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IDENTIFYING OPPORTUNITIES FOR PROGRESS ON ENERGY AND CLIMATE POLICY

A HAMILTON PROJECT AND EPIC POLICY FORUM

Washington, D.C.

Monday, March 27, 2017

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Discussants:

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P R O C E E D I N G S

SECRETARY RUBIN: Good afternoon. I'm Bob Rubin and on behalf of my colleagues at the Hamilton Project and our partners at the Energy Policy Institute in Chicago, which is run by our friend and former director of the Hamilton Project, Michael Greenstone, let me welcome you to today's discussion, which, as you know, is one about the bipartisan opportunities to deal with climate change in what is certainly a greatly changed political environment. In the interest of preserving our time for our outstanding group panelists I'm going to make just a few comments.

About seven or eight years ago, Tom Stier, who many of you know, began to intersperse our frequent business conversations with comments about climate change and I used to say to Tom don't bother me about that. I just want to talk about our business issues. But he persisted. And at some point, I spoke to some scientists I knew who were not climate scientists, but were highly conversant with the work

in this area and they're people that are very widely respected, and they shared Tom's concern that this was the existential issue of our age and a deep threat to life on Earth as we knew it.

And so over time, I became convinced, as I just mentioned a moment ago, that this really was the existential issue of our age. And it is my view at least that we will not progress, or at least we are unlikely to make progress, politically on this issue until many, many more Americans have made the voyage that I made and come to see that this, in fact, is a threat to their lives as they live them and, more broadly, as I said a moment ago, to life on Earth as we know it.

The polling shows that many more Americans recognize the existence of human-caused climate change than was the case when Tom and I were talking. But my impression is that very, very few people have really internalized this threat to the point where it becomes action-motivating.

For example, a couple years ago, I guess it

was, I raised the question of climate change with a very sophisticated private equity investor in New York, somebody I know very well, and he agreed. He said it's very important, but he said there's a lot we need to do first and we can get to this in 20 or 30 years. (Laughter) Well, that was the point.

So I said to him, well, you know, the half-life of carbon emission in the atmosphere is hundreds of years. It means what we do today will be with us for hundreds of years. But it didn't ultimately register.

Similarly, I do a fair bit of public speaking at panels, things of that sort. And when I do, people ask about all kinds of questions, but virtually never does anybody ask about climate change.

One obvious challenge to achieving the internalization, the broad public internalization, about this issue is that the issue has to be addressed with a focus on facts and analysis and not with politics, ideology, and ungrounded opinion. And as all of us know, we're now in an environment of

alternative facts and a lot else that cuts against that happening.

Another challenge, it seems to me, is to bring the threat of climate change down from the abstract to descriptions, to expressions, to explanations that connect directly with everyday lives, the everyday lives of people, very much including their jobs.

And as Michael Greenstone and I were discussing the other day, and I think this is another step that we need to take if we're going to get the attention that it requires, the baseline forecasts, as all of you know, are serious and then severe. But it's the tail risks, the low probability, although maybe not such low probability, events that could have huge consequences, the tail risks that could be truly catastrophic. And I think we've got to get a much greater focus on ensuring against the potential for those tail risks materializing.

Finally, we have little time to spare. Hank Paulson likes to say, and I think rightly, that if you

look at what climate change scientists, climate scientists were saying 10 years ago, the predictions that they were making have by and large materialized much more rapidly than they had expected. And that certainly suggests that the grave and ultimately calamitous dangers that lie in climate change may continue to materialize much more rapidly than is expected.

With this context, it seems to me the kinds of discussions we're going to have today take on an ever-greater importance and an ever-greater urgency. What we've done for this session is to assemble representatives of industry, representatives of research and development organizations, we have leading scholars, and we have senior former officials from both the Obama and the Bush administrations. And as I said at the beginning, the idea is to focus on areas of possible bipartisan cooperation to deal with the issues of climate change.

And with that, I will turn the podium over to whoever is supposed to be up here next. (Laughter)

Thank you. (Applause)

MR. DEUTCH: Good afternoon. Can everybody hear me? Okay back there? Thank you very much. It's a pleasure to be here to participate in this interesting Hamilton Project session. Our time is limited on this panel and I want to make that there's as much opportunity for discussion as for having us preach to you, so I'm going to try and keep our comments up here brief and then open it up for your conversation with the audience.

We are very lucky on our panel to have two extremely knowledgeable and I might even say distinguished individuals. On my left is Ellen Williams, who is a -- well, first of all, let me say she has a Ph.D. in chemistry, which makes her kind of credibility, you know, the gold standard of credibility. (Laughter) She is a very, very prominent and eminent successful scientists. She was the chief scientists of British Petroleum, of BP, for many years and had an outstanding career there. She is also the most recent director of the Advanced

Research Projects Agency, ARPA-E, a the Department of Energy, where she did an outstanding job, and really got to see what was going on in the technology around energy in a very, very substantial way.

And then we have Jim Connaughton, who is a, I guess, two-term chair of the Council of Environmental Quality.

MR. CONNAUGHTON: It seemed like one long term. (Laughter)

MR. DEUTCH: It seems like a long time, I'll tell you that. And who served in the Bush administration and has seen all of the issues having to do with policy. He's particularly close to business connections on the environment and has a different viewpoint, a different history, but a common interest in this very critical problem of the environment.

I want to frame the discussion here in a certain way. I believe the title of this session is "Energy Research and Development." And I want to underline very, very strongly for you all that that is

not the problem that we should be (audio drop). The problem we care about is innovation, innovation which actually happens in our society, in our industry, and in our communities; innovation which leads to less dangers of global warming and climate change.

There is a difference between research and development and achieving innovation. So part of what I will be asking my panelists to address is to relate the very necessary engine of technology change in research and development with the more demanding problem of having innovation.

I want to stress to you that energy is an especially important distinction about the difference between R&D and innovation compared to the other worlds that we sometimes deal with. For example, aerospace and defense or, for example, even medicine, medical care. Because in energy you have two or three absolutely unique issues which take you from technology into successful innovation. The first has to do with new ideas, but also you have to have a stable policy framework which allows investment. And

the amount and the size of the investment required to make a difference is much, much larger.

So those are special challenges in innovation in the area energy as opposed to research and development. You have to worry about scale, you have to worry about a stable policy environment. I make a side editorial remark. I entered the Department of Energy on the first day it was opened. We have not had any stable energy policy in the United States since then until certainly today and probably tomorrow for sure.

The second is the scale, which is enormous. So when we talk about specific technologies, which I hope we do talk about, you will see that the scale is quite important.

And finally, cost-effective implementation. That means that people who say, well, we need to spend more money on R&D and we'll get technical change that will happen are really going in a direction which is not the heart of the innovation problem.

I'm going to stop my remarks there. I'm

going to ask Ellen to begin her remarks. And I don't know, I know the question I want to ask you, but what I think might be more prudent is to allow you to say a few words and I'll come back with a question I really want to ask you. Please.

MR. WILLIAMS: Wonderful. Thank you so much, John. So I thought I'd start with my overarching message and then come back to a little background. And my overarching message reflects what John had to say, which is we have, we know that we have, the innovation capabilities to make positive changes in the energy system and to do so while driving down costs and making the changes more socially attractive. However, our present approaches to research and development, and I actually kind of include innovation as a part of research and development, or it can be and it should be, those are not coming anywhere near to making the best use of our opportunities in innovation.

So let me first say that as we focus on technology development to make the energy system more

efficient, more resilient, more fair, and cleaner, we have to do that in ways that are also economical and that have market pull. And that means we have to find some near-term social needs that will get people to buy into the changes that we're proposing.

On a technical basis, I know that we have the capability to deliver innovative new approaches that can support such changes in the energy system. Over the past half-century or so, the government and the private sector investments in research and development and innovation have created a power infrastructure of knowledge and tools rather similar in form, although not content, to those that were developed in the 19th century and that resulted in an explosion of new capability during the time of Edison.

As director of ARPA-E, I have seen the creativity and talent of U.S. scientists and engineers in taking that infrastructure and using it in profoundly innovative ways to solve old problems with totally different approaches and to create totally new approaches to the energy system, things that we

wouldn't have thought of before.

The new capabilities that are available to us and that are really opening new opportunities to change the way business is done are, first of all, the use of large-scale computation to identify new chemicals and materials. Imagine designer steel optimized to every particular application of interest or imagine windows coatings that spontaneously adapt to the temperature and the light situation that those windows face.

Another new capability is the use of new ways to fabricate and manufacture materials and devices down to the smallest scales and in full three-dimensional structures, as in additive manufacturing. This is going to revolutionize all of our industrial processes and make it possible to make them far more effective.

Another new capability is the ability to analyze and optimize large, complex systems. Our mathematical knowledge, our mathematical and applied math capabilities, and our computational abilities are

so much better now that we can actually imagine optimizing the electric power grid or the transportation networks, and do so in ways that create advances that would not have been thinkable half a century ago.

We also have the availability of powerful imaging and analysis tools, often developed for military or medical applications that can be transferred to the energy sector for use, for instance, in economically detecting natural gas leaks or developing more sustainable biofuels crafts.

We have developed approaches to managing light photonics and meta materials and using it to manage energy and information transfer. And this is an exploding new field.

And this just goes on and on. The opportunities are really out there and we really do have scientists and engineers who are willing and able to think about these things and make them available in the energy sector.

To make that real we have to do a much

better job in identifying the innovative outcomes of basic research and incentivizing the exploration of their potential for applications. This type of work is too early stage and too high risk for the private sector to undertake, so government has to play a role in this. That role, as in DARPA and in ARPA-E, should support innovative development that reduces the risks of commercial development and allows a handover to the private sector at the point where it's possible then to take that technology forward with a perceivable path towards a commercial outcome that meets the financial needs of the industry.

Finally, the feasibility of private sector development of new technological approaches, no matter how promising, will be limited unless it's possible to identify market opportunities for the outcomes. There has to be some market pull.

As an example, we can look at the development of LED lighting. Twenty years ago, advances in material science and condensed matter physics came up with entirely new materials that have

the potential to dramatically, truly dramatically, reduce the amount of energy required to produce light. Incredible new technology, but very expensive, perhaps 10, 20, 100 times more expensive than incandescent bulbs or fluorescent bulbs.

But military needs for more efficient energy-efficient lighting and eventually lighting standards put in place a market pull, a driver that allowed more investment in the development of LEDs. And over the past 10 years, the cost factor of LEDs has come down at least a factor of 10. It's now becoming quite competitive with compact fluorescents and approaching competitiveness with incandescents.

And at the same time, compact fluorescents and incandescent industries have upped their research and development, and they're now improving their efficiency. So we see a dual benefit of technological advances also then driving more advances in the competing marketplace.

So finally, we need to accelerate development of innovative technology to drive down the

costs and increase the options for modernizing the energy system. We also need to sustain innovative development in the U.S. to retain our competitiveness as a technological powerhouse. We need to do this by developing, I believe, a much stronger coupling and incentive base for drawing new innovations out of the basic energy space and maintaining some very strong thought about how we develop the market pull that will allow these new technologies to innovate, grow, and move into the commercial sector.

MR. DEUTCH: Ellen, thank you very much. Perhaps we should hear from Jim, who has a different history, but a lot of insights into this area, as well. Please.

MR. CONNAUGHTON: Great. Thank you and good to be here with all of you today. Let me begin first, this is the most important panel you're going to hear today. (Laughter)

MR. DEUTCH: Well, I'm sorry, smartest. (Laughter)

MR. CONNAUGHTON: Well, that, too, I

suppose. This is the most important. We've had 25 years of the growth of incentives driving energy policy, such that we're now -- the bucket is $150 billion sloshing around the U.S. economy in subsidies, the lion's share of which is paying for already invented technologies to find their way into the markets. Okay. So there's a big amount of money that's probably not needed anymore because it's largely a compliance market because for the last 15 years, we've built up a base of over 100 mandates at the federal, state, and local level that all contribute not just to bending the carbon curve, but also the air pollution curve and also the energy security and resiliency curve.

And so the policy bucket is really, really quite full. And if you look at Paris as the culmination of the articulation of that, which I think is appropriate, you just have to ask yourself how much more beyond what was able to be achieved through the political regulatory and legislative process, you know, compares with the summation of that? And so, as

we embark on the next 10 to 15 years, it has to be about technology. Okay. A lot of what was going before was trying to spur technology, but now we must collectively focus because the subsidies plus the mandates haven't gotten us to where we need to be. All right. So that's my essential thesis, so number one.

Two, I'm an optimist for all the reasons that Ellen just described. I mean, there's an incredible amount of advancement that's occurred in the methods of R&D and the outputs of R&D that are there to be harvested. Okay. It takes some time, but it's there now. And we have the methodologies by which we can provide higher levels of risk assurance for these investments.

But the very, very large impediment to innovation is at the heart of what John described, which is the scalability, the capital intensity, and I will add the word incumbency to the energy system, which is probably the one piece of challenging policy that we really need to deal with to create an

innovation aspiration and an innovation implementation that we seek for the energy system. So it's not power stand alone, it's not transportation stand alone, it's not agricultural production stand alone, these things marry together. And so we have to fundamentally address that set of things.

And that's not coming out of the EPA and it's not coming out of the Department of Agriculture. It's actually coming out of the agencies and the interactions of what makes that system function and how to become much more interoperable. All right. So I'm going to set aside the policy thing because we're about R&D. But, no, I think that there's a big -- there's a necessary, but not sufficient condition to R&D and advancement.

Now I want to focus on the D part of R because Ellen said she had a lot of the R part; the D part of R&D, Ellen hit on the R part of R&D. I am in the development space and I think we can all acknowledge, with fracking as perhaps one of the leading examples, if you can innovate into a

technology that is far less expensive than the alternative, more environmentally impactful technology, you're pretty likely to be quite successful. Okay. So it's still about innovating to displace the more environmentally impactful output because the ubiquity of its deployment becomes inevitable.

You can also get scenarios where things like this, which come in at a much higher price point to the Motorola Razr that it displaced, but it comes with a basket of amenities that are just overwhelmingly valuable, that people are willing to actually pay more for this net beneficial outcome. And we have to understand that, as well.

And so when it comes to development in the energy space, we talk in innovation space about the Valley of Death, but in the energy space there's a valley and there's a Dune of Death. So as you crawl your way across the desert and as you've suffered your third-degree burns, as your clothes are being torn from your back, you use the palm trees, but the palm

trees are over a 5,000-foot sand dune. Because in the energy space, when you get to the point where you're finally ready to deploy, you have a capital intensity problem that we have yet to fully understand. The private sector does not have the financial instruments to get you over that sand dune. You've got to cross the Valley of Death, actually, but to get you over that sand dune.

And then everybody is willing to pick you up on the other side. Because once you've gotten over the sand dune, the business model in energy, electricity generation, and in transportation, it's all actually very well set. So there's billions, there's trillions of dollars on the other side of that dune, but the dune is insurmountable.

So I think that's the key for us, and so we'll pick it up in the back-and-forth. But that's what I wanted to zero in on for you.

MR. DEUTCH: Thank you very much. I'm going to ask each of you one question each and then hear from the audience here.

So, Ellen, there you are the director of the Advanced Research Projects Agency in the Department of Energy. I think the most exciting and successful R&D practice that has occurred came from many decades in the government. And I notice that the President's budget contains zero dollars for ARPA-E. What do you think about that? (Laughter) And if you don't have the right answer, I will -- what do you think about?

MR. WILLIAMS: Oh, it makes me very sad. So, you know, I, of course, have looked at the President's budget, the OMB budget, and they specifically say that the reason for zeroing out R&D is that "the private sector is better positioned to finance disruptive energy technology or energy R&D." And so I will just say that from all my experience, both in the private sector and in ARPA-E, this is just not correct. That's not what ARPA-E does. ARPA-E does not compete at the stage at which the private sector does R&D.

ARPA-E is looking far too early stage at new technologies that are very high-risk and allowing

those technologies to compete kind of on an even playing field to move themselves forward on a pathway towards commercial assessment, allowing them at the end of finite period of funding to reach the point where it's possible to make an assessment about their potential for scale-up and manufacturing and their potential for moving forward for commercialization. ARPA-E then does not continue to fund those teams, but basically graduates them if you want to be polite, or kicks them out the door if you want to be cruel, and says move on.

And what ARPA-E is seeing is that over the past eight years of ARPA-E's existence, ARPA-E has invested about $1.5 million -- billion in new technology development and teams coming out of ARPA-E have gone to the private sector and raised $1.8 billion follow-on investment funds to actually begin to commercialize and move their technologies forward.

So I see this as a really positive way of taking the transition, I think it's the first Valley of Death, from the basic R&D concept through the

prototype demonstration that then gets you to the Dune of Death, which perhaps you're going to address.

(Laughter)

MR. DEUTCH: So the title of this session is "Energy Research and Development," and I would suggest to you if the United States does not have a pretty healthy ARPA-E program, we don't have really a sound energy research and development program.

Jim, the question I want to ask you, because I know it's an interest of yours, is what are you going to do about the coal industry?

MR. CONNAUGHTON: Yeah. So I work backwards on sort of the environmental impact equation. Coal is and will be used for the foreseeable future in large swaths of the global economy. We have done an incredible job of making it more efficient. We've done an incredible job of capturing and eliminating from the atmosphere the criteria air pollutants that harm people and harm ecosystems. And in return for that, we've got this massive increase in CO2 which needs to be addressed.

And as we in the developed world enjoy a pathway because of fracking and policy, enjoy a pathway to us being a less-significant contributor to that equation, it remains the case that in China, India, and a few other key economies, if you look at any of their rates of growth, it is the problem. It is the problem that must be addressed.

And as the coal was deployed to do the good thing of lifting people out of poverty, allowing economic growth and development, allowing a lot of the other good amenities that comes with access to affordable energy, we must solve the carbon capture and the carbon product equation. And that's something, I'm affiliated wit the Clear Path Foundation, that is something we're very much focused on. We've been talking about it a long time, but solving the carbon capture and carbon conversion -- the carbon has to be turned into usable product -- solving that problem is extremely capital-intensive. And there has to be a role for government in that process.

Why? Because in America and in Europe, with coal sort of flat and declining as a resource, the private sector will not invest. It will not invest in that development because it's not a growing, vital piece of the economy.

And even the aspirations of the Trump administration to retain a place for coal in the energy mix, it's not the kind of thing that gets Wall Street terribly excited. And it's not the kind of thing that gets a lot of the big family trusts terribly excited to put money into. And yet, if we don't do it, the future is certain with respect to China.

Now, one other thing I'll say about coal and this opportunity, it does need to be a combination of public-private partnership, like we see at the southern facility down in South Carolina, but it also requires regulatory certainty. And so I have a very bizarre perspective that in order to save coal in America, you actually have to regulate carbon in some form that has a third of the year profile of certainty

to it because nobody in their right mind will put money up for new coal plants unless they know where it fits in the overall carbon curve.

And an accommodation's got to be found, got to made if we want to retain coal in our mix for America and inspire China and India to do a much more effective job of combating their missions.

MR. DEUTCH: I have here some questions from the audience. I ask you if you have your cards with your questions on them, please send them forward. We have a few moments to engage in discussion.

The questions I have here are really all quite interesting. I'm tempted to answer them all myself, but I can't do that. (Laughter)

The first question asked is, to me, a university guy, a good question. Can you talk not just about technologies, but about human capital? How do we recruit, support, and retain scientists? What is the place in the scientific community for women, people of color, and immigrants?

So, Ellen, I'd ask you to speak briefly to

that really quite important question.

MR. WILLIAMS: Well, I have to say I think the most important way that we recruit scientists and engineers is by presenting them with incredible, amazing, important problems that inspire them. People will join the engineering and science enterprise because they are motivated to do amazing things.

I think that immigrants have always migrated to science and engineering as a good field. Women and minorities, we are underrepresented groups; have had a harder time moving into the science and energy fields. And again, I believe that if there is a strong mission and we can enunciate that mission and that opportunity, we have to be aware that if we're asking young people to move into the science and engineering field, we need to be sure that when they get done with their educations there will be jobs and good opportunities waiting for them.

That's, in my perspective, an important part of the mission of keeping advanced technology in the United States. If we're going to train young

scientists, they have to have a place to work. We need to have that place and that capability and that job creation here in the United States, so I think it all links together.

MR. DEUTCH: I have another question for you, Jim. You spoke about incumbency of existing technologies and I guess the firms that run them, and that this affects R&D and innovation. So what do we do about that? What do we do to encourage change and agility from the incumbency which is present?

MR. CONNAUGHTON: On power generation I think we need to finish the job of the Reagan revolution and finish the job of restructuring the electricity markets. We know how to do it and we know the benefits of it. It's been done in every other major sector. We need to finish that job in the utility sector.

I'm a big fan of the utility sector, but they are bound by their business model. So people like to criticize them, but they shouldn't be criticized. They have to produce safe, affordable,

reliable power under regulatory oversight with the Feds and the states looking over their shoulders. They carry a very big burden for society and that makes them extremely conservative.

But I can assure you, if I brought this device to any public service commission in America and asked them approve it, okay, it would be kicked out because one-tenth of 1 percent of the community wouldn't be able to figure out how to work the on/off button. Okay? And so innovation and utility sector do not go -- they don't coincide as expressions because they can't. They're not allowed to. And so I believe that's a critical pathway.

And then all the utilities will tell you about their innovation and their transformations, but that innovation's like going from the touch-tone Princess phone, right, to the cell phone, you know, and they're missing that. They think touch-tone Princess phone is the innovation. (Laughter) And by the way, because they have to and they're told to and it's not partisan. It's the nature of the public good

they provide. And so I think that's a critical one.

On transportation, the only way for transportation to move past incumbency is with competition. Okay? So we have to create the enabling environments and infrastructures that allows biofuels and electricity and other things to grow an infrastructure, to develop it in competition with the petroleum-based and with competition and choice and readily accessible infrastructure. And there, too, there's a public-private component to getting that built out.

I live in California now. It's quite remarkable what's occurred there. But if you get rid of the fractured monopolization of utilizes and you end up with larger players that have bigger balance sheets that can afford the investments in infrastructure turnover, and then you cut out the middle and then you unleash tens of thousands of innovators who are supplying into that, we know what that story looks like. And it delivers innovation into the marketplace a lot faster at a lot lower cost.

MR. DEUTCH: I'm going to read another question, but I'm going to answer it myself because I think it's really an absolutely critical and interesting one. (Laughter) And that has to do with the following question. Can the U.S. be a global leader in energy innovation? Can this country do that?

And I would say to you that probably one of the reasons that holds us back from this, from becoming the leader, we certainly have the capacity, we certainly have the people, we certainly have the ideas, is that we are very much a technology push country. That's our history. We have new technology, we push it into the system one way or another. And then the competitors we're facing around the world, let's take just for example China and photovoltaics, they're really more of an industry market pull approach to introducing new technology.

So I believe that the barrier to the United States really being able to achieve the case and its place in energy innovation for a whole series of just

a few which we've mentioned -- new smart grids, carbon capture sequestration, nuclear power, or photovoltaics widely dispersed -- all require an orientation of this country more towards use pull rather than technology push, which goes back to my basic concern with making sure the regulation and the investment framework is permanently in place. But I do think it's the right thing to focus on, what does the country have to do to regain, if you like, leadership in energy innovation?

Let me turn to a couple of other questions if we still have a couple of minutes here. The first has to do, interesting question, what do you see is the prospects for CO2 capture sequestration and use? Ellen.

MR. WILLIAMS: Okay. CO2 capture is getting better. There are very clear pathways to doing sequestration more effectively and at lower cost. CO2 use is a phenomenally hard problem. CO2 is a very stable molecule. But the topics that I talked about, the ability to design new chemicals, design new materials, really think holistically under controlled

circumstances of new systems, ways of doing manufacturing, there's really potential there.

So capture right now can become much lower in cost. Sequestration is certainly feasible. The only problem is there's no market driver for it, so it's got to be used. We really need to move toward use and this is a very high-risk area of investment and it's one that I think we really need to push on.

MR. DEUTCH: This will be our last question, I believe, to stay on time. And I think you're the target here, Jim. I don't think that this is a friendly question. (Laughter)

The question is, do we have too much regulation of energy in this country?

MR. CONNAUGHTON: Yes.

MR. DEUTCH: Are you responsible? That's not in the question, I'm just asking.

MR. CONNAUGHTON: I'm partly responsible. We do have too much. We have 100 mandates all trying to do the same thing. So I think a place where everyone could come together is let's not change the

outcome, but let's simplify the construct. Okay. And so that would be a really positive place to start because if we could simplify the construct down to a very elegant approach on power, a very elegant approach on vehicles which you're going to hear about in the next panel, and then ultimately have a way for them to work together, and then get rid of everything else, believe me, things would move a lot faster. Believe me.

I'm in the private sector. We have too much capital sitting on the sideline because it cannot move for lack of regulatory certainty. The second you thought you had a regulation in one state or at the federal level, the next day your entire profit structure, your pro forma is altered. And so all you do is make the most conservative of choices. So if we had a shared commitment to simplification, it would be huge.

One other thing that relates to that, I'm practicing free market environmentalism. So my company is about not needing the government for

anything. Okay. And we hope to be quite successful. All right. And we need to be looking at more of those examples.

We are 85 percent more efficient. We consume no water. We can use no chemicals. And we're going to be able to sell our services to the marketplace at a 30 percent discount in a commodity market. So we need to be looking at those solutions and we have to be sure regulation's not getting in the way of them finding their way into the marketplace.

MR. DEUTCH: We've dealt here in the time allocated to us with a very complicated and difficult subject, lots of importance for the country. I thank you for your attention here.

But a single takeaway I want to come back to, more money for research and development by itself is not sufficient. More regulation by itself is not sufficient. Innovation requires policy and technology.

Thank you so much for your attention. We thank you very much. (Applause)

MR. PLUMER: Hi. My name is Brad Plumer. I'm an Editor at Vox.Com. And the last panel we heard about streamlining various regulations. And then we are going to focus now, on just one sector which is now the biggest sector for CO2 emissions in the United States, the transportation sector.

And one of the wonderful, all the excitement about how the U.S. is decarbonizing and reducing emissions, it's largely focused on electricity, that's where a lot of the action is happening. And transportation has been a lot fuller and harder to decarbonize, and lately emissions have been going up, not down. And the one tool we have to sort of tackle this, are our CAFE standards which are incredibly complex and have been counteracted a bit by cheap oil.

So there's this question of: Is there a better way to do this? And Michael Greenstone and Cass Sunstein have written a paper on a very elegant alternative that Michael is going to give a presentation on. And then we are going to hear from various panelists.

So, Michael Greenstone who is the Milton Friedman Professor in Economics, and Director at the Energy Policy Institute at the University of Chicago, will give his presentation.

MR. GREENSTONE: Okay. It's a great joy to be back here at the Hamilton Project, this joint event with EPIC at the University of Chicago. So, what I wanted to talk about are what Cass, Sam and I call The Next Generation of Transportation Policy. And to get you thinking about it, I was trying to think about it myself, and remembered the red Chrysler car that my family had when I was growing up, and that was a big car, not very fuel efficient.

And then I contrasted it with the Buick SUV that we have now, which is also relatively big. And it struck me, some things have remained the same, and some things have changed. On the staying the same, I can remember very clearly endless physical fights between my brother and I in the back seat, my children are carrying on that tradition currently.

But what has changed is that the car is

dramatically different with respect to fuel economy. And in fact requires many fewer fill ups, and much less time worrying about filling up. And a lot of that is due to CAFE, and CAFE has a long history of producing more fuel-efficient cars, but what it also -- and not just to the present, but then was projected to really continue on that tradition, importantly going to 2025, through a lot of actions undertaken by the Obama administration.

Unfortunately, I think several factors came into play. One of them, I guess you are not supposed to talk about in polite company, is fracking. And fracking has greatly reduced the cost of oil, and that has changed the choices that people are making. And so the consequence of a series of things, including fracking, is that the national program really now has two problems. The first is that the fuel savings have been much more disappointing than people had expected, and the second is that the program's benefits are expensive.

So, on the fuel savings, this figure helps

to make it clear. You can see the gray line is what was projected for the miles per gallon of the fleet, and the red line is what was actually -- has been achieved through 2017. And if you go forward you can see there's the potential for that gap to go even greater.

So, in many respects, with respect to the transportation sector, the current version of CAFE is not achieving what we would like it to do. And, you know, a lot of that is driven by my family and other families switching to SUVs, which has been facilitated by the low petroleum prices.

The second thing is that the program's benefit; that is the reductions either in fuel or in CO2 have been quite expensive, and so in particular recent work suggests that the cost per ton of CO2 abated is about $240 per ton as a point -- based as a comparison, the U.S. Government's estimate of the social cost of carbon is about $37 per ton.

So, what we came up with is the idea, which is a dangerous word around Washington, but a cap-and-

trade for transportation. And it has, I think, three sets of benefits. The first is, it will have a much higher level of certainty for emissions reductions. The beauty of the cap-and-trade is you know exactly what you are going to get with respect to emissions or fuel consumption.

The second thing is, by unleashing market forces it's going to deliver the savings at a much lower cost. And then the third which I think, given Friday's events, should not be underestimated; it does not require new legislation, in fact it can be implemented under existing EPA authority.

So there are really just four simple steps in how one would go about implementing this. The first is that the federal government would determine an industry-wide cap that’s consistent with whatever U.S. policy goals are. It could be any level.

The second is the requirement that each automaker must hold a permit in gallons for the lifetime fuel consumption for each car it sells.

The third is that regulators have to --

would then set an allocation in auction rule, so that is they could auction off the permits, or give away some of them. And I'll come back to that in a minute.

And then the fourth is to help set up a robust secondary market so that there's liquidity in the trading markets.

So, a couple issues that are probably worth highlighting with this. One is you would have to determine the expected lifetime fuel consumption of all models. We think that’s actually not that hard to do, using existing data sets. The second is some automakers will benefit more than others under this program. And one way to help fix that up would be through the allocation of permits, and so that would be a way to give extra permits to some companies that would face higher cost under this. And then, just looking ahead, of course this could be merged with plans to reduce gas and consumption in the medium- and heavy-duty truck markets.

And then let me just close with, I think there is a real opportunity; this is not just a pie-

in-the-sky proposal. You know, the current system is not meeting the goals of advocates or industry. The second point is that the Trump administration has reopened the 2022 to 2025 standards, so there's an opportunity. And then the third is that California and 12 other states on Friday reaffirmed their commitment to having their own standards, which potentially sets up a legal and policy showdown with the federal government. So, we think the time is right for new ideas, and that this is one that might be worth consideration.

MR. PLUMER: Thank you. Now, I think Cass Sunstein is going to say a few more words about the paper.

MR. SUNSTEIN: You know, just to make four points. One is to underline the conclusion that the legal authority that the EPA has right now is sufficient to move in this direction, and that relieves the pressure on the United States Congress to do something in this domain.

The second point is that there's a theory

that is at the heart of the proposal, and the theory has three words, and it's maximize net benefits. And this is meant as a kind of deadly serious theory, that in the environmental domain, both on the environmental side and on the industry side, there is often at least a façade of a theory that has some other foundation, and we are tracking what's called the Reagan-Obama Consensus, the purpose of regulatory interventions as to maximize social welfare.

And that the best way to capture social welfare effects is to be very hard-headed with respect to both costs and benefits. And this proposal compared to any imaginable alternative, has significantly higher net benefits.

The third point is that, kind of built into the paper is an embrace of a linchpin of federal regulatory policy with respect to greenhouse gas emissions. And that is social cost of carbon. So, any assessment of the benefits of greenhouse gas reductions has to have some sort of monetary incarnation, and the "social cost of carbon" gives us

that.

Now, rumor has it that the current administration is going to move out hard against the social cost of carbon tomorrow, that could take two different forms. Let's call one form the technocratic, and the other the political, and the political form would be kind of the back of the hand to the technical analysis that has been produced in Germany and the United Kingdom, and the United States and elsewhere for decades and more.

The technocratic would raise reasonable questions about the technical ingredients of the current figure. You can probably tell from the terminology that to go in the political direction would be something that would be inconsistent with regulatory traditions.

And my final point is really a question that is in the paper, though the paper is cautious about, and the question is, how to think about the fact, and it is a fact that the dominant benefits of fuel economy standards, in basically any imaginable

incarnation, are consumer savings. And this is from the standpoint of both theory and practice, extremely interesting.

And the reason it's interesting is if consumers want to buy Prius, Prius, Prius; and Hybrid, Hybrid, Hybrid, they completely can do that. And the fact that they are not doing that, not, I think on any account be accompanied in a sentence with the word irrational. No one urges that, but can be accompanied in a reasonable sentence with the term "boundedly rational" which suggests that you are buying your car, maybe that the consumer savings aren’t what's foremost on your mind over the course of five or 10 years. But it's not as if consumers are oblivious to those things that aren’t foremost in their mind.

So how to think about the right conception of consumer savings produces a continuing challenge for thinking about cost and benefits. My own view is that some non-trivia segment of the consumer savings are real, and what I consider if not devastating evidence in favor of that proposition, but highly

suggestive, is the peer-reviewed and public-commented-on analyses by the Department of Transportation and EPA, which suggest that consumers are getting good cars, they cost more, but they are more fuel efficient.

You know, if they were cruddy cars, or dangerous cars, or ugly cars, or tiny cars, then the fuel -- then the consumer savings wouldn't be real. But if the account given by the Department of Transportation or the EPA is in the ballpark of correct, then the consumer savings are real enough to get the analysis off the table.

Our proposal is that whatever you believe about the consumer savings, the net benefits are going to skyrocket with these reforms, and that's good enough for government work.

MR. PLUMER: All right. So, I want to ask a question, of David Schwietert, the Executive Vice President of the Alliance of Automobile Manufacturers. Do you think this proposal alleviates a lot of the concerns with existing CAFE standards? And do you

think there are other concerns that you could see that, you know, places where you would see things working differently, or not so well?

MR. SCHWIETERT: This might be somewhat of a long answer, but maybe to baseline of some of what's occurring currently, and then that really dovetails nicely into the paper that has been released. You need to kind of keep in mind, I mean on the onset as it relates to the paper that you guys released, I mean, I think there's general agreement in the auto sector that, you know, obviously current regulatory regime certainly isn't optimized.

But if you look at what's happening. So, I work for the Auto Alliance, we have 12 leading auto manufacturers as our members, we have about 77 percent of all U.S. light-duty vehicle sales. It's very interesting, if you look at what's occurred over the last seven years, we've had seven years of year-over-year growth, which is unprecedented in modern time, but at the same time, last year also set an all-time record of light-duty vehicle sales at 17.5 million.

So, as those sales have increased, a lot of what has occurred previously under the CAFE GHG regulations that were entered into in '09, and then again in 2012, was premised on the fact that there would be a certain fleet mix as it relates to cars and trucks that people would otherwise buy. And obviously as a result of what a number of people have talked about with fracking and energy development, obviously the EIA projections on fuel cost, both in '09 and again in 2011-2012 and Joint Final Rule, hadn't really materialized like they were anticipated.

And that’s caused a shift as it related to what's happening with consumers. So, I'm going to answer your question, but I'm going to lay the groundwork a little bit more.

MR. PLUMER: Fair enough.

MR. SCHWIETERT: If you look at what's occurring right now, obviously if you look at the composition of the vehicle fleet, about 96 percent of all vehicles are internal combustion engines. Last year, some people are shocked by this question, or

answer depending. When I say, well, what would you guess is the average vehicle sales on an annual basis as it relates to the percentage of all vehicles sold with plug-in electric, electric or hybrids?

Does anybody want to guess? Last year less than 3 percent give or take. So, it shows the gulf that exists as it relates to the increased fuel efficiency, the consumers have benefitted, not only because of the '09 Agreement, but that again in 2011/2012, consumers when they are going in, the average vehicle currently is about 11-1/2 years old. So, you know, if you gave the great example of, you know, the old family vehicle, and the average consumer is going in to trade in that vehicle, they are witnessing anywhere from a 20 to 25 percent material benefit, not just vehicle, like a sedan to a sedan, but in many instances a sedan to a midsized SUV, or something different that is more tailored to their needs.

So, obviously, all of that is kind of playing out currently which I think informs a lot of

the -- not only my answer to the question -- but obviously what's kind of embedded in the paper that you've released.

So, oftentimes if you look at what's happening as it relates to consumer acceptance and the purchase of new vehicles, obviously that hinges upon a number of things. One is consumer affordability, obviously interest rates have driving a lot of that growth over the last seven years, and obviously as that's changing, vehicle costs are going up regulation is increasing.

I think Jim mentioned previously on the panel that obviously industry needs regulatory certainty as it relates to a projection, but it's not as though a manufacturer just decides to turn out a new model or an updated model, but effectively that's a five to seven, eight-year production cycle, and generally the autos over-comply on the frontend, and under-comply on the backend, but the average of all of that effectively ensures that they can reach compliance.

One of the most striking things in the paper that you've laid out is just the consolidation that would otherwise occur. So, currently we are regulated not only at the state level, based on what's occurring in California and other 177 states, but also at the federal level, with two federal agencies, EPA and NHTSA.

Obviously the paper underscores the desire to kind of consolidate, now legislatively under, you know, effectively the Clean Air Act, kind of the authorities when it comes to the efficiency of vehicles, and kind of estimating what the lifetime consumption of that vehicle may be, all of the EPA.

And I think that that's kind of a hard sell in today's, not only political environment, but also the manner in which the 2007 Massachusetts vs. EPA case which led to the endangerment finding, which led to the EPA regulating greenhouse gases. If that was to then shift just in the auto sector, not across all industries, I think there would be some major problems there, as it relates to the viability there.

And then one of the other answers to the question as it relates to the report was the degree to which EPA would be tasked to taking upon kind of the regulation of vehicle efficiency. And right now if you look at the statutory construct under NHTSA, through the Corporate Average Fuel Economy standard, there's a number of tests that need to be met as it relates to max feasible. So, effectively if the CAFE levels for cars or trucks need to be increased, it has to be max feasible, but it also has to take into account safety.

And consolidating that function that is statutorily bound over at EPA via, you know, the State Administrative Initiative, I think would also be a major challenge because you'd be taking something that is a core function of DOT per statute, and shifting it. Does it mean that EPA couldn't otherwise incorporate safety? Absolutely they could, but it's not necessarily a statutory requirement, it's more of a may versus a shall.

So, anyways, quick response as it relates to

the consolidation. Those are some of the touchstones, but I would say some of the challenges that auto manufacturers are expressing currently, are really as a result of shifts that occurred that weren't known at the time the agreement was entered into as a result of consumer changing the habits of their purchasing vehicles as it relates to not only vehicle sizes but classes, that type of thing.

And there's implications, because if we don't get it right, obviously not only manufacturers, but consumers otherwise that can be harmed as it relates to their mobility, and the needs that they have when it comes to driving light-duty vehicles.

MR. PLUMER: I'd like to get into some of those issues, but I want to drag Trevor Houser in. Is there anything to be said for the current CAFE standards? I mean, at this point there seems to be broad agreement that those should be chucked. But I don't know if there's a case for being a little more cautious about that.

MR. HOUSER: Yeah. So, first I want to

compliment Michael and Cass; and Sam Ori, who is not on stage, third author, on a great thoughtful paper, and it was a paper that would have been perfect for a different administration. It was actually curious about how you could make our vehicle standards more environmentally effective. And I want to draw everybody's attention to something that both David and Michael are touching on, and it was in the chart, but it's like really important here.

So, I disagree with David that when the standards were being set first in 2009, that there was no consideration of: what happened if oil prices changed, and consumer preferences changed? That goal of a 54-mile-per-gallon fleet is a modeled outcome. That's not actually how the standards are set. The current standards don't require the fleet to be 54 miles per gallon, it was an estimate based on what the EPA thought consumers would be buying at the oil projections of the time.

But at the insistence of the auto industry the EPA and NHTSA included a tremendous amount of

flexibility in the standards. The standards are actually set for different footprint categories, so that if consumer preferences change, the standards are flexible enough to allow that change to happen.

So, in fact, the current price collapse that we've seen was exactly anticipated, and at the auto industry's request, was factored into the standards. Now the challenge that raises, which is what Michael is highlighting, is that that undermines the environmental effectiveness because you don't have a binding outcome in terms of emissions if consumer preferences change, then the emissions' outcome changes with them.

And so what Cass and Michael propose is a very clever way to drive towards the environmental target, in a more cost-effective flexible way than the current standards. And I think that there's lots of fruitful conversation that we can have about if we all agree on a climate goal how we can tweak our vehicle program to get there in the most cost-effective manner. But that's not, of course, not what the

current administration is interested in at all.

And if it's a choice between the current standards and no standards, I think there's a lot to argue for the current standards. The EPA -- RIA at the point where the current standards were put in place showed benefits exceeding costs four-fold. Not just through fuel savings but through climate benefits and through reductions in criteria air pollutant.

The revised technical assessment that they did for the Mid Term Review which was published in July, showed lower compliance costs than originally anticipated, and still benefits that outweighed cost threefold, that role. Now, then that’s to say that Michael's and Cass' and Sam's proposal wouldn’t be even more cost-effective than that, but the current standards are designed in a pretty thoughtful way to deliver fuel savings to consumers, and environmental benefits at a net savings to the economy as a whole.

MR. PLUMER: Cass, do you want to respond to some of the points (crosstalk)?

MR. SUNSTEIN: Yes. So, I think especially

maybe today, there's an inclination on the part of some to take it as the question whether the standards as the Obama administration designed them should be weakened. And I think there's a suggestion, at least implicit, the answer is probably yes. And then there is the view that they should not be weakened, and I think there's a view on my left that the answer is yes.

And I think Michael and I want to get beyond that important but unbelievably uninteresting disagreement. So, our proposal is not junk the CAFE standards, but that there's a way of doing the CAFE standards which is consistent with any view on the right level astringency that's better. So, I do not take our paper to say, you know, Democratic administration, you could have more environmental benefits, given the same cost. I would not love that paper, and I'm pleased not to be a coauthor of that paper.

That's a likeable paper, but the paper that Greenstone has coauthored, and this is where -- and I

don’t really want to -- what I want to underline, is urging that there's a way of doing the standard that uses the now, ridiculously provocative term "cap-and-trade" which the automobile manufacturer say, that’s much better from our point of view. And which the environmentalist should say, we have no problem with that. We might not like the cap very much, but if you can get us where you are going to go, cheaper for American consumers, who could dislike that?

MR. GREENSTONE: There's no disagreement on that, (crosstalk) -- I mean, if you take the number from this -- which is a paper that I didn’t write, and Cass didn’t write and Sam didn’t write, that suggests that cost per ton abated is about $240 per ton.

Imagine if you could get that down to $40 per ton, that means you could have it six times as many ton reduction, or gallons of fuel reduction, for the same cost to the economy. And that’s really kind of at the heart of what our proposal is, which is, we are trying to be very agnostic about what the right level is and say, whatever you think it might be,

there's a better way to get there.

MR. PLUMER: So, one thing that the current CAFE centers don't do is address the millions of existing cars on the road, and pretty much once you have a gas tax or a carbon tax, it seems there's very little way of addressing that. I'm wondering if there's any way to expand this proposal to incorporate that as well, of it that is completely unfeasible.

MR. GREENSTONE: I think Cass will know much more about this, but I'll just cue it up for him. I think that it would not be hard to connect to the standards for light and heavy-duty trucks, new trucks, and in one's wild fantasies about what the future might be hold, you could potentially connect it to cap-and-trade markets from the power sector. But that would require -- Let me let Cass talk.

MR. SUNSTEIN: Okay. So, the legal constraints there are very severe on getting at old cars. But there's a great point which you made which is that, if trade in the old cars for the new cars, even if the CAFE standards aren't very aggressive,

that's a net gain for the environment. So, anything that increases the retirement of old cars is a plus.

Now the Greenstone, et al. proposal is positive on that count, and the reason is that a lower net cost CAFE standard will decrease the cost of new cars, and if you decrease the cost of new cars, then you are going to retire the old vehicles and more quickly.

MR. GREENSTONE: But, you know, I think it is also, and maybe it's also worth pointing out, Brad, there was -- I only learned this phrase when I came to Washington, the art of the possible, this has, you know, like an unconstrained blackboard world, like when I, later today going back to Chicago, you just have a gas tax. And then you would clean all this up at the new car level, at the sale point, and in the decisions about how much to drive from existing cars.

But that, as we learned Friday, if we didn't already know, legislation can be difficult, and a feature of this, which I think is very appealing, is that it requires not a single vote from Mark Meadows

or Nancy Pelosi.

MR. SCHWIETERT: One of things -- if I might jump in there real quick -- I mean, one of the things, I think Cass is absolutely right. I mean, if you look at the car universe of registered vehicles, you have over 260 million, so if you had 17.5 million light-duty sales last year, it's going to take 15-20 years to cycle out. But the fleet is actually growing at 1.6 percent a year so, you know, how can you effectively get the older less-safe vehicles off the road; which we would support?

I mean if you truly want to motivate individuals to have more efficient vehicles, you want to have enhanced fleet turnover. It doesn't mean from an altruistic purpose, automakers are looking for year-over-year record sales in perpetuity. What it means, is if you look at the data as it relates to highway crashes fatalities, effectively the vehicles that have a higher propensity for injury or fatality are the older vehicles and the more polluting vehicles.

So, you know, one of the things that, if you want to unpack it further, you know, if you look at some of the choices. If you look at the original CAFE statute, and you look at the manner in which the government has been very careful to say that, you know: even if we were to get rid of the footprint-based standard, or the classifications of cars, light-duty trucks, if you were to get rid of that classification, and effectively on a market-based principle, you know, assess carbon, which there's room for improvement versus what we are currently situated for abatement.

One of the concerns, if you look at that is that, you know, the previous regime has been premised on the fact that it's not taking away consumer choice, because automakers can make whatever vehicles and it's the average sum that, you know, renders compliance. But in the instance in which you are assessing a new tax under a cap-and-trade system, you could have an incentive for people not to buy new vehicles because they want to hold on to their older ones, even if you

lower that marginal cost of compliance.

So, there could be some negative effects as it relates to, if you look at the composition of what people are buying today versus five, seven years ago, what was estimated to be purchased, more people are shifting away from cars to trucks, SUVs as it relates to either family needs or creature comforts, or the increased fuel economy that they are witnessing versus their current.

So, what I'm saying is that there could be some perverse impacts as it relates to people holding on to vehicles as a result of the increased cost that they would pay for a truck or SUV versus today.

MR. SUNSTEIN: And that's completely right. Here is one way to think of this. You could think of this --

MR. SCHWIETERT: He's going to say it more eloquently.

MR. SUNSTEIN: No, I'm not. I'm just going to agree with what you said, and just add a kind of footnote. You can think of the U.S. with respect to

fuel economy as exactly the same position really that it was in the Bush administration with respect to acid deposition.

Do you remember there was a time when this was politically terribly inflamed and, you know, the environmentalists were saying, go hard, and the private sector were saying, go not at all.

And then the Bush administration worked hard to get a cap-and-trade program, and actually the defining book on this issue in my view is called Markers for Clean Air, and it's focused on acid deposition which has been a spectacular success, it's been able to handle surprise. And much more successful, by the way, than the advocates thought, and it broke the political (inaudible), and that required legislation. That was really hard.

The Greenstone, et al. proposal is analytically identical to the Acid Deposition Trading Program. There is no space -- no relevant space between the two, so the only space is that this is something that could be done by Republican

administration on its own.

MR. PLUMER: Okay. Trevor did you want --

MR. HOUSER: Yeah. Again, I mean, I don't have a -- I found it a super-compelling paper; I don't have a point of view of whether it is more or less cost-effective in the current system. It does, pre-supposing again, I feel like we are on a panel in an alternative universe, where we have an administration who has that goal to addressing climate change, and is interested in thoughtfully conversation about how to do it.

I mean, there is a starting point of: do you have a shared policy objective? And then I think from that you proceed to a conversation about how do you most successfully achieve that shared policy objective? But of course, there is not a shred policy objective. Right now the current administration is not interested in addressing carbon emissions from vehicles.

SPEAKER: I don't know what to say about that.

MR. GREENSTONE: I know, Cass -- maybe someone else on the panel knows, but aren't they bound by the existing legislation to do something?

MR. HOUSER: Yes. Sure. I mean, if we look at their two alternatives as either weaken the existing standards, or do something radical and swap them out for a cap-and-trade program, that Trump originated cap-and-trade program. And I would, if I were Steve Bannon, I would think the latter would seem slightly less politically attractive to me.

MR. SUNSTEIN: Can I say, you may be right but (laughter) -- but I say that, you know, you probably know more about Washington these days than I do. But what's the right word to say about that approach? It's literally deadening, because there is a -- there are people, they are human beings, they have a policy challenge, and to pre-commit to, they are just going to put the back of hand to this.

When fuel economy standards, mind you, are about greenhouse gases, but they are also about consumer savings, and if possible safety issues, they

are about energy security, which the current administration is concerned about. And they are about garden variety air pollution, which the current administration is concerned about.

Aside from the fact that there's a legal obligation, so some -- the 2021, it's locked. We are only talking about 22 to 25, that’s really important. What shape it's going to take depends on what the policy toolkit has.

MR. HOUSER: And I agree. My optimism about Republican climate action was beaten out of me over the past two years, but I certainly hope that Cass is right.

MR. SCHWIETERT: And before we turn to questions, one of the things I know -- I don’t know if it was Brad, but somebody mentioned the fact that, you know, whether it's dubbed to roll back. I mean, just to encapsulate what's kind of occurred. So, obviously a week-and-a-half ago, the President made an announcement in Michigan as it related to getting the Mid Term Review back on track.

And that was all about, like auto manufacturers and others believed that they signed up for in 2011 with the Joint Final Rule that was enacted -- or finalized in 2012 which basically said, you know, we are going to have 2012 to 2017, 2017 to '21, and then we are going to have a Mid Term Review to evaluate '22 to '25. And our concern, and you can appreciate this, I imagine -- not to speak for you -- I imagine you to flip the gasket in your former role at OIRA, the Technical Assessment Report --

MR. SUNSTEIN: About flipping a gasket, yes.

MR. SCHWIETERT: You'll know soon enough. The Technical Assessment Report came out last July, it was open for comment, extension was denied, election happened. OIRA actually reviewed the Draft Technical Assessment Report before it was released in July. But then after the election the draft GHG standard, bypassed OIRA and went out for a 30-day comment period, effectively trying to solidify it before the new administration were sworn in.

So, in our opinion, everybody has been

committed to the Mid Term Review, because it was supposed to be fact-based, analytical-based, and we are not saying we are for a rollback. What we are saying for, is what we signed up for should be kind of fulfilled as it relates to --

MR. SUNSTEIN: Okay. Can I ask? Bracketing that --

MR. SCHWIETERT: Yeah.

MR. SUNSTEIN: -- which the paper doesn't discuss, I think you --

MR. SCHWIETERT: Right. And I don't what to pull into that.

MR. SUNSTEIN: Do I hear you to say that you think the proposal in the paper is correct, and you have some legal questions?

MR. SCHWIETERT: The premise is correct, but there's a better way to get the carbon abatement versus the current structure. I think there's challenges both in terms of execution, in terms of exercising administrative authority through the Clean Air Act for an agency to take what otherwise is, kind

of a bifurcated process --

MR. SUNSTEIN: Okay. There are a lot of words there.

MR. SCHWIETERT: So, yes. There is benefit as it relates to other ways that can lower carbon abatement, but I disagree as it relates to viability as far as execution, not only --

MR. SUNSTEIN: So, viability with respect to execution could mean three things.

MR. SCHWIETERT: Mm-hmm.

MR. SUNSTEIN: One, it's legally not doable, and then we would talk about that. Two, it's politically not feasible. And three it's administratively challenging. And which of those do you mean?

MR. SCHWIETERT: All the above. I think legally you still have the problem of California and other states that are following California standard. To effectively go down post-2025 with the cap-and-trade system, you would effectively have to have California stand down as it relates to what they are

otherwise executing under their waiver, for the endangerment finding.

And then on top of that, I think if you look at the last time Congress effectively addressed climate change, I mean it was the 2005, 2007 Energy Bill. Absent that, I mean, you've had the Paris Climate Agreement and other things. So, for any administration or agency to say that, well, Congress didn't write in CO2 in the Clean Air Act, it's now being regulated after a Supreme Court --

MR. SUNSTEIN: That's supposed to be against the (crosstalk) --

MR. SCHWIETERT: I know, I know that; I know.

MR. SUNSTEIN: Under exactly this provision.

MR. SCHWIETERT: But what I'm saying is, as a result of Congress not, otherwise, stipulating explicitly the court rule the endangerment finding stands, everything moves forward. For EPA then to take on additional authorities as it relates to cap-and-trade --

MR. SUNSTEIN: (Crosstalk) -- This isn't additional authorities.

MR. SCHWIETERT: But what if it got centralized?

MR. SUNSTEIN: It's consistent with broad language as quoted in the paper.

MR. SCHWIETERT: Well, then how do solve the statutory requirement on CAFÉ?

MR. SUNSTEIN: It's a (crosstalk) --

MR. SCHWIETERT: And that effectively recedes to --

MR. SUNSTEIN: (Crosstalk) to consider safety. No. They do it together, just like they did in the things to which you signed on.

MR. PLUMER: Let's move on to other questions. (Laughter) All right. So, one in here that I was also curious about, and Dave mentioned, is California. They do have a waiver under the Clean Air Act to go in their own direction. We'll see if the Trump administration tries to do anything about that. Could a program like this cap-and-trade coexist with

California continuing its Zero Emissions Vehicles programs, or other standards? Or, would they, as Dave said, basically have to be on board, and sign on with the national program?

MR. GREENSTONE: So, I think -- I just learned this phrase from Cass. You could mean many different things.

MR. SCHWIETERT: Yes.

MR. GREENSTONE: But I'm not smart enough to get to the parts exactly to the three that you could invent. But let me just say, it would not be hard to set up a -- if you mean administratively -- it would not be hard to set up a permit program where permits had different amounts of permits for electric cars versus ICD cars. That seems like a kind of boring backroom plumbing problem. I don't think that would be hard. I don't know.

MR. SUNSTEIN: I think it's right to say California would have to agree to this, otherwise California would drive the national market in the direction that would be incompatible. So, that's

completely your point.

MR. GREENSTONE: Yeah.

MR. SUNSTEIN: But if the analysis is right, and it might not be California, California's own objections would be better met through this route; as they get the outcome without the cost.

MR. GREENSTONE: Well, you know, in principle, one of the great ways to explaining cap-and-trade is to say, you can have the same cost and greater outcome, those emissions or fuel consumption, or you could have less emissions and fuel consumption reduction, and less cost.

MR. PLUMER: Is there a way to think about -- this was another pretty popular question -- how this might affect the market for zero emissions vehicles basically? For electric vehicles, hydrogen vehicles, I mean, is that just too hard to say in advance, like programs that mandate it? Or, is there a good way to think about what affect this might have?

MR. GREENSTONE: I mean, I think one thing is easy, is you can -- again, I think this turns on

what kind of permits they would be required to hold. So with the permit for an electric vehicle reflect the emissions that are coming from the electricity is coming from the grid or not? You could imagine states taking different stances on that, or the federal government taking a different stance on that. So I think the devil there is probably in the details.

MR. SUNSTEIN: And offhand, and Brad, you can correct me if I'm wrong; offhand the electric vehicles would not get a particular boost through this proposal, compared to a program that's targeted as being pro-electric vehicles. But not just offhand, but on reflection, that's an advantage of the programs. You want to have a cap given the end that you want. You don't want to go electric vehicle crazy for its own sake.

So, if it turns out you've got the degree of benefit along with other dimensions you want, if you end up with lots of hybrids or all standard vehicles. And that's great. Electric vehicles are a means.

MR. GREENSTONE: What Cass is saying that's

very important, is that at the core of this proposal is the idea that a least-cost way to get what you want is to directly target the thing you care about; not to target like kind of bank shot. And so if you treated every vehicle as the only thing that we cared about with its greenhouse gas emission, whether they come from the grid, or whether they come from filling up with gasoline, then that would be the most direct and least-cost way to confront greenhouse gases in the transportation sector. It is possible you could start layering in secondary goals, and that way you get into how you define the permits.

MR. HOUSER: Let me try with that.

MR. PLUMER: Yeah.

MR. HOUSER: Yeah, one element from the paper that I think is particularly interesting, that Michael didn't really touch on, and again, I don't imagine this is going to be terribly relevant in the context of the Mid Review. But this is like -- this is important intellectual groundwork, I think, that's getting laid for how we think about these programs in

the long term.

And the way that they proposed structuring the cap, it's an allocation over the expected lifetime emissions of the vehicle, which controls for differences, and how frequently cars are driven, across type. Right now we assume every car has driven 12,000 miles a year. That was probably not a horrible assumption in the past. The growth of mobility services, autonomous vehicles, are probably going to be skewing the distribution of which cars are driven how long, where you have the highly efficient autonomous car that you -- or ride-sharing car that you use or the bulk of your travel.

And then you have the Hummer sitting in your driveway for your weekend off-loading adventures. And from a climate standpoint we actually don't care as much about efficiency and improvements as the Hummer as the autonomous car, because we are only driving it infrequently and that differential in BMT is not addressed in the current system, and that's kind of an interesting innovation in their proposal.

MR. PLUMER: Do you expect there would be any challenges in trying to estimate the lifetime of vehicles? Or is that really stable and well understood?

MR. GREENSTONE: It would be great if there were a national registry of every single car.

MR. PLUMER: Yeah. Yeah.

MR. GREENSTONE: And then it would be simple to do. I think you can piece it together from a couple state systems, and a couple other places, and it would not be -- it would not be impossible, nor would it require a tracking chip to deal with privacy concerns.

MR. PLUMER: Yeah. Dave, would you agree with that, or are you pro tracking chip? (Laughter)

MR. SCHWIETERT: I mean obviously the -- Actually I missed the full question. Hmm?

MR. PLUMER: Oh, just whether there will challenges in trying to estimate the lifetime mileage of these vehicles, which seems to be key to this program?

MR. SCHWIETERT: Yeah. I mean, it can be done. That is a challenge, when an average consumer goes out to buy, whether it's, you know, a sedan or a truck, obviously some people drive more, some propel drive less. I think one of the challenges is estimating what the lifetime consumption may be, and then what happens if the vehicle changes hands? Oftentimes if you look at just the ownership patterns, you know, people are increasingly leasing vehicles. They are pushing out loans further as a result of just the cost of ownership, and that type of thing.

So, there could be some challenges as it relates to the frontend cost or the permits that are purchased by a manufacturer and then, you know, pass it on to a consumer, and then what happens on second, third ownership? And obviously the utility of that vehicle could change significantly from something that was estimated to be a low mileage, you know, highly inefficient vehicle to something that’s driven quite frequently. But, you know, that’s maybe around the edges.

MR. PLUMER: All right. Here is one question. Would you expect to see a lot of trading from automakers holding these credits?

MR. GREENSTONE: You know, I think there -- So there are some automakers, some of whom probably we have a greater historical affection to in the United States, who tended to build bigger cars and bigger trucks, and I think those guys are going to find it more expensive, and I think they'll probably -- they would be desirous of buying permits from manufacturers who focus on smaller cars. So I think -- I expect there will be lots of opportunities for gain, trading for gain.

MR. PLUMER: Presumably you would see a lot of lobbying over the initial allocation of permits. I mean, that seems like something that it could be (crosstalk).

MR. GREENSTONE: That's an important point. And people get confused about that, about cap-and-trade, and it can sometimes seem unseemly the lobbying.

MR. PLUMER: Yes.

MR. GREENSTONE: And all the allocation, and why should Trevor's firm get all the permits. But besides that he's a handsome young man.

SPEAKER: Yeah.

MR. GREENSTONE: But at the end of the day that has no effect on the efficiency of the system, or no effect on the environmental emissions.

MR. PLUMER: It has a big effect on the individual companies though, right?

MR. GREENSTONE: Absolutely!

MR. HOUSER: But theoretically that's one of the -- if you need to put together a deal, for when I read it through political lines, that's when the assets of the approach is that you have a currency that you can use to put together a political coalition for a standard that doesn't require fundamentally weakening the standard to accomplish.

MR. GREENSTONE: And let me add on to that, like the current currency that we used to get the deal done, is the source of a lot of the environmental

uncertainty and the environmental problems. Because the current currency is a separate track for light trucks than it is for cars, you know, you have cars and trucks of the exact same size that they are very standards, and that's all meant to deal with some of these issues. And so, the permits are a way that doesn't undermine the goals of the program, to deal with some of the distributional issues.

MR. PLUMER: Dave, would you agree with that?

MR. SCHWIETERT: I was trying to think through another part as it related to just how carry some of that out, and I was going back to some of what I mentioned previously as it relates to how you actually assign the credit. I mean, obviously automakers are familiar with credits as it relates to the CAFE plus the EPA space, but (inaudible) --

MR. PLUMER: Does anyone else have any final closing thoughts? I think this might be a little too complicated for a lightning round, unfortunately. It's a very interesting -- I mean, I guess there is,

if, you know, you were to sit down with the Trump administration, and have a chance to sell this, probably climate change wouldn't be the way to go, I mean, what would be the way you sort of made the case for this?

MR. SUNSTEIN: So, you know, I'm thinking when I was at the Office of Information and Regulatory Affairs, conversations with Republicans weren't harder than conversation s with Democrats. You know, they have a different orientation, but they are generally in the ballpark of: what are the costs and what are the benefits?

So, the Trump administration has a challenge which is what to do with respect to '22 to '25; they seem inclined to think because of unanticipated circumstances that's too aggressive now, but how to form the new proposal is very much in their hands. And that's an opportunity.

So, the idea would be that if legal and administrative challenges can be met that their own goals, which are: to do something that's less

burdensome while producing, let's say, the same consumer and energy use security gains. That's not something on which the parties have been divided.

MR. GREENSTONE: But you are missing one key thing; that neither Nancy Pelosi nor Mark Meadows will vote.

MR. PLUMER: Perfect. Well, with that, thank you very much. This was great. (Applause) Thank you.

(Recess)

MS. SCHANZENBACH: So, welcome back. Thank you for joining us on the second half of this event. I'm Diane Schanzenbach, I'm the Director of the Hamilton Project.

Last Friday notwithstanding, I think a lot of us still expect to see a large investment in infrastructure in this nation in the coming months or years. So, the purpose of Matt Kahn's proposal today is to try to think about how do we make sure that we're making wise investments in infrastructure in light of what we think is going to come down the

pipeline.

It's a Hamilton Project tradition not to give detailed introductions of everyone, so I'll just sort of run down the line and give a very brief overview and you can read their very impressive bios in your programs. So, Alice Hill is a research fellow at the Hoover Institution and the former White House Senior Director for Resilience Policy. Mindy Lubber is the President and founding board member of CERES. Steve Strongin is the head of Global Investment Research at Goldman Sachs. His company provides generous support to us at Brookings, which helps make the work we do possible. But I'd like to reiterate that Brookings has a commitment to independence and underscore that the views he expresses today are solely those of the speaker. Then, finally -- I was required to say that if you couldn't tell. (Laughter) I think it was workshop by committee as well. Anyway, then finally we have Professor Matt Kahn, Professor of Economics at the University of Southern California, who will take the podium and give a brief overview of

his proposal. Thanks, Matt.

MR. KAHN: Folks, thank you. It's great to have the opportunity to speak to you about my new proposal on adapting to climate change and thinking about infrastructure investment. My proposal is a little more complex than the previous one. There's a lot of moving parts and I hope folks read it. I want to very briefly go over some of the new ideas and proposals.

At the end of the day, I view protecting urbanites as a bipartisan issue. We all want less risk in our life and there's a question about how we protect urban places and urban people. And, folks, to liven the mood after the horror of Hurricane Katrina, a prominent urban economist was asked, "How do you protect the people of New Orleans?" And he answered, "Give them a bus ticket to leave."

So, there is a fascinating question. I see this is a tough crowd. (Laughter) There is a fascinating question, when we want to protect urban people do we double-down and protect their place or do

we protect urban people through increased mobility and options? And my proposal tries to get a both because I know that I don't know what climate change has in store for each of us. And while we've built a durable infrastructure in the past, moving forward I want us to have a more flexible set of rules and institutions so that we can learn.

And for folks that are interested in what I have to say in my remaining four minutes, I even have new work on the economics of LEGO, because LEGO is something that we can disassemble as we learn and reassemble. Many of our coastal cities have doubled-down and made large irreversible bets, and moving forward with our new infrastructure package I don't think we can do that again. And to quote The Who, "We shouldn't be fooled again." (Laughter) Tough crowd.

Proposal number one. Improving key urban infrastructure. No more jokes. Folks, if you look around, I'm a piece of 51-year-old infrastructure and I'm aging and decaying. In many of our great coastal cities we have an older infrastructure. The New York

City subway was built in 1912. If we could do it all over again and start with a tabula rasa what would we build? Even that there can be a curse of having older infrastructure, that due to economies of scale you're stuck with that.

As the Trump administration begins to think about its stimulus boost, key decisions are going to be made about urban transportation networks, electricity grids, sewer systems. Each of these, I believe, the climate science faces increased risk. If we anticipate this and if we build in worst case scenarios, can we do better? What steps can be taken to increase system resilience in the face of the increased risks that reasonable people think we now face?

And so, in proposal number one of this exciting three step proposal, the first step, like a doctor -- I'm a doctor's son; he hopes I'll still go to medical school -- is to diagnose the infrastructure resilience challenges we face. There are very talented civil engineers and we need to incentivize

them to go city by city and to -- I am not a great engineer; my wife taught at MIT -- to go around and to kick the tires to see where are the infrastructure challenges we face.

And in this age of big data, where Chicago is installing censors for better measuring challenges, measuring traffic delays, measuring urban heat island effects, and measuring disruptions of service, we increasingly have the ability like with the thermometer everywhere to measure where the problems are. We then need financing mechanisms. There are great financing institutions, whether it's Goldman Sachs, whether it's issuing municipal debt, we need to figure out ways to finance these investments where we see that we need to make new investments.

And then in the third proposal, I'm a big believer in accountability. If cities borrow money to build a new infrastructure system, do they prove to be more resilient when the next hurricane happens? Evidence of adaptation is when the next Hurricane Sandy occurs, does it cause less damage?

In my proposal and in my academic nerdy work I've talked at length about which cities can prove that they can take a punch. And those cities, I believe, will have higher home values and more jobs will be willing to locate there because if climate change is as severe as climate scientists predict it will be then there could be a disruption of urban productivity if cities are not prepared for these challenges.

Proposal number two. This is an age in academic economics of great concern about the poor. And very legitimate questions can be asked about the exacerbation of income inequality caused by climate change. There was an extreme heat wave in Chicago about 20 years ago, and thousands of African Americans in the poor part of the city died. How, moving forward, do we reduce this suffering caused by future heat waves and shocks?

And what I talk about in the second part of my proposal is a set of steps to help the urban poor cope with the events that we think are coming? The

first one is providing information. Everyone is now checking their cellphone. You should be tweeting me @MatthewKahn1966. (Laughter) With real time's heads up would the Asian tsunami in Indonesia have caused the same damage if people had been alerted with a day ahead forecast of what was coming and had moved to higher ground?

Folks, in Los Angeles what my colleagues at UCLA were doing is they were working with the city to build cooling centers. But then you get into a question of if you don't have air conditioning and you don't have a car, how do you get to the cooling center? But there are services like Uber that can connect poor people to get to these centers so that they can have the same cooling effects that we would enjoy. I believe Brookings has central air conditioning.

And in the medium term -- and this is perhaps the more interesting part of my proposal -- I talk in the proposal about if there are people living in risky places but enjoying their network, enjoying

their community, how do we have the whole community move to higher ground? If our climate scientists can identify higher ground and if we can create like HUD's Move to Opportunity -- how many of your know of HUD's Move to Opportunity where poor households were incentivized to move to more middle class neighborhoods?

I talk in proposal number two of my project of how to incentivize poor people to move to safer places. But there we need some land views planning to allow for higher density in areas which turn out to be relatively safer in our hotter future.

Proposal number three. Folks, how many of you are from Los Angeles? I see we are diverse. My California right now is in the midst of a drought but water is priced at a half cent a gallon. To a University of Chicago economist, we have fundamentally mispriced increasingly scarce resources. Insurance is not priced to reflect its actuarial risks. Coastal real estate insurance implicitly subsidize coastal residences creating a spatial moral hazard effect.

Water pricing are kept artificially low. You don't have to be F.A. Hayek to appreciate that when you distort prices you get the wrong allocation of economic resources.

The reason there is no Elon Musk working on water innovation right now is because the price of water is so low. These individuals walk into the electric vehicle field because there is the expectation that the price of gasoline could be quite high. And so, an unintended consequence of keeping resource prices very low is to distort choices, individuals' choices, and to also knock off endogenous technological change.

So, a couple of points before I wrap up. Of course the coats are beautiful. But as they become increasingly risky there is a question that actuaries have to keep up on this risk and educate the public. I am not a behavioral economist. I believe we're grown adults. I see a bunch of grown adults in this room. And if you inform people of the emerging risks they face -- I don't want to say caveat emptor, but if

you choose to own a coastal home there has to be an element of you having skin in the game such that if a disaster occurs that you lose some equity, that this will lead households to put their homes on stilts and to take more actions to protect themselves, such that in aggregate future Hurricane Sandys cause less damage.

Yes, the climate scientists can estimate models of coastal hurricanes occurring, but how much economic damage they cause is a function in the choices individuals make. And that true free market incentives we can reallocate ourselves and implicitly move to higher ground.

Last bullet point then I'm done. The introduction of dynamic pricing for water and for electricity will allow the law of demand to work. Econ 101 was the high point of each of your lives. (Laughter) If we allow -- so, it was the Beatles who said give markets a chance. Or give peace a chance, give markets a chance. If we allow free markets to work you don't have to be Julian Simon to see how this

will help us to adapt to the new challenges we've unleashed.

Folks, thank you very much. (Applause)

MS. SCHANZENBACH: Thank you, Matt. My first question is going to go to Steve. So, there is great uncertainty associated with the economic costs of climate change. How do you design responses that will officially resilience-proof the economy here?

MR. STRONGIN: Matthew understates his paper. He only quoted 3 proposals. I think my notes sort of ran out somewhere around 40. So, there was a lot in those pages.

I found myself in an uncomfortable position for me which was I was thinking about how he had more faith in information and markets than I did, which gven my role is not something I often need to speak about. And it goes back to a core paradox and back to Bob's initial remarks. One of things I think that's critical in the way we think about climate change is this notion of urgency that comes out of the fact that we're emitting carbon today and the problems are going

to be in 20 or 30 years. And that combination makes it a particularly difficult thing to respond to with very high uncertainty and a great sense of urgency.

On the other hand, when you talk about investments, particularly about infrastructure investments, you tend to run into sort of deep issues of real options theories. And in real options theory almost always the right answer is to delay and to act later. So, how it is you begin to take the issues of urgency and delay and remove the paradox and the conflict between those two things.

And I think when you think about that, first you have to identify where are the real options issues at large. And they tend to be large in those cases where the infrastructure either needs to be reimagined or the people need to move. Those sort of dramatic shifts really require you to have more information that you typically have today, particularly when you're thoughtful about the level of uncertainty in climate change.

And then if you think about trying to

prepare for those actions, you run into this other extra paradox which is very often making today's neighborhoods somewhat more resilient, makes it harder to leave for tomorrow's truly resilient neighborhood. So, some costs begin to play a significant role in there.

And so I think when we look at that in the areas where we are really concerned about climate change is large effect. It's more than just flood levels. If you look at some of the climate models now, one of the things that they're trying to figure out is the consequences of category 6 and 7 storms. That probably goes beyond simple flooding and simple building codes.

So, when you begin to think about that I think what you really go back to is the type of infrastructure investing we were doing in the 1950s and to slightly think about how you re-anchor as opposed to anchor neighborhoods and communities. They should begin to think about how do you string wire? How do you build sewer systems? How do you create the

skeletons of tomorrow's communities so that individuals can actually move into them?

Communities don't make investment decisions in truth, individuals make them. And if you're going to have individuals migrate into more resilient communities you're really going to have to create the skeletons of those communities and the paths for those individuals to move. That's going to require deep infrastructure investing. And it's not necessarily labeled climate investing.

It also requires rethinking flood insurance. Flood insurance now is largely about rebuilding, not relocating. How do we restructure those contracts so they're a lot more friendly to those neighborhoods moving?

And then lastly, and perhaps most uncomfortably, when you think about successful migrations there are rarely models of social decorum. Right? If we think about the suburban flight from the 1950s, it's probably a really good model for what we're trying to accomplish here. It's not exactly a

social movement we want to repeat, okay.

And so thinking about the dynamics of how communities actually migrate and thinking about how we incorporate that into this process so that instead of having a catastrophe 20 years from now what we have is an orderly migration that occurs over 40 and 50 years as those weather patterns become available is how you create resiliency that is both not incredibly expensive and also doesn't violate rational thought, investment in terms of real options.

MS. SCHANZENBACH: Mindy, I'm going to go to you. How are firms and investors looking at climate risks, both from a short term and long run perspective? Particularly, what momentum exists among investors to address climate risk even without sort of the political will to do so from the White House?

MS. LUBBER: So, let me start by framing this issue of climate resilience and climate risk. For whatever reason -- and we're sitting here in the heart of Washington, D.C. -- climate change, whether you're in D.C. or anywhere else for that matter, has

become the ultimate in partisan politics, the blue states like it, the red states don't, the liberals like it, the conservatives don't, Democrats like it, Republicans don't. And this comment will run through resiliency.

It is the fact, and we can't deny it, and I'm not Pollyanna-ish to suggest we can make that change pivot overnight. But what we are talking about -- Barbara even said it earlier -- is an existential threat to our families, to our communities, to our economy, all wrapped in one. And somehow, we have allowed it to become a political hot potato.

I mean, if you think about climate, if you think about existential threats, or frankly, today's threats. Think about a bus barreling down the road coming at our children. Not one of us -- I don't really care if you have an R after your name or a D after your name -- would not jump in front of that bus to stop it from running over our children. We have a runaway bus coming at our families and we've made it a political hot potato in my judgment rather than a set

of facts that we ought to deal with in a legitimate way, the way we deal with other facts.

And climate reliance is no different. We are talking about rebuilding our cities -- and I'll answer the question -- but we're talking about making changes that will impact my home on Cape Cod, and they're going to impact somebody else who may be of a different political persuasion on Cape Cod. These issues are going to affect us as human beings, whether it's property changes, availability of water, and so on.

And in many ways we ought to have this discussion of resilience without that word climate in front of it. It takes on a political overtone and undertone and in-between tone and everything else that makes it about politics rather than about engineering and about real estate and about human beings and about families and about water systems and about Flint, Michigan, which we just saw and the toxics the children were drinking.

So, in many ways we need to detoxify and

depoliticize these issues. And while it is climate data that is driving some of the threats to our infrastructure that we need to deal with, my feeling -- and we have some good examples in Boston which I'll share with you, and generally I don't do local politics, but that are working at bringing together Republicans, Democrats, homeowners, commercial lenders to address reliance and resilience as a matter of a community.

So, you ask about companies and investors. And we work -- we have about 90 large companies and 130 investment firms or asset owners that are members of CERES of what we do, integrate sustainability into capital markets. And they're logical. They are looking at threats and climate risks and the risks we're seeing, and water risks and other sustainability threats real. They're now being asked to be factored into the SEC filings, into the new Bloomberg Taskforce. These are real threats and we ought to look at the opportunities.

So, what I am seeing is companies don't want

to own it individually. It is not their job to deal with resiliency loan or investors or communities. But a few success stories that I've seen that are worth talking about as we roll out is, one, for a community to appoint a climate resiliency officer or a resiliency officer. Again, let's take out the word climate but let's bring together the engineers, the architects, the real estate developers.

Boston is going through a transformation unlike I've seen in 30, 40 years. We are putting billions and billions of dollars into rebuilding our waterfront, a part of the city that was four hours away from looking like Hurricane Sandy in Boston rather than at Goldman Sachs and in New York City. A 4 hour and 15-minute difference. Yet we're putting billions and billions of dollars on the waterfront.

How do we make the ownership of that problem one where the city convenes the real estate developers, the insurers who have an extraordinary role to play, business people who have a stake on the waterfront, homeowners? And start looking at what are

the zoning rules, what are the changes you make at a city level. But we've got to find a way to bring that all together.

So, more a bit later, but first message, this is about rebuilding our infrastructure, not whether it's climate related or not, and building -- spending the billions of dollars we're going to spend on new clean water systems, build them in a sustainable way rather than in the old way. How we look at what the risks are and start addressing it by just spending money that's already going to be spent, but doing so in a smarter way.

MS. SCHANZENBACH: Alice, how do we think about screening investments for resiliency, in particular, what should be we doing at the state and local level?

MS. HILL: We should be doing a lot because that's where most of the building occurs and that's how we will ensure our resiliency.

I want to ask the audience a question first. How many of you have read the Third National Climate

Assessment? Okay, a few. Well, that is the statement of what the risks are to the United States. It can tell you what risks you face in your own region. And an audience that cares deeply about climate that isn't aware of its own risks is really the challenge that we have.

I agree with much of what's been said. We should focus on all hazards. We have earthquakes, tsunamis, not building to protect against those. But climate is different. Climate requires us to look at future risk. And virtually everything that we build we build to historical risk.

We do not have a national building code. Our building codes are based on model building codes which then states or localities adopt. Those model building codes do not currently reflect the future risk of climate. GAO has done some wonderful work, telling us all we need to do better. But when we build that infrastructure right now, we're building to historical norms. That means to the hundred-year flood, and it does not include extreme precipitation.

How this comes home is -- take Norfolk, our center for national security for many military installations. About a quarter of the naval fleet is homeported there. Many of the workers live off-base. They need to get to base. Norfolk is suffering subsidence and sea level rise, about 18 inches. It's sunny day flooding regularly there, which means that workers cannot get to the base, which means we are more vulnerable in our duty to perform security operations.

Norfolk built a light rail system to get people to the base. They built it with a lot of federal money, about $318 million in cost. And this is how I first got deeply involved in this issue, when I was at the White House they came and they said help us. We just built a light rail system and we didn't take into account sea level rise. We built it essentially at sea level and now it's at great risk of flooding. And if we built it higher, by the way, we could have protected ourselves from the sunny day flooding we have. We had mentioned Sandy and

how interconnected we are. Of course, when Sandy came in we had never anticipated that it would come the way it did, but it wasn't a hurricane when it arrived. What packed the punch was the storm surge. And that subway system that we had built in 1907, and subsequently further improvements -- further improvements including a brand new subway station at South Ferry at the cost of a half a billion dollars, planned for a storm surge of 12 feet.

That storm surge came over, flooded the subway station, which turned it into -- in the words of the head of the MTA -- a giant fish tank. That station, to my knowledge, still hasn't fully reopened, it will cost another half billion.

So, we are making decisions today in replacing our infrastructure independent of what President Trump does that are vulnerable because we don't have codes that reflect the future risk. We don't have civil engineers who could go and say this is your risk on a regional basis or a local basis.

We need to direct energy now to those decisions.

We only replace currently at about the rate of 1 to 2 percent. And to the point, we'll be working with existing infrastructure for a long time, even with a trillion-dollar investment. We need to make sure every time we make a choice as to that infrastructure it's resilient.

It's hard work and it's going to happen on the state and local level. And we need to be in a support mode with the science and the information to help them make the choices that they're going to need to make.

MS. SCHANZENBACH: One quick follow up question about this Norfolk example that you gave. So, what did you say when they came to you and said we just built this and it's not climate resistant at all? I mean, why didn't they figure that out a year ago?

MS. HILL: Well, it's the politics. And I don't think we're really talking about the politics here. Fascinating. You asked what we did. The White House along with other agencies decided to work with the community to see if we could get a strong regional

plan for them for what they should do with sea level rise. And there has been some tremendous work. They actually won one of these HUD competitions on resilience design and they've made some progress.

But they just had a world premiere last week of a film on the Norfolk sea level rise challenge. Interestingly, the filmmaker for political reasons never uses the word climate change because it's simply too toxic to discussion on a regional basis. The community still hasn't been able to reach consensus about what they'll do. They do have very good science and information about the risk, but they haven't figured out what collectively they want to do.

Which raises one of the greatest challenges in all of this. It's governance. Who is going to make the decisions about two towns side-by-side, one wants to build a sea wall, the other doesn't?

So, that's what we did. We tried to work with them, they made a lot of progress but they still haven't resolved how they're going to go forward.

MR. KAHN: Diane, I want to pick up on

Norfolk, Virginia because it's a great example. In some of my writing I've argued that competition matters. If Norfolk, Virginia drops the ball and does not make the investments to adapt, will Charleston, South Carolina build up its port? And if jobs and the military is mobile, if there is competition between places, this actually protects urbanites.

So, remember I started with New Orleans, of protecting urban places versus urban people. If firms are voting with their feet and moving to places that they view are safer, the insurance industry gives them a discount on premiums for moving to safer places. This is how capitalism begins. If I can use the C word, this is how capitalism begins to help us to collectively adapt.

So, I think we actually need more competition. And I'd say that the insurance industry can be the adult in the room. If we have Homer Simpsons' households and those who are using historical models of risk versus those who are on the hook, if the risking risk actually manifests itself.

MS. HILL: You're nailing a key piece of the puzzle, which I would argue is working in the wrong way right now: insurance. So, insurance creates all of their rates based on what happened last year, not based on what -- it is a rearview mirror design. So, we have not seen -- even in places where we should see -- substantial increase in insurance rates despite the fact that the risk is going on. We're starting to with flood plan changes, but only recently and only driven by federal government policy, not driven by the reality of the facts that we're talking about.

So, I think this has got to be some part market-driven and some part government-driven. But until the insurance industry incentives are in the right place -- and I will tell you insurance commissions of which I've been in 10 or 15 of them to make the case for different rate structures, nobody wants to raise rates. It's a political hot potato, whether you're an appointed commissioner or an elected commissioner. And rates are still being designed based on what happened last year and the year before.

So, for market forces that is certainly one place and it's quasi-market/public given that there is a rating commission. One place that will make a difference if we dig in and get the signals right rather than what we're seeing now.

MR. STRONGIN: I think you want to be a little careful on the way competition runs. Businesses don't manage this risk the way individuals do. Most businesses diversify this risk, they do not manage it in location.

So, for instance, if you take a typical bank today they are going to have three or four different computer sites. They're not going to have one. They're going to have backup locations. Because one of the things we saw and you saw with Sandy, and you've seen it with terrorist events and other stuff, the current emergency rarely looks like the last one. So, what you're typically doing is designing in flexibility of response, not point of defense.

So, very often this discussion sounds a lot like the development of the new Maginot line, when in

fact most businesses have a tendency to diversify risk, which is a very different set of incentives and a lot cheaper than it would be to do a point defense. Individuals, by the nature of their lives, have to do a point defense. So, it's not actually clear those two things are aligned.

Flood insurance can be redesigned. The insurance industry broadly just basically shortens the term of their policies. They're one year polices. Their goal here is to not be exposed to this risk, not to correctly price something they don't know how to correctly price. And in fact, they'll just raise their rates after the flood and make the money back because people can't go without.

So, the market mechanisms here are not particularly friendly to the individual problem. They're just not aligned. So, if you're trying to deal with the community's problem, you have to find ways of generating community solutions which are very often coordination issues. How does a community coordinate its survival? Which goes to your towns

next to each other, one of which wants to put in a holding area that goes 15 miles out, the other wants to build a wall because they want their views to look nice. One doesn't even want the wall because they care about the views and use stilts. Those types of coordination issues represent real problems here that are not just knowledge based.

MS. LUBBER: I just wanted to add on the insurance piece exactly are domestic insurers right on an annualized basis? And if there is a really bad event as what occurred with Hurricane Andrew in Florida, eventually they remove themselves from the market so that there is no insurance left. And, of course, the flood insurance program, which is about $24 billion in the hole, it's a federal program, it's tempted to correct the fact that it's in the hole by making the premiums -- they wanted to actualize or actuarily sound, and they passed the Biggert-Waters Act. The premiums shot up because the premiums do not accurately reflect the risk of living on the coastline.

And Congress immediately back-peddled, said we made a big mistake. Actually, they said FEMA made a big mistake even though they passed the legislation. (Laughter) back-peddled and now those rates are rising slowly, but they don't reflect the true risk. So, right now people are building on the coast and they are at risk.

And then the expectation from people living on the coast is that the federal government will come back and help them when the hurricane happens. Which the GAO will tell you, because of these increases in disaster payouts by the federal government, that has placed us along with the flood insurance and the crop insurance on the high-risk list. That climate change impacts create a high risk for the federal government's ability to pay.

That's a pretty astounding thing to think about. Well, who is going to pay then?

MS. SCHANZENBACH: There are many great questions from the audience, and I'm going to do a couple of them at a time and then throw it out to the

panel. I'm sure you all have many things to say. (Laughter)

So, one is at last panel consumer savings was part of the conversation. It was supposed to be a driver of better decision-making. Who saves here and how do you sell something like this to a public that isn't really scared of climate change?

I'm just sort of going to bundle three of them. Second is thinking about potential federal policy. If you were to design an infrastructure bank, which I think many people think we'll do an infrastructure bank if we move forward, will resiliency be a criteria and how would you structure that?

And then the third piece that sort of ties a lot of this together is -- I think many of us are feeling a little disheartened -- is there sort of a bipartisan way forward here that's not just about state and local?

MR. STRONGIN: There are two separate questions there.

MS. SCHANZENBACH: There are three technically.

MR. STRONGIN: I meant -- (laughter) There is one about defensive current communities which is inherently highly political, very difficult to deal with, and typically the government is unwilling to deal with the reality of those risk structures. The second is about the broader question of how we rebuild our cities on the 50-year horizon. How is it you deal with the general migration, how do you build rail systems and road systems so that they're more resilient?

One of those is a long-term planning problem that doesn't need the word climate in front of it and can be part of a bipartisan agenda. The defensive community tends to be inordinately partisan no matter how low a level you get, right down to burrow against burrow, let along red against blue.

So, I think those are very different in structure. I think, one, yes, we can do a lot with, and I think the infrastructure bank is one way of

dealing with it. The community one is going to be much harder, which is part of the reason my suggestion was to sort of duck, was to provide a road for the communities to find more resilient places as opposed trying to solve how you do the point defense.

MS. LUBBER: Right now some people believe the infrastructure bill is dead on arrival, a few people believe it's a great vehicle. Everybody's definition of what an infrastructure bill might look like is radically different. But it is a big opportunity. We are going to end up putting money into certain infrastructure issues.

Water systems. We've got state revolving funds even in the present EPA system, after cuts arguably, that might be made and let's hope they're not. That's going to spend billions of dollars on water in the states, federal money going through to the states. That money could be spent smartly, factoring in what it means to have too much water from floods sometimes not enough water from droughts. It could be built around climate data and we can invest

it smartly. Or we can just invest it the way we always have in systems that are outdated before they're finished like the rail system and like many of our water systems.

So, there is much that we have to spend money on anyway due to aging infrastructure. And when we spend the kind of money we're spending we need to look at the data, the data surrounding it. I think not looking at climate models -- and, again, I don't care what you call it -- but not looking at the data ends up with a foolish, you know, we just built a rail system and oh, by the way, we didn't look at sea level rise.

We've got to spend that money smartly. So, I've got some hope that the opportunity in front of us, which is going to be money on infrastructure, people are moving into cities, highways are different, public transportation is different. Every one of those things has to factor in climate-related data and results. And if we do that we'll be far further along.

I don't think we could take on many of these things without government intervention. I mean, it's the tragedy of the commons, it's almost -- because I own a beach house on Cape Cod is it my problem or is it those people building new buildings on the waterfront in Boston? I mean, it is a community-wide problem and we're going to need new zoning laws and systems, we're going to need city intervention, state intervention, and federal intervention. And I don't think this problem is easily suited to expecting market mechanisms to fix it.

MS. HILL: Well, I would say I think there is bipartisan opportunity here. This is a fiscal conservatives issue. It is about preparing and managing risk. So, we should be looking at how can we save in damages if we take action now. We need better cost benefit analysis but the one widely used by the federal government is that for every dollar you spend now you save four dollars on the back end in damages. That's a pretty good incentive to think I should build higher if I'm in a flood zone. That's not getting to

the land-use issue of whether we should be there at all, but at least it's preparing our built environment to survive better.

As to the migration issues, I think that we don't have any models whatsoever other than a Katrina-like diaspora that affects the economy. We're attempting to figure out how to do this on a managed basis but our only example currently is the St. John island. It has 100 residents, it's a state tribe, and we proposed spending $80 million to move 100 residents.

I don't think -- and that's what we've committed to, the federal government -- I don't think that's a sustainable model for us given the kind of flooding and coastal risk that we're going to see. So, we don't have a way to help people be incentivized to move away from the coast yet.

As to the infrastructure bank, I think we should all be calling out that nothing is spent, no taxpayer dollar is spent until we are sure it is spent resiliently. We are just putting ourselves at too

great a risk not to manage this risk going forward.

MS. SCHANZENBACH: Unfortunately, I need to draw this to an end. Matt, do you have any final words?

MR. KAHN: No. It was a great session.

MS. SCHANZENBACH: Thank you. We really do commend the proposal team. It's true that there are lots and lots of details in there and I think really smart ways to think about this moving forward. So, let's thank the panel and invite the next panel up.

(Recess)

MS. DLOUHY: Good afternoon. I'm Jennifer Dlouhy, I'm a reporter with Bloomberg News and I am excited to be here today with Ted Halstead. Ted is the founder and CEO of the Climate Leadership Council, which last month unveiled its blueprint for a conservative climate solution. And the core of that plan is a gradually increasing tax on carbon dioxide emissions with proceeds that would be rebated on a quarterly basis as a dividend to Americans. In exchange, other environmental regulations would fall

away, many of those already being targeted by the Trump administration, something I'm eager to talk to you about.

I covered this blueprint when it was first unveiled last month. I'm excited to hear a lot more about it today. Ted, I'm curious, can you just give us a broad overview of the plan and how it came together? Some of the Republican statesmen that are really behind it.

MR. HALSTEAD: Sure. Thank you all for being here. So, we spent nine months putting together our cast of characters. Our coauthors, as some of you know, included three former secretaries of Treasury, two former secretaries of state. So, Jim Baker, George Shultz, Hank Paulson, two of the foremost conservative economists, Martin Feldstein and Greg Mankiw. It also included Rob Walton the former chairman of Wal-Mart, and Tom Stephenson.

Anyway, the reason it took nine months to pull this group together is not just reaching out to the individuals in question, but we spent our time

shaping a policy that we felt could on the one hand meet the conservative test of free markets and limited government, and secondly, serve as a basis for the eventual bipartisan climate breakthrough that we all know that we need.

So, a lot of time was spent shaping the policy at the correct level of specificity that offered enough concreteness but also allowed for a fair amount of policy details that still need to be developed.

We released it on the 8th of February, two weeks into the Trump administration, had a much-publicized meeting at the White House with Gary Cohen and his staff. And to our pleasant surprise within the first three weeks we had received editorial board endorsements from literally every leading paper in the country with one exception, you'll guess, the Wall Street Journal.

But Baker and Shultz had their -- it's a funny story. Baker and Shultz had placed the original op-ed the day of our release in the Journal.

Feldstein, Mankiw, and I had one the same day in the New York Times. The only negative editorial was from the Journal, which was sort of a lukewarm critique, at one point saying if you're going to solve climate change you might as well do it through a carbon tax. But then ended up being critical.

And interestingly, Baker and Shultz took it upon themselves to write a very strong response to this. And I was skeptical because I thought, well, you know, newspapers don't allow a response op-ed to their own editorial.

So, instead what they did is they took a full length, 800-word piece and put it in the letter section. So, it got more prominence than an op-ed would have gotten because if you're Baker and Shultz you get that kind of treatment.

Anyway, since then we've continued some meetings on the Hill, but really what we've focused on is building support for this idea within corporate America because we think that getting backers from top CEOs is the necessary next step in our process. But I

have to say that everything that's been happening over the last couple days, oddly enough, heightens my enthusiasm and optimism about this becoming possible.

MS. DLOUHY: I actually want to follow up on that, but I was hoping you could give us a sense, without naming names, without detailing the specifics I know you don't want to get into, of how you've seen some evidence of traction, how you're getting some traction at the White House, how those meetings are going. And even if you can give us a sense of what you're doing on the corporate America side.

MR. HALSTEAD: Sure. So, a lot of attention went into our original White House meeting. Our goal for that day was two-fold. It was on the one hand to put our plans squarely on their radar screen, and second of all to not have it be immediately dismissed. We succeeded for six weeks until I think last week Sean Spicer tried to say that on the one hand he might be open to this but really the White House is not considering a carbon tax.

But in the meantime -- and this isn't

revealing anything about conversations we've had at the White House -- but I think it's fair to say there is a lively debate within this White House about whether or not America should stay in the Paris Treaty or not. And we've had some meetings on the Hill as well with senior members but we're not going to go into names. And we found a fair amount of receptivity because when you -- nobody has put forth a conservative market-based, concrete climate plan before.

So, when you do and when it meets the conservative test there is actually a surprising amount of open mindedness that we're finding, which is very far from saying that this will be adopted any time soon, but we think that there's an opening and I'm sure we'll get into what those political openings are.

MS. DLOUHY: So, you've mentioned the climate that we're in right now, no pun intended. We're in the middle of this great unravelling. Maybe we're 18 hours away from the President signing an

executive order that's going to begin the rollback of the clean power plan, perhaps strip the social cost of carbon. How do you square what you're proposing with this political climate? I mean, for Republicans who are already getting a lot of what they want from the Trump administration, what's your pitch to them?

MR. HALSTEAD: So, those are two questions and let me give two complete answers.

The way we pitched our plan to the White House is that it takes every one of President Trump's stated boxes, leaving aside the climate benefits, that is our plan is pro growth, it is pro jobs, it is pro competitiveness, it is deregulatory, it rebalances trade, and it is good for working class Americans because the Treasury Department issued a recent report showing that the bottom 70 percent of Americans would actually come out ahead. That is remarkable. 223 million Americans that would win under a climate solution. That, by itself, is revolutionary. So, the way we described it to the White House is this is a popular populous plan to meet your objectives.

Then the other question is what do we make of the imminent news coming tomorrow. Well, so, I may be one of the few people who is optimistic in this town given this news and I'll tell you why. Let's go back to what happened last week, which was the healthcare debacle. I think if there is any lesson to be drawn from that it is that repealing a major national program requires two things. One is a better replacement, and two, is doing so in a bipartisan manner. It's the only way you can actually have a politically viable manner to do so.

So, right now the Trump administration is pursuing a repeal only climate strategy. Fine. I believe that there will soon enough be a significant backlash to that because there is no issue in America today where there is a wider gap between the Republican leadership and the Republican base than on climate policy. I mean, the polls are very clear. The majority of Americans care about this issue. The majority -- 71 percent of Americans want to stay in the Paris Treaty, and an even larger portion of

Americans want clean energy.

So, there is a fundamental disconnect. And I think what's happening here is that with a sort of repeal only strategy there will be a significant backlash. And at that point, Republicans will be looking for a replacement plan. And that is how we are positioning our plan, as the conservative climate answer if and when the Republican party wants to introduce it.

We think that there are a lot of strategic benefits for Republicans to pursue this plan. I mean, just to name one example, here is finally a highly popular way for regulatory rollback. Because by itself, you can image how the EPA sort of threw a bull in a china shop scenario is going to play out. At some point, there are going to be Trump mothers that are going to complain that they don't trust the quality of school lunches anymore because of an emaciated EPA, or there will be another Flint-like water crisis. And at that point there will be pressure for, okay, you've repealed all these things,

what's your replacement plan? And that's where we come in.

MS. DLOUHY: So, you've laid out the benefits for Republicans, at least a political benefit that is pretty clear. What's the benefit for Democrats? I mean, I was struck, I will say, when you first rolled out this plan the modelling behind the potential emissions reductions. What's the pitch to Democrats? Why should they get on board?

MR. HALSTEAD: The pitch to Democrats is twofold. One is that our study, based on the best models available, found that our plan, which starts with a carbon tax of $40 per ton and a moderate escalation of CIP plus 2 percent per year, would realize nearly twice the emissions reductions of all Obama-era climate regulations combined. And that assumes full implementation of the clean power plan. It also found that it would accomplish nearly three times the emissions reductions of what you could call the new baseline after the Obama regulations are repealed.

But most interesting of all, and this is how we set the price at $40 per ton, is that our plan, by itself, would meet the high end of American's commitment under the Paris Treaty, meaning a 28 percent reduction by 2025 with 2005 as a baseline.

So, the number one reason why Democrats would support this over time is because it is so much more effective as climate policy. Second of all, the fact that the 100 percent dividends play would benefit the bottom 70 percent of Americans. What that means is that they would get more in monthly or quarterly dividends than they would pay in increased energy costs. That too should be very appealing.

Now, clearly, it's an uphill battle on both sides. Democrats tend to favor regulatory approaches, they tend to think that those are safer. By contrast, Republicans believe that those are growth-inhibiting. This is a case -- and this is a point we keep making to our Republican friends -- this is a case where Republicans can showcase and highlight the full power of the conservative cannon because this is a case

where you can get a smaller government and far less pollution at the same time. It's a perfect way to epitomize the power of the conservative principles of, again, limited market and free governments.

MS. DLOUHY: So, I know you've heard plenty of criticism, you've alluded to that. A faction of conservative voices, Tom Pile, Myron Ebell, Grover Norquist have obviously been public in their criticism of the plan and they say that it would place an undue economic burden especially on the poor.

Now, I know you alluded to the dividend checks that these folks would be receiving, but I am curious, you know, there is an argument that if you're upper-middle income you have better access and better chances to make investments in solar panels, by a Tesla, do things that would shrink your own carbon footprint. What's the impact? I mean, how do you address their concerns?

MR. HALSTEAD: Do you notice that Jennifer has this habit of asking three questions in one? (Laughter) So, I will try to answer each of those.

So, sure, you're talking about an upper income family that might buy an electric car. Our plan has a really interesting detail in there. We say that Americans should be able to borrow against their future dividend income stream for very specific purposes, for example, purchasing an electric vehicle. And if you think that through, that means that it would help the individual, it would help the environment, it would help the economy, and it would help auto manufacturers. It's a quadruple play, so that gets interesting.

Regarding the critique of five groups that wrote a letter to the White House criticizing our plan, you know, what amazed me was the weakness of their critique. In fact, we had a fun time with this. Shultz and I wrote an article in the National Review taking them to task and calling them to the street because they took a four-part plan and assumed it only had one part, a carbon tax. They said, huh, that's bad for jobs and can be bad for the economy. Well, that isn't exactly our plan.

One thing I want to emphasize because it's extremely important as we go into the tax debate, for those who want to advance a carbon tax there are currently two dominant strategies. One is the let's try to fold this into the tax debates and maybe have it fund corporate tax reduction and so forth. And then there is our strategy which is, no, let's have a standalone piece of legislation.

The first thing I would say is that a carbon tax by itself is deeply unpopular and a political dead end. That is why we emphasize time and time again that our plan is carbon dividends. To call our plan a carbon tax is the equivalent of calling the Social Security system a payroll tax. It is focusing exclusively on the funding mechanism as opposed to the benefits. It is the benefits, the dividends, that will sell the American public on this.

The second thing that I would stress, and this is something that is I'm sure understood by most people in this room but really not understood by most people who talk about these issues on Capitol Hill, is

that the goal from a climate perspective is not to pass a carbon tax, it is to pass or put in place a carbon tax that can grow over time. Because as we saw in British Columbia, which is the best example of a carbon tax in our hemisphere, the moment that the tax stops increasing at that point emissions start going up again. The only way to achieve your climate goals are for carbon tax increase.

And the one thing I'm sure about, I don't doubt that a short-term deal could be cut under which you trade a carbon tax for corporate income tax. But what I am sure about is that that would end up being a static onetime tax because the American people will not be happy. That's the polite way of putting it. They will not be happy with that type of plan because their energy prices will go up and they won't feel like they're getting anything in return.

Then inevitably what happens is that Washington will say, well, we've done the carbon tax, it didn't work out so well, we're not going to touch that again for five years. I think that collectively

we need to think seven steps ahead on the chessboard. And if you agree with me that the goal is a continuously rising carbon tax I would suggest to you that the only political formula capable of delivering that is a dividend strategy because it's the way in which we solve -- and I want to stress this for one moment. Conversations about climate change rarely delve into psychology so bear with me for just one moment. There is an underlying psychological problem in the climate debate, which we all sort of know but nobody talks about too explicitly. For years climate advocates have essentially been telling their fellow citizens please make short-term sacrifices now for the benefit of others in other countries in 30 or 40 years.

You know what? That's just not very motivating. And several speakers have said today have said, well, we need to instill the fear of climate change in people. Well, actually what motivates people more is their self-interest. And the beauty of the dividend solution is that it solves that

psychological problem by giving people benefits in the here and now in the form of dividends that even in year one a family of four would receive $2,000 a year in dividends, going up year to year. That really changes the politics.

MS. DLOUHY: So, nothing in this town, of course, happens in a vacuum, and I know you may desire to keep this out of a tax overhaul, but the failure of the healthcare bill, that's obviously something that some Republicans want to move on to, the Administration wants to move on to. One, how do you not keep this from getting involved in that debate? I mean, there's a core group of 17 Republicans who want to address climate, this is a great way to advance it.

And then if it does get wrapped into that it just seems like this is an irresistible a pot of money I think for lawmakers who over time may stop looking at it as a way to provide dividends to the taxpayers, but rather a revenue stream to fund a lowering of the corporate tax rate or other priorities.

MS. HALSTEAD: See what I mean by the three

questions again? (Laughter) I'm just teasing you.

So, here is how I hope things will play out. I hope that in the tax debate carbon taxes are seriously considered because what that would accomplish is it would break the lock of the no carbon tax ever crowd among the Republican party. I doubt, however, that it ever gets to the finish line.

So, it would be fine because it would sort of socialize the idea that some Republicans are familiar with a carbon tax, are comfortable with a carbon tax. And then we believe that the more promising opportunity is this standalone piece of legislation.

So, let me give you a scenario. The administration just failed on healthcare. Then whether or not they succeed on tax policy, who knows. They may fail. Either way, President Trump is likely after that to be looking for a big bipartisan win because he may realize, as he just did last week, that doing things in a purely partisan way doesn't work out so well. And then he'll be looking for a big popular

plan that might be able to expand his base.

Well, ironically enough, we believe that a repeal and replace climate strategy based on carbon dividends could offer the administration just what it needs: a big bipartisan plan that would help the working class, that would expand the President's base. I mean, imagine the cognitive dissonance of all of the protestors all over the world who love saying this president is terrible on climate change, when if this White House came out with a plan that is nearly twice as effective as Obama's in reducing emissions, I mean, that would really change politics. And there may come a time when President Trump decides he really needs to expand his base and reach out in a bipartisan way with a big policy win.

And especially if they fail on tax reform, that would be two failures, they would be looking for something big. Maybe that's wishful thinking, but we're in this for the long term.

MS. DLOUHY: I wanted to turn to audience questions, we've already got a few. In fact, two of

them are asking about the liability protections, or the notion of liability protections you've embedded in this. One, can you give us an explanation of why that's in there?

MR. HALSTEAD: So, we've tried to come up with a package that is forward looking about solving the problem. And in order to entice Republicans and business leaders to sign on to this plan, basically it boils down to let's get the market prices right and government out of the way. And I understand that for some Democrats and progressives the idea of ending tort liability for historic emitters is problematic, but from my perspective if we're trying to solve the climate problem what we need is a solution going forward. And if we have a strong solution going forward then litigating backwards is actually not helpful. In fact, it tends to impede progress.

And you asked before, well, could members change their minds about dividends in the future? Well, that's the beauty of dividends. It's sort of like a hook. If we start with the dividends and the

public starts getting used to receiving them as in the state of Alaska, which is a perfect example for this where there is a very popular dividends plan that has withstood every effort to undermine it because dividends become the third rail of politics, if we can start with a dividend play I have little doubt that it will sustain itself and then we have a long-lasting climate solution.

MS. DLOUHY: One of our audience members wants to know your opinion on taking this to the state level. If you can't do it at the federal level right away -- and obviously there have been challenges doing it in Washington state -- but if you can't do it here right away what are you thoughts on whether you go to the states and try it there?

MR. HALSTEAD: Just to clarify, that was one question, but I'm going to try to turn it this time into two. (Laughter)

So, on the state side, sure, given the current political environment. I could easily see this policy being put on some ballots in 2018. What I

would say though is that authors of those initiatives should be very careful to put in place policies that when national carbon pricing is in place, those state policies would automatically sunset.

But to me, the more interesting sort of alternative to move this plan is internationally because if you combine carbon dividends with border carbon adjustments it creates a really interesting new domino effect, whereby if one country pioneers such a system with border carbon adjustments it compels other countries to follow suit.

So, whether this starts in the U.S., in the UK, in Germany, in China, in India, and for each of those countries there is a different argument. By the way, I notice on the list there was somebody from the Chinese Embassy here today. Is somebody in fact here from the Chinese Embassy? Okay, then I will spare you my China spiel on why I think this has great potential in China. Back to you.

MS. DLOUHY: I did want to ask you about the international component of this. I mean, you were

obviously not just looking at the U.S., you were looking at China, you were looking at the UK. Are you already doing outreach there? What's kind of your endgame? What are you thinking?

MR. HALSTEAD: We're already active in the UK because we believe that a post-Brexit UK is a very ripe environment for this policy simply because, a) they're no longer wedded to the EU ETS mechanism and can (inaudible) on their own, and, b) because Theresa May's government, if you think about it, has very ambitious climate goals on the books, their policies are not meeting them, so they need new policy formulation. And Theresa May has made it clear that she is interested in more inclusive forms of growth and this would provide that.

So, the UK is a second country in which we are the most active. I mentioned the other countries, Germany, China, India, where we would like to go next. And in every country there is a somewhat different framework. And since you sort of gave me the opening, despite there being no Chinese Embassy staff in the

room, permit me to tell you briefly our framework for China.

Look, China knows it has a serious pollution and smog problem and that it must address climate change for that reason. That truck is already driving down the road. But the highest priority of China's government is to transition to consumer-led economic development. And nothing could hasten that faster than giving dividends to every Chinese citizen every month.

So, our simple message to the Chinese leadership is, look, here is a way to accomplish your environmental and economic goals at one and the same time. So, we think this idea does have potential there. We can't do everything at once, but we are growing rapidly. In fact, I have a great VP of business outreach that I'll be eager to tell you about next Monday when he starts. I can't tell you about him right now, but we are staffing up in all kinds of interesting ways and that will permit us to be more expansive.

But our initial focus will be U.S. and UK in year one then the rest of Europe, then China and then India.

MS. DLOUHY: So, this maybe a question best geared toward that new VP, but I'm wondering -- this is a question from one of the audience members, I love it -- who asks you are looking at getting CEOs on board, you're focusing a good deal on corporate America. What about the grassroots groups that represent lower income families?

MR. HALSTEAD: Well, I believe that our policy is very well suited to meet their interests in the first place, and I don't think we need to be spending our very limited time on outreach to them to reinforce -- I mean, the real battle is if and when there is a carbon price where do the revenues go? Our agenda is entirely clear. Our group is 100 percent dividends. So, we believe that we're helping those families. And I think that you can't do everything at once. We have positioned ourselves very intentionally first by reaching out to Republican and

other statesmen, and second of all by reaching out to the business community because those are the groups that are not often enough represented in these debates and where the breakthroughs are most needed.

MS. DLOUHY: We've got to wrap up soon but I want to ask you two questions. One is in the weeds, but I am curious. Given that we just saw the power of the Freedom Caucus -- this is a question from an audience member. Given that we just saw the power of the Freedom Caucus play out in the healthcare debate, how do you combat the notion, the criticism that might come from some of them that a dividend is an entitlement, something that they would fight against?

And then broadly, stepping back, I'd love to hear you address -- as we close out the session, I'd love to hear your thoughts of what success looks like. I know you're talking about a long haul. Maybe you see some action right away, but you're talking about a long process. I want to see what that success looks like to you.

MR. HALSTEAD: Great. So, on the dividend,

we have a very different view. This is not a giveaway. The dividend is actually earned through the good behavior of lowering one's carbon footprint. And that really changes the politics. It's also not redistribution because people will pay based on their carbon footprint. So, if you imagine the hypothetical billionaire who lives in an eco-home with solar panels on the roof, drives an electric car, and doesn't fly much, that person would pay zero. This is not a tax the rich plan, this is a penalize you for your carbon footprint and reward you for reducing that carbon footprint. It is earned through good behavior. That is one thing.

In terms of our long-term, medium-term objectives, our first objective was to just get our plan out there with leading Republican statesmen, we did that. Our next goal in the May to June timeframe is to unveil what we're calling the 20 Founding Members of the Climate Leadership Council, which will include a number of top CEOs as well as a few others, and will sort of serve as the ambassadors for this

idea to telegraph its seriousness in the breadth of political support for it.

We then, at that point, having a number of corporate leaders behind this, we will then begin a strategy, we will then be getting the plan introduced. I'm under no illusions that it's going to pass in this particular Congress, but I'd say maybe there is a 25 percent chance that the White House comes around to this for reasons discussed. And at the same time, the lower hanging fruit in the short-term is probably in other countries.

So, if you ask me what is our five-year plan, our five-year plan is to get this policy implemented in one leading nation to set a precedent and to start a domino effect. In other words, the United States could lead on this or it could follow. We'll pursue both strategies.

MS. DLOUHY: Ted, thank you very much for talking with us today.

MR. HALSTEAD: Thank you. It was great.

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I, Carleton J. Anderson, III do hereby certify that the forgoing electronic file when originally transmitted was reduced to text at my direction; that said transcript is a true record of the proceedings therein referenced; that I am neither counsel for, related to, nor employed by any of the parties to the action in which these proceedings were taken; and, furthermore, that I am neither a relative or employee of any attorney or counsel employed by the parties hereto, nor financially or otherwise interested in the outcome of this action.

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