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Transcript

A POLICY FRAMEWORK FOR ELECTRIC VEHICLES

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DAVID BURWELL: Good morning. Thanks for coming. Let's get started. Beautiful day here in Washington to talk about electric vehicles. This morning we're going to have – we have plenty of time. We have a two-hour time slot here, so this is a real discussion. There's lots of folks here who are as expert on this subject as the folks on this panel, although that's setting a very high bar. So I hope you will all participate.

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The report which you have in front of you is a joint product of the Carnegie Endowment for International Peace and UC Davis center for – Institute for Transportation Studies. It is on the policy priorities for advancing electric vehicles in the United States. I think the main question presented today is whether electric vehicles are an idea of the future, and always will be, or whether they're a very disruptive technological innovation that is ready for prime time and is going to have the ability to break the monopoly of fossil fuels and oil on transportation fuels.

It is a very disruptive technology, electric vehicles. It's disruptive for vehicle technology. It's disruptive for fuel technology. It's disruptive for infrastructure technology, in how we're going to charge the vehicles. It's disruptive for financing for transportation systems. If it works in – which has ended on – taxes on fossil fuels. And it's disruptive of utility administration and pricing, since it will have a dramatic effect, if successful, on utility generation and the types of fuels used to power electricity.

So it's an incredibly interesting and challenging subject. Fortunately, we have a terrific panel here. We have two of the three co-authors. All have roots in California. All know each other well and are all well-known national and even international experts on this subject. We even have one who is a – is an alumni of the Jon Stewart show who has discussed his book that he wrote. That's Dan Sperling. Dan and Debbie Gordon are here on my right, a senior associate at Carnegie, wrote "Two Billion Cars: Driving Toward Sustainability."

So it's a great panel. Another advantage of this panel is usually in Washington we have great folks who know a lot about policy but aren't really technical people at all, we just like to talk about policy, talk about things. So these folks are both policy leaders and they also have terrific technical background on the subject – they know what they're talking about. Our panel is Debbie Gordon, a senior associate here at Carnegie, is also a chemical engineer by training, worked for several years for Chevron before joining Union of Concerned Scientists. And we're very pleased to have here – her here as a senior associate at Carnegie, really focusing on unconventional oils and what they mean for the future of energy supply here.

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Dan Sperling is the director and founder of the Institute for Transportation Studies at UC Davis. He is a civil engineer by training as well as environmental policy person, and is probably a person who's had the most historical experience in promoting electric vehicles. He was promoting electric vehicles probably in the 1980s and is still at it. So the man is an obvious optimist.

And David Friedman who is a mechanical engineer by training and who's director of the Clean Vehicles Program at UC Davis – at Union of Concerned Scientists.

DEBORAH GORDON: Yes. (Laughter.)

MR. BURWELL: Both David and Debbie – both David and Debbie are – have roots at the Union of Concerned Scientists. Dan and I are both involved with the Institute for Transportation Studies. So it's a very mopped up group here, but it's very expert.

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So what we're going to do is we're going to have presentations by the authors. Debbie Gordon's going to present the report. There – then David Friedman is going to talk about state and local challenges implementing electric vehicles at the state level and Dan is going to talk more about the politics of – I don't exactly know how – he's going to be a critic.

DANIEL SPERLING: Just the opposite.

MR. BURWELL: Oh, is that – so Dan – anyway, they're going to have – talk about it. (Laughter.) So – but anyway, Debbie's first and we'll probably have presentations and then open up the mic.

MS. GORDON: Thank you so much to David Burwell, the director of the Energy and Climate Program here at Carnegie. Our third co-author can't be here, David Livingston, but I wanted to give him credit. He was a research assistant here at Carnegie who's now starting school at Oxford. So he's moved across the pond. And he's very – we have been emailing back and forth. He's very excited that this report came out. And this report actually was written when Dan was a visiting fellow here at Carnegie last spring, so Dan also has roots now back to Carnegie.

So, yes, I will brief through the report. It's – I guess this is really – as I've thought about how to – how to really approach this topic and how to approach the report, Dan and I and David Livingston spoke a lot about why the urgency. You know, as David said, you know, people have been promoting electric vehicles and other alternative transportation fuels for a very long time, but there's a sense of urgency that we were feeling and we wanted to convey that in the report. And we can talk about that during discussion to see if that's shared.

But that there, of course, are these benefits from electric vehicles in terms of air pollution, in terms of differentiating energy sources, in terms of if you may use renewable energy, in terms of climate change. There are some very clear benefits to electric vehicles that have been out there for a very long time. But there is a sense of urgency now.

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And it has to do with these promises and pitfalls. The – and the promises are just about as much promoting the move to electric vehicles in terms of very low natural gas prices, climate regulations that could help shift power plants to cleaner electricity sources, the uncertainty in gas prices which is something that I – gasoline prices, which is something that I work on with unconventional oils.

I think will be – it will build consumer interest in what alternative mobility options are because we might see a lot more fluctuation in the price of oil moving forward with all of these new oils coming onboard. And the, of course, we have these new fuel economy standards. And those fuel economy standards that are first kicking in in, what, 2016 and then again in 2025, those have credits for electric vehicles. So it creates a promise to build more electrification into the light-duty vehicle fleet.

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As equally important are the pitfalls that are confronting us right now that I think really do speak to the urgency. And I was going to talk a lot about that in the opening here because I think it sets the stage, both in terms of promoting electric vehicles but also kind of threatening what – where we might go in the transportation sector, which you'll see shortly.

But these pitfalls are these new array of petroleum resources that are global and vast, and that really helps lock in the status quo. And this renewed investment that's coming to oil is very much of a pitfall for electric vehicles. So I'd say both on what's promoting it but also what might be blocking it, together that really forms the sense of urgency – maybe, I hope, recognized politically as a new sense of urgency here.

So speaking about the – you know, what lies ahead here with oil, I think that this is a very, very important backdrop to everything transportation and beyond, actually. I this is really more about oil than transportation. So this is an Exxon graph, very interesting, that if you had looked at this graph five years ago or so, I would say maybe even less – maybe a recently as four years ago – all of those wedges would have been alternatives. But now, all of these wedges are oils.

Every single growth – except for the very top wedge in biofuels – every single growth potential in the – in the oil sector that's – and we – and I should say conventional oil is expected to plateau. It's everything we ever heard about peak oil. There is peak conventional oil. But oil won't run out. And that's why those wedges now are all different types of oils. And economics and technology are really redefining liquid hydrocarbon resources.

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So when the price of oil back in 2005, again in 2008 – again, a lot of volatility – when the price of oil really pushed upward, it turned out there was a lot of oil under the conventional oil in the ground, locked up – a lot of it not really even oil at all, it just can be made into petroleum products and it contains hydrocarbon. So again, not all of these oils are created equal. And a good rule of thumb is that the heavier the oil, the higher the carbon.

So this is probably the single largest roadblock to electric vehicles. Another oil industry projection – again, just to show you where the investment is going – you know, we live in a world where we can change the future, which is very hopeful, but it's also important to know where the capital is flowing. And the capital is very much flowing to oil, as I just said. This is BP's transportation fuel demand. You know, marching ahead to 2030, will be predominately met by oil. And as you can see here – if you can even see here, it's the thinnest little purple, you know, wedge – is electricity.

So we're not talking about a lot of capitalization from the oil side. Now, to be fair, you wouldn't expect the oil industry to provide the electricity, but this is a status quo situation and, as David said, a disruptive technology. So you are up against something that's real and happening. So why is this happening? This is – and I'll draw in here, this is the 2011 world average price of oil. So higher oil prices are moving to expand oils.

And as we step up different price points of oil over time, you get more capital potential, you get more money locked up and more reward to the investors to bring on these oils that are little bit more extreme – they're unconventional, they don't – they're not the same resources, they use different processing and they actually make a different slate of product, which is interesting. That's a topic for a different conversation though.

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So what's interesting about this is that you need that high price of oil in order to bring in electric vehicles, but with the high price of oil you bring in new oil. So that is the conundrum. And that's the single most important place for policy or the recognition that higher gas prices might not be sufficient to bring in plug-in electric vehicles in and of themselves. It's going to take policy.

So this is where we stand right now. This is from the report. It's not – it was a graph that we actually borrowed but we thought was very compelling. So this, again, shows how heavy the lift is, not to underscore how important and urgent it is to make this lift. Recent U.S. conditions put us in this dotted box, that's where electric vehicles stand right now which is why we're seeing some hybrid electric vehicles come into the market. And I do think with the fluctuating oil prices and the relatively high oil prices we're going to see more and more hybridization of vehicles.

But those are necessarily the plug-in and the real electric vehicles that have those benefits I first mentioned. You see that we have to get much higher on the gas price vertical access in order to move that box left and up to get toward the plug-ins and full electric vehicles. But then, as I just showed you, the problem is that as we get higher up on that vertical access, you get more oil. And that will – that tension will continue.

So charging onward – this is interesting – I was just talking to the World Energy Council. And so I was looking on their website and I found this, and I thought that – this was not in our report – but I found this to be very, very interesting. So they were saying the next 40 years of potential developments in global transport fuels will be spurred based on two very distinct scenarios. This is what I was just alluding to. We've got the policy path and we have the non-policy path. So there's the business as usual or there's the policy. And they're very different futures.

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Oh, it didn't come up. I'm going to have to tell you what this says now. So – no. OK, I have to tell you what it says. I'm sorry. I didn't even print up my thing. I'll do it from memory. (Chuckles.) So that on the freeway path they called it, and you can look it up and I can send you the link, it's very interesting. On the freeway path, which is business as usual, we're not charging – you know, we're not changing the market dynamics, we're just doing the business as usual – it was 3 percent of the market by 2040 would be electrified – of the vehicle market, 3 percent.

On the toll way, they called it, on the toll way path, where you had policy intervention, different dynamics in the marketplace driven by policy, it was 34 percent. So I was less interested in those absolute numbers, but I was very drawn to the relative difference between a 3 percent electric vehicle 2040 future and a 34 percent 2040 electric vehicle future. And the entire turn on that is policy. This won't happen – I guess if I had to do a takeaway here, I would say: Electric vehicles will not happen without public policy.

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So how do we get there? And these are some – we went around and around – a lot of agreement with – between the co-authors, but we were trying to figure out what were some of the nuggets – some of the hidden things that could happen. You know, we've had policies – some relative electric vehicle policies, like the electric vehicle tax credit that was just in the news on Friday. But how – what are some of, maybe, the little nuggets that could get us there, part of the sum of solutions?

One was to do a better job at motivating manufacturers. And one idea we had was the tax credits right now go to consumers. The tax credits actually could go to dealers or they could go to manufacturers as well, which would be a much more direct incentive to make these vehicles. What my colleagues will talk about, which we thought was very exciting, were the next two things, which were shining a spotlight on the states. There is a lot being done on vehicle electrification at the state.

And remember, the whole utility sector turns at the state and local level too because the electricity is generated locally. So a lot of this conversation is not a Washington conversation. A lot of this conversation is a state and a local conversation. And the cultivating local PEV clusters – that you'll see in a second in terms of a map – it's starting. The question is, how can we really keep it moving and moving fast and pushing it and giving it that urgency.

And then there's this – and I will not profess to be the world's expert, I will give more credit to David Livingston, our third author, in doing all the research. There's the huge issue of promoting vehicle electrification within the utility sector itself – huge. There are so many roadblocks to doing that. And there needs to be a revisiting of – with electricity providers so that there is this embracing. It's started. It's slow; it's very spotty from utility to utility and state to state.

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So those were the four legs that we were standing on. And this is actually the crux of our report. So don't feel you have to write everything down here as much as if you read the report this will be everything in the report. In terms of the states just showing that was the idea of benchmarking low-carbon states. So states that have low carbon electricity are some of the best options for putting electric vehicles in first if you want a lower-carbon future out of your electric vehicle.

And these were some of the states. Some are candidates that you would probably have expected and some are candidates that you might not expect that might be good candidates, like Utah. So it turns out that there are some pretty interesting states that we can promote electric

vehicles in, not only, say, the Pacific North – I mean, the Pacific Northwest or the Northeast, which have been the typical states that have done this.

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And then there are several cities that also are really shaping up – using a lot of interesting tools about parking and preferential parking and HOV lanes and tolling and just the whole way they shape up using a vehicle, giving preference to an electric vehicle. And that's something that could continue – certainly can continue and be cultivated.

So in closing out, I would say that PEV policy priorities are going to matter both in motorized and motorizing nations. I think everything we do here to advance vehicle electrification will only make more sense in some of the dirtiest cities in – around the globe, especially throughout Asia. But concerted efforts are going to be needed to move these vehicles from niche to a sustaining status.

Federal policies will be necessary, but they will not be sufficient. They're just going to be one thing to move things up, but they're not going to really kick off this market. It's really going to be state and local policies, we argued, that are going to take it from there on electric vehicles, and that any way we can think of to engage motorists, to introduce them to these vehicles, to make recharging simple – to just bridge this gap, as David said, through this disruption, going from the only vehicle we've all ever known in our lifetimes has been a gasoline-powered vehicle.

So making that transition is going to mean engaging the motorists – Dan does a lot of this work at UC Davis – working with local decision-makers, again, to help them help their communities make this transition on the road where they are, and then we thought engaging auto dealers, because that's where people make their purchase decision.

So thank you, and I will move on to David Friedman.

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DAVID FRIEDMAN: Thanks so much, Debbie. Give me one moment, and I'll – speaking of transitions, transition my slides. Great. Thank you, Debbie, David, and Dan. Thank you, everyone, for coming here.

I want to kind of work off of Debbie's talk and give people a bit of an idea on what's the state of play when it comes to electric vehicles today in terms of three really important measures: sales of electric vehicles, emissions, especially global warming emissions of electrical vehicles, and potential fuel cost savings of electric vehicles, talk about where they are today and where they need to go, and potentially how we can use, I think, some of the ideas Debbie and Dan have – are talking about to close the gaps between where we are where we need to be.

But before I talk about electric vehicles, I want to talk about oil, much as Debbie did, because oil is one of the big reasons why we're even talking about electric vehicles in the first place. So today we consume in the United States about 18 million barrels of oil every single day. And if we do nothing to improve the efficiency of our cars, our planes, trains and ships, our industry, if we do

nothing to invest in innovative technologies, that's going to rise to about 22 million barrels per day in about 20 years, 22 million barrels per day. That's the bad news.

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The good news is we're not doing nothing. For example, with the new fuel economy and greenhouse gas emissions standards, we're making progress when it comes to cutting our oil use, but we can do so much more. In fact, what our analysis shows is that we can actually cut that projected oil use in half in about 20 years if we invest in efficiency and innovation.

And electric vehicles are and can be a really important part of that investment. Whether you're talking about fuel cell vehicles like the Honda Clarity, plug-in hybrids like the Chevy Volt or battery electric vehicles like the Nissan Leaf, there's an incredible opportunity to accelerate the sales and the market for electric vehicles. And in fact when it comes to sales, the electric vehicle market is accelerating. It's actually really impressive. During the first eight months of this year, sales of electric vehicles – plug-in electric vehicles specifically – have nearly tripled compared to the same time last year. That's impressive growth.

Now, you may be surprised, because you read in the papers about, oh, all the troubles that electric vehicles are seeing in the marketplace, but that's what happens when you measure against the hype instead of when you actually look at what the real progress is. And the real progress is pretty impressive. In fact, not only have electric vehicles nearly tripled compared to last year. That was – last year was the – this year is the second year of plug-in electric vehicle sales in the modern market. Electric vehicles already, in the first eight months of their second year, have outsold hybrid electric vehicles from their second year in the market back in 2001. So not only is the market growing, they're actually already doing better than hybrid electric cars were when they were first entering the market.

Pretty impressive, but obviously not enough. We need to do a lot more if we're going to make electric vehicles a real part of the solution to cut oil use and cut global warming emissions. Basically what we need is steady, concrete progress. Electric vehicles are not a silver bullet. They're not going to save the world overnight. There isn't going to be some massive revolution in electric vehicles, and in fact the whole joke of oh, electric vehicles, they're 20 years away, they'll always be 20 years away, comes from focusing on the hype instead of charting a realistic course for an accelerated market penetration.

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I would be ecstatic if electric vehicles by 2020 were just 3 percent of the market – 3 percent of the market. If you compare that to the hype today, a lot of people would claim that electric vehicles would be failing in that scenario. That's huge progress. Accelerating to 10 percent by 2025 nationally – huge progress, and then accelerating further and further to the point where if we can meet a pace like this, if we can invest in electric vehicles to get sales like this, eventually we will effectively not even need gasoline for our cars, because whether it's through hydrogen or grid electricity, we could effectively eliminate gasoline use in our cars. That's the potential of electric vehicles. That's the potential for sales growth if we focus on evolution and don't get sidetracked by the hype of a revolution. So clearly our investments in electric vehicles so far I would say are paying off, with a tripling of sales and putting us on a path to growth.

How are they doing when it comes to global warming and pollution? Well, we just recently did a report called "State of Charge" where we looked at that question. We tried to simplify the comparison a little bit and said, are electric cars good, better or best in comparison to the gasoline cars that are out there? So deep blue means electric cars are good. It means they're better than the average compact car on the market today. The medium blue says they're actually just as good as the hybrid electric cars that are out on the market. And the best category says they blow away even the best hybrids on the market.

Now, red would be if they do worse than the gasoline cars. And I don't see any red here, because one of the good news out of our study shows that on average, no matter where you live, even in the cold-dominated regions of the nation, electric cars are going to lead to less global warming emissions on average than gasoline cars. And in fact, in nearly 50 percent of the nation, the light blue areas, electric cars are going to be even better than the best hybrid on the market. That's a really impressive place for electric cars to start off. And luckily, a lot of these light blue areas are also where most of the electric vehicles are being sold.

In the future, things look even better. We looked out to 2025 using a "business as usual" scenario, and we found that 70 percent of the country, if population distribution remains roughly the same, 70 percent of the country would be living in areas where electric cars produce less global warming pollution than even the best hybrid car on the market today, i.e., getting more than the equivalent 50 miles per gallon when it comes to global warming emissions, in some cases effectively over a hundred miles per gallon when it comes to global warming emissions.

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But that's not enough, because while that's better than the best hybrid car today, thanks to fuel economy and greenhouse gas emissions standards, 50 miles per gallon is going to be pretty common for a lot of the cars out there. In fact, when you look at on-road fuel economy, the average compact car will probably be hitting at about 50 miles per gallon. So clearly more needs to be done to invest in the grid and cleaning up the grid and getting renewable electricity onto the grid to cut those carbon emissions. In fact, we did a separate study called "Climate 30" that showed that in this time frame, we could cut the carbon intensity of the U.S. grid by about 70 percent. If you combine that with electric cars, you're talking about a serious not only oil solution, but a serious climate solution from electric cars.

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Now, let's talk about where – for a lot of people, where the rubber meets the road, and that's how much money can we save from electric cars? And there, things are actually looking pretty good as well. When you compare the average compact car today getting about 27 miles per gallon to a battery electric car like the Nissan Leaf, you can save almost $13,000 over the life of that electric car, $13,000, and that's relatively conservative, because that's at an average national rate of 11 cents per kilowatt hour and 3.50 (dollars) a gallon for gasoline. Electric vehicles can potentially tap into rates that are almost half that: about 6 cents a gallon – 6 cents a kilowatt hour, and as we all know, we can't count on 3.50 a dollar – 3.50 (dollars) a gallon gasoline for any time for the future. If you're at more like $4.00 a gallon and 6 cents a kilowatt hour, the net savings is about $18,000 over the life of that electric car. It's a lot more money in your pocket, a lot more money to help you pay for the

investment in that electric car and potentially to pay off the whole initial investment of that electric car.

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But getting those lower rates, getting those higher savings is very dependent on tapping into these kind of unique new utility rate structures – they're not that new, but they probably feel new to a lot of people – called time-of-use rates, where if you plug in at night, which is what most electric vehicles are going to do – they're not going to be charging at fast-charge stations; most of them are going to be charging at home at night – that you can tap into really inexpensive electricity. In fact, utilities generally are happy to let you tap into that inexpensive electricity, because at night, they've got a lot of unused capacity. They're basically losing money on that generating capacity. So in many ways, they're happy to sell you electricity, potentially even for a loss, so that you can shift your electricity usage to the night, because if you plug in a lot during the day, what that's going to mean for the utilities is either they're going to have to use really expensive peaking plants or they're actually going to have to invest billions of dollars in a whole new power plant to meet that demand. So they want to encourage you to charge at night.

So clearly that's what – already what electric vehicles are going to be doing. So obviously all electric vehicle owners are doing that, right? They're taking advantage of these cheap electricity rates. Well, according to a recent survey from California, it turns out not so much. Actually, in some of the biggest utility regions in California, 30 (percent) to 40 percent of the EV owners aren't using these time-of use-rates. They are losing out on the potential to save an added 200 (dollars) to a thousand dollars every single year because they're not using these rates. Well, why? I mean, it – I told you before; it's obvious you can save a lot of money with these rates. Why aren't they plugging in? Well, part of it is there are some real barriers to getting access to these rates. First of all, one of the things the survey showed is about half these people, potentially more, don't even know about time-of-use rates. The utilities don't seem to be doing a good enough job of getting that information out to consumers.

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Making things even tougher, it's actually not always very easy for consumers to access those rates. The simplest approach would be to turn your whole house over, both your electric vehicle and the house, over to these time-of use-rates, but if you're like most Americans and you turn on the air conditioning and start your washer and dryer right when you get home, you could actually end up paying more for electricity under some of these rates.

The smart way to do things would be to have a completely separate meter, basically a whole separate plug for your electric car. Makes a lot of sense: your electric car is on a separate rate, you don't start charging until later at night, you don't mess with the peaks in the grid, and the utilities give you a low rate. But a lot of people aren't doing that because it's expensive. You have to pay for a whole new meter, and the utilities have very specific requirements of exactly what those meters have to be to make sure that they're getting accurate billing information. So a lot of consumers are choosing not to do it because they think it's too expensive.

A simple solution to that is just to let the meter – the electric meter in the car or on the charger record how much electricity people are using. But some utilities, for example in San Diego,

that – they're considering things like that, or at least they're considering separate meters – in fact, they're giving away meters. But the utilities are a little nervous about doing this. Can they trust the car companies or third party vendors to make meters that are going to be accurate and fair? Also, they're concerned about investing extra money in new billing software to handle these second meters. So there's real barriers to electric vehicle consumers saving the money they should be saving when it comes to electric cars. We need a real solution for that. Debbie started telling us a little bit about that.

So we know that electric vehicles are doing well today when it comes to sales but need to do a lot better. We know that electric vehicles are – to solve that issue, we need to accelerate electric vehicle sales, and we need to start ignoring the hype. How do we do that when it comes to policy? Well, as I think you'll hear more from Dan in a little bit, we need to maintain and expand strong state zero-emission vehicle requirements. This is the push that is giving certainty to the automakers that they're going to have to create a market for electric cars, and if you push up the volumes, you can help start bringing down the costs and get people familiar with the technologies – incredibly important policies.

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Second, invest more in electric vehicles. Yes, that means more money. Electric vehicles are an investment. They're an investment in cutting our oil use. They're an investment in cleaning the air. There's a recent Congressional Budget Office study that was critical of the investments that we've put into electric vehicles so far today, because so far we haven't saved oil, and we're spending several billions of dollars or projected to spend several billions of dollars on electric vehicles. Well, guess what? We spend billions of dollars every single year supporting oil. We're not getting any carbon reductions from that. We're not getting any oil use reductions from that. We're not getting any significant reductions in oil price volatility from those investments. That's a horrible investment. We – what we need to do is really take that money and invest even more in electric vehicles so that they can cut down on the many headaches that oil brings.

And then last but certainly not least is we need to maintain the existing strong greenhouse gas and fuel economy standards for cars, and we need to put the pedal to the metal on those vehicles starting at the latest in 2025. Right now, believe it or not, despite how relatively strong those standards are, they're not strong enough to pull electric vehicles into the market. You can meet those standards just burning gasoline, mostly with conventional vehicles and some hybrids. Those standards are going to have to get a lot stronger if they're going to help get electric vehicles into the market for the long run.

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Next, when it comes to emissions, as I mentioned before, if electric vehicles are going to succeed, we need a much cleaner grid, period, end of story. There's no good reason to be investing in electric vehicles if they're not also going to cut down on carbon emissions, which means we need to invest in electric vehicles and in a cleaner grid. That means expanding on the network of renewable electricity standards that already exist across the nation. About 29 states currently have renewable electricity standards. Some of them are pretty impressive, like California's. Some of them are pretty weak. Those standards need to get stronger, and maybe we finally need to actually seriously consider a strong national renewable electricity standard so that the states that aren't

stepping up either will step on – step up on renewables or they'll be great customers for renewables from the states that are investing in that technology.

And then finally, when it comes to cleaning up the grid, we have to stop what I'm calling the production tax credit pinball, which is where every year or two, Congress has to re-up the production tax credit, which provides tax breaks for investments in renewable electricity on the grid. It's killing the industry. Every year or so, the industry has to basically worry about whether or not what the economics of their whole industry is going to be. That's got to end. It's – we've been playing yo-yo on that for who knows how long, compared to the oil side, where they're – they've been guaranteed billions of subsidies every year, again, with no real benefits in terms of emissions or avoiding oil price volatility, while the utilities – the renewable side is having to fight every single year just to renew those tax credits.

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Finally, consumers need access to reasonable rates. That means educating consumers. As I mentioned before, a lot of the people in California didn't even know about the cheaper rates. We've got to get them educated. Second, we've got to get the utilities, the auto industry and the electric supply providers together to figure out smarter ways so that consumers can have access to inexpensive charging and inexpensive electricity if they charge at night. We've got to break that barrier. We've got to get everyone in the room. The conversations are starting, but they need to be moving a lot faster, because it's just crazy that nearly 40 percent of electric vehicle owners in some parts of California aren't getting less expensive electricity that would benefit the utility.

And then final – finally, we need reasonable EV rates. In some cases, in that California case, you actually wouldn't save a lot by shifting to the time of use rates, because those utilities don't actually have very good time of use rates. So not only do consumers need easier access to those rates, those rates need to be reformed so that they really reflect how cheap it is to produce power at night and how expensive it is to produce it during the day.

So that's just a big-picture overview of the policy. I'm sure we can get into a lot more detail in the discussions. Thank you.

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MR. BURWELL: Thank you, David. That's a lot of information. (Laughter.) While Dan's coming up to the podium and putting on his PowerPoint, does anybody have a question they just have to ask to Debbie or David before – right now before we keep going? OK. I do, but I'll hold back. (Laughter.) Go ahead, Dan.

DANIEL SPERLING: I've got a lot too, so I'll – (laughter). All right. So I'm Dan Sperling, and I should say I have at least two hats that I'm wearing here. And listening to Debbie and David, I realize that, you know, we do have different experiences coming at it different ways, and so I should probably be straightforward about that. So I am mostly an academic, but I have this moonlighting job that David Burwell didn't mention. I'm a board member for the California Air Resources Board. And so part of what I'm presenting here is from the perspective of state policy, some of it as an academic. And I'll try to tell you which is which as we go along here.

So in this report, there was a – this is the – basically the sentence that I'm going to elaborate on, and that is we say that states and localities have – which have generally advanced PEV – you know, that's the new acronym, by the way – plug-in electric vehicles – so that includes both plug-in hybrid vehicles and pure battery electrics. So now you're really up with the acronyms here. They more directly – have generally advanced PEV commercialization more directly and effectively than has Washington and therefore will be – will likely be the source of the most durable solution. So the states are playing a very major role. And I'm going to focus on California because I know California the best and because California has been the leader. But there are, as Debbie said, many other states taking a lot of actions and initiatives.

So to kind of maybe summarize a lot of what you've been hearing from Debbie and David is that the future really is very uncertain for all of these alternative-fuel vehicles – electric vehicles, fuel cell vehicles. And you know, we're still very clearly in the early adoption stage. And we're clearly nowhere near penetrating to the mainstream consumers. And there's a lot of questions about how we get there and at what pace we get there. And there's the consumers – we really don't understand consumer behavior very well. What do consumers really want? What are they really willing to pay for? And as David's showed, you know, even with electricity prices there's a lot of confusion about what's going on in the marketplace. So clearly they're not responding to that in a – in a – what we might call a rational way.

[00:41:55]

There's technology – we still don't know – really know how fast battery costs are going to come down. They're definitely – they've been coming down at roughly 8 percent a year for quite a few years now, so it's very promising. But they're still a lot more expensive than, you know, engines or the internal combustion engine systems in our vehicles today. There's manufacturer behavior, how they prioritize what investments – what they're going to invest in. And every company's going to have a different strategy going into the future.

And so you know, we come down – what I'm going to be focusing on is what Debbie said and what the report is about is the policy part of that, how – what is the policy framework and policy initiatives that guide, motivate, incentivize the market and could – and you know, to a large extent – so, like, at my institute back at UC-Davis, we're doing a lot of research on the consumer especially and the policy. And we're doing a lot of analysis. But really we're at the very beginning of this experience, and we don't really know how this is all going to play out. So you know, listen to us. We think we know what we're talking about. But there is a lot of uncertainty here as we move forward, and that is indeed why policy plays an even more important role as a signal to consumers and as a signal to manufacturers.

[00:43:23]

So part of this as we move forward is there is this continuum of electrification in terms of becoming – vehicles becoming more electrified. We have the hybrid vehicles out now on the marketplace. We have – there's the – AER is all-electric range, so short, all-electric range PHEVs. That means, like, the Toyota plug-in Prius has just a small little battery, and with it you can only get about 10 miles of all-electric range. But then you have a plug-in hybrid like the Volt – the GM Volt, the Chevy Volt – that has a big battery in it, and that'll get you up to about 30 (miles) to 40 miles of all-electric range. And so you have that – you have a whole spectrum of choices in that plug-in

hybrid part of the market technology. And then you get into the pure battery electric vehicle, and you also get into the fuel cell electric vehicle, which runs on hydrogen instead of electricity but is a(n) electric vehicle.

[00:44:26]

And so there's a lot of – so the point there is that people present this as a continuum, but in reality it's not – it's a continuum in a technology sense but not necessarily in a market sense. And so we're going to have a mix of all of these going into the future, and it's very uncertain which ones are going to dominate, certainly over the next 30 or 40 years.

And to highlight a point that David made is that we do have these very aggressive new vehicle standards. California adopted it last January, the so-called 54.5 mile per gallon standards. We – my California – research where we adopted it last January, and the federal government is just about to adopt it. They just announced, you know, the details of it. And so it'll be taking place – they actually take effect in 2017 through 2025, but – and they are very aggressive. We're basically doubling the fuel economy and, you know, doubling the efficiency of our vehicles. And you'd think – or requiring it.

You'd think this would be a huge incentive for the auto makers to shift towards electric vehicles and plug-in hybrids, but yet the – if you do a rational economic analysis in – from an automotive perspective, auto maker, what should they invest in to get to that 54 mile per gallon standard? With the standards that we've just adopted, which are closer – so I put 4 (percent) and 5 percent there because those represent the improvement per year. And so the standards are somewhere between 4 (percent) and 5 percent. And you know, the light trucks tend to be closer to 4 percent; the cars are closer to 5 percent. So – but if you look at those numbers, you see that to attain that 54 mile per gallon standard by 2025, the rational response would probably be not to invest in pure electric vehicles.

And so that's – so even though many people have thought that this is the framework for that transition, it really isn't enough by itself if a company is being – now of course, every company, as I said earlier, is being very – you know, has their own business plan, their own strategy. Nissan, for instance, decided they are jumping ahead. They're going to pure electric because they thought by being an industry leader, a pioneer, that they were going to get all kinds of advantages from that, and they still believe that. But different companies are taking different perspectives.

[00:47:02]

So why are state – so I'm focusing here now with the states. And why are policymakers, and especially state policymakers, interested in electric vehicles? And this is the – you know, the litany, the list that we often hear from. But these vary – the motivations vary tremendously from across different government agencies, local governments, legislatures and different states. And I'm going to come back to this in a moment. But for California the focus has been, until very recently, local air pollution. That's the reason California has promoted aggressively electric vehicles – ZEVs, zero-emission vehicles. They've done it for air – local air pollution reasons, health reasons. But that is now switching, and the primary focus now – motivation now is climate change and greenhouse gas reduction.

And just to give you a sense of that – this is for California. This is a scenario that was generated to – as background for us developing the zero-emission vehicle mandate policy for the state. And it was also for thinking, OK, our goal in California is, you know, written into executive order by the previous governor, Arnold Schwarzenegger, and endorsed by the current governor, Jerry Brown, as well – is basically to eliminate conventional internal combustion engine vehicles by 2050. And it's not to eliminate it, but this is the – if we're going to get to 80 percent reduction in emissions, this is a scenario of how to do it. There's other kinds of scenarios.

And you might see here that fuel cell vehicles play a big role because in California – California continues to believe that fuel cell vehicles are going to play a very big role as we move towards zero-emission vehicles. And again, none of us know exactly how this is going to play out. So I call this a scenario because you could come up with different mixes here, with more pure battery electrics, more plug-in hybrids. There's different mixes. But this is just – kind of suggests the kind of mix that we're thinking is likely to happen based upon the standards and the policies that are being adopted.

[00:49:27]

And so this is the same table that Debbie showed. And you can see all these states doing different things. Now, I'm going to emphasize that first column because I'm going to talk in a moment here about the zero-emission vehicle program, which has really been the primary policy to date for promoting, pushing forward electric vehicles. And it's not only in California because California adopts it, but then there's 10 other states that also adopt it when California does. And so those are all the states there that are adopting it. And this represents about a quarter to a third of the new-car market in California that are adopting this. So this is – so this goes way beyond California, and this does represent a big part of the overall market.

So for folks in California, this is just a list of some of the policies and regulations that are in place already, all except for the very last item here. And these are the categories that Debbie put up that we – that we emphasized in the report: motivating the manufacturers and the consumers. So you have the ZEV mandate that I talked to you about. We have a consumer tax credit, the vehicle standards, carpool access, working with local governments and local agencies and other kinds of organizations and working with electricity suppliers – a lot of things that David talked about.

The last item here is cap and trade revenues. So I know here in Washington you can't talk about cap and trade and climate change – (chuckles) – but I can. (Chuckles.) And in California we do have a cap and trade program. It's in place. We're actually doing the first auction of it in another month or so – two months. It's all set up. It's – we did a practice auction with all the companies, and it went very well. And this is – when I say "we," that's with my Air Resource Board hat on because ARB is – CARB is the one that's managing the cap and trade program. And so you know, that will be enforced as of January.

[00:51:44]

So OK, the ZEV mandate – you know, many of you probably heard a little bit about it. It's had a long, torturous history, painful to many people. Many people say therefore it's been a failure. But it really had – and one can debate about it. You know, we talk – there's even movies about it, "Who Killed the Electric Car?" But in the end, it did compel the car companies to keep investing

and developing electric drive technology for the vehicles. And so from that point of view, it was a success. But in any case, you know, it's gone through this history. It started out very aggressive in 1990, and it was, you know, basically watered down every year after that. And now for the first time – just a few months ago California revised the ZEV mandate again but – and for the first time, it made it much more aggressive than it had been.

So you know, I'm going to show you these numbers in a moment right here. And these are – this is essentially what that mandate requires. This is for California. And you see the sales going up to 14 percent of new vehicle sales in 2025. So that number's about the same for all the other 10 states. It would call – for them to meet it, it would require them to – for the market to be about 14 percent ZEVs. Now, ZEVs is – you know, if you want to be accurate about it, is not really a ZEV for many reasons. One is, of course, there's upstream emissions from the power plant. But the other is even some of these vehicles, like the plug-in hybrids – we call them part of the ZEV category, and obviously they have a gasoline engine in them, and they have some emissions as well.

[00:53:42]

But in any case – so there's a complicated formula that weighs – the pure battery EVs get a lot more credit than the plug-in hybrids. So if you get into the details of it, it's a lot more complicated. But this is kind of a summary assessment of what it implies. And again, this is for not just California but the other 10 states. So the actual sales would be different in the other states, but the percentage would be the same.

And I want to – so for California – so California is doing a whole series of things – actions and policies. One of the things that I do want to mention is that it's creating the research foundation to move ahead, not only in terms of funding technology development but in funding the policy research, the market research, a lot of the issues that David was talking about. And so I'm very pleased that, you know, the state did fund an electric vehicle center in my institute at UC-Davis that receives continuous funding from the state. But it also is receiving increasingly a lot of funding from industry as well and doing all kinds of these kinds of studies.

And it's really essential; it's part of what Debbie's talking about is, you know, how do we create the ecosystem, the foundation for moving forward? There's a lot of changes. As David Burwell was saying – he was referring to disruptive – you know, this being disruptive. And to the extent it – really it is disruptive in so many ways, that means, you know, there's so many pieces of the puzzle that have to be addressed. And it doesn't just happen. You know, all the different pieces of it just don't change by themselves. And so you need a – you know, having a universities and research centers involved in this to support this is really crucial.

[00:55:26]

Another part of what California's done that other states are starting to embrace is several years ago, 2010, we created a collaborative. So we got all the key government agencies together – Public Utilities Commission, the Air Resources Board, the Energy Commission. And we also got together the car companies and the electric utilities and also brought in some of the NGOs – you know, UCS, David's – Burwell – David Friedman's – got a lot of Davids here – David Friedman's organization, Union of Concerned Scientists – (inaudible) – a member of that and a lot of other NGOs too – put together this report, "Taking Charge," that came out December 2010 and has –

basically provides the framework. In fact, a lot of our report – a lot of the ideas came from – that Debbie Gordon and I did here that we're presenting – a lot of the ideas came from this report here in California.

And just now, actually on this Friday, this report's going to be unveiled in two or three days. Governor Jerry Brown is laying out an action plan. He issued an executive order a few months ago, and now we're putting together an action plan. We have all the industry people and government people are meeting on Friday, and we're going to be trying to finalize the details of this action plan. But basically it's to support those ZEV goals of a million and a half vehicles by 2025.

[00:57:03]

And – but also – you know, so this has been to give you a flavor of the kind of initiatives that are needed at the, you know, local and state level. So one thing Jerry Brown did is he made available $100 million for fuel – for electricity charging stations. Now, this money came from a negotiation with one of the electricity companies way back – you remember the old deregulation fiasco in California, 2001, the Enron and all that. And a lot of them did some abusive, illegal things in California in terms of distorting the prices and the market. So there's still negotiations going on.

So this is with one of the major companies, and so there's $100 million that, as part of the negotiation, is now being used for electric vehicles. And so this is kind of a reconfirmation by the state and by the governor that the state really is committed to a very aggressive position with electric – with zero-emission – it's very clear the ZEV executive order, a ZEV plan, meaning including hydrogen.

So there's lots of questions when we look on the infrastructure side in terms of, again, you know, how does this actually take place? So I talked about – there's a lot of questions about the vehicle technology, but on the fuel – on the electricity infrastructure there's a lot of questions. What do we want – what do – kind of infrastructure do we need? Obviously you need – in every home you want charging or every – in every apartment complex you want charging capability. But then do you have charging at workplaces, at big box retailers? Do you – and then if you do in all those places, kind of who's paying for all that? And then do you do 110 volt, which is what we have in our house; 220 (volt), which costs extra and lets you get your vehicle charged in about four hours; or do you do really fast charging, which will charge up your car in about 20 to 30 minutes but costs a lot more money and has more challenges?

[00:59:12]

So question is where do you put these? How many do you have? Who pays for it? And a lot of it comes down to what do people want? How are they going to use it? And we – we're struggling with that. You know, I know in our airports in California, they all have these 220-volt chargers. That's a waste of money; no one needs that because you go to a(n) airport, you know, you're going to be there for at least eight hours. So 110 volt is plenty. You know, you could put 110 volt in many, many of the locations. But instead, many of them just – you know, without thinking just put these 220-volt chargers in.

So there's a lot of rethinking – you know, this is a – you know, a big transformation we're talking about. And something that states, especially local governments and utilities, have to pay

attention to is permitting for chargers. And I just couldn't help but put this little – this is what an individual has to go through. (Chuckles.) This is kind of exaggerated. But you know, this is all the – all the actions that have to take place, all the permits and approvals that have to take place to be able to put in a charger for public or home. It's not really this bad, but a lot of effort is going into streamlining it.

[01:00:33]

But again, you know, this is – here's a slide, a picture I couldn't help but show. You know, as I said, you know, there's a lot of issues about how do you set these charging infrastructure. So here they went and they put one in front of a handicap space, you know, near a McDonalds. Now, if you go into a McDonalds, first of all, you're not going to be there very long, right? FAST food, right? That's the whole point. And then put it in front of the, you know, handicap space on top of that. You know? OK, anyway. So – (laughter). That was not in California, by the way. (Soft laughter.)

So anyway, just to talk a little bit about that, the charging side of it – when we talk about the role of states and local governments, the charging is really a big, big issue, trying to figure that out. And it's important because also we don't understand very well for consumers how they make their choices. How – do they really need chargers out there everywhere before they're going to be comfortable buying vehicles? In fact, do they need fast chargers, you know, the really fast chargers, and where and who pays for it? So a lot of effort is going into – like, you know, like Jerry Brown just allocated a hundred million dollars, you know, for chargers. OK. Well, where do these go? What kind of chargers? So we're working this out. So this is – at my institute, this is, you know, (not ?) funded by the state and by industry. So these are some of the things that we're looking at. Where do they want it? So there's been lots of analysis.

One other thing I want to mention is, you know, David and Debbie both started out their talks talking about oil. And that was very good, you know, perceptive, correct way to think about it because that is the incumbent technology fuel. That's what we're competing against.

So one of the policies that's been put in place is a low-carbon fuel standard in California. It's also in place in Europe and a few other places. And I mention this as another policy that can support the transition to electric vehicles, and that is because whoever provides the electricity, when you have a low-carbon fuel standard in place, will therefore be doing a lot better than gasoline, as David Freeman mentioned. And so therefore, if you're an electricity supplier, you're earning credits. And you can sell those credits if you have a low-carbon fuel standard. They're very valuable. And it can amount to several hundred dollars per year, every year, for an electric vehicle. So this provides another policy framework for incentivizing the transition.

[01:03:24]

And so this is the list of – I gave you of all the policy – or of the categories – you know, some of the categories that we had in our report and some things California and other states are doing. But I'd like to close this by emphasizing that, you know, this is not a done deal. And Debbie and David both made that point clear. This transition has a lot of uncertainty associated with it. There's a lot of questions. So I thought I'd just kind of summarize, you know, why there is these questions from a – from a policy perspective. And there is a lot of questions. You know, how

much government intervention are we comfortable with in making – in doing this transition? And part of that has to do with, you know, how – what do we think is the real cost of the pollution that we're avoiding and the climate and the greenhouse gases we're avoiding, and how urgent is it to address those externalities?

[01:04:28]

And once we decide, you know, if you're, you know, committed to that, then the question is, how do you go about it? But there's a whole slew of policy instruments that we've been talking about that can be used. You know, some are more effective than others. Some are easier to do. And so in the end, the policy approaches really depend on, you know, what you believe? Do you believe that electric vehicles are expensive and have limited market potential, or do you believe they're attractive and sustainable and likely to dominate?

And you know, we can do all the studies, but – and you know, we have answers to many of these, but there's large uncertainty bounds around all of those answers. And so to – you know, the summary statement that I started with, and that is that states and localities which have generally advanced PEV commercialization more directly and effectively than Washington, will likely be the source of the most durable solutions. And I actually have a question mark and an exclamation point – (chuckles) – because we think that's true. I think – in the end it is – has to be true, because most of the – whenever you get into charging, that is definitely in the local state. A lot of the incentives that we're talking about are in our political system inherently state and local initiatives. So the federal government definitely has a role. It has – through the vehicles standards; it is through some of the things David talked about in terms of the electricity, it could – or it could through the electricity, on the electricity system side. But in the end, I think almost everyone would agree that it really comes down to strong local and state leadership.

So, thank you. (Applause.)

MODERATOR: Thank you, Dan. And I think this last slide is a good way to kick off the conversation because having a statement with a question and an exclamation mark is a good summary of this conversation. Heard a lot of "coulds" and "maybes" in this. And so hopefully we'll have a very robust discussion. We can open up that now. I do want to ensure the audience that your name – first name did not have to start with a D to be on this panel. (Laughter.) So these folks really know what they're talking about, obviously.

[01:06:50]

So in honor of that – of respect for that, I'm going to give the panelists an opportunity to ask a question of each other first if anybody has a question.

Debbie?

MS. GORDON: So I think as you all heard, we're – metaphorically and physically, PEVs are at a fork in the road here, and so I would ask the same question to David and to Dan, but from each of their perspectives. So looking 20 years out, you know, we always have this for anything, any alternative to oil. And internal combustion engines, it's always this proverbial 20 years from now and then it is 20 years from now and it's still 20 years from now. So the question is, looking 20 years

out from now, we talked about 2030 to 2040, so pretty much 2035 – so David, if UCS had its policy mix – you know, could just ordain that and make that happen –

MR. FRIEDMAN: We can.

MS. GORDON: (Laughter.) What share – (laughter) – what share of vehicles on the road would be PEV, electrified vehicles?

MR. FRIEDMAN: By what date again?

MS. GORDON: Twenty years out.

[01:08:00]

MR. FRIEDMAN: Twenty years out. Twenty years out, in terms of new vehicle sales, it could be a third to 40 percent if we had all the right policies in place. In terms of vehicles on the road, it would probably be about half that because cars stay on the road for about 15 years, so it takes a lot of time for those vehicles to turn over. But in 20 years we really have to be in this place. Dan kind of showed you that curve with the valley of death and exponential growth of vehicle sales. In 20 years, if we're still in that valley of death, what we've basically decided as a country is, we're not – we're not really that concerned about all the problems of our oil use. We're really not that concerned about climate change. We're really not that concerned about consumers spending tens of thousands of dollars over the life of their car for fuel. So we've got to have electric vehicles and many other technologies in 20 years over that (hump ?), out of that valley of death and really accelerating so that we can cut our oil use in half and meet our long-term greenhouse gas goals and save people a lot of money.

MS. GORDON: And – thank you. And Dan, from California's perspective, with what the governor's putting out, with everything you're working on, if everything happens according to plan in California, what share would PEVs be in 20 years?

MR.SPERLING: Well, the – as you saw, the ZEV mandate, which is, you know, in legal requirement in place, it would – in 13 years it would be 14 percent and increasing at a very rapid rate. So I guess I'd have to do a quick calculation. But it would probably be similar to what David just said.

[01:09:43]

You know, I – one little thought about this is that – going back to David Burwell's opening comments – you have these incumbent technologies and industries. And if we really follow that path, that trajectory, the oil industry, in terms of oil, is basically out of business. I don't think they're going to lay down and let that happen in a straightforward way. And that is one of the reasons that hydrogen plays a big part in this, because hydrogen is something that inherently can be an oil industry business. In fact, they have said that many times. They – many of the oil companies have had hydrogen subsidiaries in recent years when, you know, they thought it was going to happen sooner. So they're very – I don't know about very, but they're comfortable moving in that direction if that market evolves. The electricity part of it they really don't like at all, because they just feel like they have no role to play in it, except for selling natural gas to the electricity generators. And so

we're – right now in California but also in Washington, the oil industry is very aggressively pushing back against basically all of these clean energy policies, and they're fighting very aggressively, trying to undermine and extend the – push the low-carbon fuel standard in the future, you know, in Washington, with the renewable fuel standard. They're trying to, you know, slow down the requirements for advanced biofuels. So you know, that's the political – it's not just the political, it's the, what would you call it, industry organization perspective. I mean, this is very much a reality of these industries. And we're going to have to figure that out as we move forward.

MR. BURWELL: Thank you. Anybody else or one – let's open it up for discussion.

We have – we have Anisha (ph) here who's got a microphone, so please just give your name, and Victoria – oh, Victoria. We've got two folks here from our team.

Q: James Sang (sp). This is a very simple baseline question. On figure one of report, can Mrs. Gordon say a few words about the assumptions that go into the X axis? I presume different technologies line up different.

[01:12:13]

And also, actually related, Professor Sperling, did you say that battery technology is improving cost at 8 percent a year?

MR. SPERLING: Yes.

Q: Because that – in 16 years that would say that basically you push your X – Ms. Gordon's X axis off to the left-hand side, and in 32 years it's off the thing, which is – I assume it's not very realistic to assume –

MR. SPERLING: That's not percentage points a year. That's 8 percent. So if you go 8 percent from a hundred, OK, then you're 92 (percent). So it becomes a shrinking cost –

Q: OK. So it's not a constant rate of –

MR. SPERLING: OK.

Q: But on the other hand, on changing technologies, how does that X axis look – (off mic)?

[01:12:58]

MR. SPERLING: Well, the DO (ph) – OK, so I think – well, Nissan is now saying it's down to about $500; actually, privately, they're saying even lower. And what's that?

Q: (Off mic.)

MR. SPERLING: No, no. For today, for the new – so they're coming out with a new battery and technology in a couple – few months. And you know, the targets are around 200 (dollars), 150 dollars. I think those are pretty aggressive. So I think that, you know, given lithium ion technology that we have today, you know, you can get it to about a third – you know, certainly a

half to a third. And then of course there's new types of, you know, battery technologies that are being researched and developed. So – but it's always going to be – I mean, batteries inherently are going to be expensive and bulky and – you know, they're never going to become, you know, $50 or something like that.

Q: (Off mic.)

MR. SPERLING: What's that?

Q: (Off mic.)

MR. SPERLING: It's a mix –

Q: (Off mic.)

[01:14:23]

MR. SPERLING: At $150 it's still going to be – as a new car purchase, it's still going to cost more than a conventional vehicle. But you know, as David pointed out, you save – of course, it depends on, you know, electricity price you're paying and price of oil and so on. But you should be more than breaking even over the – certainly over the life of the vehicle. But you know, again, how do consumers behave? This is why consumer behavior is so critical and policy is so critical. I mean, the new vehicle standards we're just adopting for vehicles, you know, we need – why did we need regulations to tell people to save money? I mean, with these new regulations, people will be saving huge amounts of money over the life of their vehicle. But when people make purchases, they're not willing to pay a thousand dollars extra for their car, even though it's going to to save them thousands of dollars in the coming years. And so you know, there's the consumer challenge and there's the policy challenge.

MR. FRIEDMAN: And I think this is also where some of the education and people getting used to new technologies is going to become so important, because right now when a lot of people walk into a showroom, where's the dealer steering them? All too often, the dealer is steering them towards what they're used to selling, what they're comfortable with selling. If you look at advertising in the marketplace, a lot of that, in many cases, is still steering people to what they're used to buying. Part of what we need is not only a paradigm shift in terms of policy, but a paradigm shift when it comes to marketing these vehicles so that saving money the day you drive off the lot because you're saving more on fuel than you're paying in increased loan costs becomes the way more and more people think about things, as opposed to how much am I paying right up front. That's not going to happen unless you see the auto industry really kicking in.

[01:16:16]

And we are starting to see that. Look at Ford and their marketing around their EcoBoost. It's really exciting. They're bragging about how a six-cylinder engine can outperform an eight-cylinder and will save you money. That's the kind of marketing we need more and more. Ford also bragging about 47 mpg for their new Fusion – new Fusion hybrid. If we can get more of that, I think consumers will much more easily start to think about things in terms of what's my payoff in

three years or five years. And if electric vehicles hit $150 per kilowatt hour, then you're talking grand slam.

[01:16:50]

MR. BURWELL: So, I saw a lot of hands. So let's take three at a time and then we'll answer them – (inaudible). Nick first and then you and then somebody over here.

(Inaudible.)

Q: I have a question about the ZEV mandate. I'm Nick Nigro from Center for Climate and Energy Solutions. So it's – I talk to carbon. It's my understanding that the states – that the ZEV states, they have to proactively adopt the new standards? They can't – they don't just automatically adopt them. So assuming that's true, what is California willing to invest to implement the ZEV mandate, and do you think there's a risk that other states won't follow because of that requirement for investment?

MR. BURWELL: OK. (Inaudible) – investment and does it have a mandate.

Sir, name? What's your name. We need a microphone over here.

Q: Two things that might be considered and other people are talking about are, one, the concept of the autonomous driverless car that can't get in an accident and (doesn't ?) park after you get where you're going, has been touted as a solution; and orders of magnitude talks, improvements in fuel cells that might make the $4,000 fuel cell going into a $200,000 car that sells for $40,000, is much more affordable.

[01:18:24]

MR. BURWELL: So first of all, what's your name, and what's the question exactly?

Q: OK. My name is Mike Zome (ph), and I'm interested in – the question is, have you considered working with the groups or using the results of the groups that are talking about technology improvements which they claim are just around the corner, including driverless cars and very high-performance nanotechnology fuel cells?

MR. BURWELL: Assuming some of those are electric vehicles – (inaudible).

Emil.

Q: Emil Frankel. Debbie, I want to pick up on your initial comment and really the thrust of your comment – of your discussion, which is that there has to be a policy intervention in order to make this happen, if you will. And a couple of comments that I'd like particularly you and Dan to speak to – and Dan did make some reference to this – that first of all, if one assumes that the goal – the policy goal is to reduce oil dependence – not necessarily for its own sake to have an electrified fleet, but if one assumes that the goal is to reduce oil dependence – I guess I would make the point that while disruptive – disruption may be an appropriate word to apply to technology in the marketplace, it certainly is not an appropriate word to apply to policymaking, particularly in this

environment. I think the expectation of disruptive – if I can use that word – policy to reinforce electrification of the fleet is very unlikely under the best of circumstances, and these are close to the worst of circumstances, almost no matter what the outcome of the election is. It'll be influenced by the election, but – no matter what.

And the power of the oil industry that Dan made reference to I think should not be just noted. (Laughter.) They're putting huge amounts of money, enormous amounts of money into this election, at least into the presidential election, and I assume through super PACs and other direct interventions and in congressional races as well. All this has to be considered.

[01:20:52]

So I guess I would make the point, the comment that I'd like you to speak to, that if the goal is to reduce oil dependence, aren't we better off trying to reinforce policy trends and market trends that we see it – oil – gasoline prices are going up; there'll be ups and downs, but the trend over time is going up, so the market seems to be more interested in efficiency, if you will. The CAFE standards – very aggressive CAFE standard about to be implemented. While there's some resistance overall, it's been pretty remarkable that there is pretty broad acceptance of it, except for, you know, tea party Republicans, I suppose.

Aren't we better off building on that and driving efficiencies – combination of efficiencies and the internal combustion engine? There are still efficiencies that can be applied or technologies that can be applied to efficiencies to get even more – beyond the 54 miles to a gallon, along with the kind of hybridization that we've seen, combination, as opposed to expecting that we're going to get a policy intervention that will drive towards a fully, if you will, electrified fleet?

MS. GORDON: Can I – can start first, because I'll be quick on Emil's .

MR. BURWELL: OK. I'm shocked to hear you think – say that.

[01:22:16]

MS. GORDON: We'll do – we'll do Emil first. Although oil – reducing oil dependency has been a goal, you know, that it – since the '70s, that we've really been on in the country, and, you know, theoretically, I mean, it's still really important to be less dependent on something, I think that this is a paradox of plenty that we're going to confront with oil. It's going to be a lot, and it's hard to talk about getting off something when you have a lot of it. It's very attractive to be, you know – use something when it's not a shortage. There's no shortage in oil.

So I think that it's going to be other issues that – not to minimize using less oil; certainly a goal. We should definitely use less oil. But it's going to be resilience and finding substitutes in the transportation sector, which will still remain – if you make the vehicles more efficient, it's still an oil-based system. And when you're – when you have no substitutes, that creates its own sense of market failure.

So that's, I think, where electrification fits in, not for the entire fleet, but for a significant share of the fleet, having this resilience built in through a substitute for oil in addition to using oil more efficiently, with fuel economy standards, which is also important. I think that is going to speak

ultimately to the public because there's going to be volatility in the oil market. And so being dependent on one thing when there's a lot of volatility in prices is going to be very confusing, confusing politically, confusing publicly. So that would be my answer to that.

[01:23:48]

MR. BURWELL: Let's turn to Dan to ask – answer the question about California's commitment to implementation of ZEV, and then David's going to respond to this question.

MR. SPERLING: Well, I certainly can't speak for other states on what they're going to do with ZEVs, that when we passed the ZEV mandate rule in January, the major concern that car – so the car companies, you know – again, you know, back to this disruptive idea, you know, I actually, you know, kind of colloquially, I buy into the disruptive idea. But in – you know, really in many ways it's not disruptive, really. It – for the auto industry, it's – they're on this continuum. They've been on this continuum towards electric drive. It's not – I don't think for the – that industry it's disruptive anymore. There's no reason – it doesn't really – they're on that path.

So – but the main issue when we passed that ZEV mandate was the car companies came to us and said, OK, we know California's committed, you're making the investments, you'll do the infrastructure, you'll do the policies, but what about those 10 other states? We don't trust – we – you know, we're worried they're not going to be making the same commitment, and we're going to be left out, you know, to dry because we have this mandate to sell them and, you know, there won't be any market there, because the infrastructure won't be there, the policy won't be there.

So I've talked to – I have talked to the states, and they appreciate – many of them appreciate that. (Chuckles.) And they say now that the mandate is being put in place, they have the – they can go to their legislatures, and they can go to their governors and get that kind of support to move forward. But, you know, Nick's really right. That's really a big concern that exists for those other states.

[01:25:41]

MR. BURWELL: The question about how you can combine benefits of the electric vehicles with self-driving cars – (inaudible) –

MR. FRIEDMAN: Sure. And let me actually in a way combine all three questions, because the mistake we make over and over and over again is what's the answer? What's the technology? What's the solution? And just because we're talking about electric vehicles today, I would be surprised if anyone here thinks that there is the answer, the silver bullet.

What we need is a portfolio of solutions, a mix of solutions. That's what's going to drive our oil use in half in 20 years. That's what's going to cut carbon emissions. So yes, we need to invest in technologies that will allow us to get around in smarter ways so that we're not all just driving around alone stuck in traffic in our cars, you know, burning a lot of gasoline. We need electric cars to be a key part of it. We need much more efficient cars to be part of it. We need planes, trains and ships to get more efficient.

So what we really need, and I think what we really need to push back on the oil industry, who's making a lot of money maintaining the status quo and is going to fight to keep it that way, is a broader vision and a broader national goal to cut our oil use in half in 20 years and to get the suite of policies in place to support the different technologies.

And I know especially here in D.C. it's easy to be pessimistic about all that stuff, but I've got to say, we just put together a policy that's going to nearly double fuel economy in 20 years. California, for the first time in decades, just dramatically increased the zero-emission vehicle requirements. There is actually a lot of progress happening, and I think once we get past these tough economic times, you're going to see a lot of people wanting to invest in these solutions because it's better for our pocketbooks, our health and our national security.

[01:27:27]

MR. SPERLING: And let me say one policy wonk idea is that we are putting in place the kind of policies that are performance-based and market-based, you know, like the vehicle standards are performance-based. They don't pick winners. We can get in – there's nuances to it, but mostly don't pick winners. The low-carbon fuel standard, you know provides industry the – with the ability of responding any way they want. So we are moving towards policy instruments, you know, that lead to the portfolio approach that David Friedman is talking about, and I – I'm – you know, I can't believe I didn't use that expression too, because, you know, that's what I preach all the time also.

But from a policy wonk idea, we want those broad policy instruments that leave it to industry and consumers to make the choices, and then we do need the other policies to, you know, fix the little pieces, jump-start a few things here and there. But I think from a policy perspective, we're sort of moving in the right – in the right direction.

[01:28:26]

MS. GORDON: Can – David, can I just – just to fill in a little bit of the answer to the question over here is that I don't know that people realize now how electrified their cars are. I mean, cars are – really have become computers on wheels. In fact, a lot of the new cars now don't even use a key; you just press a button to start them. So that's just to tie into what you were asking, sir, about, you know, whether it's vehicle automation or any of these novel technologies. The cars are setting themselves up, actually, to be electrified, because they're basically electrified now.

MR. BURWELL: OK, I'm going to take the moderator's prerogative to ask the first of the next three questions, and then we'll get two others. This is a policy question. So the CBO just came out with a report last week saying that, well, this new fuel economy standard isn't really going to do much for greenhouse gases and promotion of electric vehicles, because for every electric – it's a fleet – because it's a fleet average for every electric vehicle, this zero greenhouse gases, the companies are going to be able to lower the mileage per gallon of the rest of their fleet. So it's actually – what you save on the electric vehicle is going to be taken away from a lower efficiency on the fleet.

So, you know, from a policy perspective, is – are – is this fuel economy standard and are ZEVs or electric vehicles really going to have greenhouse gas benefits net fleet, or are we going to need something like a gas guzzler tax for the low – for the other cars to make sure that that doesn't occur, that we're all moving forward? So that's a policy question. (Inaudible.)

And then we'll take two more. You over there, right there, and – well, then, you for –

Q: Hi, there. Damon Fordham with Project Performance Corporation. It's exciting to be here this morning. I'm about to kick off a study that FHWA is just about to initiate for looking at EV market penetration and the implications on Federal Highway Administration and the state DOTs from a financial perspective, so that's really an interesting study, and maybe talking with some of the panel members for that study.

But my question is really kind of an on-the-ground question about climatic zones. And a story that one of my team members shared with me recently was that electric vehicle purchases either in very hot climates, where they have to use the air conditioning, or in colder climates, where they're running their heaters, seeing a really unexpected drop in their range, and in fact even returning vehicles, and dealers telling them that, you know, we've had this problem a lot, where people's range is just severely impacted on whether you're running air conditioning or heating.

[01:31:14]

And I wondered if from a sort of market penetration perspective, looking at areas of the U.S., at least in the – maybe in the short term before the battery technologies improve, some of the more temperate areas, do they seem to do better in terms of market penetration scenarios for shorter-term electric vehicle penetration?

MR. BURWELL: OK. Best places to focus for EV penetration.

Q: Yes, my name is David Wagner. I'd like to ask a question about consumer preference. Most consumers or many consumers buy a car on the basis of its performance, how fast it accelerates, how fast it will go and what its range is. And could you discuss please what you see this evolution as being by 2025 and 2050?

MR. BURWELL: Vehicle performance, OK. Who wants to start – respond to my question about the CBO report? What's the answer to the CBO report?

MR. SPERLING: If you think short-term, you don't – you're going to make a lot of mistakes. I mean, the whole point of all this is not to get improvements this year or next year, you know. And that's the flaw in that whole report is, you know, the whole – we're doing this to get us on a new trajectory and to – we're making investments in the future. And they ignore that. So that's the short answer. (Chuckles.)

MS. GORDON: And then I think it goes back to what we were saying earlier. The federal policies will be necessary but not sufficient. So if they're imagining tax credits as the only policy out there pushing electric vehicles, it's going to be a really expensive policy. But when you match it up with all the state and the local action, that could just be the amount that pushes a consumer, you know, when they're making their decision to buy the vehicle. And then when you multiply that, the benefits become far greater.

[01:33:16]

Your other question, David, was CAFE standards. CAFE standards – I mean, it's great that we're finally moving them, but we're stuck with the way they were designed back in the '80s, and they're designed as a fleet average. They're not designed to make every vehicle meet a certain level. So it really doesn't matter if you put in a very efficient vehicle, a highly efficient electric vehicle or a middling-efficient hybrid vehicle. It's still going to average out, and it allows the F-110s to be made – you know, the Ford trucks – to be made to average the vehicle fleet. And that's really an artifact of the standard.

MR. SPERLING: Debbie –

[01:33:57]

MS. GORDON: I don't think it speaks to the vehicle.

MR. SPERLING: But the issue there, actually, is that built into the standards were special provisions for electrical vehicles. They were rated at zero grams per mile, and they get double credits, and so I think that was the real issue on that, is that indeed you will – I mean, because of those provisions, you will reduce the amount of greenhouse gases you would otherwise have gotten. It was kind of not so explicitly stated, but that was the underlying motive. But the answer to that is again what I said before, is that again, this is a short-term, you know, fix to get things started, not the long-term.

But as you say, Debbie, in the longer term, it is a standard that allows, you know, a whole mix of vehicle technologies.

MR. FRIEDMAN: Well, and that's why you need to clean up the grid so that you don't have this problem. If you have a grid that's 70 percent cleaner, then you're going to deliver real greenhouse gas emissions (sic). And if you get rid of this zero-gram-per-mile crediting system and tighten the standards in the long run – remember, as Dan said, we're talking long term – post-2025, instead of 163 grams per mile, we need to be talking about 100 grams per mile, eventually 50 grams per mile, setting the standards tight enough in the long run that they will help drive electric cars. But that's – you know, we got to get the market going first.

MR. SPERLING: And the other – the answer to the other – oh, are you going to –

MR. BURWELL: Well, I was just saying we do have a gas guzzler tax. I was just wondering – but the cars then – you know, they produce them just a little above so they don't have to pay. So wouldn't this be, like, an interim solution to have, just raise the existing gas guzzler tax to the point where they can't quite cheat on that?

[01:35:40]

MR. SPERLING: I'm all for it. (Chuckles.)

MR. FRIEDAN: Well, what we – part of what we really need is a – I mean, again, just as with technology we need portfolios, we need a policy portfolio. And on top of the greenhouse gas standards, something that we've looked at in California before and in other places is a system called

feebates. So in some ways it's even better than these – the gasoline taxes. Debbie helped invent the concept in California decades ago. (Laughter.) And it –

MR. SPERLING: Twenty years ago. (Laughter.)

MS. GORDON: And one year – (inaudible) –

(Laughter.)

MR. : It didn't solve much. (Laughter.)

[01:36:12]

MR. BURWELL: One year we're going to actually implement – (inaudible) –

MR. FRIEDMAN: But I think the other thing, kind of hopping to one of your other questions about electric vehicles and weather, I mean, you can't repeal the laws of physics. And yes, if you need a lot of energy to heat or cool your car, it's going to reduce your range.

But part of this, I think, again comes back to hype. Sometimes I think some of the car companies tried to get out there and only talk about their highest range possible. And I do think that can set consumers up for some disappointment, because the reality is depending on where you live, your range will vary. Look, it's the same thing for gasoline vehicles. You just don't notice because they're so inefficient –

MS. GORDON: It's true.

MR. FRIEDMAN: – and they've got such big gas tanks that you can't tell. With electric vehicles, they're so much more efficient, and they carry less energy. It's a lot more obvious. The combined solutions to that are one, being straightforward and honest with consumers; two, continuing to advance battery technology so that it isn't as much of a problem; and three, investing in fuel cell technologies which won't have that same problem and will be perfect for people who want longer range. If you want shorter range, battery electric vehicle will still be fantastic for you even in cold or hot weather. You just have to target the technology to the market needs.

MR. SPERLING: And on top of that is the plug-in hybrid. So, you know, you can get a Volt or a plug-in Prius that won't have that – you know, that – the all-electric part of it will be affected, but you still have the gasoline engine to go with it. So it goes back to what David said earlier, the portfolio approach on technology.

[01:37:47]

MR. BURWELL: So I think the broader question here is is there a geographic kind of game plan for the – for the industry? Is – where geographically, whether it's – you know, what's cold, what's not cold, what's hot, what isn't hot, what states have a law, what cities have the infrastructure? Who is thinking about a marketing plan for EVs that – geographically? How is this going to play out?

MS. GORDON: Dan's moving in.

MR. SPERLING: Well, we got the car companies out here that – (laughter) – they're the ones, actually.

MR. BURWELL: (Inaudible.)

MR. SPERLING: But there is the policy side of it. And, you know, and the question is, are we going to devise policies that do encourage the use of electric vehicles in those places that have cleaner grids? And certainly individual states are adopting their policies. And, you know, Debbie actually might want to elaborate on this, because she – and (David ?) actually – both of them did the analysis across states.

[01:38:45]

But, you know, the – one of the questions is the policy part. Like, the vehicle standard – the national vehicle standard, the greenhouse gas CAFE standards, they don't distinguish between, you know, a state that has 90 percent coal and one has, you know, no coal in terms of giving the rewards for the electric vehicle. You get the same reward – the car company gets the same reward. And one of the policy questions that hasn't been addressed yet is should we change that in a way that does reward buyers in states with clean grids relative to others?

MS. GORDON: And that is a question we grappled with a lot when we wrote the report, and we thought, you know, there are moments in time, and we thought that this moment in time is about advancing this diversification in the transportation fleet, so further differentiating who – which type of electric vehicle might or might not benefit the market. It was the – we decided it was better to just move electric vehicles into the market from that perspective.

But there is a temporal nature to this. At a certain point in time, it's not beneficial to just blindly move, you know, a new technology into the market. Then you start to divide out, well, which of this new technology, now that it's, you know, beyond niche status, which of these – which of these states might be the best to promote the – you know, promote the most. So we were thinking about it in a temporal way. Early on, moving out of niche status is probably where plug-in electric vehicles need to be.

[01:40:12]

But there was one other question. I don't think we – oh you –

MR. BURWELL: (Inaudible) – the one on – Mr. Wagner's (sp) question about the –

MS. GORDON: I was thinking about the Federal Highway Administration gas tax question. So this is work that David Burwell has done here with leadership and transportation solvency. We do have a huge issue in this country about – with the gas tax and the Highway Trust Fund, as many of you know or have read about. So the least issue for that trust fund is probably electric vehicles at this point – or vehicle electrification. The bank is going broke because the gas tax hasn't been raised, and actually has reduced in real terms, since about 1993.

So these – if electric vehicles raise that issue to the fore and federal highways and others are really seriously looking at this I guess, you know, we would say that probably would be a good thing. But I don't think I would turn to electric vehicles as the – you know, as the reason why things are going to go bust in terms of the Highway Trust Fund.

[01:41:11]

MR. BURWELL: Not anytime soon.

MR. FRIEDMAN: In terms of the performance questions –

MR. BURWELL: It's going to go bust, but not because of electric vehicles.

MR. FRIEDMAN: Right, exactly.

MR. SPERLING: Unless David and I are correct that we're going to transition to, what we'd say, 35 percent? (Laughter.)

MR. FRIEDMAN: They eventually become a problem – as Debbie was saying, the problem isn't electric cars; the problem is we already don't have enough money with current gas guzzlers to fix our bridges, to fix our roads. We need to fix that fundamental problem. Don't blame electric vehicles; don't blame efficient vehicles for that problem. Blame – one of the things that is broken in Washington right now is we're not putting enough money forward so that people are actually paying for the roads that they're driving on.

But quickly answering the performance question, I mean, I would argue as we move forward with advanced conventional vehicles, hybrid vehicles, electric vehicles, in general when it comes to acceleration, top speed, safety, all of those things except for range, you're going to get the exact same or even better performance than you've got to today. That's one of the exciting things about the technology. In range, it will vary based on the technology, but we shouldn't look at that as a problem. We should look at that as an opportunity.

We're getting into a marketplace now where consumers are going to have more options. If you – most households have at least two cars. Great, for your commuter car a battery electric vehicle might be perfect. For your vacation/family car, maybe that's a gasoline car with double the fuel economy or a hybrid of a fuel cell vehicle. Choice is going to expand for consumers so they'll be able to optimize the fleet that they should have and save money in the process.

[01:42:47]

MR. BURWELL: OK. Do we have a – these are all men asking questions – maybe they're all technologists. Are there any women would like to ask a question? OK.

MR. FRIEDMAN: It's always aggressive men.

MR. BURWELL: There in the right back. And then the man with the yellow tie, I'm just going to ask – (inaudible).

Q: (Name inaudible) – University of Maryland. I have a question regarding the role of scientists in this. So which are the methods that you expect the scientists to produce in order to support study on consumer behavior or policy analysis? And what will be the role of scientists in collecting new data and communicating with the states in order to convince them to move forward this kind of policy?

[01:43:30]

MR. BURWELL: OK. That's certainly is a Dan question.

MS. GORDON: Or a David question.

MR. SPERLING: David, that's for UCS. (Laughter.)

MR. BURWELL: And then you, sir, and then you with the yellow tie.

Q: (Inaudible.) I have a question regarding the almost $10,000 that an electric vehicle or a PEV vehicle as a tax credit. There are two concerns. First is, can we support that amount of money for a single car in this economy? We have lots of – (inaudible) – in the capital here.

And second question is, if you compare a Toyota Camry and a Toyota – sorry, a Prius hybrid and Chevy Volt – so their mileage is – economy is 40 miles per gallon to 50 miles per gallon to almost 65 miles per gallon. Toyota Camry doesn't get any benefit, Toyota Prius doesn't get any benefit but Chevy Volt gets $10,000. How can we justify that kind of incentives which many people may perceive as kind of injustice?

MR. BURWELL: OK. Justice of a big pick tax credit and then, Drew (sp), we'll add you to this.

MS. GORDON: Uh-oh. You have no mic.

Q: So I think we need more Davids. I'm Dave Grossman, Green Light Group consulting. I'm doing a project right now for NRDC through another David, David Gardiner & Associates. (Laughter.) I think that's all the Davids I can come up with right now. So I have a policy question and it relates to this project. So I support, obviously, the idea we need a policy portfolio – we need a bunch of portfolios, the no silver bullet, sliver buckshot, all that.

But if we're looking at states as the drivers of EV deployment or ZEV deployment, and say you want to rank states, just hypothetically, on the policies – who's taking leadership on this to get such deployment – it sounds like, from what the report says and the presentations, that the ZEV mandate is – you know, sounds like policy number one. States that have that are doing a whole lot.

[01:45:50]

First of all, is that right? And second, are there other really key policies? You've got an appendix in this report that has a whole lot of stuff that states are doing. And does the consumer incentive – is that the next – the next biggest thing that a state could do that wants to drive this forward? Or are there – does the HOV access really matter that much? I mean, are there other

things that we're not considering? Delaware has their vehicle to grid thing that – there aren't cars that even that yet so that's not really driving much yet, but.

We can talk about a portfolio, but what's the portfolio and what's the prioritization within that portfolio. What are the key things that states should be doing, especially, say, if they want to be starting? If they've got nothing right now, what are the first two, three policies that a state should be implementing to start doing this if the states are going to really be taking the lead in this?

MR. BURWELL: Excellent question. What's the priority of the policies? And, Drew (sp), did you have a question?

Q: I do actually – (inaudible).

MR. BURWELL: Here.

Q: I think that question is excellent and I'll just give it some additional background and then just sort of amplify it. I think I'd like to challenge the panel, and really everyone in the whole room, right? We're at an incredible moment now where we actually have commercially available electric vehicles for the first time. And in fact, there's a bit of a fire sale going on right now. You can get a Volt and you can get a Leaf for about $179 per month, right? Which is really cheap.

And if you look at the history of where we are, I think the data that you find has got to make you fairly pessimistic about the numbers that have been put up here, right? A third of the vehicles in 20 years are going to be electric vehicles, right? That – without a substantial additional set of policies, right, I can't see how that's possibly going to be reached, right?

[01:47:47]

The ZEV mandate – let's talk about the ZEV mandate. The first ZEV mandate – Dr. Sperling, remember? (Laughter) I believe in 2003, right, David, everybody, we should have had 5 percent of new vehicle sales in California.

MR. SPERLING: Ten percent.

Q: It was 10 percent – 10 percent, right. (Laughter.) It was 5 percent in 2001, right. OK, let's get a little sobering thoughts on the history of that ZEV mandate, right, which is a terrific policy but has been difficult, right, in implementation.

MR. SPERLING: Right.

Q: Let's also look at the number of just hybrid vehicles that are currently as a percentage of U.S. new vehicle sales. The number is 3 percent right now. And it's taken about 15 years, right? And the hurdles with hybrid vehicles are far less than the hurdles with electric vehicles, right. And so how in the world do we think – we all agree – I think everybody agrees in this room that we desperately need to transition. But what is going to be the policy package that's going to drive us there, given the sobering reality of the evidence that we have in front of us, right?

[01:48:52]

And I would submit that we don't really know, right? We've got a whole bunch of policies that people have sort of tried. We don't know how good HOV lanes are. We have a good sense that they're actually pretty effective, right, but no one's, I don't think, really done a good analytics study on it. I mean, I think giving large subsidies to all of the movie stars that are currently buying EVs right now is probably not the best policy that we could – you know, Leonardo DiCaprio really didn't need that big tax break.

So I'll stop and just say that I think – the challenge that I'd make for the panel is really digging down deep and thinking extremely creatively, what are the policies that we need in order to get to the USC, California, et cetera, goals of EV penetration in the next 20 years?

[01:49:36]

MR. BURWELL: OK, the role of the scientist, the fairness of the big tax credit and the policy priorities. And then we can finish it. I'm going to give – by the way, Bill Chernicoff from Toyota, I'm going to give you the last word on what you think should be the top priorities as you're actually selling these things. So we'll end with you. And you can – you can answer that question, so a warning. Scientists – role of science.

MR. FRIEDMAN: Well, Dan and I, I'm sure, can both talk plenty about this. The Union of Concerned Scientists was founded by a group of scientists who were concerned that public policy wasn't engaging the best science. And we've actually just recently launched a whole new center called the Center for Science and Democracy. Going all the way back to our founders, this nation was founded on a combination of democracy and enlightenment – science, knowledge – as building the basis for a strong democracy and a strong nation.

And scientists have an incredibly critical role here in getting the funding and doing the research to understand what consumer preferences are, how fast we can bring down the costs of these technologies. I mean, this really, at the end of the day, is very much a race to see how quickly we can bring down those costs so that these market penetrations can become viable. And we need scientists actively involved in the policy debate because all too often policy debates happen in a vacuum of facts. And we need to fill in those facts and make sure that they are understood.

So it's – to me it's hard – obviously, you know, I work for the Union of Concerned Scientists, it's no surprise – but it's, I think, hard to undervalue (sic; overvalue) the role that universities play, that the National Academy of Sciences play, that individual scientists at the companies play in making this all possible. So any scientists out there, please make sure that you're involved in the policy work and in pushing technology so that we can get things done.

[01:51:34]

And I would even transition a little bit over the fairness question as part of that because what the science tells us is that if we do nothing to combat climate change – you want to talk about an equity issue? We're talking about heaping massive costs in terms of water, in terms of flooding, in terms of energy costs, on some of the people who are the most vulnerable, who can least afford those costs. We're already spending about $2 billion a day in the United States to purchase oil. And a lot of that burden is falling heavily on the people who can least afford it.

The reason why we don't need incentives, for example, for conventional technologies – and hybrids right now is – they're in the market. They don't need incentives to get in the market. They need standards to pull them into the market. And we've got those standards in place. Electric vehicles – hybrids used to have that help about 10 years ago. They don't need it anymore. Electric vehicles need that help so that they can ultimately help deliver, along with biofuels and whole portfolio of technologies, the investment that will help the most vulnerable in our nation and in the world deal with the high and persistent costs of oil.

[01:52:47]

MR. BURWELL: OK. Broader question – fairness and utility of this 7,500 (dollar) to $10,000 tax credit.

MR. SPERLING: Yeah, you know, first of all, you have to see that $7,500 as really going to the car companies not to, you know, movie stars. You know, all of these tax credits are always going to people that are willing to pay more and are more affluent. And it does get me a little antsy as well, that we have that. So therefore the two policies that I would say are really key – well, I do think the ZEV mandate, by the way, is probably the most – is the most important one.

But after that, I'd say a feebate – going back to Debbie Gordon's history where she first developed that concept as part of her master's thesis. I really think the feebate is key to it because it's a way that takes the cost out of it, from away from the taxpayer to the car buyer. And you can structure it in a way to really favor the really low carbon, the very efficient technologies. So – and it sends a market signal to the consumer, to the industry. I really think that's key to this transition because, like, industry, business always tells us, you know, you can't legislate these changes, these transformations. At some point it has to be what the consumer wants.

The other part, I think, is less obvious and it's my – is the low-carbon fuel standard. And that one – in that case, it's not so much because it will, you know, affect the cost structure of the different options, but it's a way of getting the oil industry engaged in a positive way in this transition. Right now, they just look at that as they're on the outside of all of this stuff and they're – you know, and so they – so they're opposing it. And the oil industry – you know, the oil industry is a very diverse industry. You know, you do have the big integrated companies that approach us very differently from the independent refiners.

[01:55:05]

And so I think a low-carbon fuel standard is a way to engage them in this process of a transition, both in a mental way as well as in an economic way. So those are my two votes.

MS. GORDON: And I guess I would just round out by saying, we started the process of evaluating electric vehicles now because we thought that this was – where I first started my opening comments – this is a point of urgency. There is this sense of more models on – for sale, there is now transformations starting in the market but we've seen valleys of death before, so we know the charge is huge.

So as Drew mentioned, the National Academy, I mean, I would really put the charge up to the National Academy for an electric vehicle road map. I think it's the perfect time to revisit an electric vehicle road map for the country. And I think what we devise here would be wonderfully illustrative to the rest of the world because the world – both in terms of climate change, in terms of vehicle production and sales, you know, oil certainly – the world is becoming smaller and smaller. So why not start it here and then get other countries also to have this electrification in vehicles as they motorize as part of their goal? So that would be my recommendation.

[01:56:23]

MR. FRIEDMAN: The one thing I would add, on policy, in some ways it's actually less about policy, it's about progress. You know, we – Drew, I think, is right to challenge us on this. And what I would point to in terms of how to overcome this challenge is not the question of what are the one or two policies that will do this, it's can we finally work together with industry, with policymakers, with states to get this done?

I think the greenhouse gas and fuel economy standards are an exemplary example of how, if everyone can get together and finally agree on where we're going, it's amazing how much easier it is to get there. And part of the problem I think we have right now is – the auto industry is finally stepping up. They are trying to make this happen. The policymakers are stepping up and trying to make this happen. The utilities still need a push, but they're at least trying to sit at the table.

As was mentioned before, the serious problem right now is the oil companies aren't seriously sitting at the table and trying to figure out how to get this done. They're making a lot of money with the status quo, and that's part of what needs to change. So I think part of what we need to do is not just figure out what the right policies are, but get the oil industry to sit down at the table and come up with a serious solution and to work, the way the auto industry did, on agreeing on the common goals. And the pathway will get a lot clearer if they stop standing in the way and start rowing in the same direction as everyone else.

MR. BURWELL: So we can just a policy saying the oil companies have to be nice – (inaudible).

MR. FRIEDMAN: No, I mean – this is – yeah, the reality of policy, right, is you – (inaudible) – through the people side first.

MR. BURWELL: That's politics, right.

MR. FRIEDMAN: Policy follows. It doesn't lead the people; it follows the people.

[01:58:08]

MR. BURWELL: OK. So we have ZEV mandates, low-carbon fuel standard, feebates – to which I'm adding my gas guzzler tax increase. So let's end with our friend Bill Chernicoff from Toyota. He's the market. What does Toyota need in order to start pushing these vehicles faster?

Q: You're putting me on the spot because I promised Dan I would be nice this session. I don't think there's a – there's a clear answer. And I think Drew and some others raised some very serious issues that I think we would echo, and the subsidy issue, as to whether or not that's fair. If we're – the question isn't disagreement or agreement – whether or not we need to do things. I think the OEMs agree we should be moving forward. The question is how and when and at what cost.

[01:59:00]

And I think what is partially lost in this debate is – we talk about the vehicles that are coming out, but no one is discussing what the real cost is to the industry. And they talked about $180 for leases and stuff. And at the end of the day, the consumer has to want to buy the vehicles and the manufacturers have to do so in a way that generates at least some return of investment. And if we don't, we cannot invest in improving future technologies. And right now, the mandates that are – that are compelling these vehicles to be brought to market are costing the industry a lot of money that is undermining our ability to achieve efficiency improvements across the board in other areas.

MR. SPERLING: I think Bill just endorsed the feebates. Didn't I hear him just say that? (Laughter.)

Q: No. No, no, no, no you didn't. (Laughter.) The OMP and the targets there are setting a benchmark, but I – but then, if that's where our target is, why do we need mandates to sell prescriptive volumes of other vehicles? And I don't think that was addressed. So if we want to have performance-based targets, let's have performance-based targets and let's not set mandates for other types of vehicles. We'll get there in the most efficient way that is based on what the consumer wants.

And the problem is, and I think it was hinted – or one of the issues, there's many problems – is, you know, individuals talk about energy security, individuals talk about climate security. Consumers do not and they don't behave in that way. Consumers care about what is the best value for them as individuals. And so there's a disconnect between these broad scopes of policy.

MR. FRIEDMAN: You're just endorsing feebates again, I think.

MR. SPERLING: I think so.

Q: No. I mean, internally we may have to do it, but I don't think government should be doing that. We have a target we need to meet. If we need to offset the cost of a high-fuel-efficient technology with – by charging more for vehicles that are less efficient, each OEM will set the price of what that technology needs to be. I don't know if there's a role for government in setting that.

[02:01:17]

MR. BURWELL: OK. I think we're going to wrap up. I think that's a good way to end it, saying ultimately, in this democracy, the customer is king. And it's going to have to be – we're going to have to produce a product that the customer wants to buy. And that's good. Now, so I think this is a terrific discussion. I go back to Dan's last slide here which has both a question mark and an exclamation mark – lots of issues.

The need to identify the best policies and to prioritize them and to create that road map is still before us. I'm not quite sure where we are in that valley of death. I don't know whether it's ahead of us or behind us or we're in the middle of it, but that's another challenge to this. But this has been the start of an excellent discussion. And please join me in thanking this panel. (Applause.)

MR. SPERLING: And let me say I have a bunch of little propaganda from California from the Electric Vehicle collaborative and the Fuel Cell Partnership. And I'm giving it out free. I don't want to take it with me. They're just here for anyone that wants it. It's one of each, but you should go – you can go in order if you want more copies.

[02:22:30]

MR. FRIEDMAN: And instead of propaganda you can get science – (laughter) – about how you can cut oil use in half and the (state of charge ?) of electric cars, also available.

(END)