THE BROOKINGS INSTITUTION

ENERGY AND CLIMATE CHANGE 2010:

BACK TO THE FUTURE

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PARTICIPANTS:

Welcome:

STROBE TALBOTT
President
The Brookings Institution

PART I: INTERNATIONAL CLIMATE DIPLOMACY

Keynote Remarks:

STROBE TALBOTT
President, The Brookings Institution

TODD STERN
Special Climate Envoy
U.S. Department of State

Panelists:

WILLIAM ANTHOLIS
Senior Fellow and Managing Director
The Brookings Institution

BRUCE JONES
Director, Managing Global Insecurity Initiative
The Brookings Institution

EILEEN CLAUSSEN
President, Pew Center on Global Climate Change

PART II: SCIENCE, POLICY, AND REGULATION

Keynote Remarks:

DANIEL H. YERGIN
Co-Founder and Chairman
Cambridge Energy Research Associates

DAVID SANDALOW
Assistant Secretary for Policy and International Affairs
U.S. Department of Energy

Panelists:

SHIRLEY JACKSON, Moderator
President, Rensselaer Polytechnic Institute

CHARLES EBINGER
Senior Fellow and Director, Energy Security Initiative
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BARRY RABE
Professor of Public Policy, University of Michigan
Nonresident Senior Fellow, The Brookings Institution

MARK MURO
Fellow and Policy Director, Metropolitan Policy Program
The Brookings Institution

Jonathan Epstein
Professional Staff Member, Senate Committee on Energy and Natural Resources
Counsel, Office of Sen. Jeff Bingaman (D-N.M.)

PART III: ECONOMICS OF CLIMATE CHANGE POLICY

Lunch Keynote:

TED GAYER
Senior Fellow and Co-Director, Economic Studies
The Brookings Institution

DOUGLAS ELMENDORF
Director, Congressional Budget Office

Panelists:

TED GAYER, Introduction and Moderator
Senior Fellow and Co-Director
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ADELE MORRIS
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Senior Fellow
Resources for the Future

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P R O C E E D I N G S

MR. TALBOTT: Good morning, everybody. Everybody got some coffee or the moral equivalent?

I'm Strobe Talbott, and it's my great pleasure to welcome all of you here for an event that I don't really think could possibly be more timely and for that matter more important than this one today. And I want to thank all of you for coming on behalf of my assembled friends and colleagues from the Brookings Institution as well as some outfits that we're partnering with as we tackle what are essentially five topics that have a very compelling nexus, particularly at this point in the life of this city and our nation and our world. And that is energy, economy, climate, politics, and diplomacy. All of these are coming together in a very high stakes way.

By coincidence, we have five research programs at the Brookings Institution. We have a program that concentrates on the American economy, a program that concentrates on the global economy. We have a program that does a lot of work on what once upon a time were called urban issues and what we now call metropolitan issues. We have a foreign policy program which is itself, I think, kind of an atavistic word. We really ought to call it a life-in-a-globalized-world program. And then we have a governance program which looked at how to make more effective the institutions of American democracy.

The lights are now turning up, so I'm now blinded and I can't see any of you, but I assume you're all still there.

And the reason I run through that little bit of parochial lore, namely, the Brookings unlight goal as divided into five parts, is that all parts of Brookings are working on the nexus of energy and climate. We call this an all-Brookings priority, and we do that for reasons that I don't think probably need any explaining or justifying here.

Dick Gephardt, a guy who spent a lot of time in this town and who knows both the politics and the commerce related to the issue that we're discussing today, once said that the transition from a high carbon economy to a low or no carbon economy is going to constitute the most complex political transaction in the history of mankind. You could arguably say that the same superlative applies to our attempt here in the United States to begin -- and I stress begin -- making that transition.

And that has quite a bit to do with the immediate context of the issues that we're going to be talking about today, which is what is happening legislatively here in the nation's capital. And I think we should see the Kerry-Lieberman bill very much against the backdrop not just of the hugely important global issues that we're going to be talking about, but also against the backdrop of a national catastrophe, which is to say the oil spill off the Gulf Coast and, of course, the biggest economic downturn since the Great

Depression and one of its immediate and all too persistent consequences, which is severe unemployment.

So because the two senators have put forward their bill against that backdrop, they have understandably given it the name “The Clean Energy Jobs and American Power Act.” That is to say they are stressing it as part of a cluster of remedies for doing something about the problem of unemployment, doing something about the challenges to the export sector of our economy, our loss of competitiveness with a number of countries. China and Germany come to mind, who have made great strides that we, the United States, have not made in the export of green energy technology and taking advantage of the new global market in these areas.

So there are two fairly important overall questions that loom over the discussion today. One is, how do we find the right formula for coming up with a recession-proof and meaningful new legislation that will address the challenges both of energy and independence and also beginning to get a grip on the problem of climate change.

And, second, how do we take action as a nation that will employ our President and our Executive branch -- and I might add the gentleman we’re going to hear from next from this podium -- to exercise American leadership on this issue around the world where all countries, developed and developing, are looking to the United States in two respects:

One, they want us to demonstrate responsibility since we bear, historically, a huge responsibility for the problem itself, but they also are looking to us for leadership and example as we try to put together some sort of global deal. And that is an issue that came into heightened focus with the Copenhagen meeting of last December and is coming at us again as the administration and other governments around the world prepare for a follow-up meeting in Cancun.

If you will permit a slight plug for a personal project at Brookings, Bill Antholis, who's down here in the front row and who, along with Eileen and Bruce Jones, will be part of the first panel after we hear from Todd, he and I have just published -- we got our first books on Friday -- a new book called *Fast Forward: Ethics and Politics in an Age of Global Warming.*

It is available, but I can summarize it in a sentence, which means I hope that doesn't substitute for your looking at it. And that is that for 20 years we, the international community, have been seeking, through a process that was very much under the aegis of the United Nations, a legally binding treaty that would commit all major emitters to strict schedules of de-productions. And to make that 20-year very long story short, it hasn't worked.

And it hasn't worked anywhere near fast enough to keep up

with the pace at which a climate change itself is coming at us, which is one reason our modest recommendation is that we, collectively, need to hit the fast forward button in order to accelerate this process, and that does not mean putting the United Nations out of the process but it does mean relying much more on more informal and selective mechanisms particularly ones that would involve cooperation and coordination between and among the United States, the European Union, China, and India.

We have an excellent lineup of participants, and we hope that as many of you as possible will stay until 4:00 this afternoon. We're very glad to have two alumni of The Brookings Institution who are now in public service, who will be with us today.

We've got David Sandalow of the Department of Energy. It wasn't that long ago that David would show up for work at The Brookings Institution driving an all-electric plug-in vehicle, a test model provided by a company that's gotten a lot of attention recently, and that is the Toyota Corporation. And David wrote a book on plug-ins and did a lot of great work at Brookings, and he's now back in the government doing that.

We also have Doug Elmendorf, who was previously of our Economic Studies Program and who, of course, has now head of the Congressional Budget Office.

And then there will be a panel, the last program in the day.

And I would very, very strongly urge as many of you as possible to stick around for that because I think this panel is really going to tie things together. And that's going to be moderated by Ted Gayer, who is the co-director of our Economic Studies Program, and who has personal expertise on climate change because of the work he did in the Treasury Department during the Bush Administration.

We're also fortunate to have two of our trustees at Brookings, who are sort of like player coaches in the NHL. They're part of the governing structure of Brookings, but they also have deep substantive knowledge which they're going to share with us today. Dan Yergin, who, as you all know, is a Pulitzer Prize winning author and founder of CERA -- initials I don't even need to translate for a group like this -- and who has done a great deal of work while at Brookings helping us with issues like energy security. And he was very helpful to Bill and me on our book on climate.

Then we also have Shirley Jackson, the president of RPI and also the former head of the Nuclear Regulatory Commission, who will be speaking to us as well.

Finally, I just would like to thank you, Todd, Todd Stern, for being back here to get us started on an authoritative note that will put the issue that we're talking about in a global context. I think all of you know that

Todd has a background in law and also in one of the best and newest think tanks in Washington. That's the Center for American Progress.

But more to the point, he is a veteran of the diplomacy of climate change. I guess you can't quite say, Todd, that you were present at the Creation, but you must feel like it. You certainly have been present at the frustration, and you've been heroic and persistent in getting us from Kyoto to Buenos Aires, to Copenhagen and past Copenhagen, and taking us on the road to Cancun and beyond.

He is the lead U.S. negotiator on this issue and it's my pleasure to turn the lectern over to Todd, and then I'll join him for a little bit of a conversation with him and with you after he finishes. (Applause)

MR. STERN: Thank you very much, Strobe. Thanks to everybody for coming today in the rain. I appreciate it. I'm very delighted to be here today. Brookings does terrific work on this issue, obviously as well as so many others, and I want to commend you and for putting this event on and for the intellectual leadership that you and my old partner in crime, Bill Antholis, demonstrate day-in and day-out on these issues.

So let's turn, then, to the business at hand. Five months ago this morning, Barack Obama arrived in Copenhagen to join Hillary Clinton, rolled up his sleeves and together with the likes of Angela Merkel, Kevin Rudd, Nicolas Sarkozy, Meles Zenawi, Mohamed Nasheed, Felipe

Calderon, and many others salvaged the Copenhagen Accord from the chaos and dysfunction in which they had found it, producing the short but meaningful Copenhagen Accord.

The good news was that the Accord, while hardly perfect, represented a significant advance in a number of respects. The bad news was that the conference of the parties to the U.N. Framework Convention refused to endorse the Accord because a small but vocal contingent objected. The issue for us now is where international climate change negotiations stand today and where we are headed in 2010 and beyond.

In addressing this broad topic, I'm going to focus on three central questions:

First, can we move to the kind of new paradigm for climate diplomacy that we need and that is foreshadowed in the Copenhagen Accord?

Second, what does the United States need to do, domestically, in order to move negotiations forward.

And third, can the U.N. Framework Convention on Climate Change remain the central agent for international progress and action to address the climate challenge. And on this last point let me say we think that it can and should.

So let me turn to the first question. We can only understand

the challenge of moving to a new paradigm if we start by focusing on what came to be accepted by many, although not all and not us, as the old paradigm. That old paradigm held that the world is sharply divided into two camps that never overlap and never evolve, developed countries and developing countries, as they were defined in 1992 in the Framework Convention. With all real obligations to address climate change accruing to the developed countries. The Kyoto Protocol has often been read to enshrine this division.

Further, the frequently, the most frequently cited principle in the Framework Convention, common but differentiated responsibilities and respective capabilities, is often invoked for the proposition that developed countries must undertake legally binding commitments to reduce greenhouse gas emissions while developing countries may but are not obliged to take voluntary measures. And developing countries have commonly read the negotiating mandate for the Copenhagen discussions, the Bali Action Plan, as further codifying this division.

Now, there are multiple problems with this old paradigm. First, it is simply wrong as a matter of textual exegesis. In addition, it is fatally flawed both substantively and politically as a foundation for the future.

Starting with the text just a couple of points, and I promise not to bog down here, so just stay with me for a short minute. First, the

conventional wisdom that developed countries have legally binding requirements while developing countries are free to act or not on a purely voluntary basis is a pure myth. Both categories of countries have legally binding obligations under the Framework Convention and, indeed, under Kyoto. The obligations for developed countries, especially under Kyoto, are certainly more specific, but developing countries are actually legally bound. They have legally binding obligations to formulate, implement, and publish their mitigation programs to cut emissions.

Moreover, the idea that common but differentiated responsibilities requires a different regime for developed and developing countries on every particular, whether mitigation. transparency, or any other issue is again completely unfounded. On its face the phrase expresses the notion of a continuum of responsibilities and capabilities among countries and is completely sound in that respect. But it does not legislate an unbridgeable divide between developed and developing countries; it does not prevent differentiation among developing countries or indeed among developed countries. It does not say that China should be treated like Chad even though it's capacities are closer to many members of the OECD. It does not say that the lineup of countries in 1992 can never evolve.

And more important and most important is that it does not trump the core objective of the Framework Convention itself, which is that

we must act to avoid dangerous climate change.

Now, beyond the fact that the text does not actually support that old paradigm, the paradigm is also unworkable as a matter of substance in politics. Most fundamentally, you cannot address the climate challenge by focusing only on developed countries. Right now developed countries accounts for about 45 percent of global emissions. By 2030 that'll be about 35 percent. You can't solve the problem on that basis. Instead you need to start with the 85 percent of emissions represented by the major economies and build out from there.

Moreover, as a matter of political reality, you could get no support in the United States -- and I would argue you shouldn't get support in the United States -- for a climate agreement that required action of us but not from China and other emerging markets.

Now, the Copenhagen Accord is significant above all for two years: first, it started moving toward a new paradigm in which all significant emitters are expected to act and to act transparently; second, it included landmark provisions for financial assistance to poor countries.

Under the Accord so far, some 78 countries have submitted targets or actions for listing in the Appendices to the Accord. It reflects a bottom up architecture that was first proposed by Australia based on countries committing the measures that are rooted in their own domestic

programs. We would argue that that's the only practical way forward if you mean to include all significant economies, because no across-the-board, top-down target would be acceptable at this stage to most developing countries, and indeed it would not work well for us either.

The Accord also included provisions making clear that transparency requirements apply to all countries. The question now is whether we are going to continue moving forward toward the new paradigm that the Copenhagen Accord started sketching out. In our view, such an agreement would include domestically-derived mitigation commitments for all the major economies and as many others as possible.

It would include robust transparency provisions for all countries, both so that we're able to keep track of how we are doing in reducing emissions globally and so all countries can have confidence in the mitigation commitments made by others. And it would include far-reaching provisions on funding so that developing countries, particularly the needier among them, are given the kind of support they need for both adaptation and mitigation, and such support needs to include assistance both for acquiring and using technology and for the means to avoid deforestation.

Would this agreement be legally binding? Our answer is that it should be as soon as that result is achievable. We have made our support for a legal agreement clear for more than a year as long as the agreement is

legally symmetrical, by which I mean that the same elements are binding on all countries except the least developed.

Second agreement should be our goal. At the same time let me say, that if that goal remains out of reach for some period of time, we should not sit on our hands. A great deal can be done on every core issue of negotiations even before an ultimate legal treaty is signed.

This, then in our view, is the basic bargain of the new climate architecture as we see it. It is grounded on the need to take action that can actually address the problem. It pushes countries to deliver, but does not insist on promises that can't be kept. It understands the fundamental imperative of development for developing countries. It recognizes the need for large-scale assistance to many countries around the world. It acknowledges that a regime premised on an absolute separation of responsibilities based on a snapshot of the world in 1992 makes no sense, and it's committed to meeting the single most important objective of the Framework Convention, as I said before, to avoid dangerous climate change.

Can the conference of the parties embrace this new architecture? It certainly could because the architecture is flexible, designed to move the ball far forward but only in a way that is consistent with the development needs of developing countries. And it should because in my

view there is no going back. The old paradigm cannot deliver an achievable, ratifiable agreement. It just can't. And, substantively, it would be the wrong way to approach the climate problem in any event.

Still, that doesn't answer the question of whether there will be adequate support in the conference of the parties for an agreement based on this new paradigm. We hope do and we intend to do everything in our power to make that happen, but we don't know yet.

Let me just pause for one moment. I want to make -- clarify one point so that I'm not misunderstood. My argument about a new paradigm does not engage a debate that has been raging around us but doesn't really include us over the last year, and that's between developing countries and the industrialized parties to the Kyoto Protocol. We're obviously not a part of the Kyoto.

The issue there is whether those industrialized countries will agree to a second round of legally-binding commitments to cut emissions under Kyoto after the first period expired in 2012. This is a technical issue. Most people find it shocking that there are actually two tracks of the negotiations, but be that as it may there are. The developing countries argue that the industrialized countries must commit in that second period, and the industrialized countries thus far have refused because they argue that Kyoto would cover -- such a second period would cover only about 30

percent of global emissions.

Again, we haven't taken a position on this issue, but what I will say is that even if some kind of deal is struck in which the Kyoto industrialized countries agree to a second period, I think that would be fine, be great. It would not establish the architecture for a truly global agreement going forward that includes the U.S., China, India, and so forth.

So, one way or another, in our view we're going to need to move toward the new paradigm that I'm talking about.

Now let's move to the second question, what the U.S. needs to do domestically. In virtually every meeting that I have been in, in the last 16 months I've been asked about the status of our legislative effort. You'd be astonished at how closely the ins and outs of Congress are followed, although I think they usually mystify the people who are trying to follow them.

Many assume or contend that not much is doable in the absence of U.S. legislation. Let me make three points on this subject. First point, we have done and are doing a lot already. Under the Obama administration, the U.S. has taken historic steps toward putting our country on a path toward a clean energy future. Our 2009 stimulus plan provided more than $80 billion in investments, loans, and incentives to support a range of initiatives that are critical to transforming the way our country produces and consumes energy. This includes support from major

improvements in the efficiency with which we use energy, including the largest single investment in history in home energy efficiency.

We have invested billions to put us on a course t double the use of renewable energy by 2012, and we've targeted investments that will begin to transform our antiquated power infrastructure into one that uses a smart grid, smart metering, and other smart technologies that we need for the 21st century.

Moreover in the last year, we have made critical investments in the transportation sector that will, among other things, lead to our country's first three electric vehicle plants and 30 new battery and other electric component plants within six years. These investments are complimented by the most ambitious U.S. fuel economy and tailpipe standards ever. The combined EPA and Department of Transportation program will be begin in 2012, and by 2016 our fleet average will be up to 35.5 miles per gallon.

Further, based on the endangerment finding that EPA made last year determining that greenhouse gases can be regulated under the Clean Air Act, EPA has taken the necessary steps to allow us to regulate stationary sources as well as mobile sources.

Second point, it is profoundly in our own interest to pass wide-ranging energy and climate legislation, in other words, to go beyond where

we have gone so far. A continuing inability to find common ground on common sense policy will threaten our national security, undermine or economic competitiveness, and damage the health and well-being of our citizens. The national security risk is real. Most obviously, we need to wean ourselves from our endless dependence on foreign oil which has substantially affected our military posture around the world for decades.

In addition, unfettered climate change threatens to destabilize nations and create tens of millions of climate refugees as the result of dangers such as food and water scarcity and rising sea levels. In a frequently quoted phrase from the 2007 CNA Report prepared by 11 retired generals and admirals, climate change is a "force multiplier for instability in some of the most volatile regions of the world."

The economic case for action has been made most succinctly, I think, by Senator Lindsey Graham, who said in January, "Six months ago my biggest worry was that an emissions deal could make American business less competitive compared to China. Now my concern is that every day that we delay trying to find a price for carbon is a day that China uses to dominate the green economy."

The low carbon transformation of the global economy is on track to be the great game in energy for the 21st century. If we don't put the right rules of the road in place and soon, we will see jobs, growth, and

economic leadership to others despite a culture of innovation and entrepreneurship that should put the United States first in the world on these issues.

Finally, the risk to our people from the impacts of climate change from draughts, floods, heat waves, water shortages, more intense storms and the like are profound. And none of them, by the way, has vanished on account of the handful of mistakes recently identified in the voluminous scientific record.

Third point. It is enormously important for our international leverage and credibility that we do pass strong legislation. If the United States means to assert leadership, it needs to act like a leader. At the same time, it is not the case this year any more than last year that everything hinges on U.S. legislation. We submitted our proposed target last year contingent on our legislation, and we have no plans to alter that commitment this year. Moreover, even if legislation were to pass tomorrow, the challenges of moving toward that new paradigm would not disappear. We will need to meet those challenges one way or the other.

Let me turn now to the last of my three main questions for today, whether the UNFCCC will remain the central forum for international action to address climate change. It should, and the U.S. is committed to that result. Let me note parenthetically that the Secretariat of the UNFCCC

announced just yesterday the selection of a new executive secretary to replace Yvo de Boer. I know the U.N. had a tough final decision among exceptionally talented candidates, and we congratulate Christiana Figueres of Costa Rica on her selection and look forward to working with her.

Now, the UNFCCC should remain the central forum for climate change because it has history, credibility, and inclusiveness on its side. All nations are part of it. It has grappled with this issue for 18 years, and for all it's shortcomings, no other organization has the credibility the FCCC enjoys within the global community.

And yet let me also say that those advantages are not by themselves enough. The open question is whether the Framework Convention can act efficiently and effectively given the range of different circumstances, interests, and perspectives it contains. This is not a trivial question. Climate change, as we know, is a propounding complex problem whose solution implicates virtually every element of economic and social development.

The notion that it's hard to reach agreement among 190 nations should not actually be surprising. The risks posed by climate change and the difficulty of containing it poses challenges to every country, different challenges, sometimes different orders of magnitude. And if you're not sure about that, just ask someone from the Maldives. But it is still not

easy for anyone or any country, and it is especially not easy in a world filled with other economic and development priorities.

What this means, I think, is that we have to combine ambition with pragmatism and flexibility. We need never lose site of the fact that we all, in the wise words of my friend, Ed Miliband, the former U.K. minister for energy and climate change, we all have our own compelling constraints with regard to facing the climate challenge. Yet if there is a singular feature of climate negotiations over many years, I think it may be the lack of appreciation for Ed Miliband's point.

So many countries believe that they have the truth, the right way to proceed, the urgent demands that must be met, and appreciation for what those on the other side of the table can and can't do. What their political red lines are, whether you like them or not, has, I think, too often been missing.

Add to this reality that here, as in so many areas of public life, it is far easier -- far easier -- to stop something from happening than to get something done. And you start to appreciate the degree of difficulty presented by climate negotiations.

In short, the question that the Framework Convention faces is whether it has the capacity to find common ground on the difficult issues at the core of these negotiations and to embrace a pragmatic response even

though that response most certainly will not be everything to everyone. On this question, let me say there were days in Copenhagen that gave one pause, but there were hours in Copenhagen that gave one hope. We in the United States are approaching Cancun in a spirit of hope. The reality, of course, is that we cannot accept year after year of stalemate because the urgency of the problem we are charged with addressing does not permit that luxury.

Should we face an enduring deadlock in the UNFCCC, that institution will inevitably begin to lose its standing because countries will be forced to search for other ways to contain the climate threat. In our view, that would be a highly undesirable development. The UNFCCC is the right forum for climate change, and we should all do everything in our power to make it work.

So let me wrap up. Many people outside government have asked me this year whether I still have anything to do now that Copenhagen is over. I hope by now the answer is clear, clearly yes. The future of climate diplomacy is still waiting to be made. I think this year will not have the high profile, death defying quality of the events of Copenhagen, I hope, but it will matter a great deal just the same.

So stay tuned. I appreciate your interest, welcome your interest and engagement, and I appreciate to be here. (Applause)

MR. TALBOTT: I'm going to call a bit of an audible, literally, here. I've asked Todd to sit over there where he's going to get lavaliered. Is he going -- are we going to do the -- is somebody going to come up and lavalier him with a mic?

MR. STERN: Hello.

MR. TALBOTT: Okay. I'm concerned about you folks over here having your vision blocked of the very scintillating people who are about to sit up there. Is that working? Okay, if that's okay, fine. Otherwise, there are lots and lots of chairs over there. I don't want you to be in the blind spot, as it were, in any respect.

You got another one? Since our time is short --

MR. STERN: Nobody can hear your questions, just my answers.

MR. TALBOTT: Yeah, I'll tell up. That was terrific, Todd, and so much to talk about and not as much time as we'd like to do it. But just -- I want to just put one or two questions to you and then we'll open it up to the audience.

What is the best realistic outcome we can expect from Copenhagen, and you might put that into the context of what after Copenhagen? Another death-defying act is a terrifying prospect because those are only good entertainment if death is defied, and we don't want to

have it at the end of the process.

MR. STERN: Thanks, Strobe. Look, I think that the best way to think about this is to think about the constituent pieces of the negotiation, the different issues. So there are fundamentally six issues, and there was actually a lot of progress made on all of those issues in Copenhagen, although in different places.

So with respect to adaptation, technology, and forestry, the so-called red, there was a lot of progress made in the conventional negotiator contact groups in the -- at Copenhagen.

There's very little progress made in those groups with respect to the most difficult issues of mitigation transparency sometimes referred to as MRV and financing. But there was a lot of progress made on each of those issues in the Copenhagen Accord.

I think that the right way to think about this is for countries to be trying to carry the progress, build on the progress that was made in Copenhagen. None of those issues got done. They got, in one sense, done in the Copenhagen Accord, but the Accord didn't get accepted by the conference of the parties, so to take the issues that were in the Accord, bring them into the conference of the parties and get them further elaborated: How does the green fund work? How does the technology mechanism work? What are the elements of international consultations and analysis,

which was a sort of a buzz phrase on transparency and so forth. And to finish the issues that were making progress in the contact groups and to get the issues complete.

Now, what the actual form of an agreement would be I think we don't know yet. I think it is certainly true that many people -- I think probably say most people in the negotiating world -- don't actually think you're going to get a legal treaty this year. I'm not going, you know, comment one way or another on whether that'll happen. We have to wait to see, but I think that, even if you don't get a legal treaty this year, you could get decisions on each of those issues that would be a big bay step forward.

So I think we can reserve judgment on the ultimate form of the things, but if you could make progress on each of t hose component issues, you'd have moved things forward.

MR. TALBOTT: To what extent is the ability of President Obama and you, and others from the U.S. Government, to succeed and where you will find it in Cancun dependent on having a clean jobs, energy power, in parentheses "climate bill" passed by the Congress.

MR. STERN: With me you don't even have to put it in parentheses.

MR. TALBOTT: I don't think with a group, but you know what I mean.

MR. STERN: No, look, I have the same response to this that I've had for the last year, which I think it's absolutely critical for the United States to do this, first of all for the interest of the United States for reasons that I said, and I won't repeat again. It's also enormously important for our leverage and credibility in the international discussions, and it would greatly, I think, affect in a positive sense the atmosphere of the negotiations.

At the same time I don't think -- and I said this -- again I was asked the same question many times last year and I said I don't -- that I did not -- we will find a way to have a result and a positive result even if the legislation's not done. I said that last year, and I think the same is true this year.

I mean, we put in, the President put in the U.S. commitment. We submitted that formally as part of the, you know, Appendix 1 of the Copenhagen Accord, and that's -- I don't see any reason why that would change this year. So it would be better if the legislation got done, but if the legislation did not, we not yet done, I think that that outcome that I just described with respect to the six issues could and should still occur.

MR. TALBOTT: Good. Let's go to all of you on -- I can't see all that well, but I think I can see a hand go up. Please identify yourself succinctly, and equally succinctly pose a real question. Yes, right here. Just you -- a mic is coming to you.

MS. KENNY: Stephanie Kenny. I was one of the original state negotiators back in 1992 for the Framework. And one of the reasons that it, arguably, came out as it did was because from Day One we regarded it as an energy negotiation. The first thing we did was to ask the agency to get us the dirty dozen, and we figured out from there the eight we had to have.

To the extent that you can, I was wondering how you are looking at the key groups that we need to be now approaching and working with them, if you could give us some sense of that.

MR. STERN: Sure. Yeah, I'd be happy to, and congratulations on your service back in '92.

Look, I think that there are different -- there are a number of quite important groupings in the overall Framework Convention. Obviously we, on the developed country side, we worked a great deal with both with the Europeans and with a collection of countries that was actually created in 1997, when I was there with Stu Eisenstadt and feeling envy over the -- it's more than envy, I'm being a little facetious -- but feeling envy over the European solidarity. We banded together with Japanese, Canadians, Australians, New Zealanders, and some others to form the umbrella group. So we meet a lot and coordinate a lot with those countries.

On the other -- on the developing countries' side, I think that

there -- that I break it down maybe most importantly in three groups. The so-called basic group now is China, India, Brazil, and South Africa. China has formed that group and has been working to meet on a very regular basis with that group to coordinate their position. So that is an absolutely quite critical grouping.

I think that there is also a very important and sort of almost more nascent -- the grouping exists but the sense of their stake in the negotiations and where they stand, I think, is shifting. And that's sort of most clearly illustrated by looking at the Africans and the small island states, vulnerable countries who really have a stake in this negotiation.

And, by the way, as Secretary Clinton arrived at Thursday morning, the 17th of December, and in her pocket was the U.S. agreement to support $100 billion commitment by 2020, assuming there was adequate mitigation and transparency and so forth on the other side. That was a big, big deal, and it changed the dynamic of the negotiation in -- I mean, you could see it happening in the -- as the hours of that day wore on, because countries -- and the Africans and the small islands are perhaps must illustrative of this -- started to have a real stake. There was $100 billion on the table that they didn't want to walk away from.

And so that -- that's an important grouping of countries. I think they act within the confines of the G-77, not that I've ever been inside at

those meetings, but I think to put pressure on those who might be less interested.

I think the other significant group that you can't take your eye off of are the -- how shall I define them? -- those who oppose the Copenhagen Accord and just say in a completely neutral fashion. And so that's the so-called ALBA countries, Bolivia, Venezuela, Nicaragua, Cuba, also some others like Sudan. Saudi Arabia has kind of been in that camp. And it's a relatively small group, but a small vocal group can have a big effect, as we saw in Copenhagen. So there's not so much that we can do directly, as you might imagine with those countries, but they are -- it is important to think about how to deal with them.

There are, obviously, a lot of other players in the world, but those -- but that's kind of the way I look at it.

MR. TALBOTT: Yes, sir, right here. Mic over here, please.

MR. TANDA: Thank you. My name is Sean Tanda . I'm a journalist with AFP.

I wanted to ask you about one of the statements in your speech. You mentioned in the context of Copenhagen that a top-down approach wasn't very politically feasible.

Is that going ahead into Cancun? Do you think that's also the case that there needed to be a bottom-up approach and a top-down

approach, particularly when it comes to a mission standards? The mission cuts made will be politically feasible this year?

MR. STERN: I think it's just very difficult to imagine. Again, if the premise is -- and it is our premise -- that all of the major -- at least all of the major economies, you want to expand beyond that, need to play. I think the notion that you're going to negotiate some, you know, across-the-board target that China and India, Brazil and South Africa, and many other countries -- again, there were many other countries beyond those who submitted their targets or actions under the Copenhagen Accord. The notion that they're all going to negotiate some similar kind of arrangement is not that likely.

And, frankly, I think it's much to our own interest to have a commitment that is grounded in our own law. I mean, we sort of came into this with a sense that the way we did Kyoto didn't work so well, right? I mean, we negotiated a target in Kyoto before there was any -- not only before there was any law, but before there was any foundation of domestic support on the Hill for the kind of thing we were talking about.

And I guess it's fair to say that coming from that, that experience certainly, I think, influenced me and others on our team. And I think that the sense that we need to have the support on the Hill, I think demonstrated support on the Hill, you know, established, and first rather

than, you know, sort of reverse the order of things I think has certainly been part of our working assumptions.

So I think it's both good for the United States, and I think it's just infeasible to imagine that you could have a top-down target that would apply, that would drawn the developing countries.

MR. TALBOTT: The gentleman right here.

MR. KUNA: Hi. I'm Monifel Kuna from the Global Development Network, now no longer in Washington, but in New Delhi, India.

I agree with you that the six issues, the way you've characterized them, and the current, your summary of the status of where they are. However, I'm wondering how do you think progress is going to be made, especially on the latter three which rather -- which are harder knocks, specifically the one on mitigation.

I see positions hardening on the one hand because there is no substantive engagement on the regs, therefore, four reasons for framing the question: Either I see no progress, or put that position hardening, or the focus is on things like you're saying, how can you get the Africans and the lower income countries to put pressure on the basic -- and the basic guys are basically saying let's put the Africans. Tell them you can't trust these guys. They will promise you the moon but will give you nothing. You better

work with us. McCain said solidarity.

I think you need some sort of a track 2. I know there are lots and lots of track 2s, but there again more of tactics not of substance. And I'm wondering when, give the time left, we are going to have some meaningful engagement on the frameworks for the next stage.

MR. STERN: Well, thanks for your question, first of all. Look, I think that, first of all, there is absolutely no question that it is not going to be at all easy. I think that there are -- that there remain real divisions. As I said in my remarks, you know, it's important that we find a way to come together or eventually -- I'm not saying when that's going to be, and I don't mean I have some number, at some date in my mind because I don't -- but it's -- if this collection of countries in this institution just cannot -- I mean, Strobe talked about the 20 years that have gone into where we've gone so far -- if it just cannot make progress, then other avenues are again to be pursued.

I don't think we're there yet, and I think that progress can still be made. On mitigation, you know, on the one hand, that's the hardest and, on the other hand, maybe not so much because mitigation commitments from all the major countries are right there in the Copenhagen Accord. I mean, now they would have to migrate, but, you know, it's not that hard. At one level it's not that hard.

I think that the issue of transparency is enormously important.

It was a very, very difficult discussion last year which was not resolved until President Obama personally met with the leaders of the basic countries. I think it's a concept that is not easy for, in particular for China. I think it's China, actually, more than any of the other basics that has the most trouble with this concept. But on the other hand, progress got made. So I don't know that we can't make progress going forward.

I think it's going to be enormously important for the -- you know, the mitigation transparency, if you will, is sort of on one side of this negotiation, and financing and the pieces that hang off of the financing -- technology, adaptation, forest preservation -- that's really important. So the two fundamental financial commitments that are part of the Copenhagen Accord, one is for the donor countries, the developed countries to raise an amount, to provide an amount approaching -- "approaching the $30 billion over the 2010 to 2012 period."

This is really important that the developed countries made good on that. We're trying really hard, and I'm spending a lot of my time, as are others in our government, working on budget issues. I mean you only need to read the paper to see what state the public, FISC, is in not only here but even much more so in Europe. So it's not an easy climate for that, but it's really important.

The other issue is the commitment to the goal of mobilizing

$100 billion by 2020, and there's--the U.N. pulled together, Ban Ki-moon pulled together, the high-level group to work on that issue to try to identify public/private sources that might be needed. It's chaired -- well, it was chaired by the Prime Ministers Meles and Brown. I don't know what the U.K.'s going to do now that Gordon Brown's not in anymore.

But, and it is a genuinely high-level group. Now, our representative is Larry Summers, and Trevor Manuel from South Africa, there's a whole lot of very top-level people. Nick Stern is highly involved in it, and the idea there is to try to identify how to make good on that hundred. Now, that hundred is not till 2020. It's got to ramp up, the whole thing, both the effort -- not the money so much on the hundred -- but the effort on the hundred, and the actual visibility of how the thirty is getting raised and spent I think is going to be terribly important in terms of attracting the support of developing countries and being able to stand up to exactly the argument that you identify, which is that, you know, there will be a lot of people saying to the Africans and the Islanders and others, don't trust those guys, they won't deliver. And I think it's going to be really important, and really important to our capacity to make progress on all the issues that that side of the equation looks like it's real.

MR. TALBOTT: Is three any -- this is the last question because we've got to move on, and you've got to get back to hard work. Is

there any way to maximize the utility for your venture of the G-20, the major economies forum, aka, or previously known as the Major Emitters Forum, or maybe some merger of the two as you go forward?

MR. STERN: Well, let me talk more, more about the, about the Major Economies Forum. I actually think that that was -- I mean, we took the grouping of countries that President Bush had put together, which we thought was more or less the right group of countries. We christened it a bit, but more important than the name change was to infuse it with a different kind of mission than it had in the Bush Administration.

And it was really a two-part mission. One was to advance the negotiations toward an agreement, and the other was to begin serving as a technology platform. But let me just stay on the negotiation piece.

I think it was a very important -- it was not eight, we always had to underscore that it was not -- we were not negotiating in that forum, but it was an important place to discuss concepts. And some of the concept I think you could go back and look at the concepts in the Copenhagen Accord -- a lot of the most important ones were discussed and discussed in a very animated -- it's a different kind of discussion that takes place in the NEF than in another other forum -- certainly in the UNFCCC. But even in the, you know, the ministerial groups of 45 or 50 ministers that get pulled together periodically, last year by Copenhagen, this year by Mexico, it's just

a very different deal where there's, you know, people go at things in a pretty candid and pretty hard-hitting way back and forth.

I think the same thing is going to happen this year. I mean we have had one NEF meeting in April which was designed more to be a kind of general stocktaking and discussion of where everybody thought we were going. But we will be holding another one this summer where our intention will be to drill down hard into two or three of the toughest issues. And we will continue to have those meetings as we need to.

So you don't get a one-to-one. You agree to something in the NEF, and then it goes in and gets agreed to, you know, per se, in the negotiation. It doesn't work that way, but it's -- it does lay the groundwork for agreements that, hopefully -- that you hopefully get to. And again, I do think that happened in the Copenhagen Accord.

But respect to the G-20, you know, it's not a very different group, truthfully. There's only a couple of countries that are different. It may be at some point those will merge together, but not -- we're not quite ready to do that at this point.

MR. TALBOTT: Terrific. Please all join me in both thanking Todd and also wishing him well in this important work. (Applause)

MR. ANTHOLIS: While the microphones are going on to our panelists, I'll do a little bit of an introduction. The formal biographies for both

Eileen and Bruce are available in the back of the room, and I won't walk through all their many accomplishments, but I will talk a little bit about them a both teachers of mine.

And Eileen Claussen was -- I was a young staff assistant in the policy planning staff at the State Department, and Eileen was a very young assistant secretary, newly named assistant secretary for oceans, environment, and science at the State Department. And so in a sense Eileen was my first lecturer on climate change and lecturer and tutor. And I learned a great deal from her in the time that we served together at the State Department.

And then in the run-up to Kyoto, she left government right before Kyoto, but in many ways was a designed in the U.S. of getting us to understand how we should engage and not engage in the Kyoto process. So many people will look at Kyoto and point to its flaws. Many of the things that were done right at Kyoto really had Eileen's fingerprints all over them, and I think we all owe her a great deal of thanks for that.

Bruce Jones is a senior fellow at Brookings, based in New York, but also often in Washington. He runs our Managing Global and Security Initiative, which he co-designed with Carlos Pascual, now the U.S. Ambassador to Mexico and formerly the vice president of Foreign Policy Studies at Brookings.

Bruce has re-taught me everything that I need to know about the United Nations and about global governance in general through a number of different exercises that he and I have participated in together. And it's a real delight to have him here as well.

So what I think I'll do now that they are both mic'd and while I am getting mic'd is pose an opening question to both of them, which is, particularly in light of the presentation that Todd gave us, where are we on this issue, and what are your sense of where we're going and reactions to what we just heard? Starting with Eileen.

MS. CLAUSSEN: Where are we on this issue? I wish I could be more upbeat. I think we're in a very difficult place, internationally and domestically. Internationally we do have the Copenhagen Accord, and I would agree with Todd that it broke new ground in changing the paradigm, but we shouldn't forget that it's a series of voluntary pledges, and we do not have a great record of fulfilling voluntary pledges.

So, on the one hand, it's a stepping stone. On the other hand, we shouldn't give it more credit than it is really due.

The negotiations themselves in the U.N. I think will be very difficult as they move forward. Todd listed the six issues that are really important. That's right. I don't think you can agree on any of them without an agreement on most if not all of them, because it's a little bit of a quid pro

quo: no financing, no adaptation, no transparency, or not a very robust kind of transparency. So you have to do them all.

I have a hard time seeing how you could reach conclusions on all of them in Cancun. I think it's going to take much longer to sort of move forward on all of this, and we ought to be realistic about it. I mean, one of the issues with Copenhagen is that it was really a victim of high expectations that could never be met, and I think it's important to have a realistic view of what you can achieve and then actually try to achieve it. So, I guess maybe I'll pass on the negative domestic situation and wait for another question.

MR. ANTHOLIS: For the time being.

Bruce, your thoughts about where we are and, in particular, reactions to what we heard Todd say.

MR. JONES: Yes. First of all, I agree with just about everything that Eileen said about where we are. It's not the prettiest picture out there.

Let me focus in on the part that I know a little bit more about, the climate diplomacy piece and some of what Todd had to say about the status of negotiations within UNFCCC, and then the ability of the MEF and these kinds of issues.

I look at this and I think we have lots of the right pieces of the negotiating architecture and are absolutely missing the connective issue

between them. So, we've got the MEF, which is the right grouping of kind of big countries who can do heavy lift. We have the UNFCCC, which is inclusive. My experience of multilateral negotiations is you always need both. You always need a subgroup that can be the engine of real negotiation and you also need the more inclusive process for a variety of reasons, for legitimacy reasons. I think also because you have to have a deal that goes beyond just the 20. I think it matters to get the next 20 after the top 20 and the next 20 after that for competitive reasons, for long-term impact reasons.

But you need both. You need a subgroup and you need a major group. We have those two. We have the Financing Panel. We're about to have a Climate and Development Adaptation Panel. We're absolutely lacking the connective tissue between them. I think one of the things we saw in the Copenhagen process -- and Todd made the point that some of the concepts that were brokered at MEF came through in Copenhagen, but with no connection to the actual UNFCCC negotiation process is that when the kind of basic plus America group put their proposals on the table, it met this kind of frosty reaction from the broader membership who hadn't been consulted on any of this, who hadn't been involved in any of it, and that kind of dynamic of iterating the negotiations between the small group that has to drive the big pieces of the deal and the

broader group in bringing in the technical pieces on finance and the technical piece on adaptation. I think a lot of that is missing.

So, I have to say I'm not hugely optimistic that Cancun is going to be big success story. In fact, I think it's likely that it's not going to be a big success story, partly because -- and this is a -- you and Strobe discuss in your book -- we do have this kind of pattern of lurching to these kind of semi-false negotiating deadlines, which don't really drive real momentum.

I think we should be stepping back and looking at a slightly longer-term negotiating time frame. In the shorter term I would take the Rio 2012 event as a kind of major deadline for big changes. It would bring lots of these pieces together, and I think if we had that sort of sense of time frame in how you move the different pieces towards that, we'd be in better shape.

But one thing that I do want to just maybe sort of end on this point, and I agreed with Strobe on in his presentation, is that only one country gets to figure out how that stuff all comes together, and that's the United States. We spend a lot of time these days talking about China and the BRICs and the emerging powers and their blocking power and all that kind of stuff, and that's all real, but the only country that can actually move all the different pieces is the United States. And so the only way this stuff comes together is through U.S. leadership, as hard as that's going to be.

MR. ANTHOLIS: You've raised a couple of different, interesting -- both of you have raised a couple of different, interesting questions, and I want to make sure that we don't do Yogi Berra where we when come to a fork in a road we take it, but I would like to push a little bit on the process point. I mean, in a sense what you're saying is we've got a lot of different nodes out there, but we need more connective tissue. More connective tissue often translates into process. Process is deadly boring for a global media that descends on these meetings every year and then only sees process -- and only sees process slowing things down rather than starting things up. How do you achieve centrally connective tissue and still have good headlines for a global media that's starting on the issue?

MR. JONES: Well, I'm a global governance geek, so I'm about the last person to talk about sort of how you get general media. Look, on the connective tissue, the geeky point is that I think what you need to do is more directly the MEF and the UNFCCC processes. What Carlos and I wrote about a while back is you could actually create the MEF grouping as a subgroup within UNFCCC, which would mean that the negotiations would still happen in that subgroup but they'd automatically be referred back to the UNFCCC and the broader collection of countries would have the right to weigh in. That would be one mechanism.

I think your broader point is an important one and goes

beyond the numbers and the architecture in the process question, and here I would take a different sort of stab at the issues and a different critique of the UNFCCC altogether, which is that I think that if you look at the scale of the political and the economic transformation that we're trying to undertake through the climate negotiations, it's not obvious to me the traditional Sherpas to Summit annual U.N. meetings is in any way the right kind of mechanism to mobilize national legislation and national action. We're not trying to coordinate 190 governments. we're trying to change the political and economic behavior of 3 trillion people. And it's not obvious to me that sherpas and summits are the right device for that.

So, I -- you know, on the kind of geeky side, I think you can play with the MEF, UNFCCC, 192 versus 120 stuff. And I think that's important in the diplomacy, but it's not actually very important in the politics, and I don't think we're doing nearly enough to invest in the politics of mobilization at a national level in any of these efforts.

MR. ANTHOLIS: So, I mean, in light of that, looking ahead to Cancun and then Rio past that, not only where should we set expectations but where should we set goals? Should we be trying to fix this process, or should we be trying to demonstrate some real deliverables that cut emissions, short of domestic action. We're going to still hold off on your bracketing of U.S. legislation. What should these global confabs be focusing

themselves on?

MS. CLAUSSEN: Actually, let me comment a little bit on what Bruce said and try to wrap that in.

MR. ANTHOLIS: Mm-hmm.

MS. CLAUSSEN: I don't know if there's a real value to connecting the MEF, for example, which I think is a useful grouping with the UNFCCC, because I think the politics of that are very difficult, and there is a real value to informal discussions that are not connected. I mean, I can't think of a single negotiation that I ever participated in -- and I've done many different ones -- where there aren't informal groupings of small groups and slightly larger groups and a lot of bilateral -- I mean, things that actually get you to take off your hat and not sit behind the microphone and give a speech, but something where you can actually talk about what's really going on and what you really can do and what you really can't do in an honest way without everybody taking notes. I mean, I -- my time at the State Department was marred by the fact that there was always somebody there taking notes, so what could you say when someone was taking notes? But, I mean, I really think that's the way these things get done. I mean, you have to these bilaterals in small groupings, and I think it's good to keep them separate from the more formal process. And now that I've said that I've said that, I've sort of forgotten what your question was.

MR. ANTHOLIS: That's okay. So, in light of that -- and I share those sympathies -- in light of that, how should we be thinking about Cancun and Rio after that? You've got informal processes where people are trying to actually move balls. You've got formal processes where people are focused on the channels in which the balls are going to move and making sure that they're routed in the right way. And the legitimacy issue is not a small issue, because it provides a certain kind of push for that, an umbrella for that, but incredibly difficult to achieve when a number of countries who are part of the legitimacy process don't believe in the issue want to stop progress. So, in light of that, what kind of benchmark should we be setting?

MS. CLAUSSEN: I mean, I -- you've got two tracks here. You've got the formal negotiations, which I think continue and where you try to make progress across countries, but the most important thing is to make progress within countries, because nothing can be agreed across countries unless you have a foundation within your country for whatever it is -- for your program, for the way you're going to proceed, for what your constraints are. And so if I was going to sort of say what has the focus really got to be in the next couple of years? It's on domestic programs, domestic policies, domestic progress -- because they're won't be any real agreement, binding or otherwise, unless things happen at home and for everybody, I mean, not just for us obviously, but for everybody.

MR. ANTHOLIS: So, I think one thing that we heard Todd say in his speech, obviously the administration has said at Copenhagen that it was going to take a certain set of actions, certain targets, contingent on domestic legislation. The administration remains committed at some level to domestic legislation. How hard, what's achievable, all of that is to be determined.

Going into this next set of meetings, short of a -- well, first of all, what would a full bill do in terms of raising U.S. stature internationally, and short of that happening, what would count? There's all kinds of talk about the U.S. having the authority to implement EPA action under the Clean Air Act. There are the steps are already taken that the administration tries to take credit for internationally. What counts as domestic action in this context?

MS. CLAUSSEN: Well, let's just look at the pieces and how they add up. I mean, I think if you were to get a piece of domestic legislation, it would probably have a mostly economy-wide -- not entirely, but close to it -- target of 17 percent below 2005 levels, which is the level that the administration put forward in the Copenhagen accord and in the run-up to Copenhagen. I would never say there is no chance of getting there this year, but I think the chances are painfully small. Is there a chance of something that is less than that but legislation because there's a lot of focus

in the U.S. on legislation? Maybe slightly larger, but still small.

So, what are the other alternatives? I mean, clearly the EPA is a major alternative, but we and others have done a lot of analysis of what you could do under the Clean Air Act and how it adds up. It's not nothing. It's significant. But it's not that close to, let's say, the 17 percent target. Can you do other things with sort of pushing stimulus money or anything else into the clean energy space? Can the states, which are faltering a little bit -- and I guess you're going to talk about that later -- can they come back up and try to do a little more? Can they meet their renewable targets? Can they move forward with their own sort of cap and trade systems?

The picture domestically is very difficult, and I think the focus internationally has been on U.S. legislation, because that is the clearest way to have a policy, and I think if we fail to do that this year, there will be a very great disappointment. And, you know, I think it was Strobe who said everybody watches in great detail exactly what's happening domestically on legislation. If we don't manage to do it, there will be a lot of disappointment, and the ability to U.S. to lead is almost nonexistent if we don't have something real. And without us being able to have something that is real, it's hard to imagine how a lot of these other things actually get worked out. Even though we can do some things under the Clean Air Act -- and we will -- and we can do some other things, they don't add up to a lot, and people will

say, you know, where is the United States?

MR. ANTHOLIS: Bruce, on the same set of questions, how much, from your experience in New York at the various international confabs are people looking at the domestic actions on the U.S., and how close do they pay attention to the particulars of what's actually happening on the Hill?

MR. JONES: I think -- I agree with Eileen, and I think that it's very hard to believe the United States is going to be able to drive any serious negotiating position without enacting domestic legislation. Stuff along the way maybe at the margins helps, but everybody is focused on the legislation. And, by the way, they're focused on it in part because in the lead-up to Copenhagen we told them to. Senator Kerry was at Poznan stressing that we were going to have domestic legislation before Copenhagen, and that was going to be the basis for action. Everybody else in the world was saying, no, you're not and why are we hinging Copenhagen on this, and we were saying, yes, we will. So, we told everybody to focus on national legislation, and they are. And everybody else pays attention to everything that happens in Washington. International politics is a function of interagency turf war in the United States. So, everybody is completely focused on what's happening in Washington, and there's no way we can roll that back.

I think what we can roll back instead is the deadline by which

we think this is happening internationally. Right now the national process and the international process are out of sync. If we go to Cancun, we will not have enough legislation to be putting a serious package forward. It will be yet another failure. We'll scramble around trying to figure out why the process failed -- it wasn't a process failure -- and we'll be where we are now except a little worse.

So, I would say that what we can change is we can change the timeline that we're thinking about for real international negotiations. We can't change the reality that those negotiations hinge on national action by us and by others. It's just the United States, but us more than others.

MR. ANTHOLIS: Mm-hmm. Talk a little bit about the interaction at Copenhagen and then beyond in Cancun and Rio. We're going to shift from doing the negotiations in the developed world to an emerging market -- two big emerging market players: Mexico and Brazil. How from -- how have you tracked and thought about China's growing role, the role of the basics and how they relate to countries that are much more like what we consider to be developing countries than what these countries are?

MR. JONES: I think in a range of issue areas we've -- and it's very tough what I'm going to say to do, but we've not managed to capture the ground in the way that would allow us to be shaping the groupings and

driving negotiations. We've seeded that ground effectively to China with the emerging with the economies. In some places, it was going to be impossibly hard to not have that outcome. Other cases I'm not sure it was that hard.

Todd made the point, and I think correctly, that changing the dynamics in Copenhagen, the $100 billion financing agreement by the United States which swung the Africans to our side of the process was absolutely critical in the negotiation dynamics and kind of peeled away from China the mask of we're negotiating for the G-77, right? And that's going to have to happen.

I think on some of these issues, climate is particularly tough because every single part of that grouping has divergent interests, and it's not as if the basic group have the interests. They just have the similar interest in not allowing us to dictate the play, right? I think we're missing an opportunity of working with Mexico more closely than we could be, because Mexico is closer to us politically than Brazil is and South Africa is going to be, and although they may not be exactly where we are on climate issues, they're embedded in a broader and deeper bilateral relationship, which means that they have to find ways to work in this issue. They're part of MEF in the way the Danes were not.

So, I think there are things that the Mexicans could be doing if we were working more closely with them on how these things move as we're

managing the Cancun process. I don't see quite enough of us working with the Mexicans to kind of shape the expectations of Cancun, the preparations for Cancun.

MR. ANTHOLIS: President Calderon is going to be in Washington later this week. Do we expect that this is going to be a topic that he and President Obama are going to discuss, Eileen maybe and then --

MS. CLAUSSEN: I actually don't know.

MR. JONES: It is a topic they're going to discuss. What they're going to say remains to be seen.

MR. ANTHOLIS: There are a few other issues on the table.

MR. JONES: One or two other topics.

MS. CLAUSSEN: And there'll be all those note takers.

MR. JONES: Yes, and there'll be a lot of note takers, yeah. On the note takers, by the way, in my experience there are always subgroups in broader mechanisms without note takers in the basement of something --

MS. CLAUSSEN: Yeah.

MR. JONES: -- and the question is how far in advance of the broad group negotiations do they get composed? The problem with Copenhagen is they got composed two and a half days before the final --

before the presidents arrived, not nearly enough time to do the heavy lift. But there are lots of examples of subgroups working in a much more constructive spirit within broader group negotiation --

MS. CLAUSSEN: Yeah.

MR. JONES: -- to achieve real outcomes.

MS. CLAUSSEN: Right.

MR. JONES: And I think that's where we need to go.

MS. CLAUSSEN: Yeah.

MR. ANTHOLIS: Well, let's come back to the China point, because some people will say as terrific as the channels could be established, it was unclear with respect to China who you were negotiating with. There was this great myth for a while that if we could only be like China we would have one voice on issues like climate change. We would act. We would follow through on our action. But I think observers seemed to see on the ground in Copenhagen with China was the Chinese top leaders finally, when they got in the room with Obama, could strike a deal, but there was -- the Chinese negotiators working the halls of the U.N. process were throwing up roadblocks at every formal and informal setting: No, we need to come back and consult. What should we make of China? Is there a one-China policy or a two-China policy?

MR. JONES: You can go first.

MS. CLAUSSEN: No, no, no, I was waiting for you.

MR. JONES: Look, I think that this is -- it's not unique to China and it's not unique to climate negotiations. I think on a lot of these issues the more you get into a situation or -- two things that happen at a lot of the global negotiations right now: First, although the issue is happening at international negotiation level, the substance is national domestic action, right? This is not foreign policy in some abstract domain; this is about coordinating core national economic policy. So, it's not up to negotiators, right? They can sort of say what they want Copenhagen or Cancun or whatever, but in the end, Congress and the Senate are not going to be dictated by that negotiation. The same is true is India, and the same is true in Brazil. So, you have a disconnect between -- again, a disconnect between what has to happen nationally and what happens internationally, and that's true here just as it's true in China and Brazil and other places. That's one issue.

The second issue is that I think that the pattern of these negotiations -- and here I agree with you, Strobe, in the about some of the dynamics of the UNFCCC. The U.N. is a place where everybody is trained to say no. The job is to sit there and say no until somebody who is at a higher pay grade than you takes the risk of saying yes, right? And so that's all you have. If you only have diplomats and sherpas doing this negotiation,

you'll spend an awful of time saying no, and then you have a couple hours of the presidents' time when they get to say yes. And that's a really dysfunctional way of doing business in something as complex as this. If it were me -- I'm not going to -- this is an imprecise analogy, but I think if you think about the transformation in the U.S.-Russian relationship that happened after the end of the cold war and the Gore-Chernomyrdin process of sustained, intensive vice presidential-level negotiations? I think that something that's politically analogous, not structurally analogous but politically analogous to that, probably has to happen among the core group of countries that are doing the climate deal. I don't think it's going to happen through summit diplomacy where you get three hours of the President's time once a year or twice a year. I just don't think that's enough.

MS. CLAUSSEN: Yeah, I actually think the Gore-Chernomyrdin process was an interesting approach, which yielded I think real results. I don't know if people are going to be willing to do it on this subject, because it's a big commitment of time, and you really have to be serious about it if you're going to engage in that kind of a process, but the potential for that giving us something that is much more meaningful is huge if we could actually do it.

MR. ANTHOLIS: Mm-hmm. And you're suggesting that sort of bilateral U.S. and China to keep it sustained on this set of issues.

MS. CLAUSSEN: Yeah, I mean, you know, we've started a whole sort of series. We sort of changed the Hank Paulson a little bit with the --

MR. ANTHOLIS: Right. First it was the strategic economic dialog.

MS. CLAUSSEN: Right.

MR. ANTHOLIS: Now it's the strategic and economic dialog.

MS. CLAUSSEN: Right. Right. I mean -- and we have, you know, a fair amount of cooperation, whatever that means, on technology. Not entirely clear to me what that means, because it strikes me that it's more competition than cooperation, but be that as it may, I don't think we've had anything that really covers the kinds of issues that you would have to get to in an international negotiation that would eventually maybe lead to a binding agreement. I mean, it hasn't been at that kind of a level. It's been sort of specific, but different.

MR. ANTHOLIS: Right.

MS. CLAUSSEN: And I don't know if there's appetite on the part of both countries to do it, but if you could, I think that would be immensely valuable. Immensely valuable.

MR. ANTHOLIS: So, I'm going to ask Eileen to indulge me a fantasy. Say comprehensive climate and energy legislation gets passed this

year. It was an extraordinary display when the legislation was introduced how many corporations came out in support of it. Certainly a sea change from where we were 12 years ago. I think it's very easy to see the glass is half empty. The progress that has been made in the United States is extraordinary even if it doesn't take us across the goal line. But say it does. But say the U.N. process still continues to bog down. So, you would have demonstrated U.S. leadership, a commitment from the United States to act, certainly a commitment from the European Union to act, more pressure on India and China to act. What happens then?

It feels like there's an analogy to where we were in global trade right after World War II when an international trade organization was first negotiated and then failed because we couldn't get Senate ratification. But an informal process developed called the GATT is something like that. And it was semi-formal in that there was an agreement, but it was a general agreement not a treaty, that ended up linking economies to one another. Permit me that fantasy. Is that something that's possible?

MS. CLAUSSEN: That's your book. That's your book, right?

MR. JONES: Well, there's an element to that in there, but is it a fantasy or is a wall that we could inhabit at some point in the next three to five years?

MS. CLAUSSEN: It depends on -- I'm really -- to me what

you're thinking of here -- is this a replacement? Is this a side -- is this a replacement for what we'll call U.N. negotiations, sort of -- or a shift to a different format so that you -- is that what you're really -- I mean, it's not --

MR. ANTHOLIS: I think one thing that we heard Todd say is that, you know, the hope is for an eventual legally binding agreement --

MS. CLAUSSEN: Right.

MR. JONES: Right, but in the interim --

MS. CLAUSSEN: Right.

MR. ANTHOLIS: -- particularly if there is domestic U.S. action, there has to be some framework for cooperation and understanding of where emissions are going. What might that look like? I mean, in our book we only sketch a preliminary vision of it, but there's lots of different conceptions of what it might be, something that might merge into an international agreement at some point, something with a small cluster of countries?

MS. CLAUSSEN: If you take -- I mean, if you take the point that this is a bottom-up kind of a process and it's domestically driven in all the major countries or in all countries. You do need a form for that to sort of emerge. I think it actually could be the U.N. form if you wanted. I don't know if there's a value to trying to create another whole structure to do it, because I don't know how different it would -- I mean, I don't know how different it

would be. The GATT, I mean, there is sort of a general agreement on that, a whole series of pieces. You could say the framework convention is the general agreement and then you have different kinds of pieces.

So, I don't know that you necessarily need a different structure to do it, but I do think the focus in the next number of years is going to have to be on domestic action, getting that to be transparent, providing the financing because there is no -- you don't get the one without the -- I mean, doing all of that kind of stuff, but it's going to be domestically driven, and everybody's politics are different. I mean, I can recall a dinner where -- a very small dinner here in Washington with one of the major -- one of the basic countries, and somebody from the U.S. saying, oh, you just have to understand our politics. It's so difficult for us to get anything done. And the ambassador from the other country said do you think you're the only one with domestic politics, you know?

MR. ANTHOLIS: Well, I think that's one of the things that I think we saw in China for the first time. There was an assumption that most of the major players were democracies but that China could simply itself and lo and behold the domestic conflicts came out apparent for other negotiators, and the Chinese have now said that they stand by Copenhagen; they're going to move forward. But what that actually means is a question to be answered.

Bruce your own thoughts on this?

MR. JONES: I'm intrigued by your proposal in the book. I said to you earlier I thought you missed a trick by not calling it the Global Legal Agreement of Reduction Admissions, or GLAR, and shining a spotlight on the problem. But that's a detail.

MR. ANTHOLIS: Legal was a trip -- was a (inaudible).

MR. JONES: Yeah, I know.

Here's what I think the core difference between GATT and GAR is. With GATT, with the trade agreement, everybody joining in got a huge economic benefit. So, you could have a wall and say in order to get in you have to do the following things, and there was a huge incentive for countries to try to jump over that wall and get in. With GAR, everybody who's in is going to have to pay huge costs, and you risk having a scenario where if you negotiate GAR among 20 and the 20 are in, actually there's a pretty big incentive for the next 60 to stay out and not jump over that wall and not adopt those things. I was sort of looking at those numbers of the -- you know, if you take the 20 economies that are in MEF or the G20, the next 20 down add up to India plus Japan. I mean, they're also significant, right? And that will change over time. And so if we end up with a reductions regime that only binds the 20 and others have to kind of join over time, I think the incentives structure is the opposite. I think the inventive will be for

people to sty out and reap a competitive advantage of staying out.

So, I think the goal of a GAR-like mechanism is probably a good one, but it's for -- I go back to the point. I actually that even if the motor of the negotiations is a small group, ultimately it has to be crafted as a universal agreement; otherwise, I think there's these real comparative advantage problems.

MR. ANTHOLIS: Simple answer to that, and I don't want to dwell on our book, is that GAR is the carrot because it allows you to do a missions trading between countries and the stick is potentially border tariff adjustments, which was going to be my next question, but we've only got a few more minutes and I want to open up to audience questions here if we have any.

Please. Yep, right there.

MS. WIRTH: I'm Mitzi Wirth . I'm with the Naval Post-Graduate School and working on energy issues and managed to get something going when energy was a forbidden subject in the Bush administration and we got the line in to the President's State of the Union the nation has a problem -- we're addicted to oil. My question for you is how do we get -- how do we tell the story in the United States so you get enough support from the bottom up to get your legislators to vote the way you want them to?

And I think this is -- I mean, assuming that if they don't hear from their folks back home, I find it very hard to -- and particularly with this teacup business. I mean, how do we tell the story?

And I think that's an enormous challenge, and I'm a great believer in children's books for adults, because it's -- nobody has time to read the long things, and, in fact, Mike Mullen, who's chairman of the Joint Chiefs of Staff, was at dinner with us about six or seven years ago and I'd been asked to do this Rethinking Education policy for the Defense Department. And I had a lot of ideas that were really new or they weren't new, it's just DOD hadn't thought about them, and I had them on three sheets with some bullet points. And Mike said to me, Mitsy, if it takes more than five minutes, I'll never get to it.

And so I think you have to find ways to capture these stories in cartoons. I don't know how you'd go about doing it, but I think it turns out to be incredibly tough, takes great creativity. I mean, if -- I'm sure you've seen *The Story of Stuff* --

MR. ANTHOLIS: If we can get to the question, because --

MS. WIRTH: My question -- yes, sorry.

MR. ANTHOLIS: Right. That's okay. Just we're running a little short on time. I don't want to make a plug for 125-page book published by the Brookings Press, but quickly.

MS. CLAUSSEN: Actually, I think there's another panel that's going to talk a little bit about this, but I don't think we've done a very good job of telling any of the stories, because there really are national security stories, there are energy security stories, there are climate change stories, there are clean economy stories, there are a lot of different stories. And the fact is we've not told them clearly. And if you look at public opinion polls, even though you can raise questions about how they're done on the sample size and the kinds of questions that are asked, the number of people who think this is a priority actually has gotten smaller, and the number of people who even understand that this is a problem has gotten smaller over time rather than sort of kept pace with what the science actually tells us. So, storytelling is enormously important, and I think we have been a failure.

MR. ANTHOLIS: Other questions. We have a few more minutes. In the back there. Yes, sir? Microphone's coming.

MR. HANLEY: All right, thank you. My name's James Hanley. I'm with the Carbon Tech Center.

And I went to Copenhagen kind of with the idea that there could be some global international agreement on climate change that would begin to outline allocations and responsibilities among nations, and I came away from the experienced with a kind of a metaphor of a group of young teenagers sitting around a pizza arguing over who was going to get the

slices, and the pizza, of course, is going to get smaller over the next 40 years as we try to constrain carbon emissions. And it seems to me that the negotiating dynamic of arguing over allocations doesn't lead to an agreement or to harmony or to emissions reductions. So, I'm fundamentally very skeptical of the idea that --

MR. ANTHOLIS: Is there a question?

MR. HANLEY: My question is can we get to something else? And the question that I'm looking at is an internationally organized carbon price. It seems to me if we start looking at a U.S. carbon tax rather than neutral, it would be my preference. And there are good reasons to do that because it would allow the price to go up. It seems to me that if the U.S. began by enacting just that simple measure -- and the Chinese have shown interest in this as well -- we would begin to use things like the WTO to get water tax adjustments and get an international price, which would start to do a lot of what needs to be done to drive the innovation and alternative energy and reduce the responsibilities.

MR. ANTHOLIS: Eileen, prospects for a carbon tax.

MS. CLAUSSEN: I mean, prospects for a globally sort of harmonized tax are even lower than the chances of getting a binding agreement. And I think domestically the biggest line of those who oppose doing anything on the climate issue is that it's, to quote the Senate Minority

Leader, “a job-killing energy tax.” It’s a sure way to make sure we don’t do anything.

MR. ANTHOLIS: Bruce, your own sense internationally?

MS. CLAUSSEN: Leaving aside the merits. I mean, I’m not arguing on the merits.

MR. JONES: Yeah, I’ll take a --

MR. HANLEY: (inaudible)

MR. ANTHOLIS: I’m sorry, we’ve just got a limited amount of time, Bruce.

MR. JONES: Yeah, basically with Eileen, I think that, I mean, there are merits to a tax, but on the politics I agree. Then on the -- it connects back to the storyline question. The storyline that can work I think is that China is eating our (inaudible) storyline on the green economy. That’s the storyline that you can move Congress on.

MS. CLAUSSEN: Yeah.

MR. JONES: The rest of it --

MS. CLAUSSEN: Maybe.

MR. JONES: -- kind of too complicated. Maybe. But it’s the best shot we have.

MR. ANTHOLIS: I saw a gentleman over here. Why don’t we cluster two or three questions. One there, gentleman there with a tie and the

hand up. Do I see a hand over here, too, or no? Yes. Back there.

MR. BLASSEN: Yes, I'm Rich Blassen . I'm doing a piece for Ecosystem Marketplace on the March MOU between Brazil and China -- Brazil and United States, but my question is a follow-up from that last question.

Okay, how about if there's problem with the carbon tax, how about carbon markets? Look at REDD. And what -- speak about the progress from voluntary to regional to compliance market and how eventually the best market will depend upon a treaty.

MR. ANTHOLIS: So, that gentleman there.

MR. FRIBERG: Lars Friberg, climate and energy attaché, Swedish Embassy.

What beyond the anachronistic (inaudible), what parts of the Kyoto treaty would you think the U.S. would be willing to (inaudible) some new kind of agreement? And following on what was mentioned earlier, climate negotiations are already inherently very complex. Do you think linking them to the trade regime, as in, you know, border tax adjustment and so on, as a way to put pressure because European -- and it's very striking you've mentioned European Union I think once. They have done their lesson. They've put money on the table. And no one is really following their leadership. So, how can we -- you know, what's the -- how to persuade

China to play ball?

MR. JONES: Back there.

MR. NEWBERT: My name is Newbert . My first -- I will make a first comment to Bruce. You mentioned that the United Nations is a place where a thing don't get done. I really think it is the contrary. It (inaudible) a big organization that you have multiple interest and need to have anything like it down in there. So, by my questions with regard to -- what should be role of the State Department in debating these issues? Do the State Department bring in EPAs with scientists or is it just the State Department sitting there looking at the policy side and putting the scientists aside? Or how big is the department when it come to addressing this issue?

Thanks.

MR. ANTHOLIS: So, we have questions about other markets, carbon markets, REDD, what parts of Kyoto could be recycled, particularly those that Europe itself has signed up to and has led on, and then finally also what should the roles of the State Department be in all --

MR. JONES: Let me take a couple of them. I think what I said about the U.N. is that -- I think I didn't say it's a place where things get done. I think it said it's a place where people are paid to say no, which is a slightly different thing. But, actually, there is a lot of stuff that does get done in the U.N. This is just kind of a fiction in Washington that sort of nothing happens

in the U.N. Total nonsense. Lots of stuff gets done in the U.N., including lots of stuff the United States cares about -- Convention on Nuclear Terrorism -- a whole host of things that get done at the kind of level of (inaudible) negotiations. It's boring and it's sclerotic, but lots of stuff gets done. Whether or not it's the right framework for doing what we're talking about here, we've been debating that point.

On the link to trade, previously when I've been involved in multilateral negotiations, it's always been tempting to link to trade, because in trade there are massive incentives. Trade negotiators will tell you never ever, ever, ever, ever, link anything to trade. But it is striking to me -- if you look at previous environment on -- you know these issues better than I, but, I mean, the Montreal Convention on Chlorophyll Carbons was linked to trade. The penalties were in trade where they were real incentives. Now, it may be if you do your proposal and you have emissions trading and there are real incentives there, you could avoid the risks of link to trade, but you've got to have the incentives for these things as well as the disincentives so there's something there.

On the markets point, I just want -- I'll let you cover more detail on this, but it's -- it goes to the broader argument I was trying to make. There is movement on the markets issue. There is movement on the finance issue. There is movement on a bunch of these issues, and what we

keep on doing is we keep on putting a deadline for a summit negotiation ahead of that movement, all right? So, we're going to get to Cancun. Not nearly enough will have been done on the markets issue. Not nearly enough will have been done on finance. Not nearly enough will have been done institutions. And we'll be trying to kind of negotiate the mitigation piece in the absence of these fundamental additional pillars of the deal, and it's just a kind of mistake we keep on repeating. This is why I think we need a longer horizon that could allow several of these processes to mature and you bring them together with very, very, very tough negotiations on the mitigation piece in some sort of subgroup along the way. And the markets piece is fundamental to that.

MS. CLAUSSEN: Yeah, I'm going to try to answer your question about the State Department and sort of -- the way policy gets made in the U.S., and it's varied by administration, is through an inter-agency process, so all the relevant agencies are at the table. I mean, I used to run it at a political level in the Clinton Administration early -- first five years. Everybody's at the table. EPA's at the table. The Department of Energy's at the table. All the White House offices that care are at the table. So, there's a sharing of stuff, so the State Department may only have a limited capacity, but the government as a whole in the U.S., actually, has an enormous capacity. And my own experience is that we were always the best

substantively prepared of any government that ever goes to any negotiation, because, in fact, there are all these pieces and we are able to pull it together. We also probably have the largest delegations that go, because we bring experts in all of those areas. So, I think it's not just a State Department capacity. It's the capacity of the government.

And, by the way, a lot of other governments have very limited capacity, and that's huge problem, because even in the context of an international negotiation, there could be five different groups meeting simultaneously, and if you're a government that only has one person that focuses on this. You know, you miss out on a huge amount of stuff. You're not part of the dialog, and that actually is a problem, but it's not a U.S. problem.

On the markets stuff, I think there has been a lot of progress. I mean, REDD could move. I mean, it's so close, I think, that it's just unfortunate that they couldn't get to those kinds of decisions in Copenhagen. The real question is whether in any subsequent negotiation leading up to something larger, individual decisions get made or whether they all get put off for this great summit, as you put it, where not everything is quite prepared and then nothing happens. I mean, I think that's the danger. It's not that some of those pieces haven't made enormous progress. But they are all tied together. I mean, there will be none of this of stuff unless the U.S. and

the developed countries are able to put at least the fast-track financing on the table. I mean, that's just a reality.

MR. ANTHOLIS: I was going to say the exact same thing and then just simply add that the other thing that will drive those markets is a price on carbon in the United States whether it's a tax or --

MS. CLAUSSEN: Yeah --

MR. ANTHOLIS: -- cap and trade or something else, which it, in addition to driving a market, will also generate funding for direct government assistance, because it's all, as Eileen said, tied together.

MS. CLAUSSEN: Yeah.

MR. ANTHOLIS: I want to thank Eileen and Bruce for giving us a tour of this inordinately complex set of issues. I think the quote Strobe mentioned before of Dick Gephardt was illustrated by the complexity of the answers they gave, but also we owe them a debt of gratitude for the concision and the clarity of their answers. So, please join me in thanking them both. (Applause)

And we'll take a quick set change to -- well, actually -- yes, in two minutes. I see our next speaker and his introducer, and in two minutes we'll introduce them.

So, thank you both.

(Pause)

MR. ANTHOLIS: (inaudible) Dan Yergin, who, as I'm sure you all know, is the founder of Cambridge Energy Research Associates, and the Pulitzer Prize winning author of *The Prize* as well as *The Commanding Heights*, which is as good a book, but just didn't win the award. So, with that, Dan Yergin.

MR. YERGIN: That's a great introduction. Thank you.

I want to congratulate Strobe, Bill, and the entire Brookings team for pulling together this exceptional, timely, and very rich in content conference. I think we all benefit from it. And I just want to do them a slight favor, because they're too modest to do it. This book *Fast Forward* is a really good book. It's incredibly timely. It went to press just within the last couple of weeks, and I urge everyone to have their copy. It brings a lot to bear, and it bring it very much -- it gives a real perspective for the kind of discussion that's happening here and the discussion that will unfold around the world in the months ahead.

So, I'm very pleased to introduce another Brookings alumnus, as Strobe has already pointed out. David Sandalow is a senior fellow in the Foreign Policy Study Program Institution. David has a very distinguished career at the juncture of international politics, public policy, and the environment and has made, continues to make, and will make -- continue to make a very significant contribution. Prior to becoming assistant secretary

for policy and international affairs at the Department of Energy, he had been -- and then at Brookings before that -- he'd been assistant secretary of state for oceans, environment, and science. He was also senior director for environmental affairs at the National Security Council in the White House. A number of other positions and has also written some very significant books on the issues most recently about the energy transition through we are now living.

So, I think our plan, David, is first for you to speak for about 20 minutes or so and set out parameters for what you're focusing on and what you're concerned about, and then we will turn that into a discussion for the rest of the time.

So, please join me in welcoming David Sandalow. (Applause)

MR. SANDALOW: Thanks, Dan. It is a great honor to be introduced by Dan Yergin. For anyone who's ever written a book on energy, Dan, you are the gold standard, the guiding light, the North Star.

MR. YERGIN: Thank you.

MR. SANDALOW: So, Dan actually taught -- he taught me a lot before I ever met him and even more since. So, it's great to -- and an honor to be introduced by you and it's particularly an honor to come back and be hosted by my former boss in two different locations, Strobe Talbott.

For anybody who's ever written a book on any topic, Strobe

Talbott is all those things. Your breadth is unbelievable, Strobe, from arms control to global governance to now to climate change. And this may be -- for those who haven't read it -- not only is this I think one of the best tick-tocks of the climate negotiations in the past decade, it is also the only climate book I know of that quotes Plutarch, Immanuel Kant, Hannah Arendt, Adam Smith, and Mark Twain. So, I highly commend *Fast Forward* to all of you.

This is the Ho-ping Hotel in Shanghai. I want to start by going back to the summer of 1981, when I was privileged to be an exchange student in Shanghai. I was one of the first groups of exchange students to go to China from the United States after normalization of relations between our two countries.

During that summer, there was one telephone line in the entire city of Shanghai that we could use to call home. One. And we would take cabs down to the Ho-ping Hotel every weekend to do that. Now, I have been to Beijing six times in the year that I've been in this job, and every time I have the same ritual, which those of you who travel to Beijing from this city probably share. It's a 14-hour non-stop flight, absolutely no BlackBerry coverage during the time that you're, you know, up in the air. As soon as I hit the tarmac in China, I pull out my BlackBerry, I see the 50 messages that have come in. By the time I get to the, you know, to the gate, I've already

sent back three messages around the world. In the terminal I've already made three calls, right? Now, if you had told me back in the summer of 1981 that someday I would be landing at Beijing Airport, I would pull something out of my pocket, you know, that was tiny, call around the world by the time got to the airport gate, there's not a chance in the world that I would have believed you. Or there's an old telephone. If you told me that this is what this -- the skyline to the city of Shanghai would look like, I wouldn't have believed it either.

So, you know, working in these energy and climate areas can be - can sometimes take leaps of optimism. I think they're absolutely justified. If we get the best minds around the world, if we get the best -- if we get real resources devoted to solving these challenges, I think we can do it, and that's what I want to talk about today.

I thought I would just in a few minutes talk about, first, some things we're doing domestically at the Department of Energy to help solve these problems, some things we're doing bilaterally, some things we're doing multilaterally, then a quick note about some new analysis and research we have underway, and then a conversation with all of you.

So, it's really fun to work in the Department of Energy these days. I have to say that one reason it is a lot of fun is our boss, Steve Chu, who people here will know won the 1997 Novel Prize in physics. He is a

transformational leader at DOE. I've worked other places in the federal government. As Dan said, I've never worked at DOE before, and I sit in these budget meetings and I wonder what was it like before the Secretary knew more about the topics he's being briefed on than the people who are briefing him. He's also -- he's a very good manager.

And we have had this -- what is an extraordinary opportunity, which is to invest $40 billion of funding. It's under Department of Energy Management under the Recovery Act for Clean Energy. And we have invested in a variety of different airs. We're in the process of investing in home weatherization. Extraordinary opportunity there, by the way.

There are enormous numbers of low-income homes in this country that waste huge amounts of energy by investing small amounts of money in each home. We can improve the energy efficiency, save people money, improve comfort, and create jobs. It's a quadruple win. We've been greening federal buildings. Significant expansion for renewable energy tax credits.

A lot of work on plug-ins. This is incredibly promising technology. General Motors and Nissan are both coming out with the first commercial model plug-ins for mass distribution in the United States this fall. We've working to build up an American plug-in vehicle industry: high-speed rail, carbon capture and storage. United States, China, Russia, India have

vast amounts of coal. Unless we find ways to burn that coal cleanly, we are not going to solve the global warming problem. We've investing in bringing down the cost of carbon capture and storage.

We have 5,000 clean energy projects around the country at this point, across a range of areas. This is not mainly what I came here to talk about, but it is obviously mainly what the Recovery Act is all about. On the Y-axis the one-month job change in the United States. You can see running right up until the signing of the Recovery Act, the hemorrhaging of jobs in this country throughout 2008, the turnaround after the Recovery Act, and the build back up. We obviously have an enormous ways to go to put Americans back to work, but we are moving strongly in the right direction.

This is what I mainly came here about -- came here to talk about, which -- and this is a bit of a complicated chart, but just across the top there you see different stages in the energy investment chain from basic R&D, advanced R&D, to pilot, pilot to demo, commercial, and then down the side you see different categories of investments. the circles represent the amount of funding that we put it in the at year in each of these categories across this grid, and you see because of the Recovery Act investment we're heavily invested in the pre-commercial or just about commercial stages of the chain. But we're invested everywhere as well. Trying to create energy revolution for the United States and the world and talk a little bit about that.

We're doubling renewables with a 30 percent tax credit and loan guarantees. Transforming transportation, this has been a big area. I mentioned this briefly before, but this administration has just in the past year taken without any close competition the most historic steps ever to transform the transportation industry with agreement between major stakeholders and automotive fuel efficiency, the Cash for Clunkers program, grants for battery manufacturing and electric vehicles, and retooling auto factories.

We're also working to restart the domestic nuclear industry. This is base load low-carbon to no-carbon electricity. Very significant work going into restarting this industry with significant loan guarantees. New power plants. It's a big, big job creator. And we're working to -- we just put a Blue Ribbon Commission to look at the nuclear waste issue.

So, I want to talk some about DOE's investment in early-stage research, which I think would be transformational. Dan Yergin has said that what's happened in shale gas in the past decade is the biggest innovation in energy in this era, and as many people in this audience will know, U.S. recoverable reserves of shale gas have doubled in just the past several years due to advances in -- mainly in hydraulic fracturing technologies.

So, where did that come from? Along the bottom there you see U.S. Department of Energy research funding during the 1980s and a little bit into the 1990s, which supported early-stage development of this

technology. And then we see the slow ramp-up in the production in the graph. I think -- this type of investment in early-stage energy technologies can be transformational. I think one of the challenges from kind of a political standpoint can be that the payoffs, although big, sometimes can be a way, you know, years offs, so I think it is really important to look at the energy transformation that's happening today, trace it back to where it came from. In this case, this huge energy transformation came in significant measure from government funding. And the question at the bottom, could methane hydrates be next? -- we're investing significant funding in methane hydrates technology today.

One of the programs that I think we're most excited about at the Department of Energy is our ARPA-E project. It's modeled after the Defense Advance Research Projects Agency, which DARPA was created after Sputnik. DARPA is widely credited in the work there -- helped to lead to the creation of the internet. Also hugely important innovation such as Teflon came out of DARPA. At ARPA-E we're trying to do the same type of path-breaking research. Secretary Chu likes to say that with ARPA-E programs we are swinging for the fences. It's like in baseball, when you swing for the fences sometimes you hit homeruns, sometimes you strike out, but you've got to be swinging for the fences in order to get those homeruns, and that's what we're doing at ARPA-E.

Just a few examples of some of the projects that we're funding, and there are now dozens of them. This project is focused on large grid-scale storage of energy. People here will know one of the challenges with renewable energy in particular with solar and wind is that the sources are intermittent. Sun doesn't always shine. Wind doesn't always blow. In order to really scale up those sources, we're going to need massive cheap energy storage, which we don't now have. So, this is work in to that.

The basic insight of this process, which comes out of some MIT researchers, essentially in rough approximation putting an aluminum plant in reverse. Aluminum plants take massive amounts of electricity to convert different metal and metal ions into aluminum, and the idea here is to have electricity used to convert dissolved metal salts and then to be able discharge when you're in discharge mode and draw the electricity out. In a kind of rough parallel is putting an aluminum plant in reverse. Not yet proving a commercial scale, but we've got work underway to do it. If this type of thing works, we would have literally swimming pool-size batteries, industrial-size batteries that could be transformational for renewable energy.

Also doing work on carbon capture and storage. Within the body there are enzymes that capture carbon dioxide. We have researchers with expertise in this area looking at whether there's learning from biological mimicking within those enzymes that could be used for CCS technologies to

dramatically lower the cost of capture of carbon dioxide out of flu streams.

And similar work in -- or somewhat similar work for transforming cellulosic biofuels into usable forms of liquid fuels. You know, termites have learned how to do that. I figure human being may be able to learn how to do that, too.

So, that's a brief talk about what we're doing about -- doing domestically at the Department of Energy in researching and technology. Let me just talk some about our bilateral work and then our multilateral work -- and a bilateral work focus on China.

So, I was -- last September, I was on the eight-lane highway between Beijing and Tianjin going -- we were driving like 60 miles an hour -- huge road -- when the Bullet Train came by. It was very cool. It was, you know, going, like, 220 miles an hour in the relative of speed, like 140 miles. I was just -- one moment it's here and the next moment it's gone out in the distance. As we did this, it occurred to me, there's a metaphor here. I mean, I think the United States, all these programs that we have we're getting up to speed, we're making progress in our clean energy work, but the Chinese are investing heavily -- heavily -- in this technology -- in these technology spaces, as are other countries around the world. And I think we all need to work together in order to get the benefits of all this work that all our countries are doing. So, this has been a major priority of ours over the

course of the past year.

One project which we're particularly excited about is -- we're in the process of standing up is -- the U.S.-China Clean Energy Research Center. It's a $150 million project, funding split evenly between our two countries, focusing first on building energy efficiency, CCS in clean vehicles. We actually have an active funding opportunity announcement out there right now. It closes at the end of this week. And we are going to China next week, actually, with this on the agenda in part to talk about standing this up.

We have a range of projects in a variety of areas. These were all announced by President Obama and President Hu Jintao at the summit in November in Beijing, but we have electric vehicles initiative. We had the first-ever U.S.-China electric vehicles forum last fall in China. Tremendous discussion actually, a day and a half of very engaged technical discussions among the experts. A lot of agreement that if we can get together on battery standards, some other common standards, we can really make a difference in shaping global markets. A lot of work on energy efficiency, renewable energy. Shale gas I think is one of the most exciting areas here. The Chinese resource in shale gas is much less well characterized than the U.S. resource. We're working together here. A lot of commercial opportunities for U.S. companies in this area. A lot of work on coal and also on greenhouse gas data collection as well.

So, that's just a word about our bilateral work. I can talk more about that. Let me say a word about our multilateral work. On July 19th and 20th, Secretary Chu is going to be hosting the first-ever clean energy ministerial. We have -- the goal here is simple and straightforward, and the goal is to make concrete progress in advancing clean energy technologies. We're not interested in talk. We're not going to negotiate a communiqué. What we're doing is inviting groups of countries, groups as small as two, as large as everybody who's at the meeting, to come forward and make specific progress on a range of different clean energy technologies.

An electrical foundation for this grows out of the work last year at the Major Economies Forum, which had a process called the Global Partnership Technology Action Plan. It's a great resource, actually, for anybody interested in this. So, we've invited these countries; getting terrific response, a lot of acceptances.

We are also creating a track 2 process. We would be thrilled if the private sector of civil society would participate. We see this as a real opportunity to advance clean energy technology across a range of areas, and let me just talk about one of them, and that's in energy efficient appliances.

This chart shows refrigerators and refrigerator standards. On the left you see the energy per unit, the average energy per unit, and on the

right you see -- on the bottom you see years, and so the red is the -- the red line, excuse me, is the volume of refrigerators from 1947 up to -- and this may reflect also the waist lines of Americans, I'm not sure, but you see these are U.S. refrigerators, you know, going up in volume, but at the same time, you see the average efficiency and the average cost of those refrigerators dropping dramatically, and that's because of dramatic advances and the energy efficiency of chillers and other parts of refrigerator technology, and advanced by standards initially in the state of California and then spread globally.

And there is a lot of good work that's been done on international coordination of appliance energy efficiency standards and labeling programs and incentives. In the United States, the energy saved just from refrigerators from these standards saves as much carbon as the renewable energy that we have deployed in the grid today, just from refrigerators. So the energy saving potential here is enormous. We think we can -- we hope we can really shape markets in this. And this is the type of discussion that we hope to have in the Clean Energy Ministerial on issues like appliance energy efficiency standards, smart grid, CCF related set of topics. We hope this will be a real contribution to helping move the world towards clean energy.

So let me close this by talking about some analysis that we

have underway at DOE right now, it's kind of interesting, it's on a set of issues that economists might call positive spillovers, or we've also used the phrase international carbon multiplier. Both of those are pretty wonky, and my favorite phrase is just the U.S. leadership effect.

The question that we're asking here is, if the U.S. acts strongly to reduce emissions and promote technologies, what benefits does it have around the world? So for many years commentators have said that the U.S. leadership is important in fighting global warming, that we're the world's largest economy, we have extraordinary innovative capacities, if we get moving, others will, too.

And so there are at least two broad reasons I think that's probably true, from my observation of this area, one of them is really a political leadership effect, that is, you know, if we act, I think other countries will do so, as well. The EU has been the most explicit about this. The EU, you know, has said that if other -- that they were 20 percent, and if other countries act, they're 30 percent.

But a number of other countries around the world, although less explicit, I think have the same calculation in mind. Now, one way of thinking about this is, that means that every time that we reduce the United States, it'll be multiplied by other times reduced abroad. And so when you see these part-time calculations of what it costs to reduce emissions in the

United States, multiply that by some factor, because we're going to generate emission -- additional emission reductions abroad every time we do that.

But I think there's not just a political leadership effect, there is also a technological effect, and that's what we've been looking at most closely at DOE. And it wouldn't be right to close without some more -- one or two more wonky graphs. So on the left here, you have expenditures in euros actually, this was produced in Europe, and on the right you have volume, you have cost, excuse me, on the Y access you have cost in cap X, and on the right you have volume, and across solar PV, solar CSP -- solar power and CCS, the basic points these charts are making is that as production volumes increase, costs come down.

And so as the United States is the world's largest market increases its demand for these clean energy technologies, we can expect across a range of them that the cost will come down, and that will have -- that will speed deployment not just in the United States, but around the world. So it's another positive spillover, it's a carbon multiplier, or I like to call it the U.S. leadership effect.

And so we're looking at how can we quantify the U.S. leadership effect, which technologies does it supply most to, talking with folks about the political aspects of this, as well. I think -- I mainly mention it today because I think it's a great form of experts and I wanted to start a

dialogue on this topic. How big is the U.S. leadership effect, how can we enhance the U.S. leadership effect, and what do we need to do to make it real? So I guess it was 29 years ago that I was in Shanghai. I think the interesting question is, 29 years from now, what will the world look like? I've got teenage kids right now, I'm convinced that some day that they're going to -- my grandkids will look at them and say, what, you couldn't plug in cars when you were young, that's so weird.

I think the answer to the question, what will the world look like, is up to us. With all the talent in this room, all the talent that's being invested in the clean energy area, with all the resources that's going into it, I believe we can change the world. Thank you very much.

MR. YERGIN: Thank you very much, David. In terms of changing the world and plug-in cars, it does remind me that those of us who even have grown up children now, many of them have never typed on a typewriter, so your point is well taken about plug-in cars.

David, if you take this audience as a large focus group, I'm quite confident that, given the choice between positive spillover, spill being a term not very positive these days, international carbon multiplier, that sounds like increasing carbon, and U.S. leadership effect, I think this audience overwhelmingly favors U.S. leadership effect. Everybody who agrees, please clap. Okay, there's your answer. I'm mindful of the time, so let me

just start quickly. There's been a lot of discussion, and so I'll try and be quick in my questions and quick in your answers. A lot of discussion already about Copenhagen this morning. Half a year later, just what's your takeaway?

MR. SANDALOW: I was deeply involved in the multilateral climate negotiations when I was in government in the '90s. In this tour I actually -- I have not been very deeply involved in those negotiations, except that I was in Copenhagen for two weeks. Todd asked me to come and help how I could, and it was an extraordinary experience in many ways. I'm sure other people have already talked about the challenge of the Copenhagen Conference.

The last 24 hours of that conference, I have to say, were just a remarkable experience. We sat in this small room, and sitting around the table was, you know, Angela Merkel and Sarkozy and you know, Gordon Brown, and Calderon of Mexico, and Ban Ki-moon and Meles Zenawi of Ethiopia. It was a remarkable gathering of heads of state, and there were 113 heads of state who came to that meeting.

And so I think the under emphasized story from Copenhagen is the enormous political attention of this issue that's reflected in the fact that 113 heads of state came to that conference. And there are obviously challenges with the whole consensus based decision-making process in the

U.N., which -- but I think the U.N. is an essential forum that we, you know, it has a critical role in the solution of this problem. But I guess my main -- is the contrast between sitting in that room and the experience I had of the White House staff in the mid-'90s, and the NSC staff working on these issues.

And one of my main jobs at the time was to go to the senior directors of the regional office of the NSC, who mainly they were among the most accomplished foreign policy professionals our country had, I know I'm not giving you a short answer, I apologize for that, but I would say to them, we need to put climate change in the talking points for this meeting when, you know, so and so comes to talk to the president, and they would look at me like I was nuts.

And it wasn't a top two issue at the time. And eventually I think they figured out the President wanted to talk about climate change, and so they did it, but the change from that period until now is remarkable. And so climate change is really a top two issue in bilateral relationships, and I think that's my main observation in coming out of the Copenhagen Conference.

MR. YERGIN: Around that same time, of course, we started to see a kind of chipping away or there seemed to be a chipping away at the consensus around the science in climate change. How do you read that

today and what's your message on that?

MR. SANDALOW: Look, I'm not a scientist, but I will say that I think the -- I don't know if I would call it -- I would not call it a chipping away at the consensus of science. I think there have been attacks on the IPCT process. There were a few minor errors in that process. The consensus view that I've seen from the scientific community is that the conclusions of the IPCT are absolutely valid, and there are some minor changes in procedure to be undertaken going forward.

But, look, I mean the vast scientific consensus is that we are in a very scary situation when it comes to climate change and we need to address it. There are tremendous opportunities I believe for our economy in doing so, but we need to address it.

MR. YERGIN: As you said, you've been to China six times in 12 months in a desperate effort to increase your frequent flyer miles, which you're succeeding that. A couple of questions about China. One is that we often hear it said China is going to get ahead of us on renewable energy technology, you talked about the cooperative facility that's been set up; what are we worried that they're going to get ahead of us on? We know that they can manufacture turbans more cheaply because they can manufacture everything more cheaply. What is it -- are we worried that they're going to get ahead of us or are we really the source of the intellectual content?

MR. SANDALOW: Look, there's -- yes, first, by the way, on the flights, United suspended the non-stop flight between Washington and Beijing for four or five months, which was a major reduction in the quality of my life, but they've now restored it, which is terrific.

But on the -- the Chinese are absolutely racing ahead in a variety of different areas. And they are investing very, very heavily in plug-in electric vehicles. They are obviously dominant players in world solar markets. They are a huge market for wind. They have the world leading long-distance transmission lines. They've got 1,000 kilovolt long-distance, you know, transmission lines, which they're stringing across, you know, from the West to the East, and the United States is 765, I guess. So they're major and dominant players, and I think for U.S. business to be competitive in this space, we need to be investing heavily and supporting that, and that's exactly what we're doing under the Recovery Act. And I think there is a balance of cooperation and competition there. I strongly believe that working together with the Chinese government, we can do more than acting alone, we can, for example, work on common standards to speed the deployment of clean energy technologies, we can cooperate in some research areas where it makes sense to do so, pooling our knowledge. At the same time, our businesses are going to be competing in the global marketplace.

MR. YERGIN: When you're going on these six trips, what do you talk to the Chinese about, mainly technology?

MR. SANDALOW: Yes, we have talked about energy efficiency, renewable energy, electric vehicles, technology in all these areas, as well as market access for U.S. businesses. And I have to say it's been, for example, the first -- first when Secretary Chu went on to China last July, he did jointly with Secretary -- Commerce Secretary Lock, with a combined theme of technology cooperation and market access for U.S. businesses.

MR. YERGIN: I mean, China is both an oil producer, its oil production is actually going up, but tell us what you see happening with electric battery automobiles there, specifically your sense of dynamism there.

MR. SANDALOW: I was -- actually, on the trip to Tianjin that I talked about, where the high-speed rail -- the -- train came by, I was on the way to see a new lithium ion battery manufacturing facility, a company called Li Sheng , an enormous new facility which they are creating -- manufacturing batteries substantially for automotive market. BYD, a leading Chinese lithium ion battery manufacturer, has bought manufacturing capacity, I think sold 400,000 cars last year, planning to diversify into electric vehicles, and is coming out with an electric vehicle model.

The Chinese have 20 electric vehicle cities that they're

investing in with new infrastructure. They're investing in a big way in this. And, look, it's a very good thing to diversify China's transportation fuel mix away from simply a reliance on oil to electricity, as well. The energy security benefits for the world as a whole from China doing that are very significant. So I think it's an area that we want to promote. At the same time, we want to be sure that we are investing in our own domestic capacity here so that we're creating American jobs in this industry at the same time.

MR. YERGIN: Do you think it's an area where we might wake up in two or three years and find a surprise we're still back in the Ho-ping Hotel and they're --

MR. SANDALOW: Look, not if we get ahead of the curve, and not if we continue the investments we're making, and we really have smart policy in this area.

MR. YERGIN: Let me ask you two DOE questions. The first one is, it's now a year that you've been in DOE, what's it been like? And secondly, specifically you talked about the Recovery Act and so forth, this is a much more expanded effort for the Department of Energy in energy R&D deployment commercialization, what have we learned about that so far?

MR. SANDALOW: First, it's really fun working at DOE, I have to say, and I would think the main reason may be what I talked about in my speech, which is Steve Chu - he's terrific, he's fun to work for. In addition to

being brilliant and a good manager, he's also -- he's actually a very nice guy and really terrific to spend time with. And he's put together a team that is really first rate, and I'm really -- great to spend time with him. And this -- the opportunity to invest these funds is -- it's a big one, it's a -- it's quite -- the stewardship of these funds is an enormous responsibility and opportunity.

Secretary Chu brought from the beginning a very skilled manager, one of the heads of Mackenzie's Energy Practices, to run the implementation of the Recovery Act, Matt Rogers, who's -- Matt has put together just an incredible effort to play these funds with transparency accountability, hitting our job creation targets and our energy innovation and transformation targets, so it's -- it's been a big push and it continues. I mean it's very much in the swing right now, and it's going to continue, as well, as we have the kind of -- if we have the follow through parts of this. My only -- the only thing I will say I don't like about DOE is the Forestville building.

MR. YERGIN: Why?

MR. SANDALOW: I probably said too much already.

MR. YERGIN: Okay. It's functional?

MR. SANDALOW: It's functional.

MR. YERGIN: Okay, it's functional, it's definitely functional. The spill, it's actually the leak in the Gulf of Mexico. Obviously, authority is divided among number of different departments, from Interior, Coast Guard,

and DOE; what do you -- tell us about what you see is the effect and some of the consequences.

MR. SANDALOW: It's obviously a terrible tragedy. And job one is stopping the leak, and that's where federal resources are mainly devoted at this time. Secretary Chu has been down to Houston, was down there last week, I think literally rolling up his sleeves to help in this effort, has helped to put together a team of experts from the National Labs.

There is a wide range in scientific expertise across -- of course, in our -- in the DOE National Lab system, and one of the questions that's been put out is whether people with expertise not directly in, you know, oil production exploration, but in other areas might have ideas or be able to contribute.

Actually, Secretary Chu personally, as well as others, have already brought to the response some work on gamma radiology and using gamma radiology to image inside the pipes, which I understand is a contribution to the problem, solving the problem. You know, there's a lot more that needs to be done, but it's a very -- obviously a very serious situation. Interior Department is obviously, you know, is in the lead and is taking, you know, along with the Coast Guard, taking very serious steps in this area.

MR. YERGIN: You talked about Shell gas and showing that

investment in this decade may not have an effect for a decade and a half. Now we have this tremendous resource, the numbers keep going up, the Canadians have just come out with extraordinary numbers, as well. How does the arrival of gas in this scale and at this price range change the energy discussion, is it still early days -- how does it fit into what's happening with climate?

MR. SANDALOW: I think it's still early days, but it's potentially transformational. I think we could see natural gas used for electricity generation and significantly higher percentages than it is right now in the U.S. mix. Depending on how this plays out, one can imagine scenarios in vehicle penetration, as well, though I think most of it will be used in electricity generation.

It obviously has significant implications on the energy security front. Before the advent of this technology in the past couple of years, the projections were for steadily increasing imports of natural gas to the United States. Now I think the projections are in the opposite direction, so I think it's potentially very significant, and not just in the United States. As I mentioned briefly in my remarks, in China, in Eastern Europe, in other parts of the world, as well, it's potentially transformational for energy security calculations.

MR. YERGIN: You've spent a lot of time before you were in

the department looking at transportation issues, focus on electric car. With the drive to batteries and electric cars, obviously some people say with all this gas, we should be pushing gas more directly into transportation. Do you think that the momentum towards electric vehicles and the focus on that is so strong that this is not a focus or do you see --

MR. SANDALOW: Well, I very much support increased use of natural gas in vehicles. I think it's definitely got utility in some applications. I think -- the -- in the transportation area right now is that 96 percent of the fuel in our transportation fleet comes from this one product, petroleum, about which you know something, Dan. And, I mean, it actually -- it doesn't seem odd to us that 96 percent of the energy in our transport sector comes as one fuel, because we've grown up with that, our parents grew up with that, our grandparents grew up with that.

MR. YERGIN: Sort of --

MR. SANDALOW: Yeah, but it is actually in, you know, many respects extremely unusual to have this one function so utterly dependent upon one fuel, and that has huge implications geopolitically, environmentally, economically, and so I think a core challenge here is diversifying the fuel mix in our transportation fleet, that includes natural gas.

I think my own guess or projection would be that batteries are the more transformational technology, and, you know, electric vehicles I think

will be a very, very big force over the course of the next couple of decades where we should be doing natural gas.

You know, by the way, also biofuels potentially play a very significant role here.

MR. YERGIN: I know our time is getting short, so let me ask you two last questions. One is, part of development of electric cars also means changes in the grid and electric supply system, a lot of different definitions of what is a smart grid. How do you see the timing of that, and is that moving at the speed you would have expected?

MR. SANDALOW: Well, I think there's a lot of movement forward on smart grid. It's been a big piece of our Recovery Act investments. There's actually a lot of work internationally on this. I mean it's astounding actually how dumb of a grid we have today. I mean, you know, a lot of people have said this is -- I've heard a number of speeches on this topic, you know, if Edison came back today, he would recognize the grid.

And I heard a utility executive say recently, you know, the only way that we know when our customers aren't getting electricity from our plants is that they pick up the telephone and call us, and that's actually pretty antiquated technology given what we have today, so, you know, there's tremendous potential.

And just one other thing on that, too, so in this -- okay, we're

obviously a bunch of self-selected energy experts -- energy and climate experts. How many people here know how much it costs them to run their refrigerator a year?

MR. YERGIN: One, two.

MR. SANDALOW: It's actually astounding. And we lack -- and how many people in here know within, you know, 25 cents, how much gasoline is selling for on the streets of Washington today? Probably -- I mean, the difference between this is amazing. We are highly, you know, attuned to one and absolutely unclear on what it cost -- I think that's going to change over the next several years.

MR. YERGIN: David, one last question to really be the bridge into the next panel. Clean energy, a lot of your talk is on clean energy. What's in clean energy? Is nuclear clean energy?

MR. SANDALOW: Yes.

MR. YERGIN: Shell Gas clean energy?

MR. SANDALOW: It can be. I mean, I think -- look, nuclear is a key part of our energy future here. It's low or no carbon. It's expensive today, but it can play a key role. Shell Gas is obviously for, you know, half this -- two emissions of coal for the same unit of energy, it's got, you know, zero conventional pollutants, you know. Well, not zero conventional pollutants, but zero pollutants in some categories, and much lower. So Shell

Gas has the potential, you know, a very important role in the clean energy future.

MR. YERGIN: We have the next panel come in, a terrific panel with Shirley Jackson. I'm going to turn it back to Bill Antholis, I believe, and so -- or Strobe, I'm not sure who, but please, everybody, join me in thanking David for his remarks today and for the terrific contribution he's making. Thank you. (Applause)

MR. TALBOTT: Since Dan is a trustee, I ask his advice, I said can we give these folks a chance to get a cup of coffee, he said, no, make them work, go straight into the next panel. Why don't you folks all come on up?

I'm very grateful to have three colleagues from Brookings and also Jonathan who's joined us from the Congress. And while they're getting lavaliered, and so we can economize on time and move quickly along here, I just wanted to say a word or two of introduction about Shirley Jackson. And I'm going to exploit, Shirley, you better watch out because I'm confessing what I'm about to do.

I'm going to exploit her background and expertise to make a point that has come up during the course of the morning, but I just want to make absolutely sure that it's front and center or at least at the base of our thinking about this whole issue. Shirley, as you all know, has multiple

credentials to be leading this panel, and, indeed, to be doing many other things. She is deeply involved in the Council Competitiveness's Commission on Energy Security and Sustainability, which, of course, is right in the center of what we're talking about. She serves on the President's Council of Advisors on Science and Technology, PCAST, and no small measure because of her background as the head of the Nuclear Regulatory Commission.

But what I want to particularly underscore with an ulterior motive is that Shirley is an educator, which means that it is part of her current profession to think and work in a way that takes account of the fate of future generations. And that is a point that sometimes slips into the background or seems a little too abstract to have much meaning in the world of today, when we're worried about today's gas prices, who's going to vote for whom in November, who's going to be able to keep his job in the Congress after November and things like that.

But taking a longer view is a pretty essential part of being responsible, both individually and as a community on the issue of climate change. It strikes me that, as you think back over 10- or 12,000 years of human history, every generation has always felt a degree of responsibility for its progeny. That comes with human nature, it's one reason that we have survived as long as we have. But there have only been two cases in all of

human history where the generation in charge had more than just a responsibility for the next generation, but had an existential responsibility for the next generation.

The first, of course, was during the Cold War, when, if we had had stupid leadership as opposed to wise leadership, we could have blown up the planet and incinerated much of humanity. By the way, a possibility that's still available to us, but at least one that we have more or less within bounds. And it happens to be an issue that Shirley knows very, very well in her capacity as an expert on nuclear energy issues.

But the other existential threat is, of course, climate change. And I've been listening carefully to the superb discussion that's been going on, and I've heard elusions to this, including at the tail end of David Sandalow's talk, where he showed that beautiful from the moon or from outer space photograph of our planet and wondered what his grandchildren were going to say, and imagined them saying you mean you people didn't even have plug-in cars back then. Well, I'm worried that we might get a rather tougher message from our grandchildren than just their wonderment at our technological lack of sophistication. I think we're running a very real risk that our grandchildren could say something closer to, what the hell were you people thinking, and why in God's name did you not get a grip on this problem when you had an opportunity to because now we're in charge and

it's too late to do anything about it.

So this is the issue of what I call not just intergenerational responsibility, but transgenerational responsibility in that it isn't just about conserving the legacy that we got from previous generations, it's making sure that there is a legacy for future generations, and I can't imagine anybody better to open a discussion including on that point than somebody who is responsible for educating the next generation.

So, Shirley, over to you.

DR. JACKSON: Thank you. I'm also educating the next generation of those who will help to solve the issues. You know, events in the Gulf of Mexico and here in Washington over the last few weeks have shifted the dates and alliances in ways that we could not have imagined. But tackling the linked, and they are linked, vulnerabilities of energy security and climate change remains one of our top priorities at both the international level, as you have heard through discussions this morning, and at the domestic level, which we're about to discuss in more depth. In fact, as Strobe has clearly stated, it is a key priority because it is the key challenge in my mind of our time and a fundamental intergenerational responsibility that I not only agree with, but understand as a university president.

But how does the United States actually construct a comprehensive and consistent framework that takes into account the policy,

regulation, infrastructure, markets, research, technological innovation, and human capital needed to transform our energy system?

In other words, how are the linked challenges of energy security and climate change policy to be articulated in a way that can lead to movement, articulated to the public and to legislature?

Now, I have suggested that our nation needs a comprehensive energy security and climate change roadmap guided by five key principals, the first, which we've had some discussion about, redundancy of supply and diversity of source, to provide protection against the supply disruption events, such as accidents, natural disasters, or geopolitical instability, and to provide a hedge against price volatility, and this includes the use of what are called bridge technologies that include things like natural gas, nuclear energy and what people refer to as cleaner coal. A second principal involves, of course, a focus on energy conservation, efficiency and environmental sustainability, and this includes the development of new technologies, but with calculations of full life cycle costs of both policies themselves and product.

A third is linking optimum source to sector of use, thinking strategically about how each sector uses energy and intersects with other sectors. Now, the Kerry Lieberman bill tries, in fact, to do this, as one looks across from utilities to manufacturing to transportation, but one aspect of transportation that we never talk about very much is airline transportation.

The fourth key principal involves, of course, investment in sound infrastructure for energy, generation, transmission and distribution, and that includes, of course, the smart grid, but it includes fundamentally a stronger grid, but it also includes methodologies for extracting or developing other types of energy sources and how we get them to where they're used. And the fifth key principal, of course, is having well functioning energy markets with transparent price and pricing signals and safeguards against market manipulation. And one needs to think about that as one looks at carbon allowances trading, looking at setting fees on carbon content, et cetera.

But given the fluctuations in public and political opinions, the volatility of world markets and the tasks that were left on the table at Copenhagen, some may be looking today for a less comprehensive plan of action. But unfortunately, a less comprehensive plan may prove incoherent and ultimately ineffective and doesn't look at the intersecting vulnerability.

So how do we get around this? Are there points of consensus and how do we build upon them? How do we educate the public? What are technological challenges and how can we overcome them?

You've heard some about what is going on in the Department of Energy and David Sandalow's very compelling presentation, but what is the right sustainable framework for linking research, basic research to user

need research to translational pathways for the creation use and commercialization of new energy technology? If we're going to have leadership globally, we have to get this together. And so fundamentally, how are we going to go from rhetoric to reality? What is realistically possible, and what time frame, and in what sectors, and what sectors first? And if we are successful in passing climate change legislation, money will be generated from user fees; what will the money be used for, what should it be used for?

So to help us to begin to address some of these questions, we have a distinguished panel of experts and let me now introduce them. We have substituting for Robert Simon, who's in your program, who is the Staff Director of the Committee on Energy and Natural Resources in the United States, is his colleague on the Committee, Dr. Jonathan Epstein.

And, Dr. Epstein, thank you for being here. Dr. Epstein is an authority on energy research and development, working closely with Committee Chairman Senator Jeff Bingaman on national defense, energy R&D and global competitiveness.

And Dr. Epstein, and each one will speak in turn with brief remarks, and then we'll have a brief moderated discussion, but we would like to get your questions and thoughts. Dr. Epstein will provide us insights into the latest discussions in the Senate on where we stand with climate change and

energy legislation.

Then we have Dr. Barry Rabe. He's, in fact, closer to me, and he is professor of public policy in the Gerald R. Ford School of Public Policy at the University of Michigan, with appointments, as well, in the School of Natural Resources and in the program in the environment, and he's a non-resident senior fellow in governance studies at Brookings.

Dr. Rabe will discuss some very interesting and very late breaking polling work on U.S. citizens' attitudes toward an appetite for government action to address the challenges of climate change. And in light of one of the earlier questions from the audience, this is an important work.

Mark Muro is next to Dr. Epstein, and he is a fellow and director of policy for the Brookings Institution's Metropolitan Policy Program. And he is research director of the Brookings Mountain West Initiative. He will discuss the need for innovation and financial support if the U.S. is going to transform our energy system.

And finally we have Dr. Charles Ebinger, who is the director of the Energy Security Initiative at the Brookings Institution. He's had very extensive energy experience as an energy consultant across the world. He has a strong policy and foreign policy background. In fact, he helped to establish the International Energy Agency and its oil sharing mechanism. And Dr. Ebinger will focus on the short and mid term steps in energy system

transformation. In particular, he will discuss the bridging technologies our nation needs as we transition from fossil fuel dependency.

Now, each panelist has been asked to talk for about 5, and I think they were given up to 10, but as the moderator, I'm going to ask them to 5 minutes of comments so that we can then have a discussion. And we only have one hour for this total discussion with four very dynamic individuals with important messages, so let us begin.

Dr. Epstein.

DR. EPSTEIN: Well, thank you. It's very rare when I get out of my rabbit hole called the U.S. Senate. It's usually Bob Simon's job. But I think it's also evident that -- why I'm here. If you look at the energy dynamic in the Senate, I will basically speak to the Senate. When I listen to Chairman Bingaman in my meetings with him, and he routinely has many visitors come in, and I sit there and take notes for follow-up, the message he -- they ask him routinely now is, well, what do you think about energy bill prospects and climate bill prospects, and I think the latest coming from the chairman is confused. I hate to use that word, but the events that have transpired since late April have sent a whole new dynamic motion in the Senate, as it should.

If you look at the calendar, what we call the Day Book for the hearings, this week alone I think there must be ten hearings on the deep

water horizon. The Energy Committee is having Secretary Salazar and others, but it's not just the Energy Committee, it's Homeland Security. There's even one in small business, on the effects of small business. And the body as a whole has to grind through the effect of this incident before it can realign itself on the legislation before the Senate.

And to give you an idea of the magnitude of this incident, I was driving to work today after dropping my daughter off at kindergarten, and I was listening to NPR, and you know, it just struck me, and Dr. Jackson will probably appreciate this, but they're putting a commission together, and they use the word the Three Mile Island Commission in magnitude or scope in the same phrase as what happened at the end of April. And so when you see this kind of phraseology being used by the executive branch, and the press picking up on it, and the Senate, of course, and the Congress as a whole, responds accordingly to this, you can see why Chairman Bingaman has used the word a little bit confused right now as to how energy policy will move in the Congress.

Let me just give you where we are before the incident happened. There's S1462, I think which is basically the Energy Committee energy bill. We have a jurisdiction primarily of energy. That bill was reported out in late May/June timeframe last year and has been on the Senate calendar.

I think you all are all familiar with some of the efforts underway to try to develop coherent energy policy and climate policy. It's not necessarily a jurisdiction of the Energy Committee, we do have jurisdiction, but it's multi jurisdictional, and I think you all have heard the Kerry-Lieberman legislation, and I really won't speak to that, per se, because that's still being evaluated by our committee and the other committees of jurisdiction.

But the trick, if you will, then is to merge these two pieces of legislation together in whatever form and bring them to the Senate floor for debate and consideration, knowing that anything of this magnitude has a 60-vote threshold to cut off debate. And that's all a very steep hill to climb as you move forward. The fact that the legislation that the Kerry-Lieberman proposes is so grand and sweeping means there's a lot to digest by each of the committees and we're in the process of doing that.

I think within the energy bill context, it's been out there for about a year, and within my world, which is innovation and R&D, I think it's -- we have fairly well settled principals of proposing things such as energy hubs, increased, applied funding for energy R&D, increased basic science funding to move forward. That's been examined I think out in the public court now for about a year now, and we've had generally positive results in that area.

So I'm going to stop my comments right about now to just turn it over to my colleagues. But again, there's a lot of dynamic going on right now and it's even a little more turbulent and it'll shake out, it'll take another -- a least a few weeks before we have a clear signal.

DR. JACKSON: Well, that's an important set-up, because, you know, what happens is, things seem to be moving in a certain way, as you're pointing out, through the Congress, and then something happens. On the one week it's immigration reform, but then, of course, this major catastrophic event in the Gulf. But a lot of what drives, obviously, what happens in the Congress has to do with what citizens believe, particularly the electoral public. And so I think, Dr. Rabe, why don't you tell us what you've learned about the public thinking on these issues of climate change and energy and the linkage, how much do they even understand about the linkage, and how much are those attitudes likely to be modified by both what happened in the Congress as it moves back and forth, but also from specific incidents like the deep water horizon?

DR. RABE: Certainly. Well, it's been a tumultuous couple of years for climate policy discussions, as we've been discussing. It's also been a couple of remarkable years for the way in which Americans come to understand and view this issue. We're all familiar with volatility and surveys and head to head races for political office, but it's relatively rare in longer

term survey analysis to see levels of fluctuation as we have in just a matter of a couple of years in basic questions concerning climate change, global warming.

One measure -- and most of my comments here are drawn from a series of telephone surveys that I've been involved with over recent years that are published through the Governance Studies Program at Brookings. One goes to the baseline of November 2008, the presidential election, using a standard question, do you believe that there is solid evidence that the global temperatures have increased over the last four decades, even before we get to human causation. We found 72 percent of Americans respond and said yes, and that's pretty consistent. The most recent survey analysis from a few weeks ago, that has dropped to 52 percent.

In however you turn the prism, and Eileen Claussen raised good questions about methodology and survey issues and survey techniques and the like, we have seen significant changes in the human causation issue, problem severity, do you see signs of climate change in your own locality or home arena across the board.

That said, we've also asked not only what do you think is going on, but why, and what we're finding is that, yes, there has been a huge decline in confidence and the capacity of media to report credibly on

this issue. There has been a stunning decline in the last year in the extent to which Americans believe scientists studying climate are credible sources of information. But to invoke Tip O'Neill, all climate policy understanding or all climate change understanding seems to be local. However we frame the question in survey after survey, American citizens relate their understanding of temperature and climate and climate change most intensively to local experience, what they have seen in weather patterns in relatively recent periods of time, temperature up, down, what were things like a year ago, however you put that survey together. So I think this is clearly a volatile area.

And to go back to a question that was raised in our first panel, how we begin to understand, present, package and present data on this very fundamental issue becomes a significant challenge going ahead.

A second area I just want to touch upon briefly, although we might engage this in other ways, as well, is policy and support for policy initiatives. What we have not seen in these surveys is a commensurate drop in public support for the idea that governments across levels in the United States ought to be doing something to reduce greenhouse gases. Even among people who are seeing less signs or are less persuaded that global temperatures are warming, we have not seen that kind of shift. So when we ask state, federal, local, or state, local, federal, there's not that same tectonic

shift, there is, indeed, some movement, but not nearly as significant as one might have expected. And consequently, when we look at our most recent survey analysis, we see a similar kind of triage in terms of response to different policy initiatives, pretty substantially by margins in the 60 to 70 percent level, Americans cutting across most demographic divides, but with a substantial and enduring partisan split, which has been there throughout survey analysis on this issue.

Americans strongly like the idea of renewable energy standards or portfolio standards, that tends to come in a track unit about a 70 percent level pretty consistently over time. There's consistently strong support for the policy tool that David Sandalow was talking about before, mandatory vehicle fuel efficiency standards, even in the state of Michigan.

Similar issues for renewable fuel mandates, especially when you move to beyond ethanol and other biofuels, even subsidies in different regulatory activities that would support nuclear power. Where support begins to drop off, as it has all along, is when you move into areas that are more explicitly known as carbon pricing, cap and trade. Try to convey in a one paragraph question what cap and trade is all about for carbon. And we've seen, in fact, our textbook analysis of how if you maneuver a question or a line here or there, you can get a ten to 15 percentage point balance.

The most recent survey analysis that we have when we talk

about allocation of permits and explain how cap and trade would work, without talking about optioning or revenue generating capacity, we find a near majority of Americans are supportive of cap and trade, although clearly there's much uncertainty and much volatility depending upon how you shift and frame that question.

Then dropping further in support when you use the T word, taxation, fossil fuel taxation or carbon taxes, although here, interestingly, we consistently see significant differences. Fossil fuel taxes, carbon taxes survey at a higher rate of support consistently over years than gasoline taxes. And then, of course, issues emerge such as how much the tax is going to be or what is the cost going to be of cap and trade.

And here's some work that we've done, and we published this through Brookings, we began in surveys in recent years to ask the same question, how do you feel about cap and trade, how do you feel about carbon tax, but then come back to the same question and put a price tag to it, $15 a month per person using the Waxman-Markey. Remember way back when, when the postage stamp was invoked, a postage stamp a day. You price that out to about $15 a month. When you ask that question of American citizens, support for cap and trade drops, support for carbon tax actually goes up a bit, so they're statistically indistinguishable from one another. Support for both drops as the rate goes up. And clearly there is

much, much work and thought that can be done here.

We've also begun to explore issues such as if, in fact, revenue is generated through a tax or a carbon trading mechanism. Much is being done in the 10 northeastern states through the Regional Greenhouse Gas Initiative. How would you like to use or reallocate that revenue? I think there's some interesting elements and pieces in there, as well, but perhaps we can get to that later on.

DR. JACKSON: Okay. Mr. Muro, you're an advocate of innovation and financial support to get us from here to there. And then, of course, Mr. Ebinger is going to tell us what he's going to -- from here to there. What do you mean by innovation in this context?

MR. MURO: Well, and it's a pleasure to be here. You know, I think we've heard a lot of, you know, critical background here in congressional dynamics, carbon dynamics, international forums, public opinion, but, you know, I think we need to focus on what really has been largely neglected, you know, in many of these discussions, clean energy technology, but how we're going to pay for it over the long (inaudible).

Now, I want to make three points. The first point I want to make is, we can't leave energy system innovation, I mean R&D efforts, technology breakthroughs and so on out of the discussions, and they tend to disappear for long periods of time in some of these discussions.

Put simply, we just don't have the technology base we need to be able to reduce carbon emissions by 80 percent by 2050 to keep global warming within acceptable bounds. We can make sizeable gains in the next 10 to 15 years through simple efficiencies and the deployment of basically existing technologies, but beyond that, we simply don't have the basic science, the applied R&D, the demonstration breakthroughs, the refinements, the continuous iteration and process innovation we need to deliver, you know, low-cost deployment and the massive emission cuts the nation and the world are going to need over the next 40 years. I'm worried not so much about the next 10 years, I'm worried about year 30 to 40. And we simply don't have even things that people believe we have.

We need solar panels three times more efficient than the ones we have now, but we don't have them, and that breakthrough is actually farther away than people think.

DR. JACKSON: We do have the material?

MR. MURO: Yeah, the material, yeah.

DR. JACKSON: Okay.

MR. MURO: Transmission lines that don't lose significant portions of their load, and then we need batteries for vehicles ten times better and cheaper than we have, and we're going to need a whole new battery chemistry to do that. So my point here is not that these are not worth

shooting for, my point is they're farther away for the cheap massive deployment that we need.

So we need breakthroughs, big, disruptive breakthroughs to change the game, not so much in the next 10 years or 15 years, it's about 30, 40, 50 years from now, we could come up short. Now to my second point, we need to figure out how to pay for such breakthroughs here in Washington because we're going to need public investments to get many of them. The magic of the market will help us immensely if it's properly nudged and shaped, but it won't deliver all the innovations even then we need even with the high carbon price or regulatory interventions. Why? The reason is, we have very significant, widely recognized market failures that impede the private innovation system, and they're inherent. Nobody is doing anything wrong, they're simply structural problems of the market.

Often it's hard for companies to realize the benefits of long range innovative activity because those of public goods. They accrue to groups of companies. They can't be fully monetized for individual companies.

We have tremendous uncertainty and lack of information about relevant market and policy conditions now and going forward, and the kind of turbulence that I think Jonathan has spoken about is probably going to be, in many respects, a standard, you know, steady circumstance of

market creation. So we're going to need to recognize that the federal government is going to need to invest aggressively and soon on a large scale, which brings me to the final point. We need revenue for clean energy innovation, and lots of it. By our calculations, we need to be spending 15 to 25 billion a year on federal clean energy R&D just to give us research intense, you know, on par with other innovation driven sectors like IT, health, or even agriculture, which is actually more research intensive than the energy sector.

We're spending about 4- or $5 billion a year now, a significant improvement on where we've been, but that's one-fifth the level of the early 1980s as a share of GDP. So where is another 10- or 20 billion a year going to come from, you know, in the near to median term? That's the question we need to answer, it's something that bothers Jonathan, I know, and it should bother us all.

We've seen the difficulties that we'll continue to have with the yearly appropriations process, it's not going to get any easier. The funding of just three of Energy Secretary Chu's eight proposed energy innovation hubs last year reflects how tight money is. The kind of scrutiny of every single dollar, that's a very serious problem for the future. But as it happens, comprehensive climate legislation hasn't worked very well either as a revenue source. Here, I mean I think a lot of people, you know, welcomed

Waxman-Markey and other comprehensive bills as a welcome vehicle for generating substantial dedicated revenue for clean energy R&D, but despite efforts in that direction, that bill applied only about 2 to 3 percent of the allowance revenue to R&D, per se, and less than 3 billion. Things aren't that much different with Kerry-Lieberman in the Senate, again, at the same level of R&D effort.

And to be fair, there's another 5 or 7 percent of the revenue that will go to deployment efforts around clean energy vehicles, advanced batteries and so on. But even then, massive allowance giveaways, you know, again, severely depressed, but the stream of revenue available for public needs.

So, in short, you know, we have a congressional dynamic that continues to require the legislators give away the store in certain ways simply to get the political support needed to pass the instrument. So we're groping to a vision of, you know, economic transformation through climate response, but we're not there yet, and we're going to need, you know, sooner or later a major dedicated revenue source for clean energy R&D through some sort of major climate bill, and as of now, I think even -- I'd be interested in hearing what the, you know, survey data is saying about innovation investments, but still in Congress, this is not a top priority, and we keep dishing out revenue to many other purposes, but not sufficiently to this one I think core long-term need.

So we're going to need to get more serious now and ask two questions to each and every piece of climate or energy legislation that comes down the pike, among many other questions, but we need to ask what does it do for clean energy R&D and where is the money going to come from. So I think there's, you know, an important, you know, choice that needs to be -- or an assessment that needs to be made of every vehicle. So when we can obtain better answers to those questions, then I think the nation will be in a better position for the future.

So thank you.

DR. JACKSON: Well, you know, many people deal with the here and now and think about how do we get from here to there, and I'm going to come back with a follow-on question for each one of you that links what you say to each other. But let me hear from you, Dr. Ebinger.

DR. EBINGER: Thank you, Shirley. We just hit the nail on the head with Mark's presentation, and that is the only way we are going to transform our energy situation is by paying higher prices for energy, and until this country wakes up to that fact, I don't think any of the things I'm going to talk about or what you've already heard about are going to occur. Let me just start with electricity grid, because we've heard some mention of that earlier today, and just talk about -- because we all know that in the final analysis, we can start -- we can talk about smart grid until we're blue in the

face, and people have different definitions of smart grid, as we've heard. I generally think of it more at the distribution level to the end use customer, but there are things on the centralized grid that can count a smart grid, too.

But the reality is, we don't have a modern electricity grid, we have a fragmented grid, essentially an east, a west, and a separate one in Texas. It's not a high D.C. current grid that can move power more efficiently and effectively over long distances. To upgrade this grid there have been numerous studies recently done.

DR. EBINGER: The cheapest investment required that I have seen was one done by FERC. And that placed a price of $350 billion over 10 years, a manageable sum if we put some kind of fee on everyone's electricity bill. But, of course, no one wants to do that. But the reality is, until you have that grid, the transition to the world of renewables is not going to occur because our vast wind resources that we have kind of from North Texas up to the Canadian border and a few other places like Wyoming and, of course, some offshore areas, and our vast solar resources in the Southwest, which are far away from major load centers in most cases, need a modern transmission network in order to deliver those resources in the volumes that we believe they could be delivered if we had such a network.

But the problems here aren't just cost and aren't just political will to do this. We have some real institutional problems that we need to

address head-on. And again, the Congress, and to some extent the administration, have not really tackled these as head-on as they might. Just contemplate that we're talking about a vastly different array of physical entities that comprise our electricity grid. So we're going to have to get the interests of the investor-owned utilities; of government utilities, like TVA, Bonneville Power, and so forth. Municipalities often own their utility grids. We've got imports coming fairly substantial from Canada, our neighbor to the north. We've got also merchant plants, meaning someone builds a plant and takes the risk that there will be an end-use market for their electricity. We now have regional transmission organizations. And to top -- on top of everything else, we have about half the states roughly in the country with deregulated power markets and half with regulated power markets and power moving back and forth into these markets. And how you allocate costs can keep lawyers and consultants busy for the next hundred years.

So I'm just saying we've got to take the transmission network and turn it into a modern grid if we're going to deliver not only the renewable resources but our conventional resources in greater volumes as well.

We have heard a lot about, and I'm a strong proponent that natural gas, particular shale gas, is transformative. Dan Yergin made a reference to not only the huge shale gas reserves we have in this country, but -- and our neighbor to the north in a report released last week, probably

60 percent more than we believe we have. But what we need to start realizing is right now every utility, if they think about using more natural gas for power generation or for other uses, makes that decision based on their own network. What I would argue we need is the United States' government and the Canadian government to sit down, look at where these resources are, decide where we can allocate them on a bilateral basis in the cheapest possible manner, what additional transmission lines for the gas need to be made, if indeed they do, and really come up with a North American gas plan. Because otherwise we're going to make some investments that aren't the least cost way of using these gas reserves.

NGVs, natural gas vehicles, offer a tremendous opportunity, but again it's not going to transform our dependence on oil. The best estimates I've seen is if we pushed all out, meaning all vehicle fleets and other gas uses in transportation, that we might replace eight percent of petroleum demand after quite a substantial investment but that is a homegrown energy resource and so probably merits some examination of the relative economics of doing that.

Coming back to transmission for a minute, one point I forgot to mention is again because of our regulatory process, it now takes about 14 years to get a major transmission line sited, approved, environmental assessments, and whatever. So in a sense, unless we streamline this

process, we are already living in 2024, 2025 in terms of what we're going to have as a network to develop our bridge renewables.

DR. JACKSON: Thank you. Okay. So now we have the issues clearly delineated. Let me go back to you, Dr. Epstein. And I'm going to have two quick follow-on questions because I'm going to leave time for the audience.

Has Congress in a way boxed itself in? You know, we have PECO . But then there are things that are left outside of PECO, like things having to do with oil -- things like oil depletion allowances. And then there's been kind of an extension of what that means into things that relate more to manufacturing, but yet it gets left outside of the envelope of things that one can consider. We have allowances that are made in order to, of course, garner political support. And then because we have PECO, because there are certain things that are sacrosanct, we end up using revenues that potentially might be generated by whatever the scheme is that ultimately gets enacted, assuming it does, largely being used to plug other holes. And therefore, we don't have the actual revenue base to do what we think. And perhaps that can cause cynicism on the part of the larger public in terms of what benefit this really becomes to that. Can you speak a little to that?

DR. EPSTEIN: Sure. PECO is an interesting topic, I mean, for those inside the Beltway. Usually around February of every year we

have this thing called the budget resolution and PECO, and imminently gets wrapped up in that. But I think in terms of energy and incentives for energy R&D, Senator Bingaman actually gave a nice talk to the President's Council on Science and Technology.

SPEAKER: I know. I just saw it.

DR. EPSTEIN: Yeah. And I actually helped write that speech. But, you know, part of that -- that speech, interestingly enough, you know, usually when you're a speech writer you come up with your own ideas and you shove it under the door and then you go away. On this one he did to PCAST, he actually pulled me back in on the Friday before at about 3 p.m., I think, and had his own outline, which is the most terrifying experience you could have when it's due Monday morning. (Laughter)

The outline was specifically for Senator Bingaman. He sits on the Energy Committee and the Finance Committee. And so it gives him a unique view of the incentives to promote energy as a whole. You know, the Energy Committee, by and large, uses year-to-year appropriations and authorizes them, but the Finance Committee deals in a world of PECO and tax incentives. And there's a -- I think the Environmental Law Institute -- there's a very interesting chart that I would recommend everyone looking at. If you look at the world of total incentives that we as a Congress allocate towards promoting energy -- renewable, nuclear, fossil -- you'll see huge

disparities because the fossil energy incentives were enacted before PECO. PECO was due to the Budget Act of 1974, which is a very rational, easy to explain thing to the taxpayer that if you're going to allocate for it you've got to pay for it from another revenue stream. And that was enacted in '74. Most of the fossil energy tax incentives, as I understand it -- and I'm not the tax person, although I quickly learned about it over tortured phone calls Friday afternoon -- were done before 1974. They're embedded in the law. They just -- they were done before PECO.

If you look at renewables or even some of the nuclear incentives we put in the 2005 Act or maybe some of the transmission incentives, I'm not quite sure, they were done in a world of PECO. And as a result, our window is about 10 years. And even worse, if you look at some of the investment tax credits for wind and things like that, they expire sometimes in two to three year windows. And you can actually look in the renewable world for the wind energy generation. There's a very famous chart. I think AWEA we called them. The Wind Energy Trade Association shows that as the ITC expires you'll see build-up and decrease, build-up and decrease. And that's because of PECO.

So there's an argument I think we need to look at holistically, and Senator Bingaman was the one that came up with that I would say but I think many inside the Congress worry about it, is how do you -- how do you

promote a coherent, long-term energy policy when it has to be paid for? And if you look at the tax incentives, in many ways they are many times more than the annual appropriations we do to incentivize.

In the climate world that's equally true. You know, if you look at the two percent for R&D that comes from auction certificates. It's a PECO rule. In other words, if you want to get up to 15- to $25 billion, you're talking numbers in auction certificates well above 10 percent I think. And then that catches people's attention. So intimately tied up in the policy debate is the PECO argument. It's a sound argument we use but you need to consider it now as you move forward.

DR. JACKSON: Right. And you have to consider what's in and what's out. You know, what's been grandfathered. But given those kinds of constraints, Mr. Muro, let me ask you this question and then I'll come back to you, Dr. Epstein.

You talked about market failures that would suggest the need for federal government intervention. But I know you're involved with the Metropolitan Studies Program, obviously. And what I don't hear a lot about is, are there, in fact, other impact mechanisms that can provide more linkage from the federal to the state level that also involves public-private partnerships. And so while there may be market failures, are there ways to incent or bring together parts of the private sector to make and join in these

sorts of investments as well? Do you have some thoughts about that?

MR. MURO: Absolutely.

DR. JACKSON: Please be succinct.

MR. MURO: And partnerships are actually beneficial even as forms of research activity, too. So we should be seeking --

DR. JACKSON: Right. Absolutely.

MR. MUNRO: -- multi --

DR. JACKSON: I haven't, you know, limited what those things --

MR. MUNRO: Right.

DR. JACKSON: -- could be structured to support. But I'm just asking you your perspective about, one, is this one part of a picture; and two, you know, how can they be structured?

MR. MUNRO: I think that's -- it's a critical way to enlarging the investment here and should be thought about even -- we should have, you know, partnership be rewarded in R&D. You know, we're thinking about those sort of -- structuring all of these kinds of linkages. And it's a critical thing, though we still will need -- there is though a strong federal responsibility.

DR. JACKSON: Absolutely. We're not -- that's a given. You know, I'm on your side on that.

MR. MUNRO: Yeah. So, no, absolutely. And we need research combinations between states where -- though they are vulnerable as we've seen with the state local fiscal crisis and, you know, we have promoted the notion of energy discovery innovation research centers or the hub idea, which is, you know, not only to reward and accelerate collaborative research but to get, you know, large companies' dollars at the table. Same with universities. So we need to be thinking institutionally constantly about creating multidisciplinary partnerships, financial and other.

DR. JACKSON: This is kind of a joint question for Drs. Ebinger and Rabe. You know, as you look at this kind of jumble of layering and who has what jurisdiction and who doesn't, you have -- I'm well familiar with the fact that Texas is its own country as far as the grid is concerned because as chairman of the NRC, the Nuclear Regulatory Commission, it turns out that the stability of the grid is important both for nuclear power plants, and nuclear power plants play a key role in stabilizing the great big base load plants, too. But the interoperability of the grid becomes important if there is a breakdown.

So is federal preemption the strategy here? Or will that only exacerbate innovation that is occurring at state levels, although there are some experiments that seem to be working in states and some not. So, I'd like to hear from both of you in that regard.

DR. RABE: Clearly the -- one of the unexpected developments of the last decade or so is that a policy arena that's been talked about as global warming and global climate change has had so much policy content below the national level, certainly local. But in American parlance at the state and regional level.

And so, you know, as we gather today there are 29 states that have global portfolio standards, 22 or 23 that have made some degree of commitment to carbon cap and trade. And so when you ask the issue of preemption, that's an inevitable question of federal system. And it's an issue that's emerging in Australia, in Canada, in India, where there is some shared governance concerns. It even emerges in some cases in China, which we tend not to think of as a federated republic by any stretch of the imagination.

Within that there are always opportunities for learning best lessons, best practices, distilling from real world experience what may or may not work. I'm not convinced we are on the verge of that. I think preemption has many merits but can often be a blunt instrument. And frankly, opens up the possibility of an incredibly complex set of negotiations. You know, suspend imagination and say that the Senate of the United States has an epiphany tomorrow and passes Carrie Lieberman as written, and the President signs it into law by weekend. There are provisions there that talk about preemption and compensation to states. Every state has a

different understanding of what compensation should mean.

DR. JACKSON: Of course.

MR. RABE: And within that you get into some very complex bargaining kinds of issues, especially after a 10-year process where states have dominated the playing field.

DR. JACKSON: Absolutely. Charlie?

DR. EBINGER: That's a tough one. Because I'm not sure the courts wouldn't get -- ultimately get challenges with federal preemption. But I think on balance that the situation has, both for natural gas pipelines and power lines, that the situation has gotten to the point where we need federal preemption.

DR. JACKSON: That's interesting. There is a kind of preemption that exists in the nuclear arena but you can ask me after the fact.

Let me go back on this question of the commission that's being created, the presidential commission that relates to the incident in the Gulf of Mexico. And you said that terms like comparing it to the Three Mile Island Commission, which had a big effect on my career --

SPEAKER: Oh, yeah.

DR. JACKSON: -- the way we structured the NRC. It raises the question of how well prepared is the government and the Congress to really understand the risk, and, therefore, how it should fold into or not public

policy development, especially as it plays out in legislation and in other arenas.

SPEAKER: Well, I'll take a stab very quickly. You know, and again, I have to caveat myself because there are many hearings underway right now and there's only so much information members of Congress can absorb in the area of risk. But informed risk assessment versus the need, there's a balancing act. We need nuclear power but we accept a certain amount of risk. And we promote our regulations accordingly from the NRC in that balance. And I think in many ways people are asking in this latest incident has that risk balance been properly adjusted. And I think there will be many more hearings to uncover that.

But there are some people at the national laboratories saying, look, these are big Department of Energy facilities that deal with nuclear power and in some ways our nuclear surety of the weapons themselves, to apply many of these tools that they've used in some of the latest incident –- the latest incident that's happened from a scientific point of view. So I think that's an ongoing discussion but some people are asking that question in that context.

DR. JACKSON: We only have about five more minutes. Let me take one or two questions from the audience. This gentleman here, and this gentleman here. Please.

MR. WEISS: Yes. Marc Weiss, Global Urban Development. This question is for Jonathan Epstein.

I'm just wondering on the theory that half a loaf is way better than none at all, is it possible that if this year Carrie Lieberman doesn't do too well that the Senate will pass the Energy Bill that you describe, the House will pass that bill, and the President will sign? Is that something that could happen this year?

DR. EPSTEIN: Oh, I think it's way above my pay grade. I think Senator Bingaman has advocated bringing the narrower bill to the floor and in the nature of the Senate offering up amendments. But I think that has to be all resolved at a leadership level with Senator Reid and the chairman of the committee. But I think, you know, I think that's just something that the members have to figure out and respond accordingly. And I understand that they're looking at -- they're supposed to be looking at that after Memorial recess.

DR. JACKSON: Right. Please. This gentleman here.

MR. ALTMAN: Hi, I'm Fred Altman. And my question is for Dr. Rabe.

Is there anything in the survey data that would suggest how we can make our scientific knowledge more acceptable? If we can't sell what is the best information we have, there's nothing else that's going to

happen either, I'm afraid.

MR. RABE: It's a fair question. I think there are several issues. One, I have been intrigued again with the state experience by how in a lot of jurisdictions the ability to understand changes in climate really becomes significant and real in the lives of people because you're talking about more localized impacts as opposed to debating a temperature degree up or down.

An example. The only jurisdiction in North America that has an aggressive program to impose a carbon tax is British Columbia. I don't think that would have happened if there hadn't been something called the mountain pine beetle that because of changes in winter temperatures proliferated -- you can gather the rest of the story. And in each part of North America there is a different climate story and issue under play. I'm not saying you salami slice into each unit but that clearly becomes part of the issue and part of the package. I also think there are huge reorganizational issues, and now as we're looking at the possible reorganization in the Department of Commerce to create a climate service or a National Climate Service, it's a very interesting moment to think about the confluence of disciplines that need to be at this for the long haul.

DR. JACKSON: Before we thank the panel -- and we should because it's a very distinguished group and I would encourage you to grab

one of these folks if they can stay for lunch -- I think a question -- I raised the question about Congress and risk assessment. But to what extent should the oil and gas industry itself, as a matter of regulatory oversight, legislation, whatever, be required to do more robust disaster scenario planning and risk assessment and then to develop industry comprehensive and transparent disaster mitigation plans coming out of that?

Should that occur, Dr. Epstein?

DR. EPSTEIN: Well, I think people, again, that's for the elected officials to decide, but I think for those of us that have worked in the nuclear industry, such as yourself and even myself, there is a scheme in place to do that. It's well tested. It's been robust. And the issue --

DR. JACKSON: There are lessons we can take from that.

DR. EPSTEIN: Yeah. And the issue for the elected officials is should that be applied to what has happened there?

DR. JACKSON: Dr. Muro, your thoughts about that? Yes? No?

MR. MURO: Because there is a similar industry precedent, I think it seems to make sense.

DR. JACKSON: Dr. Ebinger?

DR. EBINGER: I would just add I think the Department of the Interior has been asleep at the switch, particularly during President Bush's

years, and we're seeing that come home to roost.

DR. JACKSON: Dr. Rabe?

MR. RABE: This is a triggering moment. We know environmental policy is usually made after triggers. Sometimes it's good policy, sometimes not so good.

DR. JACKSON: Congress and the staff has to cover a million things. These things affect metropolitan areas and places where people live. We need to understand the global context, and we have to ask people the right question because may be we don't ask them are they willing to pay $15 a month for climate change mitigation, but $15 to transform our energy industry through innovation into a globally competitive framework because the rest of the world, with or without Copenhagen, is moving there anyway.

Thank you very much. (Applause)

(Pause)

MR. GAYER: -- about seven years ago. At the time I was working at the Council of Economic Advisors and it was a very productive day for me when my boss, Greg Mankiw was described in the New Republic as "a nerd." In fact, it was the lead line of the article. It said, "Greg Mankiw is a nerd."

Greg, being very gracious, would share the glory, frequently telling reporters that all the economists at CEA were also nerds. Believe it or

not, probably not, the small community of D.C. economists has a unique and unspoken competition of who can be considered the nerdiest of all. It is with great affection and with great admiration that I crown Doug the winner. (Laughter)

This past year, Doug was described by the Huffington Post as not just a nerd, but an uber-nerd. And he was described by the Washington Examiner -- this one is my favorite -- "a geek with guts." I think that was the title of the article.

So why do I view the nerd crown with such admiration? To me it highlights Doug's intellectual curiosity on a wide range of economic issues, including budget policies, social security, Medicare, financial markets, and macro economics. It also highlights his intellectual honesty and his dedication to the use of unbiased analysis to assess policy issues. These skills make Doug an ideal CBO director where the key job is to report analyses as clearly as possible without regard to political consequences, a job Doug does exceptionally well.

Doug might also know that in my house he carries another title. Months ago, in a futile attempt to impress my three-year-old, which is always trouble, I showed him a picture of Doug in the newspaper. I was excited seeing somebody I know in the newspaper. I said, "Do you remember meeting this guy?" And he quickly turned around and said, "Of

course, he's our rabbi." (Laughter)

Now, it could be that my son thinks all men with beards are rabbis. Maybe. But I'd rather give him more credit and believe that my boy has a good eye for wise and patient people, two qualities required of both rabbis and of CBO directors. So please join me in welcoming not quite the family rabbi, but, in fact, CBO director, Doug Elmendorf. (Applause)

MR. ELMENDORF: Thank you, Ted, for that very gracious and interesting introduction. (Laughter)

As Ted mentioned, I spent a couple of years at Brookings before becoming CBO director. Those were absolutely crucial years in my life. If I had not had that opportunity, I don't think I would be CBO director today, and I know I would not be as effective at being CBO director as I hope I am. So I'm very grateful to Brookings, not particularly to the current leadership of the Economic Studies Program, although I am very fond of that leadership, but to the predecessors of the current leadership who brought me into Brookings: Belle Sawhill and Bill Gale. And also I'm grateful, of course, to Bill Antholis and Strobe Talbott for helping to support me during my time at Brookings.

I'm honored to be here with all of you today. The Congressional Budget Office has done a great deal of work over the past decade on climate and energy policy. And I hope to distill a little of that work

for you today. As you know, human activities around the world are producing increasing concentrations of greenhouse gases, particularly carbon dioxide resulting from the consumption of fossil fuels and deforestation. Researchers generally conclude that a continued increase in atmospheric concentrations of greenhouse gases would have serious and costly effects.

Now, as you know and have talked about I'm sure, a comprehensive response to that challenge would include a collection of strategies, research to better understand the scientific processes at work, and to develop technologies to address them, measures to help the economy and society adapt to the projected warming and other expected changes, and efforts to reduce emissions, averting at least some of the potential damage to the environment and the attending economic costs.

Today I'm going to focus just on a third of those strategies: efforts to reduce emissions. As you may know or should know, the Congressional Budget Office does not make policy recommendations. We are not for or against any particular climate or energy policy. We are not for or against any particular approach to reducing greenhouse gas emissions. But we have tried in the work that we've done to distill the lessons of research done by people at think tanks and universities and in the private sector and elsewhere in the government, to do our own analysis and

modeling, and to pull that together in a way that can help members of Congress understand the economic and other consequences of policies they are considering. And as we have done that regarding policies to reduce greenhouse gas emissions, we have come across, we think, at least five key lessons of economic analysis. Let me try to summarize those for you today.

The first lesson is that to reduce greenhouse gas emissions at the lowest social cost, the government should put a price on emissions. The amount of greenhouse gas emissions depend on numerous decisions made by millions of firms and households throughout the economy. Decisions including what technologies to produce goods and services, how much people drive, where they live, and on and on. Just as central planning is not an effective way to organize the decisions about the production and consumption of all of these goods, neither is central planning an effective way to organize the reduction of greenhouse gas emissions. Market-based approaches that create financial incentives for firms and households to reduce emission give all of the independent actors the latitude to decide what is the least costly way to reduce emissions.

Now, price can be established in a variety of ways through tax on carbon, through cap and trade systems, through various alternatives to cap and trade that are being discussed today. I won't go into those

specifics. The crucial point is that putting a price on emissions creates incentives for conservation, for substitution and production, and for technological innovation, exactly the changes that are needed to reduce emissions over time. Either a tax or a cap and trade program would cause the prices of goods and services to reflect -- to rise in order to reflect the amount of emissions. Those higher prices will provide incentives for firms and households to conserve energy, to produce goods in a manner that lowers emissions, and to replace the existing capital stock with capital that results in fewer emissions.

However, as important as it is to establish a price, establishing a price is probably not sufficient. It is a part -- an essential part of an overall strategy to reduce emissions but it is not the only essential part. There are some complimentary parts that economic analysis points to. One reason that a price signal is probably not sufficient is that price signals don't always work in the real world the way they do in economic models. People don't have perfect information, they aren't fully rational, and contracts don't always reflect costs correctly.

For example, consider rental housing. Apartment owners may lack appropriate incentives to undertake efficiency improvements if renters are responsible for heating and cooling bills and if apartment rents don't accurately reflect the energy efficiency, and thus the energy costs of

appliances in the apartment. So in addition to establishing a price to raising the cost of energy, efficiency standards or the dissemination of additional information about energy efficiency would be two complimentary ways to address the social problem.

Another reason that reducing emissions efficiently requires more than just a price signal is that government has a key role to play in funding basic research and probably in support for adaptation and for changes in other policies related to energy. For example, nuclear power regulation.

In general, markets underinvest in research and development because the benefits of those activities are not captured entirely by the organization doing the research and development but spill over to others in the economy. With that in mind, federal funding could be provided for R&D of technologies to lower emissions, such as improvements in energy efficiency, advances in low or zero emission technologies, and development of sequestration technologies which capture and store carbon for long periods.

Federal support would probably be most cost-effective if it went towards basic research on technologies that are in the early stages of development. And such research is more likely to be underfunded in the absence of government support than is research closer to the production

process because that basic research is more likely to create knowledge that is beneficial to other firms but does not generate profits for the firm conducting the research. So the first lesson, as I said, is that to reduce greenhouse gas emissions at the lowest social cost the government should put a price on emissions. But that price is not sufficient.

Now, lesson two moves on and says to reduce greenhouse gas emissions at the lowest social cost, the price should rise gradually over time and should avoid unnecessary volatility. A gradual increase in price would lead to gradual reductions in greenhouse gas emissions relative to what would occur in the absence of the policy. Gradual reductions are important because the economy is a large ship that takes time to turn. It takes time for research to be conducted and technology to be designed, tested, refined, and disseminated widely. It takes time for patterns or production and consumption to change. And it takes time for business and household capital to wear out and be replaced with different sorts of capital.

For example, replacing gas guzzling cars with more efficient ones or coal fire generating facilities with facilities that rely on renewable energy sources is much cheaper and more efficient if we can wait for the normal replacement cycle, rather than having to scrap existing capital quickly. If one forces those processes to occur too rapidly, that could raise the cost of achieving the desired cap on cumulative emissions without

yielding proportionately greater benefits because climate change really depends on the accumulation of emissions over multiple decades rather than the flow of new emissions in any given year.

By that same logic, if one intends to reduce greenhouse gas emissions over time, it is important to get started on the process now so that the adjustment process can be more gradual. To have a price rise over time one needs naturally a tax that increases the magnitude or caps on emissions that narrow -- that tighten progressively over time.

Now, in addition to wanting the price to rise slowly to achieve reduction to the lowest social cost, one would like the price of emissions to not be more volatile than is necessary. And the reasoning here is the same as the one I just gave really which is that gradual adjustment is least costly. If the price of emissions jumps up and jumps down, then that would progressively force more reductions in emissions when it is costly to do so, and then allow for smaller reductions when it is less costly to do so. And that raises the overall cost.

The point here is the demand for emissions-producing activities can shift significantly over short periods of time in response, for example, to the weather and the consequent demand for energy. In contrast, the value of reducing emissions is nearly constant over time because the ultimate costs of climate change arise from the total stock of

emissions in the atmosphere, a stock that dwarfs the annual flow of new emissions. As a consequence, if you force a fixed time path of the quantity of emission reductions, then one is creating a volatile price and varying pressure for reductions that makes the process less efficient.

In contrast, the tax that keeps the price relatively smooth or banking and borrowing provisions in a cap and trade system that help to dam excess volatility in the price can lower the cost of emissions reductions because firms would undertake more reductions at times when it is less costly to do so and less reductions at times when it is more costly to do so. So the second lesson of economic analysis for reducing greenhouse gas emissions in an efficient way is to have the price rise gradually over time and avoid unnecessary volatility.

The third lesson of economic analysis for reducing greenhouse gas emissions efficiently is that the scope of emissions that are priced should be as broad as possible. Remember, the pricing emission makes emissions reductions efficient because it lets producers and consumers decide on the cheapest way to achieve a certain amount of reductions. And that process is most effective if the largest number of producers and consumers are involved.

That does not mean that everyone needs to face exactly the same price or be under exactly the same system. As long as the prices

faced by different producers and consumers are similar, then the outcome will be fairly efficient. But if the prices are widely in variance with each other then certain aspects -- certain sectors of the economy will be forced to make emissions reductions at lower costs -- at higher costs, rather, than other sectors of the economy that are making only lower cost emissions reductions.

The issue about the scope of the emissions reductions that are captured by whatever system one might establish arises in a number of different contexts in climate policy. One of them is in a cap and trade or similar system and thinking about whether there should be a single system that covers the entire economy or different systems established for different parts of the economy. Having everyone in the same system would be most efficient, but carving up different emissions sources into different systems can be nearly as efficient if the prices end up being nearly the same across the different pieces of the economy.

The second context in which this issue arises in climate policy is considering international coordination. Because a ton of greenhouse gas emissions from any point on the globe at a given time would have essentially the same effect on climate change, the most cost-effective global way to limit the damage from climate change is to reduce emissions wherever on the planet is cheapest. Achieving that goal perfectly would require a uniform

incentive to reduce emissions in every corner of every country. But this, as in many other areas of economic policy, one should probably not let the perfect be the enemy of the good. Achieving efficient emissions across the globe approximately would just require similar incentives in every country, or at least in every country with significant opportunities to reduce emissions.

And because U.S. emissions of carbon dioxide from fossil fuels are only about 20 percent of global emissions of that sort and net greenhouse gas emissions from the U.S. are an even smaller share of net global emissions, it is clearly necessary to include at least a significant subset of other emitting countries if we are to achieve global reductions in emissions at a low social cost.

The third context in which the question of the scope of emissions' reductions arises is in considering offsets, that is reductions in greenhouse gases from activities not subject to basic limits on emissions. And such reductions can arise from disposing of waste in different ways, from changing methods of farming, and from lessening deforestation. Broadening the scope of greenhouse gas pricing through the use of offsets allows less expensive reductions from activities not subject to emission limits to substitute for more expensive reductions from activities that are subject to the limits. However, it is challenging to verify that offsets represent real emissions reductions. In particular, that they are incremental reductions that

would otherwise not have occurred; that they are permanent, not merely delaying the release of greenhouse gases; and they are correctly measured so the effect on greenhouse gas emissions that we think we are getting is what is actually happening. Not just in that sector, but in keeping -- taking account of offsetting changes elsewhere in the economy.

Therefore, full inclusion of offsets in an emission reduction system risks not achieving the ultimate goal of a certain amount of emissions reductions. As a result, there is a strong economic logic to include offsets that are fairly straightforward to verify. For example, the capture of methane from animal waste. And to proceed more slowly on offsets that are very challenging to identify and to quality, such as reduced deforestation in developing countries.

The fourth lesson of economic analysis for this topic is that an efficient system for reducing greenhouse gas emissions would probably lower overall GDP, employment, and household purchasing power by a modest amount relative to what would occur otherwise. And I should say leaving aside the economic effects of slowing climate change itself. The reduction in GDP would occur because resources would be devoted to achieving something that is not included in measured GDP. For example, think about resources that could be used to improve fuel efficiency in cars or to create fancier upholstery. We count fancier upholstery in measuring the

output of economy. We don't count effects on the content of the atmosphere. That is not to say that we shouldn't count them in a broader social sense but that one should not be surprised if a thing that one does measure a certain way but doesn't include certain benefits then ends up showing costs.

Now, the amount of loss in GDP is very uncertain because it depends on things the analysts don't know much about. Essentially, technological progress over very long time periods in areas we have not really explored and our behavioral responses to changes in prices beyond what we have seen historically. However, most experts project that the long-term loss from a policy like the American Clean Energy and Security Act of 2009 would be a few percent of GDP, roughly equal to normal growth in GDP over just a few years.

The reduction in employment would occur because shifts in product demand across industries would generate shifts in the demand for workers. And the supply of workers would not adjust immediately or costlessly. Specifically, production in employment would shift away from industries related to the production of carbon-based energy and energy intensive goods and services, and toward the production of alternative and lower emission energy sources, toward goods that use energy more efficiently, and toward non-energy intensive goods and services.

Those shifts in employment would occur gradually over a long period, as long as the cap on emissions or the carbon tax -- whatever was establishing the price -- was rising gradually so the incentives and the constraints became progressively tighter. Workers would follow the shifts in demand but they wouldn't follow right away and they wouldn't follow without cost.

I think the key point here is that analysts who focus only on the green jobs created by a policy to reduce emissions or only on the old jobs lost because of a policy to reduce emissions, are each missing a very large part of the story. Both effects would be at work. And both the modeling that's been done and the history of the United States' experience suggest that the overall effect would be a small decline in employment. For example, during the past half-century the U.S. economy has adjusted to a sustained decline in demand for manufacturing workers, while maintaining an overall level of high employment apart from recessions.

The reduction in households' purchasing power that would occur would occur again because resources would be devoted to achieving a goal not measured in our traditional measures of income. The loss of purchasing power begins with the gross costs of complying with a policy. Firms would need to pay taxes or buy allowances, make changes in their production processes or buy offsets. And they're going to tend to pass

those costs along to consumers in the form of higher prices for goods and services. Those price increases are essential to the success of the policy because they're the most important mechanism through which businesses and households would be encouraged to make investments and make behavioral changes that reduce emissions. But those price changes would also reduce purchasing power.

The other side of this is that households could also, depending on the policy, receive compensation. And the compensation can be derived from the revenue received by the government in the course of having a carbon tax or selling allowances under a cap and trade system. So the net loss and purchasing power to households depends on the gross costs of complying with a program minus the compensation they receive.

Keeping track of all that is very complicated because households would bear costs and receive compensation in their roles as consumers, as workers, as business owners, as shareholders, as taxpayers, and so on. And the Congressional Budget Office has tried to keep track of those pieces in some work that we've done. We've estimated that the net loss in purchasing power from the primary cap and trade system in the American Clean Energy Act of last year would be a loss of a tenth of a percent of GDP in 2015, rising by 2050 to about eight-tenths of a percent of GDP. So a little under -- starting from next to nothing and rising to a little

under one percent of GDP. Measured in terms of the 2010 economy, the average loss per household would be $90 in 2012, we estimate; about $900 in 2050.

The fifth lesson of economic analysis for reducing emissions of greenhouse gases is that the details of the policies used have significant effects on how workers in different industries and how households at different income levels or otherwise different circumstances would be affected by the policies. As I noted a minute ago, a policy that reduces greenhouse gas emissions would naturally tend to help some industries and hurt others. Coal mining would probably see the largest percentage decline in employment because when it is burned, coal produces more greenhouse gases per unit of energy than do other fossil fuels.

A mitigating factor can be the development of technologies to capture and store emissions of coal fire powered plants, allowing them to continue in operation and thus continue to purchase coal. Employment would also decline in oil and gas extraction, refining, mining, construction, chemicals productions, transportation services, and other industries. However, employment would increase in the very large services sector and the industries that manufacture equipment for the production of energy using low cost technologies. It's just the point I made a moment ago about the shift in the demand for work. Those shifts have costs for workers, and

policies can be designed to cushion those effects. For example, the government could allocate a portion of emission allowances in a cap and trade system free-of-charge to firms in particular industries, such as those likely to face a high level of international competition.

The government could also use a portion of the revenue from auction of the allowances to fund benefits for workers who lose their jobs because of legislation. Of course, that protection has costs because those resources cannot then be used to help other firms in other industries or other households. But that is a choice, and the choices that policymakers make are absolutely crucial to the distribution of the benefits and costs.

Another version of that same point is that policies that reduce emissions could affect households at different income levels differently depending on how the revenues collected under the policy are distributed to households. The amount of revenue involved is quite large. CBO estimated that the value of allowances in the cap and trade system under the legislation passed by the House last year would total nearly $900 billion during the next decade. So where that $900 billion goes, not surprisingly, matters tremendously for the benefits and costs in the short run of that kind of policy, leaving aside the longer term issues about the transformation of the economy. It's a lot of money being moved around.

Now, the increases in prices that I've discussed would have

the largest direct effect -- the largest -- impose the largest directed burden on low income households because they spend a larger share of their income. But there are ways of distributing the value of the allowances if policymakers chose to that could offset or more than offset the effects of the price changes. If all of the allowances were sold, for example, and the proceeds used to pay lump sum rebates -- equal lump sum rebates to every household in the United States -- lower income households would benefit from the policy overall because the rebate would exceed no loss in purchasing power from higher prices. Higher income households would lose from that policy because the lump sum rebate would be less than the loss of their purchasing power.

The other ways of distributing the allowance value would have very different effects. If all the allowances were given away, for example, to producers with no conditions attached, then the benefits of those allowances would accrue primarily to shareholders who are disproportionately very high income people. So the distributional benefits would be completely different, again, depending on what's done with the value of the allowances, even for the same underlying policy in reducing carbon emissions. And recent climate bills have tackled this issue in a variety of ways and have come to a variety of different approaches at the end.

So to conclude, in the work that we've done at CBO over a

period of many years, we think there are a number -- for all of the uncertainties -- and there are tremendous uncertainties on this issue -- we think there are some pretty clear points that have emerged from the economic research and analysis that we and others have done. If one chooses -- and again, it's not a recommendation from CBO, but if one chooses to reduce greenhouse gas emissions, then -- and one wants to do that at the lowest social cost, economic analysis points very clearly to establishing a price on emissions, to doing complimentary policies to establishing that price, to having that price rise gradually and to not be unnecessarily volatile over time.

Even still, reducing greenhouse gas emissions would probably lower overall GDP, employment, and households' purchasing power by a modest amount relative to what would occur otherwise, and leaving aside, again, the benefits of the climate change itself. But policy design would have a very significant effect on the distribution of those costs.

Thank you very much. (Applause)

MR. GAYER: Great. Thank you again, Doug. So, as moderator I was going to pitch a few questions and then open it up to the crowd.

MR. ELMENDORF: Okay.

MR. GAYER: So first, in some -- you know, your first point on

the importance of prices, I think as often happens among economists -- economist preferences sometimes are inversed to political will. So if you took a poll, I think, of economists, you would find the preference -- for much the reason you said -- would be on how to reduce carbon emissions. Let's start with a carbon tax, maybe a close second, cap and trade. And a third would be efficiency measures and command and control regulations would fall after that.

However, it seems that if you hear all the kind of political heat -- for lack of a better phrase -- and on the bills, there seems to be this focus that taxes are off limits because they're politically unpopular, cap and trade, lo and behold, is pitched as bad because it's a tax. And so therefore is facing, at least to say it mildly, political opposition. My question is -- my premise is the reason why we find this is because taxes are in economic (inaudible) what we call salient. They're easy to score. They're easy to see. Cap and trade maybe a little less salient but yet still fairly easy. And my concern is we lead to a political outcome where the thing -- the costs that are hidden, which most economists would say are higher, are the costs -- are the measures that we use.

So I would ask, one, if -- to reflect on that. And two, since CBO is out to measure what is measurable in some sense, and you talk a lot about cap and trade and the costs of cap and trade, is there a role for CBO

to -- and I don't know if it's possible to put greater salience on the regulative cost savings of one approach to the other even if it -- and I don't know how you put hard numbers on command and control and EPA regulations or whatnot. But how to in some sense adjust for this maybe innate bias I would say. It's a long question but let's see what you got.

MR. ELMENDORF: I guess a few thoughts. One is that I think it's very important for people to understand that command and control regulation would raise the prices. If it is effective regulation in terms of reducing greenhouse gas emissions, it would raise the price of goods and services that involve a lot of greenhouse gas emissions and their production. And I agree that effect is not quite as salient but it is there and it is larger than the effect of using a price mechanism. That's the result from economic analysis. And so I think it's crucial in a lot of economic policy and a lot of economics in general. What is most salient, what appears most obvious, is not the full story. This is a very important illustration of that I think.

I think the second point to emphasize is that taxes have both incentive effects, raising the relative -- or cap and trade system. Any way in which we establish a price on carbon emissions. There are incentive effects in raising the price of some goods and services or some activities relative to others. There's a slightly separate question which is the burden. The crucial part of the price mechanism in reducing emissions in a cost-efficient way is

the relative price. It's changing the choices that firms and households made. It is not particularly imposing a burden. The money that's collected from a tax for a cap and trade system can be given back to households. And if it is given back to households, then that offsets nearly all of the burden while preserving the change in relative prices necessary to motivate changes in behavior.

I don't think it offsets literally all of the burden because as I said, if you're using resources to accomplish goals that are not measured in GDP or measured in income, there will be some net loss. But a very large fraction of the gross costs, the direct costs, can go back to households. They do go back to households. It's a question of how they go back to households really. They can go back directly. They can go back in various indirect ways. So I think partly what people need to do, and CBO has written how to this effect, is to distinguish between the need for changes in relative prices to create incentives and the question of the burden.

Now, what CBO can do more generally to make these issues more salient, I don't really know. I mean, we -- I came here. (Laughter) We write things. We try to, you know, we try to make our views clear. And I think because people understand we're not advocates for particular policies, we have no ax to grind ourselves, they understand that our views are reflecting the consensus of expert analysis in the area. I think that gives us

some credibility but these effects are subtle and hidden and difficult to explain. And I don't have a magic solution to those problems.

MR. GAYER: Well, maybe as a follow-up -- I should know this better than I do -- maybe you can explain a little bit of the CBO process. And by that I mean, you know, how much discretion do you have to issue reports on whatever issue you want versus -- or in particular legislation? And which components of the legislation? In particular, this is a great example of climate, which you had mentioned a few times leaving aside benefits. So benefits are really hard to quantify in a climate bill but any policy ignoring the benefits is a bad policy if the benefits are zero. So it's obviously half the equation if not more. So how kind of -- how much discretion and empowerment do you have to kind of look broadly at these issues or to issue reports or whatnot on some of these, as I called it, insalient aspects or hidden costs?

MR. ELMENDORF: So the way CBO works is that we respond to requests from Congress. Our job is to do analysis that members of Congress and their staffs find useful in making policy decisions. Much of our written work, we do cost estimates of legislation. And it is written into law that CBO will provide or will do its best to provide estimates of the budgetary effects of legislation that is voted out of committees. We provide hundreds of formal written estimates in a year and thousands of informal

estimates. That's a response to the legislative process at work.

Beyond that we write a lot of studies, issue briefs, letters. Almost all of that is in response to particular questions from particular members, although usually it develops over a course of time as we get questions from lots of sources. So on the distributional effects of climate policies being considered in Congress, we've had requests from lots of members of Congress on both sides of the aisle and both sides of the Hill. In the end, the letter or something is usually written "Dear Senator So-and-So" or "Dear Chairman So-and-So," but usually in response to a wide set of requests.

We get a lot more requests than we can respond to, both in volume, but also in scope. So there are issues that we don't have the analytic capacity to address that we're asked about and we have to say we're sorry. And sometimes that's because we don't have the right staff or enough staff ourselves. Sometimes it's because the research community on which we depend hasn't done that research. So, and the work that we just released a few weeks ago about the effects of climate policies on employment, we note that these are the effects of the increases in prices under a cap and trade system or under a carbon tax and how that plays to the economy. We do not capture the effects of any change in the pace of climate change on employment, and we say we don't capture that because

that is something that has been less well studied in the literature.

So, I think the place where we have great latitude -- complete latitude, essentially -- is in the answer we provide. So our answer is our best judgment based on the analytic work that's been done in the world to any given question. But the questions are really chosen by members of Congress, sometimes specifically for individual products but more often just in general in the course of a lot of interactions and testimonies and so on.

MR. GAYER: Let me ask one more question before I open it up. You mentioned your labor market study or the effect of employment on climate. And for you maybe this is a nerdy question but on the labor markets I read the study and it seems -- and you were right in qualifying everything by saying there's a high degree of uncertainty here. I'm trying to link it back. The key, I think -- one of the keys for the uncertainty is how quickly labor markets adjust. And this is kind of a lesson coming out of the last two years which I think every economist has to reevaluate their models and kind of have a big dose of humility on the tools of economics. And I'm wondering what are the lessons from the last two years or even the last two recessions I should say and the ability of labor markets to adjust to any sort of changes, whether or not they're shocks or price on carbon or anything like that? Is this something that effects the tools that CBO is using in their analysis of changes in the labor market or responses in the labor market?

MR. ELMENDORF: So I don't think our views about the evolution of labor markets over the long run have been affected very greatly by the experience of the past few years. We've been certainly reminder the past few years that in response to large sudden shocks, a tremendous amount of pain can occur in the labor market.

The climate policies that most people are talking about, however, involve often gradual changes in policy, essentially, and then gradual changes in economic activity. That's why a number of places, including what I said today, look more at the evidence on how the U.S. has responded to the decline in demand for manufacturing workers which has occurred over a long period of time.

I think one important issue that's somewhat unresolved in our minds about the affects of climate policy is how much foresight firms and workers will have. So, the policy might be phased in gradually, but at least in principle if a law like the one the House passed last year, if that bill became law, one could look ahead at many years and form some expectation of what would be happening to the price of carbon emissions and thus to other aspects of the economy. The more that firms and workers saw ahead to that and moved ahead of time, the more people who saw when they were young that while they could have a short career in some area, they would have a longer career somewhere else -- the more that

foresight occurs, the less costly the disruptions will be. On the other hand, even if a system were adopted that in principle would last forever, people I think would understand that Congress can re-legislate, the actual path of the price of carbon allowance -- you know, allowances to emit carbon would be very uncertain. People don't always have great foresight in those decisions.

So, it's not clear, but I think that's an important area of uncertainty in how costly this sort of transition would be, is the extent to which every year a sort of change comes as a new surprise, versus the extent which people can look out and see what's coming.

SPEAKER: I don't want to hog all the questions, so if it's okay --

MR. GAYER: Turn it over, and I think we have people with mikes, so, if you have a question, please wait for the mike and introduce yourself. The mike is coming.

MS. KENNY: Stephanie Kenny . You spoke to the point of burden but I didn't hear price elasticity and I wonder how you calculate that, how you account for that because the larger consumers/emitters are those who probably have the greatest elasticity in what they can and are willing to pay.

MR. ELMENDORF: So, we account for -- so, when we do analyze climate policies, we form an estimate of the -- what we think the --

and it's a cap and trade system -- what the allowance price will be over time, and then an estimate of the price of allowance is derived from estimates about the elasticities, about how responsive firms and households will be to changes in price because if ultimately there was a fixed quantity of allowances, and people are very responsive to small changes in price, then the price doesn't have to go up very much. If they're very unresponsive to changes in price, the price has to rise by a lot to get to the needed response.

So, the elasticities are absolutely crucial and I think very uncertain because as I mentioned we're looking at price changes outside of the range of our experience, and we're building in, essentially, technological responses that are not even gleams in scientists' eyes now. But we build on estimates of elasticities in the literature. We use, actually, a sort of composite elasticity based on things we have read. And if you want to read more about our model, we actually have a working paper that describes how we do this.

Whether it is true that larger emitters are more flexible or not, I think depends a lot on the nature of what they're doing. So, I think it's not so much a matter of size as what business you are in. Some things have closer substitutes than others, and some things will respond more than others, and that is, in fact, why establishing a price is a cost efficient way to reduce emissions because it naturally demands more response from the

places where it is easier. It doesn't rely on people like me figuring out which company and which activity has more opportunities to reduce emissions. It lets the companies figure it out themselves.

MR. WARA: Hi. I'm Mike Wara, Stanford Law School. My question is about how you think about uncertainty. You spoke, I thought, very honestly about the difficulties in estimating small differences between large numbers that are way out in the distant future. And I'm curious how you view your role in communicating uncertainty to policymakers, how that might impact, how you communicate results, just what your thinking is on that because I think it's very relevant in the climate change context in terms of our understanding of what will be in 2030 in the baseline case or the policy case.

MR. ELMENDORF: We wrestle with that question a lot, not only in climate policy. I think the most standard line I utter when I talk about any topic is the uncertainty which I think we are beset by at every turn, and we wrestle with ways to communicate the clearly. Partly we just say it, like I said it here. Sometimes we provide a range of estimates to reflect uncertainty. So, if you look at a study we released, an issue brief, last fall about the costs of policies to reduce greenhouse gas emissions, there was a picture of affects on GDP, and we have a -- we show ranges. So, that's a very visual, very salient way, I think, to show the uncertainty.

It has its risks though. We find when we provide ranges it's not uncommon for people to pick the end of the -- individual people to pick the end of the range they find most congenial to their way of thinking and to say things like CBO says the effect could be as large as, or it could be as small as, and that introduces a certain cacophony into the discourse in Congress and beyond, so we don't always do that and that's one of the reasons.

For budget estimates as well, there are budget processes that depend on numbers. There's a PAYGO law in Congress, there are PAYGO rules that the House and Senate each follow, that have to do with the cost of legislation and they're just written in a way that demands a point estimate, sometimes demands a point estimate down to the hundred millionths or millionths place, and I shrug, but that's the process.

So, in some cases we have to do point estimates, some cases we give ranges, but we do that in only cases we can and with some recognition of the risk of that sowing more confusion.

MR. GAYER: I would just reinforce the point. This was the first lesson, I think, when I went into the policy world at CEA and I was obviously at a much lower level than where Doug is right now, was somebody requests, what's the effect of X and Y, it's an almost unanswerable question even within precision, and then, okay, so how do

you do it? And you try and give wide bounds. And then they'll just pick the one in the middle and there's lots of discussions among economist types and whoever within -- is some number better -- I mean, you have to provide a number. But for us is some number better than no number? For the very reasons Doug said. It's a real challenge because the number is what's going to selectively be picked and carry the day.

Charlie?

DR. EBINGER: Charles Ebinger from Brookings. This may seem like a strange question, but do you ever, as we get anecdotal evidence about the damage that may be occurring from climate change like the pine beetles in the forest, do you ever get asked to make an assessment of what are the costs of not acting?

MR. ELMENDORF: We released a long study last summer, I think, about consequences of climate change and it was drawing -- we don't have natural scientists at CBO, we have economists, we have a doctor, but mostly economists and budget analysts, but we tried to again distill the lessons of a very large literature of the consequences of climate change, so it's a study of about ten pages with about ten pages of footnotes. And so that's -- so we are certainly trying to inform the Congress about both the consequences of policies they're considering and the consequences of no policy at all. And we look to update that work over time.

I think the fact that it's not readily quantified is a very big deal. Things that you can add and subtract, you know, to get some net number have a salience, have a power that the words often do not, but I don't know how to solve that problem. I mean, I think the -- as best I understand -- the state of the literature in this area, the economic consequences of climate change, the sort of thing that one might in principle add or subtract to the effects on household purchasing power, or so on, are not as well quantified and are believed to be further out in time in their largest effects. So, we have a situation here where the actions we're taking in the world today and tomorrow and the next day, have a very long tail of effects out 40 or 50 years and beyond, but the benefits come later than the cost in some direct way, and I think that -- and people often have a high discount rate in their thinking. So, I think the lack of quantification and the fact that even if it were quantified it would be -- I think much of the benefit would be not just beyond the next election cycle, but beyond the lives of many people who are making those decisions today, is a problem that we can't solve, but we are trying to illuminate both sides of the issues to the extent that we can.

SPEAKER: I have a question about your comment about how research funding should be allocated, and you mentioned basic research, and I've read a couple articles about the NIH's experience with turning basic research into prototype products and they find that what they term as a

valiant death basically between promising science and a promising prototype that then can be shown to, say, an MBA and convinced that this is something with profit potential.

So, I'm kind of curious about where you came up with that stand on how research money should be allocated.

MR. ELMENDORF: Yes, well, let me try to clarify that. I'm aware of that work. On a spectrum, from the most basic research to the development which is closest to being used tomorrow to make something, I think the economic analysis points pretty clearly toward the government's role being more important at the earlier part of that process, but I don't -- so I was trying to divide, in a sense, into early and late. If one thinks about early and the middle and late, or yet finer gradations, I was not trying to be specific about that. I think that is less clear, at what point the government should essentially hand the baton over to other researchers, and I think also there probably isn't a single, simple answer to that that applies in all cases either.

What we have done in the health area in particular over the last decade is to sharply increase the amount of government funding at some points along that process and I think it's very useful for people to be thinking hard about whether we've done that all at the right place, and maybe we haven't. And we've done some work at CBO on this issue in the

climate area also and other aspects of research and development.

So, I think your point's well taken. I was not trying to divide this up that precisely but just to emphasize, I think, the correct general point that when things are closer to being of direct practical relevance, that is often generally the point at which the originators of some work reap the largest share of the benefits and in the earlier stages where there is less of that. But whether the government has gotten that dialed just right at every point along that spectrum, I think, is an open question. I was not trying to speak to that.

MR. TALBOTT: Doug, among the admirable things you did was you very succinctly and sophisticatedly summarized the science at the very beginning, including the risk and the uncertainty. In your responsiveness to members of Congress, how often do you have to deal with skepticism about the scientific premise, which is to say skepticism about whether the risks are there? Does that impact on any way on the way you pose the questions to yourself and the way you answer them?

MR. ELMENDORF: Well, so, there are members of Congress who are skeptical of the science, skeptical of what is the mainstream of climate science. In the report that we wrote about the consequences of climate change, we tried to describe the mainstream of climate science and also to note that this was not a -- these views were not universally held, and

we tried in that report to note the things that were more widely -- the views that were more widely held than others.

So, we try to be straightforward about that. I think most members of Congress don't look to CBO as their source of scientific knowledge, they have other places to go for that and they should go there. As I said, this study was unusual for us. It seemed worth our doing for the reasons, I think, that were raised, which are that there are costs and benefits of changes and we felt the need to show both, and there were a lot of members of Congress who wanted us to say -- to try to distil the science in a way that would be understandable by, I think, other members, who were more skeptical.

How our report was read, I'm not really sure. I think that different members' views about the risks undoubtedly affects their decisions about what policies to support or not support. But I don't get very brought into that myself, and CBO doesn't get very brought into that. I think it was very important for us to respond to requests for this particular report, but it's not something that we bring a lot of expertise on as a general rule.

MR. GAYER: This will be the last question.

MS. JOHNSON: Hi. I'm Laura Johnson, Natural Resources Defense Council, and I have two comments that are thinly disguised as questions.

The first is, I'm not sure why -- I read your report, your employment report, and it was very thorough, but one thing that is true of all of these climate models that look at costs for consumers is that income is going up. So, when you report purchasing power going down, that's relative to a baseline. So, I'm just wondering why you're not more careful to day that, or at least the other studies, I think they come up with that.

The second thing is I like net numbers, too, even though what I just talked about was not a net number, but I looked at your numbers in your report, and I looked at you have a graph in the report that has basically bars of the number of jobs lost, and it's across three different studies. And so I basically looked at, you know, what are the average losses in each of the sectors that you looked at. And one of the sectors, the one which you mentioned, which is a service sector, which is expected to grow, if you take out the losses from the CRA study, which is the industry sponsored study, and you just take out those service sector jobs that are lost in that model, you end up with about 0 percent change in employment. And then you can sort of say, well, if you take out a few more of the other sectors, then maybe there's going to be growth in glass and steel because all of these things have to actually run the economy, right? So the new products are going to be made of all these things. Then it becomes slightly positive and that's pretty much the historical evidence. If you look at environmental regulation

in the past, it's basically zero, slightly positive, that's the consensus in the literature.

So, I'm not sure whether you could answer --

MR. ELMENDORF: So, on the first question, I tried -- we try at CBO to be clear about the baseline to which certain effects are being compared. I did say in my comments here, reduction in GDP relative to what would otherwise occur, and I put that in the context of worth a couple years of regular GDP growth. So, we try hard to do that. Certainly when we talk about the affects of the costs to households 40 years from now, we try to express that relative to the income they will have then, that's why the real dollar cost rises much more than the cost expressed as a share of GDP.

So, we probably don't do it in every sentence because it gets a little cumbersome to write and to read, but we try very hard to do that, so I completely agree about the importance of that.

On the second issue, we evaluated those three studies as best we could. We expressed a certain particular concern about one aspect of the CRA study, not related to its genesis, as you were commenting, but a particular aspect of the economic modeling that we said we were more skeptical of than the way that was handled in the other two studies. It had to do with basically the response -- the way in which labor markets respond. How readily they respond to shocks of this sort. But our reading of the

evidence and the logic of achieving a very profound shift in the nature of production, and thus the nature of demand for work in the economy, is that that will lead to dislocations, which is a nice way of saying there will be people who will be without jobs. And it just isn't the case that one can take a coal miner and have them turn up as a solar panel maker, instantly, and without cost.

So, I think we've been clear. And again, I think I was clear here, that the U.S. economy has shown remarkable flexibility over time and we expect that would continue, but that that doesn't mean that all this just happens overnight. And I think our summary of those studies and our -- the points as we made in past testimonies and reports, is quite consistent with research in this area.

MR. GAYER: Great. Before thanking Doug, I just want to remind everybody we are going to start at 2:45, a session over there, so get yourself some coffee, charge up, and we'll be continuing the discussion over there. But now let's thank Doug. Thank you so much. (Applause)

MR. ELMENDORF: Thank you very much.

(Whereupon, a luncheon recess was taken.)

A F T E R N O O N S E S S I O N

MR. GAYER: Welcome back, everybody. I hope you enjoyed that lunch with Doug Elmendorf, I know I did.

We are essentially going to expand on Doug's talk, I think, in this session. We've got three distinguished economists and a lawyer, I should say -- I shouldn't insult him by assuming he's an economist -- here to talk on many of the issues that Doug talked about a little bit more in depth. We're going to essentially expand on the economics of policy design with respect to climate. We're going to drill down a little bit on the issues of offsets. Doug talked on the cost savings and also the validity issues surrounding offsets. And we're also going to discuss the regulatory approach to addressing climate change, which Doug also alluded to, some of the pros and cons along those lines.

So, the format I propose is we're going to have each one of our panelists talk for about 10 to 12 minutes at the podium and then we will open it up for moderated Q&A. I'll ask some questions and then I'll welcome all the questions from everybody out there, from all of you.

So, to start off, I'd like to introduce Adele Morris. Adele is a fellow and policy director for Climate and Energy Economics at the Brookings Institution. Before joining Brookings she was a senior economist at the Joint Economic Committee and before that she spent nine years at

the Treasury Department as its chief natural resource economist. Adele's departure from Treasury was of particular note to me. It occurred, I think it was about a week before I arrived at Treasury. I was very excited to be working alongside Adele since we had known each other from years before, and, lo and behold, she bolted. I didn't take it personally or I tried not to.

I started at Brookings eight months ago and she's still here, so that's a good empirical test, I hope. Anyway, Adele, please start it off and then I'll introduce our other speakers in between each of the talks. So, take it away, please.

MS. MORRIS: Thank you, Ted, and I appreciate the introduction and I want you to know not to take it personally, just like I won't take it personally that as soon as I got to Brookings, Doug Elmendorf left for CBO.

And I'd like to thank very much the folks at Brookings who worked so hard to put this conference together and to those of you in the audience who stuck around to listen to more economics.

Perhaps the best thanks go to Doug for such a great setup. This agenda is working really well for me because I can summarize the first part of my talk in three words, 'what Doug said', and then the rest of my talk is probably best summarized by what Doug didn't say. By that I mean, I'm going to take a look at specific legislation and tell you how it stacks up

against the principles that Doug outlined, probably in a way that a director of a nonpartisan objective federal agency wouldn't be comfortable doing.

So, Doug was right, is the summary of his talk. He was right that the objective of climate policy at its essence is to reduce the risk to the environment at the lowest possible social cost. And he's right that the key to that is a steady growing price on carbon in addition to the ancillary policies that he mentioned, and that that price should be applied as broadly as possible, across greenhouse gases and their sources, and that that is the underlying policy necessary, if not sufficient, for cost effective abatement of the risk of climate change.

He's also right that it's not a free lunch. Contrary to how this policy is often marketed, our research, which CBO also considered, is that we shouldn't expect climate policy to solve other problems. We shouldn't expect it necessarily to create jobs, to boost economic growth, or to rejuvenate the U.S. manufacturing sector, and we shouldn't necessarily expect it to drive us in the short run towards energy independence. If you look at the actual effect of -- projected effects of climate policy on U.S. petroleum consumption you'll find that those effects are projected to be quite modest.

But the point again is that we're reducing emissions because we're worried about the threat they pose to the earth's climate and done

properly, the submissions abatement, the environmental benefits of that will be justified -- will justify the modest costs involved.

Doug's right that some folks will be burdened more than others in a way that depends critically on the details of the policy design. We don't need to use climate policy as a vehicle for redistribution, but we do want to be mindful of the effects of higher energy prices on the poor and we want to do what we can to ensure that they're not worse off than they were before our environmental objectives are pursued.

So, there we leave off with the principles that Doug gave us, very wise, if not rabbinic . And let's see how the draft legislation stacks up. And I'm going to, perhaps timely, perhaps just picky, I'm going to start with the Kerry-Lieberman legislation that was just released.

Now, I welcome this bill, I want to make that clear, I welcome the bill because I know how much hard work has gone into it, I know it's a sincere effort on the part of the sponsors and others, and I welcome the bill because, as Dallas will tell you shortly, we need new legislation to help us avoid the potentially costly application of the Clean Air Act as it stands now, to greenhouse gases.

Now, before I start talking about the Kerry-Lieberman bill, I want to qualify what I'm going to say by saying that like most analysts, I'm truly -- really still trying to understand it. At 1,000 pages it takes a little while

to digest it. I printed it out. You know, normally when people talk about a bill being a heavy lift, they mean, it's difficult to pass, but this one is literally a heavy lift and so I'm still working through it.

But, I'd like to go over the features of it that I think are consistent with the principles that Doug talked about and some things I think where we're not yet there.

So, the Kerry-Lieberman bill, it establishes a price on carbon, it's kind of a combination of a cap and trade program for the electricity sector along with some other industrial sectors expanding over time, plus an allowance purchase requirement on the transportation sector. And the prices in the different sectors are equilibrated, at least in theory, because the price of the allowances sold to the transportation sector are set by prices of the allowances in the straight ahead cap and trade sector.

So, we do have what Doug was suggesting, a price broadly set on carbon in the economy. We are endeavoring to equalize the marginal abatement costs across sectors, that's a cost minimizing role. And we are seeing that as the cap ratchets down over time we're going to reduce emissions. So, we should see the environmental performance of this bill being successful.

Now, in terms of the volatility of prices, we're not quite sure -- there are some provisions in there that can help. There's banking and a

limited amount of borrowing. That can help smooth prices over time although it's not clear exactly the full ability of the provisions in there to really reduce the kind of volatility Doug was talking about to a really modest level.

So, so far, so good. Now, let me get to the parts where I think it's not as consistent with Doug's principles as it could be. And I kind of look at this bill in the context of the history of bills we've had over time and we had the House pass a bill last year, and I guess it's in the eye of the beholder whether we've made adequate yearly progress between the bill last year and the bill this year, but I think there are some aspects that could use even more progress.

I'm going to provide three critiques, and succinctly they are about the cost containment, about the potential for cost minimization, and the fiscal responsibility aspect of the legislation.

So, let's talk about cost containment. There are two provisions in the bill that are meant to reduce the overall cost of attaining the environmental goal. One of them is offsets -- Michael is going to talk about offsets here in just a minute; I'll leave the offset discussion to him -- the other is something called a cost containment reserve, and that's what I'm going to focus my remarks on.

Basically the way this works is, there's an annual set of caps that gradually ratchets down, and a slice of that is skimmed off the top of

each of those caps and it goes into a pool at the beginning of the program. And in addition to the pool that's created, there's a price path. It starts at $25 a ton and it goes up at 5 percent over inflation. Now, these pool of allowances are available at the price each year, according to the price path from the government. Now this is marketed as a hard price collar. It's hard in the sense that the price the government charges for allowances out of this pool is fixed, but it's not a collar in terms of its ability to contain the costs of the program to the U.S. economy. Now, let me explain why that is. So, each year there's a limit on how many allowances can come out of the reserve pool, so the price is set, but there's a quantity limitation.

Now, if it's the case that for whatever reason the price of allowances has reached this limit and surpassed it, and these reserve pool allowances come into this system, the government sells them, for example, at $25, but the equilibrium trading price in the secondary market for allowances, it could be much higher than $25. There's nothing constraining the price that matters to the U.S. economy, which is the price of allowances out there, because the quantity of these allowances is constrained.

So, I don't believe that you can properly characterize this as a hard price collar on the prices that actually matter to the effect of this policy on the U.S. economy, and I think the clear way forward is to convert this thing into an actual price collar and allow these allowances to come into the

economy without limits to their quantity.

Now, that's an unlimited supply, but of course there's going to be limited demand because these things aren't cheap, but what it means is that it truncates the downside risk to the U.S. economy and our estimates suggest that the risk of very seriously over emitting relative to your cap are quite small, so for a relatively small expected effect on your emissions performance you can actually completely eliminate the downside risk to the U.S. economy. I think this is a bargain worth taking and part of the reason is not just economic, but the effects of the economic performance on the bill on the likelihood that it's going to endure.

Now, remember, to protect the climate we have to persist with this policy permanently. So, this policy has to survive through all the ups and downs and all our future republican congresses and I think it's important to keep that in mind.

So, now, while I'm talking about risks and unforeseen factors in the performance of the program I just want to make a shameless plug for a new paper that we're releasing today on the expected economics of the Copenhagen Accord. One of the things we've found in that study -- it's available out in the lobby -- is that an important factor in the performance of our commitments is what other countries are doing and those economic spillovers. We, of course, think the results are quite interesting in that

regard.

Okay, so the final critique -- the next critique I'm going to make is about the cost minimization and the main point I want to make there is that the policy will tend to blunt the incentives to conserve energy to the extent that allowance value is passed along through energy bills, and I think that's an important consideration. If those tons aren't reduced in the electricity sector, they're going to come from somewhere else that's more costly.

And that brings me to my third critique which is the fiscal responsibility. I think normally I'd say a cap and trade system need not raise revenue because the point of that price on carbon is not -- its economic purpose is to change the relative price of different fuels, according to their environmental damage. But given that we have this gaping maw of federal deficits, I think it's important to keep alive the conversation about using allowance value to reduce the deficit.

So, in conclusion, I mean, I think that there are good features to this bill, I think we have more work to do, I think it would be very useful for the conversation to include Senators Collins and Cantwell, and discussion around their legislation, and finally just a plea in the pursuit of climate policy to keep our objectives clean. As Doug said, reducing the risk to the environment at the least possible cost. When we lard up our objectives with all kinds of other stuff, whether it's, you know, protecting certain U.S.

industries or driving abatement to specific technologies, or subsidizing folks who might be your opponents if you did it another way, I think all that runs the risk of hiding the tree with so many ornaments that it just collapses of its own weight and I think it would be a real shame for that to happen.

So, I applaud this new bill and I'd love to see where we go from here. Thanks. (Applause)

MR. GAYER: Thanks, Adele. Next up we have Michael Wara, who is an assistant professor of law at Stanford University. He actually has a science background as a geochemist and climate scientist, and after receiving his JD from Stanford, he was an associate in Holland & Knights Government Practice Group where he focused on climate change, land use, and environmental law. He also currently is a research fellow at the program in energy and sustainable development in Stanford's Freeman Spogli Institute for International Studies, and he's going to be talking to us today about offsets.

MR. WARA: Well, first I'd like to say thanks to Ted for inviting me and to the Brookings Institute more generally. I was really excited to come and speak on a panel of economists, actually.

I'm going to talk about offsets in general and the role that they have come to play in the various proposals in Congress as well as more specifically the role that they play in the current bill.

In addition, I'm going to talk -- my area of research is really the international offsets market, the clean development mechanism, and various smaller offset markets, mostly voluntary, that exist around the world, then I'm going to talk about some of the relevant experience when it comes to actually implementing offset programs in practice on the ground and how that informs how we should think about the current legislative proposal and the different sets of risks and benefits that are likely to play out for it.

So, first off, it's important to emphasize that almost more than in any other location -- any other jurisdiction, offsets matter to federal climate policy. The level of offsetting that's permitted under the current Kerry-Lieberman proposal as well as all of the previous bills, far exceeds the level of offsetting that's been permitted under the EU Emissions Trading Scheme, or any of the state programs that have been implemented or are in the process of being implemented in the United States.

In effect, this is a cap, trade, and offset bill. EPA, in their best guess about the sources of abatement out to 2020 and even to 2030 suggest that -- this is Waxman-Markey, obviously we don't have the analysis yet for Kerry-Lieberman -- but they suggest that more than half of the abatement will occur via offsets rather than via reductions by covered sources.

So, getting the offsets proportion of the bill right matters very

much in terms of the overall environmental performance of the bill and arguably its cost effectiveness. If we are paying, say, $12 a ton, but we're only reducing one-third as many tons as we think we are because our offsets aren't of high quality, then our cost is really triple that and the cost effectiveness is obviously far lower. So, this is a real concern.

At the same time, the experience on the ground, in terms of implementing offset programs, is that they are incredibly challenging regulatory vehicles, that there are deep conceptual difficulties when it comes to understanding the baseline, the future emissions path of a particular industry or a particular project -- a particular offset project, and there is sufficient agency discretion and sufficient incentives to use that discretion in ways that doesn't necessarily benefit the environment, but may benefit offset project developers to skew programs in directions that are not net positive, and certainly do not meet the ideal standard that offsets should met of no net harm, i.e., a reduction doesn't occur under the cap, it occurs outside the cap, the total emissions to the atmosphere are the same. There's zero change.

So, we need to get both the domestic offset policy correct in whatever federal bill is ultimately passed, whether it's this one or in some later Congress, and we also need to get the international component right, and both are equally important and the particular proposal we have before us now contains different risks in the domestic and international sections.

Just to give you a sense for why offsets are a concern I want to tell you a story about wind, in particular, wind farms in China. So, wind farms are eligible to generate Clean Development Mechanism offset credits. And a couple of years ago David Victor and I wrote a paper that basically demonstrated that every single wind farm in China was applying for credit under the Clean Development Mechanism, that is, all the projects, all the new wind farms being built were making a claim that they wouldn't have been built, but for CDM funding. That's the claim that needs to be proven in order to demonstrate that the reduction is real, that it's additional in the terms of offsetting.

That's a very difficult claim to support in the face of things like the 11th 5-year plan which sets targets for renewable energy added capacity in China, and in the face of numerous policy statements on the part of the Chinese government that it was their objective to grow a domestic turbine industry and to grow renewable power generation as a way to diversify fuel mix and reduce local air quality concerns.

So, some of those plants aren't additional, but we don't know which ones. Time passes, and so there's an environmental concern there, a profound environmental concern in the sense that credits are being generated at wind farms in China that are being used by coal-fired power plants in Germany in lieu of allowances.

So, the cap is higher in Europe because wind farms are getting what we sometimes refer to as “anyway credits,” credits for what they would have done anyway, in China. That’s a problem from an environmental perspective. But it turns out it’s not just a problem from an environmental perspective if the offset regulatory system isn’t right.

Last December, right before COP-15 , the CDM executive board met and basically rejected 100 different Chinese wind projects -- nearly 100 -- that had expected to be approved at the executive board meeting, and the upset to the market was profound. The CDM market was, in essence, thrown into disarray because there was no investor certainty about why these projects had been rejected, what the rationale was. There was obviously some environmental concern but understanding what it was and how to fix it wasn’t made clear by the regulator.

And so this just points to the need to create a process that both creates environmental credibility so that the projects that are getting approved are producing real reductions, and also to balance that against creating investor certainty that’s going to lead to the kinds of private financial flows that are going to be necessary to make offset markets work to serve their purpose as a cost containment vehicle.

So, the basic story from the CDM right now is that no one is happy. Environmental groups view many of the projects with extreme

suspicion, I think with some good reason, and the business community that has attempted to make money out of investment in these emission reduction products, to do well, by doing good, has ended up not doing well by doing good, ended up mostly going into receivership or Chapter 11 by trying to do good. And so the picture emerging out of this first attempt at a large offset program is not terribly positive. So to the extent that the U.S. system is going to depend on very large-scale offset programs, actually much larger than the current CDM, we need to look carefully at the lessons there and also implement responses to them that are responsive both to the environmental concerns, so that we actually produce the outcome in terms of the atmosphere that we would want from the program and responsive to the concerns -- legitimate concerns -- of investors in these projects so that there is actually money flowing towards producing these emission reductions.

So, can the U.S. do better? Well, certainly the perspective of many of the staff that have worked on these bills is, we can. We can do better than the CDM executive board, than the international, than the U.N. system has done. The key challenges are going to be establishing very tough, conservative baselines, environmental baselines, that essentially derive who and what kinds of activities get credit and how much credit, at the same time as establishing standards and guidance for investors that are

predictable and stable across relatively long time scales and those two demands are, in some sense, in tension with each other. New information arises that may cast -- may cause doubt regarding the (inaudible) of a particular project, actually changing the rules for that project upsets investor certainty and can be corrosive to the market.

So, I'm just going to talk for a few minutes about what the current bill looks like and how it strikes that balance.

On the one hand, the current bill does attempt to incorporate a number of -- incorporates a number of provisions that are probably superior to the current CDM executive board, the CDM regulatory system, in the sense that there is the ability of both the administrator of the EPA and the Secretary of Agriculture who jointly administer this program -- more about that in a second -- to review -- periodically review the program, make changes as necessary, shift course in the face of new information. That's a flexibility that, because of the design of the UN system, the regulatory body does not have to a large extent, at least not in a reasoned, predictable manner.

At the same time, the bill extends on an approach that was first -- first appeared in the Kerry-Boxer bill where a positive list of project types is included and that positive list, the list of project types that -- for which offset methodologies shall be promulgated by either the secretary or

the administrator, is much longer in Kerry-Lieberman than it was in previous iterations of this process. And that, I think, creates environmental risk for the program because ideally one would like the EPA administrator and the Secretary of Agriculture to be making those decisions based on the science, based on what we know about offset projects as Doug Elmendorf said, based on the idea that we should do the offsets that we understand the best, that are the simplest, first, and then work toward doing the more complex and less certain projects. That's not the approach that's being taken in this bill. This is very much a go-fast approach. That makes sense from a cost containment perspective because if we don't go fast, we aren't going to have the offsets available to reduce costs in the way that might be ideal from an economic modeling perspective for the economy. Unfortunately, the regulatory experience suggests that if we do go fast, we're going to get a lot of bad tons in the system and that's a concern from the environmental perspective and ultimately from a cost-effectiveness perspective as well.

So, the positive list and the requirement that EPA or USDA promulgate methodologies for offsets projects on a very short timeframe is probably not a strong environmental asset of the bill, but good from a cost containment perspective.

The other component of this bill -- well, there are two more things I want to talk about very quickly. One is the issue of who's capped

and who's not, and this tends to be missed, but -- or tends to be brushed under the rug in some contexts, but the reality is that the decision to allow a particular emission source to be an offset versus placing it under the cap, making it a covered source and forcing it under allowances, is, in essence, a decision about whether a particular firm or industry gets to have an asset on their books or a compliance liability. It's political and there are a number of covered sources -- or there were a number of sources that were covered in Waxman-Markey that are uncovered in Lieberman-Warner and so eligible to produce large quantities of offsets because they possess the ability to reduce their emissions at low cost. Whether that's a good thing or a bad thing is, of course, open to debate. But I would just note that if emission sources are in some sense easy to quantify, easy to measure, tend to look like a point source rather than a disbursed source of emissions, it may make sense to put them in the cap rather than to deal with the regulatory complexity of reducing their emissions via an offset system.

Finally, and I think in the current context around MMS this is a point that should be familiar, dual role agencies, agencies that have a job of promoting an industry and also regulating it, can be problematic. And that is what is being created in this bill as far as domestic, agriculture, and forestry is concerned. USDA, an agency charged with promoting the health of the agriculture industry and U.S. farmers, is also being charged with playing cop

to those industries, playing the role of offset regulator and enforcer and ensuring the environmental quality of the offsets that are created by those industries, and that's a real concern, from an environmental perspective. It may also be very good, from a cost-containment perspective in terms of producing lots of offsets quickly. And in the defense of USDA, there's certainly an important role that has to be played there because if there's one agency that knows the most about farming, farmers, and farming practices in practice, it is USDA. EPA has far less familiarity with that sector largely because they are exempt, at least from many of the major environmental laws, via statute.

So, with that, I'll conclude. Thanks very much. (Applause)

MR. GAYER: Thank you, Michael.

Next up we'll have Dallas Burtraw. Dallas is a senior fellow at the Resources for the Future. He's a leading expert in environmental economics having conducted research on the design of environmental regulations, the cost and benefits of environmental regulations, and the regulation and restructuring of the electricity industry. His recent work looks at carbon emission trading in the EU as well as cost effectiveness of trading programs for nitrogen oxides and sulfur dioxide here in the U.S. and he's going to talk to us about more recent work of his on the regulation of greenhouse gases under the Clean Air Act.

So, Dallas, take it away.

MR. BURTRAW: Thanks. Audio visual, maybe you can cut away from this for now so that people who can't see clearly and can look at the screen and we'll come back to slides towards the end. Thank you.

Thank you, Ted and Brookings, for inviting me today.

Well, what happens if Congress doesn't enact new legislation? My friends outside the country and many people in the U.S. have the general perception that there is no progress being made with respect to achieving greenhouse gas reductions in the U.S. And even this morning, Todd Stern we heard talk about the emergence of, I think, what is the new current global paradigm of domestically supportable actions swept up in the nomenclature of nationally appropriate mitigation actions, NAMAs. Usually that notion is applied to the developing world, but it applies with force also to the developed world and I think it's very important for us to think about what's actually going on because the challenge that -- even an unexpressed challenge, in the eventuality that we don't have comprehensive climate policy in place for several years, is the signal to the rest of the world that the United States is doing nothing when in fact a lot is happening in the United States.

How do we evaluate that? How do we characterize it? This is a challenge that I think the administration leadership faces in the eventuality

that all these other policies that we've seen put in place are what we have going forward for the next several years and we need to try to broker international cooperation in that environment.

So, what is knowable with respect to policy? What implements the course of greenhouse gas emissions in this country and internationally? And the federal Clean Air Act has inertia. Although its critics rightly claim that the authors of the Clean Air Act did not anticipate its use for controlling greenhouse gases, apparently it was designed to be able to accommodate unanticipated developments in science and it has been used to do so. So, with the 2007 Supreme Court decision in *Massachusetts v. The EPA*, which declared the greenhouse gases were, in fact, pollutants and eligible to be regulated under the Clean Air Act, the second stage, a domino theory if you will, in which then under the pressure of lawsuits that would have been pending against the EPA, where the EPA was forced to make a move towards the determination of whether or not greenhouse gases pose a danger to health and welfare.

And with that, findings which some characterize as the biggest "duh" moment in recent regulatory findings, but still it was an important and comprehensive effort that the EPA put in place to retrieve that finding, then the EPA was compelled to regulate. We see mobile source regulation put in place now, and now with that in place it cascades into regulation affecting

existing sources.

So, the main attention and controversy today is how we will regulate these stationary sources which constitute the area where the most emission reductions are expected to be achieved, at least under a cost effective approach to reducing greenhouse gases over the next couple decades of climate policy.

Well, we may be waiting for a while for the construction of this new high speed train that's going to take us somewhere on climate policy. The Clean Air Act is like a freight train. It's big, it's hard to stop, and it's already moving, and it's broadly popular with the American electorate, so it will take comprehensive economy-wide climate policy to substitute for the Clean Air Act, I would maintain, it's not going to go away by itself and in fact it has tremendous inertia already.

And while there's a lot of disagreement about the pace at which glaciers are melting, everybody here today has expressed agreement at one thing which seems to be about the glacial pace of climate policy, so hence we need to understand what is going under the Clean Air Act, which is really our plan A. To paraphrase John Lennon, history is what happens to you while you're busy making other plans.

Now, this causes a lot of consternation to me and to my economics sisters and brethren who have argued that the Clean Air Act is a

second best approach, at least second best, compared to a cost-effective approach to achieving emission reductions, and cost effectiveness is so important because of what we may be asking our children and our grandchildren to do over the next few decades, that the cost could be very significant as we think the effects of climate change could be very significant. We have a lot to learn still, so it's very important to put a cost effective institution in place.

And economists fret that regulation under the Clean Air Act will be unnecessarily expensive, so by analogy, let me draw you to our historic experiment with what Rob Stavins characterized as the grand experiment in applying economic ideas to environmental regulation which was the SO2 trading program. It has a cost that we've estimated to be about 1- to $2 billion pr year to reduce sulfur dioxide emissions by roughly 50 percent from what they otherwise would have been. And that is just one-quarter of what was anticipated at the time of passage of the 1990 Clean Air Act amendments.

If one accounts for changes that might have occurred anyway, and there's really no reason to exaggerate the cost savings under the Title IV SO2 trading program, it's still the case that cost savings are estimated to be about 60 percent of what they would have been with traditional regulation.

Would a comprehensive trading approach achieve similar cost savings for greenhouse gas regulation? The answer is, yes, especially in the long run. Greenhouse gases are ubiquitous in our economy and the opportunity for emission reductions will be widespread, disparate, unanticipated, sometimes simple, and sometimes exotic. The beauty of a market based approach is that it can identify those opportunities in ways that a regulator might not.

However, it is not clear to me that this result holds in the short run over the first decade or so of climate policy.

There are several parts of the Clean Air Act for regulating existing sources and in a recent paper with Art Frost and Nathan Richardson we identify what we label as the knowable pathway as the one that would define the most predictable, likely, and practical way under the mechanism of the Clean Air Act to achieve emission reductions. This pathway is Section 111, new source performance standards, and despite the misleading name, Section 111D actually applies to existing sources that are not already regulated elsewhere under the act or are not subsequently regulated elsewhere under the act. This section allows EPA to determine the best system for emission reductions, for regulation of pollutant from new and existing sources and opens the door to possibilities well beyond prescriptive approaches.

MR. BURTRAW: So why would a comprehensive climate policy be better than regulation under the Clean Air Act? Conceptually, economists offer two strong reasons why incentive-based approaches such as emissions trading is likely to be more efficient: Number one, when costs are heterogeneous, and that is the cost of emission reductions differ across the economy; and secondly, when information about those costs is privately held and not visible to the regulator. Then the market can do a much better job of identifying opportunities for emission reductions then can the government.

But in the first decade of climate policy, it's not clear to me that either of these conditions strongly apply. That is, smart regulation under the Clean Air Act may not lead to substantially different outcomes in terms of the actions that are taken and costs that are incurred than would emerge under comprehensive emission trading over the next decade.

So, before you throw me out of here, let me try to defend myself. Many sources face similar opportunities to reduce emissions or energy use and the low hanging fruit is what's visible to the regulator. By analogy, consider another very successful emissions trading program, the Northeast NOx Program in the ozone transport region.

In phase 1 of this program, coal-fired EGUs -- electric generating units -- were required to install low NOx burners. This was a

fairly obvious measure, but under a trading program, not everyone would necessarily have installed low NOx burners as the most cost-effective thing to do. And some sources would have gone further and installed post-combustion controls. Nonetheless, low NOx burners are mandated as part of phase one as a prerequisite for trading, which began in phase 2.

And in phase 2, many sources did install post-combustion controls. But at that level of the cap in phase 2 for NOx, we can be sure that just about every source would have installed low NOx burners. In other words, the regulator could see what was an inevitable outcome across this whole fleet of units and mandated some of those measures perhaps out of order of cost effectiveness, but, nonetheless, not truly disrupting the course at which investments would have occurred for the industry. So, for this technology to be mandated didn't reduce some inefficiency, but it did also provide time and opportunity for learning about how trading program would take shape in phase 2.

When it comes to harvesting low-hanging fruit, regulators can pretty well see what needs to be done and there's little loss through prescriptive regulations. It's when it comes time to harvest fruit higher up in the tree that is very much harder for the regulator to see what needs to be done, and trading can yield important cost savings.

So, what are the sources that would be affected under Section

111-D ? One example is the opportunity for efficiency improvements at existing power plants where apparently there is plenty of low-hanging fruit.

Two years ago or so, I didn't really think much about this, that there was an opportunity at existing -- in the operation of existing fossil fuel power plants to achieve emission reductions, just through the changes in the operations in these plants. But the EPA and the National Energy Technology Labs indicate that we could improve fleet-wide efficiency of 3 to 5 percent at coal EGUs. That's a 3 to 5 percent reduction in emissions from those facilities.

So now if we can go to the slides? Thank you. Do I have to pick this up? Next slide, please -- oh, there we go. That's good.

So, this picture gives an illustration of the heat rate, which is essentially the operating efficiency of coal electric generating units across the country. And that's organized along the horizontal axis with the less efficient units as you move to the right.

On the vertical axis is the heat input or fuel use at these plants, so vertically you can see where are the most important units and moving left to right, you see efficient moving to inefficient units currently. And that black line represents where 95 percent of the heat input occurs. So it's units to the right of that black line that are those that can be characterized as surprisingly inefficient, yet they continue to exist.

We've -- thank you. We've tried to look at how this can be explained. It isn't explained with technology or coal type, it's only weakly explained by vintage. The factors that do seem to explain it in our preliminary analysis are the ownership structure of these plants, and the fuel price that these plants see in those regions of the country.

Further, the EPA and NETL have suggested additional reductions could e achieved by requiring 5 percent average biomass coal firing at existing plants. So, clearly neither of these goals could be achieved in a cost-effective way by requiring 5 percent efficiency improvements and 5 percent biomass coal firing at every plant, because the opportunities differ at any plant depending on where they're located geographically and where they are located in this graph.

To be reasonably cost-effective, regulation of the Clean Air Act would have to be clever. One reason to think this might occur is that today the agency is populated with hundreds of persons who have achieved a master's in public policy or its equivalent. And they've been trained well and prepared to argue that the Clean Air Act should be used in a cost-effective way.

The EPA might do well in achieving the opportunity for near-term emission reductions at a low cost through implementation of an efficiency performance standard, preferably a tradable performance

standard, as was used under the Clean Air Act for the phase-out of lead in the 1980s. For example, it would appear quite feasible for the agency to allow tradable performance standard within a source category such as coal EGUs. And the EPA could determine this to be the best system for emission reduction -- for pollution reductions.

With a smart attitude, the EPA might venture even further into the realm of smart regulation under existing authority -- the process of implementing 111-D regulations for existing sources would involve delegation of enforcement to the states. And a process similar to the state implementation process under the National Ambient Air Quality Standards.

Under this approach, the EPA could develop a model rule and allow the states to opt into a cap to be -- if they deem that to be the best system for emission reductions. I remind you that the successful NOx budget program was implemented under a different part of the Clean Air Act, but it is also -- it took shape in the same way where states were authorized to opt in to a cap and consequently the NOx trading program took shape underneath that cap.

Coal-fired EGUs are just 1 of 60 source categories and/or each of these offer some type of low-hanging fruit. For example, if you were to look at steam gas units, natural gas combined cycle units, or gas turbines, all those pictures have a similar shape to the pictures that I'm showing you

here.

Based on what is expected to occur in the next decade, there would not be substantial difference in domestic compliance actions between programs under the Clean Air Act and actions taken under comprehensive approach like Waxman-Markey. And let me illustrate that with one more figure.

Okay. This figure actually summarizes also what the previous speakers on this panel have been saying. And so from the bottom working -- this represents the emission reductions that are expected to be achieved from 2005 levels by 2020. And the blue reflects domestic actions, the red reflects domestic offsets, the green reflects international offsets, and then the white reflects direct investments internationally in forestation and other matters. And Michael's point was that the green, international offsets, amount to as much or more as domestic emission reductions that would be achieved.

Now, if we were to look at what would happen -- did this work? Let me try again. Okay.

If we were to look at what would happen under Clean Air Act enforcement, just in a tradable performance standard requiring a 5 percent inefficiency improvement and 5 percent biomass coal firing would achieve that bottom brown line in terms of domestic emission reductions by 2020. I

feel it could achieve it by that level.

If you look across other source categories and use a fairly cautious approach with no trading of cross source categories, but just other sort of smart performance standard approaches across these source categories, EPA indicates that the Clean Air Act could achieve about 6 percent reduction in domestic emissions. So we're working our way up to that 10 percent that is achieved domestically under Waxman-Markey. But that 10 percent also includes the opportunity for banking. If you were to scale that amount down by the portion that's being banked for use after 2020, it actually comes in at the same level as what we indicate here under Clean Air Act enforcement. And if the EPA were to be so bold as to go forward and actually try to allow for trading across source categories and allow -- which would enable fuel switching between natural gas and coal, et cetera -- we could even achieve much greater emission reductions.

Well, let me just close by saying that the Clean Air Act is not my preferred way to go. One reason that trading would be preferable is that it would provide an obvious signal to the international community about our commitment to achieving emission reductions. And secondly, as we heard so much about this morning, provides an obvious way to achieve funding to meet our international financial pledge. Because offsets provide a major way that that is going to be achieved.

It constitutes a comprehensive policy framework, and it avoids the legal risks and delays that are implicit under the Clean Air Act. And finally, it takes us on the path towards the law of one price, which is an absolutely essential as we move out towards 2030 and on to 2050 to try to achieve CO2 reductions across the economy.

But in the short term, little is lost and something is gained from progress under the Clean Air Act. And so I think that it's important for us to recognize that it's not a lost ball game if we are stuck with the Clean Air Act for some years into the future.

Thank you. (Applause)

MR. GAYER: Thank you, Dallas.

I want to leave enough time for questions from the audience, so I'm just going to ask one question of our panel. And I'm going to ask actually for Michael, because offsets is an issue that I've often wrestled with.

I think you do have somewhat uniform views among economists on kind of the preferred approach. But with offsets there's an inherent tradeoff there, as you alluded to, which is they allow the flexibility to get lower cost reductions outside the cap. But they also have the potential of undermining the cap.

So first I have, one, a comment and, one, a question. One is on the comment, it ties to what Doug said, which is you talked about EPA's

analysis. I don't know when EPA does an analysis of offsets. Certainly if you allow more offsets of any bill you drive down the costs, but you also raise the cap or you undermine the validity of the cap, potentially, given the validity of the offsets. And I don't know if that actually makes it into the EPA analysis.

So this gets back to what we said with Doug, which is when EPA does analysis the number kind of gets carried forth in the debate and the cost number is what's getting carried forth. So you could always lower the number -- the cost number -- by kind of ramping up the offsets from which -- is maybe why we see so many offsets in the bill. But anyway, that's my comment.

My question is just to help me grapple with this tradeoff. I wonder whether or not if you put the necessary oversight for me to feel comfortable that you get credible offsets, are the transaction -- be -- the transaction costs of doing that be so high as to undermine the cost effectiveness?

I'm wondering -- I need -- the answer is, when you do that tradeoff is there anything in the intersection? Meaning, I know you -- you know, there's lots of things you can do, as you alluded to, to make sure these are valid. But that costs money. And so at the end of the day, I'm wondering how much flexibility you have there. Anyway.

MR. WARA: Well, the -- let's see. The biggest transaction cost that -- so, let me just respond to your first comment --

MR. GAYER: Sure.

MR. WARA: -- and say that the offset production schedules that are used in the EIA, EPA, and the CBO analysis of Waxman-Markey differ substantially. And the best way to understand them is that CBO and EIA are more conservative in their views about how many offsets will actually come to market given a certain carbon price than EPA. EPA is more aggressive so you get a lower carbon price from EPA. That's the main reason.

Leaving that aside, to your question. The biggest transaction cost right now is the cost of risk for these companies that are trying to do international offset projects. So, I think that the road not taken so far is one in which environmental standards are very high, but they're very predictable. You could have very tough predictable standards.

Right now, we have relatively lax, very unpredictable standards. And so -- and that creates a certain set of outcomes, both in terms of which projects are incentivized, i.e., the projects whose only costs are the transaction costs, right? So, the business as usual projects that have to try to get lucky in the regulatory process are the ones that tend to come forward right now. That certainly could change, and it may be

possible, given the development of a body of regulation and -- likely given the U.S. context in the Clean Air Act -- case law regarding different offset categories and final agency action on them. That there could emerge a set of clear guidelines with relatively low transaction costs.

That's not going to happen fast, though. And that's an important thing to emphasize. You know, there's -- the bill kind of has this go-fast approach because it is legitimately concerned with the politics of cost containment. But it's not clear that either the Clean Air Act into which these offset provisions will be incorporated will allow for that or whether that's possible, whether it's possible to combine the speed, the low transaction cost, and the environmental credibility. And that's -- I should have maybe added that third factor. But it's conceivable we could get to that system. And actually, to be fair, the CDM is moving in that direction in certain respects. Okay?

MR. GAYER: We have somebody in the back. And please wait in the green -- did somebody just raise their hand? No, sorry. Someone's -- go ahead up here in the front.

And please just state your name -- wait for the mic and state your name, please.

MR. CHENG: Yeah, no problem. Chow Cheng , freelance correspondent (inaudible).

To Adele, should we have a transparent and democratic process to get the price for the CO2? And this is in your term. I think in this way will be permanent and can be survived.

And to Michael and Dallas, should we have created a new agency to deal with the climate change? And if you want to use the Clean Air Act for dealing with this, it's very cumbersome and very awkward. And particularly, the (inaudible) EPA mission and function is not (inaudible).

So I think -- and also -- the reason I have this is, this is a very important. Michael talked about the problem in China in doing this way. We'll avoid the problems in China. So, it's the process to get coal and to have a new agency to deal with the climate change.

Thank you.

MS. MORRIS: Yeah, I'll address the process question. I see our Congress at work. You know, we have a democratic process and we're struggling with that to make sensible climate policy. And, you know, we've seen all sorts of climate bills emerging from the House and the Senate. What we haven't seen so far --

MR. CHENG: (inaudible)

MR. GAYER: Let's just -- we're running out of time, so (inaudible).

MS. MORRIS: What we haven't seen so far is the President

weigh in with great specificity. And I think there our democratic process could be enhanced by clear guidance from the President about what he thinks would be the best approach for the environment and the economy. So I think we have the process, we're working through it, what emerges from all this remains to be seen.

MR. GAYER: Michael, do you have a quick thought? Either of you?

MR. WARA: You know, I don't think a new agency is really required. The EPA knows the sources the best, and they also have the most experience almost of -- perhaps with the exception of the European Commission, with emissions trading of any agency in the world.

MR. BURTRAW: I just want to agree with that and add that I didn't hear anyone say that they want to use the Clean Air Act to regulate greenhouse gasses.

What I said was that you're not standing on the platform at the train station. You're sitting on the freight train. The freight train is already moving, so let's try to figure out how fast it's going and where it's going to take us, and let's hope that we can get a better train built soon.

MR. GAYER: Good point. Go ahead, right here.

MR. HOPKINS: Mark Hopkins, United Nations Foundation.

I was so glad Michael gave his talk because you were kind of

the only one on the regulatory side in this whole thing.

And I just want to point out, the IEA estimates between now and 2030 over 50 percent of -- mitigation energy related mitigation -- is going to come from an improved energy efficiency. After 30 years of energy -- of deploying energy efficiency, it's now our largest single energy supply resource in the United States. Yet, we have -- as Mackenzie shows, we have about 35 percent -- we could reduce by about 35 percent in a highly cost-effective manner. Yet, at the same time, those reductions aren't being made with the current price.

Now say you put a price on carbon. Say it's 50 percent of the cost, electricity. In the state of Maryland, energy electricity prices rose 2 years ago by 70 percent. Last year the average Maryland household used the same amount of electricity they did prior to the 70 percent rise.

MR. GAYER: Can you get to the question, please? We're running out of time.

MR. HOPKINS: I think there is an enormous amount -- I think we are focusing an awful lot on price where it is extremely politically difficult where there is so much that can be done in termed in this early section -- or period -- in terms of the regulatory answers that, as you point out, that are obvious things that people would do if there was a price.

MR. GAYER: I don't know if there's -- do you want to respond,

anybody? I don't know what the question is. More a statement than a question. Yeah.

Let's go -- we're out of time. So I want to get one more question over here.

MS. SHALI: Haia Shali from the World Resources Institute.

I was wondering if any of you could comment a little bit, both from the cost containment perspective as well as the environmental perspective on trade rebates and their role in either Kerry-Lieberman or the previous -- Waxman-Markey.

MR. GAYER: Anybody know?

MR. BURTRAW: Yeah. What you're -- I think the vocabulary, Adele, that I would use to characterize this is output-based updating allocation to energy intensive trade exposed industries.

MR. GAYER: It rolls off the tongue.

MS. MORRIS: Yeah, what he said.

MR. BURTRAW: That's --

MR. GAYER: That's not (inaudible) --

MR. BURTRAW: Go ahead, Adele. I'm sure you have something to say about that.

MS. MORRIS: No, no. Go right ahead. You did that so well.

MR. BURTRAW: Well, that I did -- rather than -- this is not our

grandfather's approach, so to speak, of giving away free allowances to firms based on their historic performance, but rather giving them away based on their contemporary performance. So as long as a firm continues to keep value added onshore, then it would earn allowances for free if it qualified as an energy-intensive and trade exposed industry.

And the argument behind -- in support of this is that it's an approach that would protect jobs and reduce the leakage offshore and it would also tend to reduce the costs because essentially you're giving those allowances away for free to those industries and in this case, and at least in a competitive market, we would expect -- because that's essentially an output subsidy, we'd expect that allowance price not to be reflected in product prices.

So, it's a way of cost containment. It still has a real cost because it means that you're not going to achieve some level of emission reductions from those industries. The rest of the economy has to do more work. It's not a free lunch, but it is a band aid to get -- to hold us over until there was a global regime.

And finally, I'll just say -- this idea competes with the idea of a border tax adjustment, which probably most economists would prefer but our WTO lawyers give us trouble on that one, so.

MR. GAYER: Well, we're running over. So I want to thank all

of you for staying to the very end. I appreciate it. And I thank our guests. And join me in thanking them for being here. Thanks. (Applause)

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