CARNEGIE ENDOWMENT
FOR INTERNATIONAL PEACE

Transcript

GREENHOUSE GAS WELCOME DINNER

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DAVID BURWELL: Hi, folks. Don't stop eating. I just have a few remarks to say before dinner and our speaker.

I'm David Burwell. I'm director of the energy and climate program at – here at Carnegie. And I want to thank all of you for coming out on a snowy evening. I thought we lost – I guess we lost a few folks on our team. I apologize to Hannah (sp) because I – a donor who organized this because I said absolutely no more than 33 people tonight. (Chuckles.) And then it snowed. (Laughter.) So we've turned back about 20 people tonight, so thanks for coming out.

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And thanks also for participating in an effort tomorrow – and taking the time tomorrow to participate in an effort which I think is probably a little more difficult than the Cubs winning the World Series. (Laughter.) I used to say that about the Red Sox because I'm from Boston, but they actually won a World Series.

And that's how are we going to decarbonize the transportation sector? Gary Toth (ph). Thanks, Gary, for showing up. Nice to see you.

I was in – I've been working on this issue of transportation and carbon emissions for a long time – and basically sustainable transportation, really – feeling that carbon is the ultimate constrainer of driving towards a sustainable transportation system. But it's been extremely difficult.

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I was in Europe two weeks ago. And you think of Europe – well, why can't the United States be more like Europe? They've got dense cities, they've got all sorts of options for transportation, they've got taxes on gasoline that are about $4 a gallon. You know – gosh, why can't we just be like Europe?

So I picked up this publication, and it was from the European Commission. And it was about progress towards reducing greenhouse-gas emissions in Europe, 1998 to 2008. And it had a little chart. And was like – it went down 8 percent in the industrial sector and 30 percent in the residential sector. And everything was going great and – except transportation, up 24 percent in their carbon emissions in Europe, even though they've had all these – all these, you know, supposedly good development patterns and good – and all these good strategies.

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So this is a really, really, really tough issue. And it's going to be more and more important, not only here in the United States but all over the world, and particularly as we urbanize and try to make – decarbonize our urban areas.

So this effort which we're launching tonight – and I do have to thank Toyota for being our first primary sponsor. Is William here, or Bill? Anybody from Toyota here? They're not here. I guess they're driving. They must have got caught in the snow, right? (Laughter.) They couldn't take the subway. Although I was caught in the subway for an hour this morning, so it's not exactly – you can get caught in the subway too.

So anyway, thank you for being part of this effort. It's a very important effort. And we're hopeful that the product that ultimately comes out of this research project, which by the way – if you can get a name for it you get an extra dessert. (Laughter.)

We decided it's the "Not Moving Cooler 2 Project." (Laughter.) "Moving Cooler 1" was looking at the demand side and activity piece. We're going to combine that with vehicles and fuels and operating and other strategies to try to find out what are the ultimately most efficient combinations of strategies, broken down by regions to actually at least bring transportation emissions down to neutral if we're going to succeed in our broader climate goals of staying below 2 degrees centigrade by 2050.

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So that's our job. And we have a – we're very fortunate to have tonight an esteemed expert and non-resident Carnegie fellow to talk a little bit about the argument for engaging in this exercise. Debbie Gordon, most of you know, has been an active participant in trying to address the issues of transportation and sustainability and emissions.

She is the author, with Dan Sperling, most recently of "Two Billion Cars: Driving Toward Sustainable Transportation" (sic) or "Sustainability in Transportation" (sic), which is now outdated. Her next book is "Three Billion Cars." It's out next week. (Laughter.)

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And we've retained Debbie for another project, to help us on several fronts. But Carnegie is engaged in an initiative to try to develop an argument – or the best argument for pricing transportation carbon, basically as a deficit-reduction strategy. If you look at the last two times – maybe the three times that the gas tax has been increased, it's not bee increased for – to fund the transportation program. It's been increased primarily for deficit reduction.

Since everything in this country's going to be about policy – in Washington it's going to be about deficit reduction, there is a strong argument for transportation pricing as a way of raising the capital to invest in a truly sustainable carbon-efficient transportation system and financing the transition to a low-carbon transportation infrastructure.

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So that's a little plug for Carnegie. It's called the Leadership Initiative for Transportation Solvency, and it involves a leadership team of Bill Bradley, Democrat, Tom Ridge, Republican, and Dave Walker, Independent, who are leading our effort to do this. And Debbie's presentation tonight is going to be a chapter in this book – or this report on why we should step up to the plate, belly up to the bar, whatever you say, and price transportation carbon for deficit reduction.

So I'm going to offend Debbie and ask her to speak during dinner. I'm supposed to stand up here until they actually serve dinner. So Hannah, could you – (laughter). So dinner is on the way. And the – so we'll have dinner. And Debbie will give a talk for about 20 minutes, give her PowerPoint on this report, which I have a copy here. And it's – this is the little plug for – it's called "The Role of Transportation in

Driving Climate Disruption." And that's – there's copies out – outside. And you can pick one up on the – as you leave. They will also be available tomorrow.

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And so Debbie will give her talk, then we're going to have a little question-and-answer session. And then we'll talk again a little bit about what the program is for tomorrow. And hopefully the goal at the end of tomorrow is that we have all the information we need to create a good, steady design for this broader initiative that's going to be implemented by a steering committee, which hopefully you will – some of you will be members of.

And it's going to be implemented with the Cambridge Systematics. And Joanne – folks from Cambridge Systematics are here: Joanne Potter and Chip Taggart and other folks.

And the folks from the Nicholas School of Public Policy – Nicholas School for Public – Environmental Policy Solutions, right? Is that – that's close. Craig Raborn and folks from there.

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So we've got an excellent team of consultants who know all about modeling for carbon reduction and transportation. So our job tomorrow is give them a good – a good research scope in order to go forward with that.

With that, I think I will ask Debbie to come up and talk a little bit about the science of transportation carbon and why transportation – that all carbon emissions are not equal and that – why transportation carbon emissions have a more aggressive climate-warming result – or climate-forcing result than other types of emissions and why, therefore, that the control of transportation carbon emissions can have a more significant – at least in the short-term – reduction and a cooling effect.

And then we'll talk, and then we'll talk about tomorrow. Okay? I guess everybody's had dinner now. (Laughter.) Debbie? Thanks. (Applause.)

[00:09:50]

DEBORAH GORDON: I'm not offended. You should definitely eat. And David just tells you the whole paper, so – (laughter). He stole my thunder.

So "Moving Cooler 1" was published in the summer of '09. And it underscored this growing role that transportation was going to have in climate change – playing a role in climate change. And the key – this key sector was reported in that report to contribute about 20 percent to greenhouse-gas emissions. And that is the number that you'll see out there.

Eighteen months later, it's a little bit higher. I think it's closer to 31 percent. But really, what I'm here to tell you is that that's not the whole story. You know, as bad as 28 percent sounds, it's really not what's driving climate change. And that – we're going to talk about that.

So just taking a little bit of a step back because we're probably all well-versed in climate change. But things have happened in the last – a couple of years. And they've been happening through the century, actually.

The evidence of global warming is there. There still will be always deniers, but the reality is that the ratio of high-to-low temperatures has been increasing since 1960. The current decade is the warmest on record. And as we've seen this past spring, over and over again, all over the world, that scientists are warning that a whole host of impacts from climate change are now being witnessed.

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I mean, interestingly to me – I guess I first got interested in climate change when I was a chemical engineering student and I learned about the greenhouse effect in the late '70s. And I thought, wow, this is pretty profound. I mean, it just – it rocked me in a way that – it then went dormant for a bit, and I didn't hear much about it. And then in the summer of 1988, I was working in the House science, space and technology subcommittee. And it was the time when Hansen came and testified. And that's when it really – the whole concept – in the States at least, the concept, in policy circles, of climate change was launched.

You know, so there was that downtime in – from the late '70s to the late '80s for me. And then it went underground again. So we've had pretty much a generation – I'm not doing anything about this. And now we're starting to see these impacts.

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The greenhouse-gas inventory is often held up – this is the thing, especially internationally – you know, inventorying, monitoring, reporting, verifying. This is, you know, a big deal around the globe. But the truth is that we focus on what we measure. And what I've found in my life, professionally, doing engineering and policy work, is that very often what we're not measuring, we're not looking for. And that ends up being some of the bigger problems that we have.

The things that we're looking for, we deal with. The things that we're not realizing – and this was actually interestingly an issue with CO2 for a very long time because CO2 – carbon dioxide – is inert. And so it was never regulated. The EPA didn't regulate it back in the '70s when air pollution was being regulated because everyone thought, it's not harmful.

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Well, it turns out that we weren't looking until – in the more recent years. And we realized, well, all of that inertness is what creates the greenhouse effect. And it rises and it sits.

But when it comes to greenhouse-gas emission inventory, there are several – you'll see them in little X's. It's hard to see. But there are air pollutants that are not inventoried from a greenhouse-gas perspective, specifically ozone precursors, smog, particulates and aerosols that end up playing a huge role in climate change when it comes to the actual impacts that we're going to have.

But still, not to, you know, pull the whole rug out under this, CO2 is the driving force. That's what the biggest focus has been on, and for good reason. It's huge emission-loading. Most of the fuel that goes in comes out as CO2. So we're talking huge quantities of this air pollutant compared to the others – has a

very long life – you know, something on the order of a century. So it's a big concern. And we're just – we're not going to ignore it. And it's also – the levels in the atmosphere are at the highest levels in nearly a million years. So it's something that we are paying more and more attention to. And it's manmade – much of it is.

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When you look – and this relates back to the 20 percent that is in the executive summary of "Moving Cooler 1" – so when you look at greenhouse-gas emission shares just from the direct greenhouse-gas emissions that we inventory, transportation today contributes about 30 percent of total greenhouse-gas emissions. But the – and electric actually is – produces more produces more greenhouse-gas emissions which has us really focusing on the power sector. That's been a bigger focus then, I would argue, transportation has been. And even when you distribute the power-sector's emissions to all of the other primary sectors, transportation is just after industry.

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So transportation is not seen, in large ways – it's seen as part of the problem, it's just not seen as the driving force in the problem. And I would argue, besides what David said, that this is a tough nut to crack. I think that it's not really seen as the big part of the problem and it's also distributed over many, many, many vehicles on the road so it's a hard problem. But the reality is that each sector of the economy emits a unique portfolio of gases and aerosols and these change the climate differently over different time frames and that's what I want to explore a little bit with you.

So I think that the issue is much bigger than this. This is the graphic you'll always see to say why we should speak on transportation but it goes far beyond this. The reason it goes far beyond this is because of air pollutants, that it turns out that the on-road part of transportation cars and trucks, primarily they emit a tremendous amount of gases that are warming agents. Ozone being a principle one, hydrocarbon and NOx form smog or ozone, it's actually facilitated by carbon monoxide which is a huge emission from the transportation sector. And then, also, diesel fuel – not so much cars but trucks – are very much responsible for black carbon.

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Those two gasses or those – well, you can't really call – ozone is a reacted gas. But those two emissions are warming agents and they're very strong warming agents especially in the short term. Sulfates and organic carbon, however, interestingly, are cooling agents in the short term. So the cooling agents don't come out of transportation, the cooling agents come out of power plants and industry – and aerosols as well.

So you have a cooling agent – you have this distribution of other greenhouse gasses that are doing different things which I will show you are masking the CO2, which is what we're really often focused on, and when you consider the whole picture, which is the CO2, these other indirect greenhouse gasses and then you end up having some cooling agents in the gasses too, that you end up with radiative forcing from

climate change actually being decreased a little bit by those gasses that will, in the short term, cool the environment and that's not to be confused with being good for the environment because they're not. (Chuckles.)

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These gasses – sulfates is a primary one, particulates is another, are terrible. They're terrible air pollutants, they're very much responsible for respiratory disease and they're not something to be ignored. But when you're talking about climate change it really starts to change the picture in terms of where transportation sits.

So climate change and air pollution, it turns out, are the bigger picture that needs to be considered here. We've often really talked about climate change as greenhouse-gas emissions and we're not – we've not yet really tied a pretty bow around what we've dealt with a long – for a long time, which is air pollution from motor vehicles and other sources and climate change, but it turns out they are inextricably linked.

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The graph that's hard to see, but you can see it in the report it shows all of these complex interactions that are going on in the climate between greenhouse gasses and also air pollutants and so there ends up being two goals if you want to deal with climate change. One is to reduce CO2, we talked about that, and we reduce CO2 our grandchildren will thank us. We're talking about long-term warming, it's going to be around for this 100 years.

But there's also – the short-term effect of these warming pollutants like ozone and black carbon and if we reduce those not only will we help the climate but we will benefit. We will benefit in terms of public health so these two become inextricably linked. It's not only that it's linked, to us in the U.S., it turns out that air pollution is transcontinental. So whatever air pollution that we know this – whatever air pollution we're producing in one place, our air pollution goes to Europe and then it swirls all around the globe over and over again.

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So this becomes more than just a U.S. benefit to the extent that we're addressing climate change, but looking at it from, also, an air-pollution perspective we are helping all of us that are sharing the air that's travelling around. So here's the Seminole figure that I wanted to not lead with –that I remember when – (chuckles) – David and Shin-pei first looked at the report they – I got a call and I heard a gasp at the other – (chuckles) – end of the line because it's really – the news on this graph is that, from modeling from NASA – and we've worked with a scientist at NASA, Nadine Unger, whose published with colleagues about this, who's now at the Yale school – I think she's at the Yale School of Forestry but she moved to Yale, she moved her modeling operations to Yale.

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What they found, on a global scale, was that on-road transportation, which is the first part here, as we were just saying, has a tremendous amount of warming but extremely little countervailing cooling, say, over a 20-year timeframe. So it puts it at the top of the list in terms of radiative forcing. These are from top net radiative forcing to the bottom, to the least radiative cooling, actually, at the very bottom. And so on-road transportation ends up being the number-one climate offender in the short term.

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And if you look down the list, power is in the middle, power has a little bit more warming than it does cooling but has a tremendous amount of air pollution that comes out which is terrible for us, again, but it turns – it turns out to mask its climate impacts. So the power sector – and I'll show you, in a second, why this is really good news for transportation – the power sector is actually not so offensive in the short term in terms of climate change. And industry, interestingly, is at the bottom with a tremendous amount of sulfates and particulates and it has a net cooling effect in the short term.

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And interestingly over time – and this is why we can't ignore the power sector and the industrial sector – because over time, of course, this is dynamic and it's going to keep on changing and so again, from a global perspective, over time, the top line is power and you can see how it starts extremely low in the current timeframe but over a hundred years power, globally, ends up being the biggest problem that we're going to have so we can't ignore it.

On-road transportation starts as the worst offender, today, and then moves into second place over the hundred-year timeframe and then the third is industry. So again, this is not great news that we can just ignore other sectors, but it reestablishes the preeminence of transportation as the big part of the problem. And why is it the big part of the problem? This comes from "Two Billion Cars" which, David was joking, but it is so true, I think we're going to move to 3 billion cars very quickly.

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We have about 300 million cars in the – and the trucks in the U.S. The number is not changing very quickly but we do have a health replacement rate especially when the economy is good so we have the opportunity to keep on improving that fleet. There about 1 billion motor vehicles worldwide and globally, that's today, is a snapshot – and globally – when we first wrote the book we thought maybe 15(years), 20 years out we would double that. I think now it could be a decade. It's growing that quickly. I mean, we can't even keep up with China's numbers.

So there is a monoculture around automobiles that burn oil that marks this sector and it is, what David was saying, it makes it very difficult to change. We're rooted in this and much of the world is following us in this but we must. I mean, because the whole concept of a monoculture isn't sustainable when you have one thing to do everything it becomes, you know, a fool's game. That you can't, both in terms of environment, but even in terms of a resource question we're not going to have, you know, necessarily the ready oil that we need.

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I'm not here to argue that oil is going away any time soon but it's – you know, to have the ready oil we need there's going to be a lot of competition around the globe for it. And that brings us to the second problem that all of Moving Cooler helps to solve which is, to the extent that you attack the oil problem and the energy problem in cars by making them more efficient or moving us off oil, you also have a tremendous economic benefit and security benefit in reducing petroleum which is always the bonus.

You know, there are very few other sectors that could actually say how much money they'll save you but transportation could save a tremendous amount of money and ageta (ph) for this country if we attack that oil monoculture that I was just talking about. Transportation is almost three quarters of our petroleum dependence today and much more than the other sectors.

So we're trying to, in Moving Cooler – and moving on with this new name that you guys are going to think of something, I called it Moving Cooler in this – to unbundle, somehow, and repackage energy and climate – because the IPCC actually has an energy sector that they model and if you look at that, and it's in the report, it's 86 percent of all greenhouse gas – direct greenhouse-gas emissions and any time you're dealing with something that that's big of a bundle it's not very meaningful.

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So it means unbundling that and we're just talking about how you unbundle on-road transportation as opposed to power and industry, those seem to be the big focus for climate change and deservedly as – remember the graph over the hundred years – those are the big sectors, the big players but there's a lot of interaction between these. On-road transportation, if you look at the solution sets, they touch on power. Are we going to go to electric vehicles? What will that mean for power? What will that mean for climate from the power sector?

If we're talking about – as here we're talking about fuel-cycle emissions – you're talking about, again, how does the industrial sector affect the transportation sector when you change fuels? Because you're no longer making gasoline, necessarily, you might be making biofuels which is a different agricultural and industrial complex to make those. So you have to draw the circle very big to really get the whole picture when you're talking about climate change and transportation.

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And what's interesting, here, in this graph, to me, is not necessarily what's good because, you know, there are many different options that we can move to. I think the issue here that's so stark is what's bad. If you look at the sources that are most negative in terms of their direct climate impacts, the unconventional oils that have, already through Canadian tar sands, moved into our – they've moved into our supply chain, are hugely carbon intensive. We're basically recarbonizing our fuel, now, to burn it in our cars.

And with China – and we'll follow quickly behind coal to liquids. I mean, we're talking about putting vastly more, maybe 80(percent), 100 percent, doubling our carbon emissions if we stay with oil. So

it's – besides the monoculture the other reason to change quickly, and to make this point in Moving Cooler, is that we're now just recarbonizing our fossil-fuel stream to get oil into our cars.

NASA, interestingly, ran a simulation that they looked at plug-in electric vehicles as an example – this is really interesting. But they were asking if there was a major, major technology shift over the next 20 years, a 50 percent – imagine, they said, a 50-percent reduction in on-road transportation from moving to electric vehicles – imagine we could just get them out there in the fleet – would there be a difference how – because this often comes up as a kickback in terms of, well, electric vehicles might be an answer but what are they going to do to the power sector?

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So they ran two scenarios and one of them was: What if we could also have a transformation in the power sector – which we've imagined, many of us – so we can have all renewables and low – very low carbon electricity? That is what they call S1 both for the U.S. and globally. And interestingly, the second scenario was: Well, what if those plug-in vehicles were just powered by conventional power plants as we know them today?

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I mean, the assumption is, this would be terrible. But the reality is – because if you harken back to what I was saying about all the cooling agents that come from the power plants – it turns out that in the short term, in the 20-year short them, which is midterm, it turns out it doesn't really matter how we get the power. That moving to electric vehicles as quickly as we can is actually going to be good for the environment no matter how slowly, in this midterm, between now and 2050 we want to keep moving the power sector cleaner.

But in this midterm it actually will benefit the environment, benefit climate change either way. I won't say the environment because it won't benefit the environment to get all of those emissions out of the power plants but it will benefit climate change, either way – and even more so is the little asterisk that's a little scary – even more so the climate – the climate will benefit if we generate that electricity with conventional power that has tremendous cooling that's built into it, in terms of the climate.

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So it only says that transportation is a great place to jump off and jump off quickly. Now, remember, I know David is right because we – it's so hard to get a handle on this very varied disaggregated sector but reality is, compared to power and industry, the turnover rates in transportation are much quicker than they are in power and industry. You're talking about 10(year), 15-year lifetimes in cars as opposed to 30(year) or 50-year lifetimes in power and in industry or even 100(years) when you look at the refineries around the country.

So there really is an opportunity in transportation, I would argue, if we have the right policy bundles to make that work. So what are the right policy bundles? Transforming transportation, how are we going to finally do this thing? It's been – it's been the heavy lift forever. So transforming vehicles is the easiest

and I put quotes, "easiest", it's hard but it's the easiest because, again, people replace them and if we actually get the vehicles out there and get the prices right we can get people into different vehicles.

Transforming fuels is harder but as we saw, it's more about the supply right now because the type of power if we get into, say, electric vehicles, the type of power might not hurt climate change, it might actually help and it's also about, of course, transforming mobility which is the single-most-important thing to do but the single-hardest thing to do in this whole equation.

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And I put the two little photos here of the sprawled (ph) development which has become the law and it's not only the law – sprawl is the law in the U.S., now, sprawl is the law in China, sprawl is the law in a lot of other parts of the world. But then, also, the picture next to it, which I find fascinating, which is the concept of "not all trips are equal value." You know, some trips are really important: You know, going to school and being part of your community and being a productive member of society and some trips just aren't that valuable. So there – there are ways to change that.

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So as you move forward into Moving Cooler 2 – whatever we want to call it – what are these integrated strategies going to be? I just want to throw some out because these are the ones I've thought a tremendous amount about over the last couple of decades, actually. Fuel-economy standards, of course, held up there as the preeminent way. It's, you know, command and control. Now there's talk of possibly 60-miles-per-gallon by 2025, what about heavy trucks? We'll probably have fuel-economy standards on them. Two wheels I put up there not because it's a huge issue in the U.S., huge issue in Asia, huge to get two wheelers to become much more fuel efficient.

Emission standards, we talked about that. Emissions, air pollution is a huge part of climate change. So the climate change – you know, documents in the climate-change advocacy needs to keep advocating for lower pollution, as well, that'll be very important when it comes it to ozone and particulates. Feebates, I think it's just a matter of time – feebates being where you have a product, you have a choice, a range of products in the market like cars and when you say to your public is, if you buy this car and it's a gas guzzler, you're going to pay a fee, if you buy this car and it's a gas sipper, you're going to get a rebate and you know what? The fees are going to pay for the rebates so it's self-financing.

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I think it's an idea that's been something I've worked on for years starting in California. I think it's one of those ideas that it's just a matter of time before it comes because it's – it's fair. I think people have choice and they decide what to do and polluter pays. And then increasing R&D investments is going to be very important. We see this now, we're up against China, it's batteries, it's lightweight materials, very, very important.

Transforming fuels, the second leg of this stool, what to do about that. Low-carbon fuel standards happening in California, not yet happening nationally but the idea here, again, is having that fuel cycle that I

showed you, the fuel-cycle emission that bring the industrial and agricultural emissions into the alternative-fuel scenario. If you really know what your emissions are it's not just – it's not isolated, it's the whole circle and we saw this with corn ethanol.

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We didn't have fuel-cycle emissions for corn ethanol and what we did was we invested billions in corn ethanol and found out, you know, it's really bad for climate change. So you need to do fuel-cycle emissions. Something that David and Shin-pei and I have talked a lot about, the idea of a fuel-price floor. When I talk to – I had a project a couple of years ago where I had the good fortune of interviewing entrepreneurs and venture capitalists all around the country that work on these issues, transportation issues, car – mostly auto – and how to get that novel car out there.

And they all said to me, we don't know what the price of fuel is going to be tomorrow. We fall into the valley of death. You know, we had a scenario – I don't know if I can remember the actual numbers but, you know, remember pegged in everyone's mind was the summer of 2008 when the price of gas 4.25(dollars) a gallon and oil was almost $150 a barrel. So what happened was, just before that, it was 70(dollars) then after that, six months later, it went back to 70(dollars). So it went 70(dollars), 150(dollars), $70 a barrel then six months later it went to 35(dollars) and then it went back up to 60(dollars) and now it's floating up to 80(dollars).

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There is no way we can have rational choice and product and supply in this country in that type of pricing regime. So the idea behind a pricing – a fuel-price floor would be, it has to go up at the market, we're in a global market, but you could peg a floor to it so that it never goes below. So when it goes below it becomes money that's being recouped and rebated to public or put into R&D or whatever you – it's money that's not exported to OPEC. So you can keep that money, and you would have different decisions and different supply because you would have some certainty in what the price of oil was going to be. If you were a consumer buying something, you would know how to do the calculation to buy a car because, you know what, oil is not going to go below 2.75 (dollars) or $3 a gallon.

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And it would make, I think, a lot of sense in terms of, you know, where we're going with technology. And then, of course, increasing R&D in biofuels and hydrogen. I think that the jury is still really out with biofuels. I mean, I don't want to be too pessimistic about biofuels, but I was at a conference last year giving also a keynote – interestingly, it was, like, a continuing ed at TRB. And some researchers came up from – I think it was Colorado State University. And they were working on algae. And, you know, algae – it's so green. Everyone – everyone – likes algae. I mean, raise your hands if you don't like algae. (Laughter.) I mean, everyone's into it because it's green.

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So the first thing he said when he was talking about it is, you know, we can produce it. But the problem is – and they'll figure ways to produce it – the problem is it acts like gasoline but it doesn't have the composition of gasoline. So when you put it into the cars that we are all driving today, it has a whole different emissions profile. NOx is going to go up, PM is going to go up. I mean, air pollution is going to be thrown on its head from biofuels because all these cars aren't getting redesigned.

We're not – we're not going out tomorrow and buying new cars to burn biofuel. We're just going to go to the gas pump and mindlessly put, you know, put it in our tank. And it's going to change everything. So nothing in this game comes without a cost. And I think that, probably, is the number-one reason when David said how hard a nut it is to crack, it's because of all the tradeoffs that keep going around and around – which is why I keep coming back to electric vehicles because I think, somehow, that might help.

And then the third leg of the stool was transforming mobility. The solvency report is all about the first bullet – putting a price on carbon, trying to – trying it to funding carbon reduction. You know, so spending the money really wisely on low-carbon alternatives to not only bringing it in but spending it in the smartest way possible. Investing in new mobility services – we really need to move beyond transit. It's so important that we get to this next level of getting around not in our own cars.

[00:37:21]

My favorite example is – I think it's called Avego – is this new company; it's an app on iPhone. It's an Irish company. So you can get the app on your iPhone if you're really savvy. And you're driving around in your car and someone else with the app pings you that they want a ride. So you stop and you pick them up.

I mean, you know, they know where you are. It's all, you know, ITS – and they know where you are. It's, you know, GPS-based. And they pick you – they pick you up. And your account credits their account. So you get paid to give them a ride. They get a ride. And it's all done on, you know, an iPod right in front of you, which brings up the next thing in terms of enhancing mobility – the idea that social networking –

I mean, I laugh all the time, I mean, my kids are so social, they don't go anywhere. They just Facebook each other on the – on their computers. They never even move to have a date with anyone. They just do it online with each other now. They're so much less carbon-intensive than I was, believe me. I was a lot more carbon-intensive in 11th grade than my son is.

[00:38:26]

And then, the whole idea of limiting sprawl development. I mean, it's just going to be huge. And that's also a big part of the solvency project.

So coming to a closure here. Target on-road transportation – why? Because on-road transportation is a key to mitigating climate change, especially in the next 20 years. And it buys us time. It buys us time even if we use the power we have now. It'll buy us time to fix the power sector and to fix

industry. And in Nadine Unger's words are – a colleague at now Yale but who was at NASA at the time – "targeting on-road transportation is win, win, win." It's good for the climate in both the short- and the long-term. And it's good for our health. So I called it "moving cooler two." I'm sorry.

[00:39:14]

Moving forward, I would just end by saying, very important to balance the trade-offs: environment, energy, economics. I mean – and I know that this will all be in the modeling that Cambridge Systematics will do. And a key to plugging the solvency report is that the concept behind all of this is if we can support a new, low-carbon, location-efficient, productive high-growth economy that's not carbon – it's not the old style of putting carbon in – and energy in – to get productivity out, then if we figure out how to do that, we will maintain our leadership in the U.S. That's really the nut to crack here. So that's it. Thank you. (Applause.)

MR.   : (Off-mic.)

MS. GORDON: Yeah. Sure. (Inaudible.)

Q: Debbie, your emphasis – it would be interesting. On transportation, it's kind of the first thing to take on – (inaudible, off mic) – because it sets up this statement of take a longer view of the industry and energy – (inaudible) – power generation. Yet there are those who would argue that – and I think this was in the famous McKinsey study, which I'm not sure I totally understood, so I may not be accurate – but that, in some ways, transportation is the toughest because we're, you know – our dependence on oil. There are a lot of – you know, a lot of reasons.

[00:40:43]

You understand the sector (better than I ?) as to why the transportation system is dependent on oil in such a – and totally dependent on petroleum. I think that they said it'd take a long time. And with limited resources, we're better off – I know some people in this room are interested in transportation – but as a society, we're better off trying to take on power-generation industry first and leave transportation as the last low-hanging fruit, transportation being the highest. And I'm just wondering what your – (inaudible, cross talk) –

MS. GORDON: Well, when something's the lowest-hanging fruit – low-hanging fruit, it means, usually, that it's economic to do so – not just easy, but usually there's a payback and it doesn't – it's not a very big push to do it. So it will make sense to do the things that are truly the lowest-hanging fruit anyway. And they should happen, you know, without much pushing them if they're that easily done – you know, feasible to do and economical to do. So I don't think that this works in contention with that.

[00:41:46]

But when you start really pushing the envelope on climate change as we tried to do with cap and trade – okay, so here's your example – so we tried this. I mean, we pulled out all the stops in terms of cap and trade, trying to cap and trade – we put all of these resources into – political resources into trying to

make this the paradigm. And it was very much centered on power – wasn't centered on anything else. And it – and it didn't happen.

My argument would be, there wasn't enough gain in that. I would think for – that's not a low-hanging fruit, cap and trade. That's very hard and difficult. And so I would take – I would use those resources, re-allocate them to the higher-hanging fruit – and transportation – knowing that over the next 20 (years) to 50 years, transportation is what's going to drive climate change. So I think you need to do both. You have to be facile with both because if we do – even if we were amazing at changing and transforming transportation, you know, we're going to come to mid-century and that power and industry is going to bite us in the back.

[00:42:48]

So you really do need to do both. The question is, which one do you sprint on? And which one do you, you know, start a nice clip on? And I would argue we need to really start sprinting on transportation.

Q: So this 30 percent or 28 percent number on transportation is a matter of perspective, right? Because it's basically a smoke – it's not a smoke – it's a tailpipe measurement. And as you rightly pointed out and you started to allude to as Alberta – and everything else – the gas that you fill in the car has a prequel. It has a foreshadow. And it's – I mean, not to sound uncharitable, but it's like Enron accounting because currently, that is being counted in industry. And essentially, you produce gas by burning more gas under it in a distillation and a boiling process.

And so, even the gas that you fill into the car already has a carbon implication even before it goes – and that's – Tina just left, but the FDA last year said it's off the order of 50 percent. So really, if you add 50 percent to 30 (percent), to keep the math simple, it's 45 percent. And that also is – in a scenario where in Saudi Arabia you burn 12 cents to get 88 cents back, whereas in Alberta it's close to 50-50.

[00:44:23]

So transportation is not 30 percent. Transportation is 45 percent and growing. And when you think of industry, I mean, do you think of, you know, spot welding by robotic arms? It's not burning crude oil to make the rest of the crude lighter. And so I think we are not going to – I think what we have done, conveniently, is turn this into a supply-side problem. And we are all hoping that we're going to win (inaudible) v. (inaudible).

[00:44:56]

Supply has not brought us here. Demand has brought us here. And we will not solve the problem without attacking demand. And I think transportation is more than industry, more than absolutely anything else. And also, this MPG thing is a red herring because of rebound effect. And basically, doubling mileage is essentially halving the price of gas. And actually, in this country, counties where gas is cheapest use gas the most. So there is nothing to say that if you went from, you know, 20 miles per gallon to 40 miles per gallon, that people wouldn't be eating at least a substantial portion of the additional 40 miles per gallon by just driving more.

I mean, this is not – I mean, it has to be that we drive demand down. We have to recognize transportation for what it is and not think of it as a quarter of the problem when it's really half the problem.

[00:45:50]

MS. GORDON: You know, we've talked a lot about this in the solvency project. And the interesting thing with the supply and demand in transportation is it's politically impossible to drive demand down unless there's something to put the demand in. So you really need to have this, almost, wedge or small step-stone in order to change this over time. So in other words, if you're going to price transportation, you need to have some place where those people are going to go because they're not all going to stay home. I mean, my son might stay home on Facebook, but they're not all going to stay home.

And you wouldn't want to, as an economy, to price people out of their cars – besides the fact it's not politically feasible to price people out of their cars. So we're going to need to somehow introduce pricing – carbon pricing as well, we would argue – introduce pricing in a smaller level upfront, be extremely diligent about dedicating that to alternative mobility options and low-carbon mobility options. And then over time, you would end up ramping up the price when there's someplace for people to go.

So it is a demand problem, but it's not a single-demand solution because people will not be taxed out of their cars. Now, they could be convinced to leave their cars at home if there's a place for them to go besides driving. But if there's no other alternative, then we're stuck where we are.

[00:47:13]

And I would argue, the last 25 years we've been stuck where we are because the price of gas is so low. And we haven't really invested in any other way of going than in a car burning oil. So people have chosen the only option in front of them – door one. I mean, if you only have door one, you pick door one every time.

And I don't know that the take-back on fuel economy – I'm not a silver-bullet person, and I don't believe fuel-economy standards are a silver bullet. And many people will shop it that way – that it's just such a simple technology answer – just raise that fuel economy and give people those cars. I don't think that's the answer. I think it's a very important part of an integrated strategy. I just don't believe – besides the fact if we don't down-weight these gasoline-powered cars – that we could now get a lot less – not use as much fuel in – we won't have a good shell of a vehicle to electrify because you can't use electricity in a heavy vehicle. It's so wasteful. It's crazy.

[00:48:12]

I mean, why would you generate that much power just to put it into the weight of the vehicle in giving it some inertia? Doesn't make any sense. So I think the fuel economy is a really important part of the equation; I just wouldn't stop anywhere near there. And as you saw, it was one of about, you know, 12 or 13, 15 things that I put up there. It's just – it's one of. But I think it's a big part of the – part of – it's part of the recipe.

Q: Thanks. I'm very interested in the whole – what you presented on the black carbon and the organic carbon and the sulfates and that sort of thing. And I haven't seen – I know that's all pretty new research. I haven't seen that taken into account anywhere in any of the analyses that have been done up to this point. Is that just because it's so new? And also – I mean, I was just looking into this issue to see what the EPA had to say about it on their web site recently – and they were saying that, you know, we still don't know the 100-year global-warming potential equivalents.

[00:49:14]

I guess I'm wondering, you know, is the research at a point where we can at least put it out there and maybe start to incorporate into the analysis? Do we know enough?

[00:49:23]

MS. GORDON: I think it's all moving in real time. So the work at NASA was late 2008 into 2009 and now continuing in 2010. And Dave and I were just talking about this. So now that Nadine has left NASA and she's now at Yale with her climate-modeling venture, I think it's very much something that needs to get out there. I think that it would be foolish for us to spend countless resources and not get the gains we want. I think that that would be the worst case. Doing nothing is probably the second-worst case. Doing something that's really expensive and claiming victory and then having it – the climate continue to warm would be really not a good thing.

So I think it's – those models are actually – they're validated by Europeans. They're in – they're very widely published in the technical – in technical circles. And they have not – and I would probably argue they have not really hit broader circles because it was coming from NASA. You know, not many people are reading their journals. I just – Dave and I happen to read the journals. (Chuckles.)

[00:50:29]

Q: I'm just going to introduce myself and request amnesty up front. I'm Ken Adler with the EPA. And I'm just talking in terms of my – the numbers that I've seen on the black-carbon issue. I think it's important, one, to make sure everybody understands that the black carbon in the United States is much different than the black carbon in a lot of other places.

In the United States, black carbon comes almost exclusively from diesel engines. And so when you talk about, you know, "Moving Cooler 2" and the context of black carbon – and it should be a part of that – it's really about freight issues. And that's where the issue of – it's not a mobility, per se, in terms of passenger miles. It's a mobility in terms of freight issues.

[00:51:13]

The second issue with the black carbon that's really important to understand and that we haven't sorted out completely is that in the next 20 years our emissions of black carbon in the United States is going to go down almost by 90 percent. So from our regulations on diesel engines and on both on-road and off-road, we are going to be – our black-carbon footprint's going to be very small.

But the rest of the world has not adopted these regulations. And so when you look at black carbon, what we do in the United States and what we do about it is much different than the rest of the world. It also happens that what you do about black carbon in the Northern Hemisphere – I mean, further up towards the Arctic Circle is much different than what you do down near the equator because of the location of the black carbon is very important as well.

[00:52:02]

So the implication of black carbon and the effect it has on our total greenhouse-gas footprint in the United States – I'm not sure it's – in the next 20 years – one of the things we're – I don't know personally is how important – I mean, that black carbon is going to go down substantially in the next 20 years. What impact is that going to have on global warming? I don't really know. But it is going to be substantially reduced.

MS. GORDON: Well, it does tie into what the fellow next to you is saying. So if we're looking just at the vehicle and the tailpipe, you're right. But if we're looking at where we're getting the oil, it's not necessarily true.

I mean, if we get the oil from shale, if we get the oil more from tar sands, if we get the oil from coal, then – which is where we're headed – then we're talking about all of that carbon, when it's burned, doesn't – the part of the carbon that doesn't go to CO2, which is a very big part of it, is almost too heavy to burn and it makes particulates and aerosols.

[00:53:07]

And so that ends up being a big part of – also recarbonizing will be black carbon from the industrial sector for our transportation sector. And that – I would EPA is looking at where the fuel is coming from because there is no guarantee that this sweet Saudi crude is in our future. None.

Right now our number-one trading partner for oil – does anyone know what it is?

AUDIENCE MEMBER: Canada.

MS. GORDON: Yeah. It's Canada. We don't even get the sweet stuff anymore. So it's really a changing picture.

Q: My name is – (inaudible) – I'm with the Federal Highway Administration. And I work with EPA and Housing and Urban Development, so I get it. I'm onboard.

[00:53:50]

My question for you is, is that – did I understand you right, that you would rather us have electric vehicles that are fuelled by electricity coming from a coal-fired power plant?

MS. GORDON: No. (Laughter.)

Q: Because that's – I just –

MS. GORDON: No. The point I was trying to make is if we put electrification of the vehicle fleet on a high priority like China is, then what we're doing – what we will do climate-wise won't hurt us. We'll have other impacts from that. We need to also, as a secondary support, move toward low-carbon power.

But I would make my first priority getting – there's always been this chicken-and-egg, what do you do first? You have – do you have the power? Do you have the vehicle? You know, what do you – what's the launchpad?

[00:54:39]

Well, the reality is, with electric vehicles, the launchpad is the vehicle. That's the thing that needs to move first. And then we need to actually – as the power – the demand for power grows, we're going to need new power sources. Those should be low-zero carbon. There's no reason for them not to be.

Q: And I guess my second question was – you said there was a cooling aspect to – is it the reflective nature of the –

MS. GORDON: Yeah. It's reflective nature, it's clouds and – here, I'll show you again.

Q: It's just not something I often think about –

[00:55:14]

MS. GORDON: So it's scattering of sunlight into space. It's sulfates – which is, you know, not pretty. That's acid rain. But sulfates and organic carbon, they scatter. And aerosols are cooling agents, and they change the property of clouds – make them brighter and longer-lived.

So, you know, it's really – it's interesting because I think that that – the greenhouse effect is so well-proven. I mean, it's the reason, until we've entered this global economy, that we actually had flowers and fruit in the winter when I was growing up – was because of greenhouses. So it's absolutely, you know, defensible that this greenhouse effect is truly real.

But the climate science is still – you know, in terms of all of those competing reactions. That said, we know CO2 is the driving force. So it's a good first cut, which we've been doing for the last, you know – monitoring and watching these direct greenhouse gases. And now as we get more information, the question is as a community how fast facile are we to incorporate new information about a very, very complex, very profoundly important issue, which is climate change?

[00:56:25]

So this is that type of new information that is worthwhile to start to reconsider and also clean up pollution at the same time.

Q: And to follow up on the discussion of the sulfates and organic carbon and aerosols, you talked about it having a masking effect and short-term cooling effect. Does that mean the picture's different long-term or you're not sure and still figuring that out?

MS. GORDON: So here's the picture long-term. This is 100 years. So if you look – this globally. If you look, you see how these sectors – now, what NASA did that was so unusual in this – up to this point in time we'd been really looking at chemical species and assembling profile of chemical species.

[00:57:13]

But NASA started to – looking at sectors, human activity, when they were modeling this because that's the thing that we change with our policy. It's hard to change chemicals with our policies directly, but you can attempt to change human activity. So over the long-term you see the top line, which to my eyes is kind of purple, is power. So it starts – if you look at, like, 2010, it starts right around – net cooling, net warming around zero – close to zero.

And in a hundred years, over the – well, over the next 90 years it moves up to first place in terms of its net radiative forcing, which means it has that much more warming than cooling. Transportation – or on-road transportation already starts with more warming than cooling. It's not much cooling in on-road.

[00:58:02]

And so that ends up still pretty high, but below power. So those end up being your first charge and your second charge over the long-term – power and on-road transportation. But with that much benefit from on-road transportation in the near-term – in the 20-year mid-term timeframe, it makes sense to charge ahead on transportation and really make a difference.

Q: (Off mic) – associates is just tracking these trend lines. I mean, is it that things – the way power is generated, for example – that it doesn't change –

(Cross talk.)

MS. GORDON: Yeah, yeah, yeah. Yes. It was no – it's business as usual for those years.

Q: And I just wanted to ask: Can you explain a little bit the mechanism of that shift from the short-term masking to the long-term warming or –

MS. GORDON: That's a really good question because I didn't get into – I'm not a climate scientist. I have to – as an engineer. I think over the long term you have – I'm imagining that much more – that's much more in terms of demand or in terms of supply, in terms of power plants.

[00:59:12]

So today, globally, you have a certain number of power plants. And that's the sector that's growing the fastest. We're seeing the power sector, you know – even faster than transportation. So the 2 billion cars is one thing, but the power sector is everywhere.

Q: (Off mic) – answer that question – is that – (off mic) – these ones that have longer-term effect is that – (inaudible, cross talk) – for a long time, whereas the particulates filter out, and so therefore they unmask it.

MS. GORDON: Yes. That is – no, that actually is. You're right. It's about a 20-year lifetime for the cooling agents. And we saw that the CO2 as the principle climate gas has a 100-year lifetime. So once you've emitted that, it's accumulating. And it's growing faster in power and accumulating even faster.

[01:00:07]

Q: Digging into that black carbon just a little bit more – and maybe this is best for Nadine. And I haven't been reading up my journal articles. But I'm curious in terms of black-carbon expectations there with the radiative forcing if that's also accounting for darkening of the, you know, ice fields and other things such that then you start getting the other positive feedback loops going on and you get methane pulses that are going to, you know, make us laugh at any of those projections from anthropomorphic sources. And that's where the 20 years – so I guess, is that captured in this analysis?

MS. GORDON: I don't know that they went – actually, there is definitely – I'll give anyone who wants, I'll send – actually, it's cited in the paper. So you can go read these volumes of papers and all of their assumptions, but methane is definitely accounted for.

[01:00:51]

I'm trying to think of the main gases they put in. It was, besides the ones that you would expect – the carbon dioxide – carbon dioxide, carbon monoxide, methane, particulates, black carbon, organic carbon, sulfates, NOx, hydrocarbon. They were all in there.

But to what extent those processes –

Q: The emissions or what was coming out of – (inaudible, cross talk).

MS. GORDON: Yeah. To what extent those processes are known – I think that Nadine's goal here is to keep the model as a growing organism. I mean, this model is going to be organic and it's going to keep on transforming as we know more and more.

Q: Right. See, and there's – that's the thing. That's the real big gorilla in the room, that, you know – even if the direct rate in forcing effects – and atmospheric chemistry things are doing, you know, what I think is demonstrably an important thing for us to be paying attention to.

[01:01:37]

If we suddenly then, you know, five or six times over add a radiative forcing effect beyond anything that we've done in industrialization, you know, we're in a very different space than we otherwise are. And, you know, that's doomsday-ish, but it's out there.

MS. GORDON: Right. I mean, the goal has been to do the most we could do, be the most honest brokers we can with the information we have. And so we've had a certain amount of information about the direct greenhouse gases for the last several – couple of decades, and we've really focused on that and inventoried those.

I would argue we need to start inventorying for climate purposes all of these other precursor emissions and bring in the air pollution into that so that there is much more – a much more comprehensive look at – because what you measure, like I said in the beginning, is really what you start to pay attention to.

[01:02:22]

Q: So, quick question – I'm Deron Lavaas with the Natural Resources Defense Council. A great presentation. I wonder, in Nadine's modeling or in EPA's inventories of greenhouse-gas emissions from transportation, if adequate account is taken of the – what's called in the oil industry the deconventionalization (ph) of reserves and production, and the shift – you know, there's basically carbon drift happening in the industry as oil becomes harder to get ahold of in the size of the finds that are necessary to feed, you know, a growing world.

And so you have more deep-water drilling, right? You have more drilling in extreme places around the world. And you have a shift to heavier grades and to sands. And then conceivably, as you were noting, we could start really tapping our biggest endowment of fossil fuels, namely coal, in order to feed this thirst we have for liquid fuels. And then let, you know, the carbon drift really accelerate.

[01:03:28]

Is that – is that carbon drift taking – I assume, on an annual basis the fuel mix gets more carbon-intensive if you count what's embedded based on upstream – what happens upstream and what happens midstream in the refining process for these heavier grades of fuel. Is that taken into account in Nadine's model or any EPA inventories? You don't know? Do you know?

MS. GORDON: It was really, as I read it – it's a snapshot – what Emil (ph) asked, it's a snapshot of business as usual. So I think that if we are going to take account of what's probably going to happen in the marketplace over time, it could be worse than this. The trajectories could be higher if we're going to just continually recarbonize. And of course the carbon being the longest-lived will only mean that the out years are even higher.

[01:04:21]

Q: So some of these curves could be understating the problem in terms of –

MS. GORDON: Yeah, because I would – I think that their baseline was 2000 emissions, as their complete profile. And I don't think that we were really in the carbon-to-liquid – I mean in the tar sands business as much back in 2000. I'm thinking back. I mean, that's really been maybe in the last five years.

David?

Q: So going back to this life cycle question that was asked earlier about why just pump the wheel? Why not go back to the wellhead and do well-to-wheel and that kind of stuff? And I guess this is a modeling problem too because I was looking at the biofuel stuff that you had up there and some of it was not so good like corn ethanol but some of it, like switchgrass and the other stuff, was really good but I've seen other models that says biofuels is up 80 percent or even 110 percent of the carbon of conventional gasoline.

If you go to the feed stocks that have, you know, fertilizer and everything in it so how do you deal with that if you're dealing just with part of the – first of all, is it real? I mean, where do you stand on biofuels on life-cycle costing? And second, how do you model anything if they're using different, you know, time periods or calculations for its carbon emissions?

[01:05:47]

MS. GORDON: I think biofuels are really thorny because they are, when it comes to transportation in that second leg of the stool of transforming fuels, they're the low-hanging fruit because what biofuels are as we were saying earlier, they mean that you don't have to change out your vehicle because they're liquid just like gasoline is so they look like they're all that. The problem is, is that I think the jury is really out. They're out definitely in terms of land use and agricultural impacts; they're out in terms of what it means in terms of the fuel cycle.

I think all the biofuels will be a little bit different so they're really out in terms of what I was saying earlier, the air-pollution impacts out of your tailpipe. When you burn something that's a switchgrass or something that's garbage or something that's, you know, coming from any number of – algae they're going to be all different hydrocarbon chains. I mean, they all kind of look like oil but they're not going to be –

AUDIENCE MEMBER: (Sneezes.)

[01:06:38]

MS. GORDON: – bless you – they're not all going to be oil as the car is designed and it's a really important point. I mean, this is actually a point with what EPA has done so most of what comes out of our tailpipe is CO2 because almost all the energy that comes in, 99-percent plus, comes out as CO2 which is why cars are such an offender in terms of long-term climate change and only very, very small PPM, parts per million, come out as all of these other noxious pollutants that have health impacts and now we know climate impacts.

But they are so tightly designed by the catalyst, so tightly regulated that if you change the way that vehicle, what it's burning and how it's burning, the catalyst won't necessarily operate the way the catalyst is designed to operate. So it's not – I think the jury is really out on what the real bigger, long-term impacts are on biofuels. But we're going to march there because it is the low-hanging fruit for many, many companies both in the agribusiness and also petroleum to stay with a liquid fuel.

[01:07:47]

I mean, that's the problem we have. We have a vested-interest problem in transportation. We've got automakers and we have fuel manufacturers in oil that have a hundred years of doing this and changing that becomes really tough.

MR. : Plus there is sunk cost.

[01:08:04]

MS. GORDON: And we have tremendous sunk cost and we have all the money coming – you know, the profit going back to the status quo that really makes oil. I mean, they make cars and oil. They don't – the oil companies don't want to make electricity – (chuckles) – they don't want to get into that business so it's thorny like you were saying.

Q: Jumping in again or just on that, I mean, to David's question around consistency of analysis. I mean, it does seem that LCFS could play a role here where, you know, too bad it's not necessarily done on national scale but, obviously, we've looked to California before to do some work and then we'll see what we do. But it does seem there that's where we could, at least, have one consistent analytical framework to say, all right, what is our scope of life-cycle analysis and what's in or what's out here? So we, at least, have something comparative.

And that way can see what the various pathways for, you know, a whole range of these options are with fuels combined with vehicular technologies that can then – you know, and potentially even then start to assess the conventional air pollutants associated with the two and then make a more holistic decision –

[01:09:04]

MS. GORDON: And I don't want to leave you in the dark the same with this because at Argonne National Lab, Michael Wang and the GREET project, he has been working on fuel-cycle analysis on these fuels for a very long time and we know so much more than we did a decade ago about it. Do we know everything? No. But we know – we know enough to say corn ethanol is really a problem and we didn't know that. We didn't know to say that 10 years ago.

Now what is it? 10 billion(dollars) a year going to corn ethanol so it's not – it's not a great investment. I mean, it's helping farmers – (laughter).

MR. : (Inaudible, off mic.)

MS. GORDON: That's an ag policy. (Laughter.) So thank you, yeah. (Applause.)

[01:09:55]

MR. BURWELL: So now that we've cleared up the science problem, I guess, it's pretty – going to be pretty easy from here. (Laughter.) I guess, I mean – have the microphone so I can make my own editorial remarks but – (laughter) – you know it does seem like the internal-combustion engine and liquid fuel, (kind of ?), however sourced are going to be – it's a big problem and we're – it's going to be with us for a long time. So it is going to be a very tough issue and you know, it seems that – again, back to, you know, our own little editorial – that stopping emissions of any sort coming out of the tailpipe is really important and I take Emil's remark that, you know, why don't you do the easy stuff first?

And there are some easy steps and – but you know, I'm reminded by the comment I remember John Kennedy said which was, you know, he told the story about this French field marshal who owned a big garden and he went out in his garden one day and he told his gardener to plant a certain tree and the

gardener said, you know, why do that? You know, it's not going to flower for a hundred years and the field marshal said in response, well, then plant it today.

[01:11:09]

And I think to solve or redress this problem we're going to have to do everything and – including all the hard stuff, the stuff that's going to take the longest time and is the most difficult is the stuff we have to start on, absolutely, right away because we're going to need every tool and toolbox as we figure this out. And you know, it is – it is interesting I was – a comment I was pleased to see because I tend to read stuff – (chuckles) – journals and stuff and one of the thing I like to read is the AASHTO Journal, right? Because I know what the industry is doing.

And I was pleased, about a year ago, seeing that they – that AASHTO just – you know, everybody knows who is AASHTO is, right? Trade association for the state DOTs – and I said, they decided to tackle climate change and so they were going to have a major address at their annual meeting on climate and they're going to have a keynote and the keynoter was chief of research for Ford Motor Company. His – (chuckles) – which was, now, what does that have to do with the way they do their business?

[01:12:17]

So it's going to take all sectors, it's going to take the demand side, it's going take the supply side, it's going take the, you know, its technology pieces and so and that's what we're here to – that's what we're here to solve so I'm very pleased that Debbie was able to lay this all out because we've got an agenda ahead of us. So tomorrow morning, just to give you a prequel, again, the bad news is you have to be back here at 8:30 in the morning. Is that right, Anna? Wherever Anna is.

MS. : (Off mic.)

MR. BURWELL: 8:30? It's like – are we going to start work at 8:30? Or is it like coffee and coffee and donuts?

MS. : (Off mic, inaudible.)

[01:12:55]

MR. BURWELL: Oh good, okay. Good so – (laughter) – all right so, if you don't want coffee and doughnuts you can come at 10 minutes to 9:00. But otherwise, back here, this room. I think we're going to have about – we have about 48 people signed up for this. It's a very good group. Everybody from all sides of the transportation equation, NPOs are represented and DOTs are represented and the technology and the ITS America and all the technology folks are represented and the DOT is represented and we're going to have a keynote by Beth Osborne from the policy office at USDOT.

[01:13:35]

I told her to stick to the technical issues here relating to carbon reduction but you can – I'm sure you all have questions about the transportation bill and so she'll probably respond to those as well. Of

course Shailen has got that whole bill in his left pocket there so you can grab it on the way out. So 8:30 tomorrow morning be here.

I've been told to ask you to go home and think about two things as you go to sleep tonight – (laughter) – and write them down on a little pad next to your bed which is, number one, what are the main obstacles, in your mind, to the reduction of transportation of carbon? That's number one. And number two is, what are the research initiatives that we need to undertake in order to address those obstacles? So bring your homework tomorrow morning.

[01:14:31]

And I want to also thank Shin-pei Tsay and Deron Lovaas who are our two facilitators – primary facilitators tomorrow. Deron has been struggling with this issue with me and a bunch of other folks for several years and if it wasn't for him I don't think Moving Cooler 1 would have actually ever seen the light of day and along with Chip and Joanne and all these other folks raised a lot of money and got it done so I really want to thank him. And Shin-pei is running our leadership initiatives for transportation solvency so it's beyond the call of duty what they are doing tomorrow. So thank them and I'll see you all tomorrow at 8:30. Thank you. (Applause.)

(END)