THE BROOKINGS INSTITUTION

AMERICA'S ENERGY FUTURE: NEW SOLUTIONS TO FUEL ECONOMIC GROWTH AND PROSPERITY

Washington, D.C.

Wednesday, May 18, 2011

PARTICIPANTS:

Welcome:

Roger C. Altman
Founder and Chairman
Evercore Partners

PANEL DISCUSSION: NEW POLICIES FOR A CLEANER ECONOMY

Moderator:

Michael Greenstone
Director, The Hamilton Project

Panelists:

Joseph Aldy
Assistant Professor of Public Policy
Harvard Kennedy School

John Deutch
Institute Professor, Massachusetts Institute of Technology
Distinguished Fellow, The Brookings Institution

Ted Gayer
Co-Director, Economic Studies

* * * * *

P R O C E E D I N G S

MR. ALTMAN: I'm Roger Altman and I'd like to welcome you to today's Hamilton Project Forum on Energy and Energy Policy.

I'm quite pleased that we've taken on this complex topic because we all know that the United States has had great difficulty coming to grips with energy policy. It would not be farfetched, I don't think, to say that. Since the first oil embargo in 1973 we have not succeeded in forging a cogent and effective policy, despite countless promises from leaders on both sides of the aisle and many in the private sector. And over those 38 years, the economic and political challenge of energy has become much more acute. As developing countries advance and world population rises, the demand for fossil fuels has grown dramatically. The direct and indirect costs of those fuels have risen sharply. The negative impacts on our climate have become indisputable, and the search for alternatives to fossil fuels has accelerated. Yet, we have not made much progress towards changing the picture. Nor is the outlook for changing the picture, at least today, a particularly encouraging one.

This country, and for that matter the world's dependence on oil, gas, and coal is not on track to change over the foreseeable future. Just look at any of the good quality independent forecasts of energy consumption and the composition of that consumption and you'll see what I mean. Including that the prospects, unfortunately for "new nuclear" as

it's called, have just been set back considerably by the tragedy in Japan.

I know that many people think that all of the talk and all of the efforts towards renewables are changing our fundamental dependence and those are certainly worthwhile efforts but they haven't changed the outlook to any meaningful degree, at least yet.

And that gets to one of the four Hamilton themes for discussion today, namely that the real costs of fossil fuels, including social costs, are not visible to consumers and to society, and as a result, consumption is skewed towards forms of energy which seem relatively cheap to consumers but actually aren't. And that we need the full costs, direct and indirect, to be reflected in the price of energy products to consumers. That's one of the key themes for today.

We're also going to discuss the importance of R&D and the right role for government in that function. We're going to discuss a more efficient approach to environmental regulation, and we're going to discuss the necessity of addressing climate change on a global basis.

Let me just say a final word about the actual format. We're going to start with a panel moderated by our director, the Hamilton Project's director, Michael Greenstone. And let me just say Michael, who is a professor of environmental economics at MIT, has done a lot of very important work on this subject. And he's doing a brilliant job as the Hamilton Project's director but he is extraordinarily qualified to lead this

forum today.

The first panel will center around four papers being released today. You should all have them and I especially suggest that you take a look at the framing paper, which Michael and Adam Looney put together. It's the first paper in the deck you have, focusing on strategies to give all energy sources equal footing in the marketplace and to expand our opportunities to use lower costs and cleaner alternatives.

After a short break we'll have a second panel. Bob Rubin will moderate that one. And I'll let Michael describe the actual panelists and the formats, but I think you're going to find both of these panels to be really provocative and really stimulating. And then our keynote speaker, Senator Maria Cantwell, is going to talk about, among other things, the congressional climate, pardon the pun, for energy policy.

So I think it's going to be an exciting day. I'm really glad we're taking this topic on. I'm going to turn this over to Michael. Thank you.

(Applause)

MR. GREENSTONE: Thank you, Roger. And thanks to everyone for coming here today.

I thought I would begin by introducing our distinguished panel. I have the good fortunate of being able to call all of them friends. Some better friends than others.

And I will start with John Deutch, who is the institute professor at MIT. All of our panel members have at one point been in academia and also in government. John has had countless roles in government, ranging from the director of the CIA to high ranking positions in the Department of Energy and the Department of Defense, and we're very fortunate to have him here today.

To my right we have Joe Aldy, who is currently on the faculty at the Kennedy School at Harvard. He also serves as special assistant to the president in the first couple of years of the Obama administration, focusing on energy and climate change. Joe is well qualified to talk about both the economics and the politics of these issues.

And then finally we have Ted Gayer, who is the co-head of economic studies at Brookings. He formerly taught at Georgetown and I believe served in the Council of Economic Advisors and in the Treasury as the deputy assistant secretary for economics.

So with that introduction of this distinguished group I thought I would spend just a couple minutes talking about the strategy paper that Adam Looney and I put together. And it really has, if you get, you know, it goes on and on, page after page, but there's really only two points. So, oops, I gave it away.

So the first is extraordinarily obvious. And it's that energy consumption is vital to our well-being. It powers our factories and

computers. It fuels our cars and keeps us cool on, you know, hot summer days in Washington, D.C. And in fact, innovations in energy production have really been at the center of a lot of the economic progress that this country has made, transforming itself from agricultural-based economy to a manufacturing-based one to a service sector one. Through those transformations there's been incredible advances in well-being. I think life expectancy in the last century has doubled in the United States, and I think a lot of that is due to increased energy consumption.

This reliance on a central role of energy consumption is not limited to the United States as a lot of countries are now entering rates of economic growth that I think are practically unprecedented. And I just pulled these statistics last night. They are staggering. In 1990, China's GDP per capita was $350 per person. Today, it's $7,500. That's 20 years later. In India's case, their per capita income was $870 in 1990. Today, it's almost $3,400. And a lot of that growth is fueled by energy consumption. And as Roger highlighted, energy consumption is not going to go away and it's really a central part of increasing living standards and well-being around the world. And in fact, we put together or stole this graph on projections of world energy consumption. In the next 25 years, energy consumption is projected to increase by about 40 percent.

So that's the first point. As I said, that's the especially obvious one. There's a second point, which I think is well understood but

maybe not quantified in quite the way that at least we were used to trying to quantify things. And so that's what we really tried to do with the second part of this. And that is really, you know, is this energy consumption and increasing energy consumption a problem and, you know, the short answer is it's not a problem except for one thing. The criteria we use to choose the energy sources are largely -- not completely, but largely made up of the -- or determined by the prices we pay at the pump and the prices we face on our utility bills each month.

But however, as much as we wish it were not the case, there are other costs. And those other costs are not as obvious as they are at the pump or on the utility bill but they come in three basic varieties. The first is there's threats to our national security related to our consumption of petroleum. And I'll talk a little bit more about that. Our energy sources compromise our health and well-being. And then the third is our energy choices lead to climate change. And I'll talk about each of these in turn now.

So at Hamilton Project we love to have a great graph to capture our points and when it comes to national security we're not quite able to do that so I will just state the obvious. Oil plays a hugely important role in our economy. It powers most of our transportation sector and the issue with that is that the world's reserves are largely concentrated in regions of the world that may not always have the United States' best

interest at heart. And I think it's safe to say, you know, finding an exact causal link between oil and this or that foreign policy action is difficult but I think it's safe to say that there's no doubt that our reliance on oil has constrained our foreign policy objectives.

The second form of an indirect cost that is related to our form of energy consumption comes from the form of conventional air pollution. This is sulfur dioxide, total suspended particulates, carbon monoxide ozone. And here on this map we plotted the counties in the United States that have air pollution readings that exceed the federal standards. And there are federal standards for five different pollutants and the counties are colored by how many different pollutants they exceed the standard for. So black is the worst and yellow only exceeds for one of the pollutants. And the gray areas are all below the federal standards.

And the point to make here is there's about 400 counties in the United States that account for probably two-thirds of the population where the level of air quality exceeds what the EPA has judged to be safe. And in fact, in some of my own research I've shown that the levels of air pollution that we breathe lead to a few extra thousand infant deaths each year. The EPA estimates that air pollution contributes to one in 20 deaths annually. And in a really pioneering work the National Academies of Science established that the costs of air pollution, setting aside carbon, to the economy, if you tallied it all up, all the health costs and the lost days of

work and children not being able to attend school, are about $120 billion per year. So again, that's a cost that we pay. It's not a cost we pay when we fill up the tank but it is a real cost.

The third cost that we pay from the form of our energy choices is in the form of climate change. And the burning of fossil fuels leads to the accumulation of greenhouse gases in the atmosphere. And there's now very strong evidence that that is leading to higher temperatures, will lead to sea level rise, will lead to stronger storms. And all of those things will affect the well-being of people in the United States and people around the globe.

And what I've done here is put together a figure that counts the number of days that the average person in the United States faces annually where the temperature falls in different ranges. And so like the modal day for a person in the United States, they have about 75 days a year where the temperature is between 60 and 70. So that's kind of a typical day. And in the gray, the gray lines or blue-green lines are the current distribution of temperature. And what I really want you to focus on is the very last part, which is the number of days where the temperature is greater than 90 degrees Fahrenheit. And to be clear, that's not the high temperature; that's the average of the high and the low. So to be above 90 is really a hot day, even by Washington, D.C. standards.

And what you can see is that currently the average American

faces about one day a year where the temperature is that high. And what the purple lines are trying to say is they come from a state-of-the-art climate model and they indicate that by the end of the century we're on a path where the average person will face more than 40 days a year in the United States where temperatures are greater than 90 degrees. So it's just a massive change in the way we would live.

And what's troubling about that is that the bad things associated with temperature -- not a day that went from 65 to 75 -- they're all concentrated at the extremes. And so it would lead in a kind of -- not a virtuous circle, to more and more energy consumption for cooling. It would threaten mortality rates. And all of that is just in the United States.

So the United States Government recently came up with an estimate of what the damages are associated with an extra ton of carbon dioxide emissions in the atmosphere and they put that at about $21 per ton. And so let's put that in some context. Currently, the United States emits about six billion tons per year. So we counted $120 billion a year in losses associated with regular air pollution and now we get to add to that another $120 billion associated with the changing climate.

So again, just at the risk of overdoing this, these are costs that are real. These are not costs that we pay at the pump but they alter our life in important ways. So what we set out to do was to try and find a way to quantify -- pull this all together in some easy to see summary

numbers.

And so here what we've put in this graph is the cost of producing -- setting aside these indirect costs that I've been talking about -- the costs of producing a kilowatt hour of electricity from a variety of different energy sources. And what you can see is -- I'll just read across it here -- is an existing coal plant produces electricity at about 3.2 cents per kilowatt hour. That's all the way on the left. A new natural gas plant produces at about 5.5 cents per kilowatt hour. Wind with backup costs about 9 cents per kilowatt hour. New nuclear, as Roger alluded to, costs about 10 cents a kilowatt hour. And new solar with a backup natural gas plant beside it would cost about 12 cents a kilowatt hour.

So when you look at this -- and that's basically how we make energy policy -- coal looks like a fantastic deal. Like, who doesn't want to pay the cheapest amount for energy? And so what we tried to do then was say, well, what happens if we add in the health costs and what happens if we add in the changing climate costs. And so our purple bars here are adding in the health costs. And it fundamentally starts to change the calculation. Whereas coal looked like the best deal in town, like you can't burn enough of it, now it looks different. The air pollution costs -- the health costs associated with -- using coal are actually greater than the private costs of producing. It's 3.4 cents per kilowatt hour.

And then you can add in on top of that in the light gray -- we

are working on our color schemes at the Hamilton Project -- the carbon -- the climate damages associated with an extra -- with the greenhouse gas accumulation. And so for coal you get to add another 2.2 cents a kilowatt hour and you add a little bit for natural gas and a little bit for some of the others. And what fundamentally changes or happens is what looked like a great deal, which was the use of coal, no longer looks like such a great deal. And in fact, the true costs of coal exceed the private costs by about 170 percent. And other technologies now look much more competitive.

So the thesis of our paper is we've created an energy playing field that is tilted towards energy sources that only appear cheap at the pump and in our utility bills. And our argument and suggestions or principles for policy going forward is that we don't have to have a tilted playing field. We could level the playing field and thereby let all energy sources compete on the same footing. And that would largely involve recognizing these social costs.

And, you know, I want to emphasize for those of you who are good at noticing that 3.2 is smaller than 8.8, this would not be for free. It would cost us more. It would cost more at the pump and our monthly utility bills, but the total costs would be lower and that's the key point. These costs that we are hiding from ourselves would now be out in the daylight.

So in our strategy paper we offer four basic principles to

achieve this goal. The first is to appropriately price energy so that all the social costs are reflected. The second is to fund basic research, development, and demonstration to get new energy sources up and running. The third is to make regulations more efficient. That's going to involve a heavy use of cost-benefit analysis. And the fourth is that addressing climate will necessarily require international cooperation and we should be pursuing all of those.

All of these principles are reflected in the three specific policy proposals that we're going to talk about on this panel, and that, indeed, is why we chose these very distinguished set of authors to come forward with proposals. And so why don't we get down to business?

And I think, John, are you the first speaker? I think you are the first. We couldn't wait.

MR. DEUTCH: Thank you very much. Can everyone hear me?

I'm delighted to be here. I notice that I am by a big margin, perhaps even if you sum them all up, the oldest person on this panel, which means that I've made the most mistakes. I'm also very pleased to be here today where Senator John Warner is here, who is one of the people who I've worked with and respect the most in my time in Washington.

At the base of this chart you see a small cartoon of a piñata

celebration. The idea of a piñata celebration is you take somebody, you blindfold them, you put all kinds of goodies in a model animal made out of clay or papier-mâché and you have the blindfolded person swing their stick until they break the piñata and candy and gold fall to the floor for you to pick up. This seems to be the approach that people take to research and development. The notion is that the private sector -- the private sector does not invest enough because they don't capture the benefits of research and development, therefore, the government should spend money on research and development. And as a result of that, unanticipated treasure will fall upon us.

The purpose of my comments here today is simply to say that it also takes good management, thought and analysis to do that job properly. So the process of innovation in the energy sector goes through three separate steps. This initial research and development phase where the uses of the R&D come about in profitable and unanticipated ways justifying government support, but then a very important step which we do badly and is the second point I wish to make to you today, that demonstration is the key to successful innovation in the energy area because it shows the private sector what is likely to work under current regulations and costing and what is not. The third is the deployment by the private sector of this new technology into the energy marketplace, into the energy activity of the country, and for the government to begin to

subsidize that deployment by whatever device is costly and is hugely uncertain because you don't know where the market is going.

The demonstration step is key and today I want to propose to you a new mechanism, a quasi-public corporation to actually carry out that demonstration activity for the federal government.

Now, what is the purpose of technology demonstration? It is to provide information to the private sector on the cost, the technical performance, and the environmental effects of new technology. The private sector in the face of uncertain policy, in the face of uncertain technical performance, is going to be unready to carry out these pioneer investments. And there are a number of different examples. The provision of an energy technology corporation would be exclusively to carry out these functions for a series of defined projects. It would be managed by an independent board of directors. It would have a one-time appropriation of $60 billion to carry out these projects. And it would have flexible hiring authority to get people from the private sector who have the technical background and the financial expertise to manage this complicated process.

Furthermore, the mechanisms that would be available to this corporation would be commercial sector mechanisms for making investments in pioneer plants. It would not include the unbelievable amount of federal procurement regulations that will tilt a project's activity,

design, and cost from what a commercial plant would be.

We've had three different epics when we've tried technology demonstration in our country. The first was in the early -- in the mid-70s -- I have to take pause here to put my microphone back on, unless somebody has yanked it from me already. (Laughter) -- when basically these projects were done by direct government appropriation. That was the time when I regret to say I started in this business with direct government support for big demonstration projects. The second epic was the synthetic fuels corporation, the establishment of that by the 1980 Energy Security Act. And finally, is the most recent and largest, in fact, expenditure on demonstrations through the recovery program over the last two and three years.

In the complicated chart below I have in a set of columns the kinds of activities that you would want to have a successful demonstration program. An explicit policy that you're designing for; analytic support so that you knew what you were doing; indirect assistance mechanisms to allow the most efficient use of pioneer plant financing; and very importantly, information dissemination of the results from the project to the rest of the industry; free of government regulations; and some evaluation system. You will see that none of the demonstration efforts of the past have had all of these features that are required for a successful demonstration project program. If you spend the money and you don't

have these measures in place, you are not going to have a good outcome. You'll be hearing later from another panel member about the importance of analysis and environmental regulation. You must have modeling and simulation capability to know what you're doing. Absent that, this will not work.

So let me say that we have many different proposals -- she's told me my time is up -- many different proposals for technology demonstration, and I won't go through them now. But let me say that the energy technology corporation that I'm proposing has features that I think are more advantageous, though perhaps politically more difficult to achieve in this city, but I draw to your attention as addressing the key piece of energy innovation, which is the demonstration part of the innovation chain.

Thank you very much.

(Applause)

MR. GREENSTONE: Next we have Joe Aldy, who is going to tell us about a new clean energy standard. Do you want to go ahead, Joe?

MR. ALDY: I apologize I don't have a piñata. It's a pleasure to be here, and thank you all for coming.

In considering how we can promote the deployment of clean energy in the power sector, I think there are four key policy objectives to

consider. First, such a policy should deliver fiscal benefits, both in reducing the need for fiscal outlays and tax credits to promote clean energy and potentially to raise revenues to deal with our current fiscal situation. Second, that it should promote investment and address some of the uncertainties that are inhibiting investment in both power generation and upstream manufacturing and resource development investments. Third, it should streamline the regulatory landscape, both addressing what I think are the key uncertainties associated with the prospect of EPA regulation, as well as the hodge-podge of state policies. And finally, and perhaps most importantly, it should actually deliver significant improvements for the global environment by reducing greenhouse gas emissions.

So in light of these objectives, I identified three design principles when considering how to formulate a national clean energy standard. The first is that it should be simple. This will deliver the clearest signals for investment in clean energy. Second, it should be cost effective to ensure we get the biggest bang for the buck. And third, and also to facilitate investment, I think it needs to have -- deliver price certainty.

So the proposal for a national clean energy standard, there are four key elements. The first is that it should be technology neutral. And I've identified a performance metric based off of the tons of CO_2 emitted per megawatt hour of generation. Second, that those power

plants that actually beat the standard should be able to generate clean energy credits and be able to trade those credits to power plants that have higher costs of meeting the performance goals. Third, and drawing off of what I think is some of the successful experience at the state level, there should be a compliance mechanism that allows power plants to also go to the federal government and buy additional clean energy credits at a preset price. This draws off of the experience in the states in using alternative compliance payments. And then finally, in order to finance John's piñata effort, that some of these revenues from the sale of the federal clean energy credits should go to finance energy R&D.

Now, in terms of the performance goals, I think it's useful to look back over the past five, six decades at the emission intensity in the U.S. power sector. We've seen a gradual improvement over time and in 2010 the emission intensity in the U.S. power sector was about 0.56 tons of CO_2 per megawatt hour. The goals that I've set out would start in 2015 and in that year I've established a goal of 0.4 of CO_2 per megawatt hour. This is roughly comparable to what some talk about in terms of a 60 percent clean energy portfolio approach.

This is a feasible goal. It's actually in line with what Japan and the E.U. have now in terms of their emission intensities. This is clearly an ambitious goal over the next five years. And in fact, by 2020, with the set of goals that I've laid out, if we were to meet the performance

goal, power sector emissions would be about 34 percent below 2005 levels.

Now, I think it's important the design of this, to create incentives for investment. As I noted, that one mechanism for compliance is that a power plant may go to the federal government and buy clean energy credits that I would establish at an initial price of $15 per credit, ramping up to about $30 per credit in 2025. This credit, I think, in light of the ambition of the performance goals, is likely to be binding on the tradable clean energy credit market. That is that the federal clean energy credits will effectively be setting the price for the emissions of CO_2 in the power sector. Over the first 10 years of the program you would actually see the credits delivering about $21 per megawatt hour of revenue to renewable. This is important. This is effectively equivalent to the current production tax credit that wind and other renewable sources receive through the generation of power. But it doesn't involve the fiscal outlays associated with tax credits.

If one were to look at some of the recent analysis of the opportunities to reduce the emission intensity of the power sector, the price that I would set for federal clean energy credits in 2020 would deliver emission reductions on the order of about 15 percent below 2005 levels by 2020.

The electricity rate impacts of such an approach are going to

be quite modest. I looked at the year 2015 and did a rather simple upper bound analysis where I made some conservative assumptions to assess what the impact would be for rate payers. My upper bound estimate is about a little bit less than three percent increase in electricity prices nationwide. This is equal to about one-quarter of a penny per kilowatt hour. Of course, there's a lot of variation in the mix of energy across the country, so I also did this analysis looking at about 20 regions across the continental United States based off of some EIA analysis and found that you will see some impacts larger in some states than others. But what's interesting is that in light of the improvements in the cost environment for power since 2008, even with this clean energy standard about two out of three states would have lower electricity rates in 2015 under this policy than they did in 2008.

Now, the -- my final slide here is to talk about a clean energy fund. I agree completely with what Michael has said and what John has said about the need to support investment in energy R&D. I propose taking about $2 billion in 2015 and wrapping it up to $5 billion by 2025 that can be used to support a variety of energy R&D and demonstration efforts, whether it is it look at the new merit-based approach for ARPA-E that's been financed for the last few years at the Department of Energy, whether it's John's proposal or others. I would note that in the initial analysis I've done there should be revenues in excess of this $2 billion in 2015 or the

$5 billion in 2025 and that the balance of these revenues should be used to facilitate deficit reduction or to lower the rates on existing taxes.

Thank you, and I look forward to our discussion today.

(Applause)

MR. GREENSTONE: Next up we have Ted Gayer. He's going to talk about a better approach to environmental regulation, getting the costs and benefits right. And Ted has promised that a discussion of cost-benefit analysis will, with the proper amount of caffeine, keep everyone awake.

(Laughter)

MR. GAYER: I will try to keep that promise. Thank you again for the invitation to speak here today. My mic? Hello.

MR. GREENSTONE: You can go to the podium if you like.

MR. GAYER: Is that better? All righty. Sorry about that. Don't start the clock.

(Laughter)

MR. GAYER: Okay. Thank you again for the -- oh, I've advanced my slides, too. I've got all sorts of technical errors.

Thanks for the opportunity to speak here today. As Michael alluded to in the opening, we face extreme, severe challenges with our environment and climate change, and as he also alluded to, if we're going to tackle this we need to have all the tools at our disposal. So the focus of

my paper is a conceptual defense of cost-benefit analysis, but a critique of some of the ways it's done in practice. And I specifically focus on three different ways that it can be improved.

Okay. So, first, just a brief background. Cost-benefit analysis, I think, does and should form the basis of sound regulatory policy. It's the best tool at our disposal to maximize the scope to improve social welfare and to incorporate the external costs that Michael was referring to earlier. The regulatory process broadly speaking is a system in which regulations are considered proposed and ultimately finalized by the executive branch agency. And for significant regulations in the current system, significant is defined by regulations over $100 million of annual economic impact. There is an established interagency review process headed by the OMB, so a lot of my proposals are targeted towards that agency with an OMB, Office of Information Regulatory Affairs. There's a longstanding, well established principle within this process to use cost-benefit analysis. It expands administrations from Reagan to Clinton and recently again President Obama reaffirmed the need to propose regulations in which the benefits justify the costs.

Nonetheless, there are problems with cost-benefit analysis in the way it's used in practice. The three that I focus on, and this alludes to something John said before, I think there's clear steps on what needs to be done to conduct a cost-benefit analysis in agencies. There's not

enough focus on the quality of the inputs, the empirical claims that are feeding into those models, and not enough exposure to outside opinion and thorough assessment of the quality of the study. Not all studies are the same and so we want to make sure that we get them right.

There's been a recent methodological shift from the longstanding principle of what I call consumer sovereignty, and that's a little cryptic so I'll explain more about that later. And finally, the process itself, the oversight process itself as it currently exists for those significant regulations doesn't really afford enough time for there to be a thorough review and external checks on the analysis.

So proposal one, to get at the first problem, is essentially just let's focus on not just providing information which we should on the assumptions and the findings of these analyses. Even now if you try and find some of this information, good luck. It's very hard to find. So I propose a checklist where you can very clearly find out what were the assumptions used in these analyses? what was the discount rate? Did they adjust for inflation? What were their findings? What were the best guess for the benefits and costs of the various options that they considered? And more importantly, I think there needs to be a greater focus on quality assessment, that each of these analyses use external studies as inputs but there's no kind of deference to the fact that some studies are better than others.

So in my paper I go through different kinds of tools he can use to basically come up with quality assessment. And I think that the most important tool is openness and replicability. There's been a shift in academic journals. I think increasingly if you're an author submitting a paper you have to provide your data and programs to the outside world. Anyone can go out and try and replicate your results, check to make sure they're robust. I think given the magnitude of these regulations it would be useful to have such open access to all data and programs for any of these inputs so that any analyst out there -- we can have essentially decentralized checks on all the work that's done so that we're given a thorough review and making sure that we're considering the best options.

Okay. My second proposal deals with -- is to exclude private net benefits in the cost-benefit analysis for energy efficiency standards. So let me give like a stripped down, simple explanation of the methodological issue here. So a broad definition of energy efficient standards is it's a mandate, a regulation that removes less energy efficiency products from the market. So if you're doing the cost-benefit analysis, you've got to kind of come up with your ledger. What does this mean? Well, on the benefit side it's pretty clear. We get less energy use, less fossil fuel use, less pollution, therefore, more environmental benefits and we have the ledger -- the benefit side of the ledger is actually clear.

Where the controversy I think comes in is on the other side,

what's the impact on consumers? So the traditional approach, which I endorse, is that consumers have had a full array of energy -- of appliance options, let's say for appliances or vehicles, and the mandate of the regulation has restricted their options so the consumers are made worse off. Now, this isn't to say you shouldn't do the regulation. It's just to say you have the environmental benefits, the external benefits set up against the cost to the consumers of having less market options or fewer market options.

An alternative approach which is increasingly being used is to assume that consumers essentially were mistaken in their original choices to purchase poorly -- less energy efficient products so they're essentially gaining from the mandate from getting their options restricted.

So who is right? It's going to depend on the circumstances at hand. I think for most energy efficiency products it comes down to the question of whether or not consumers or the regulators know better what will save the consumer money over the long run. Now, my view is that for big ticket items, like vehicles and appliances, the default should fall to the consumer, that there are costs associated with these energy efficiency standards. We should be transparent about them and stack them up against the environmental benefits.

Why does this matter? It's an esoteric question in some sense. The concern that I have is if you shift that focus, what you're doing

is you're taking environmental regulations which have been and should be directed at mitigating the harm as Michael said, the social harm, the harm that my market actions do to others or to the environment. Instead, you're directing regulations to protecting me from bad consumer choices, which I think essentially leads to less effective environmental regulations. And as we tackle our problems going forward I think we need to be very cautious about that.

So I'm getting the yank sign so I'm just briefly going to go through my third proposal.

The third proposal is to improve regulatory oversight through an earlier review process for essentially super major regulations. For the billion dollar annual impact regulations, there's just not enough time. We need more time in the process to do a thorough evaluation. So I'm offering -- and this echoes other proposals that others have made in the past -- I'm offering a proposal of a six-month review process to fully vet to get outside ability to replicate the results and get inputs into the findings.

Thank you very much.

(Applause)

MR. GREENSTONE: Thank you, Ted. We're now going to have a few minutes of discussion amongst us and then we'll open the floor to questions.

So I thought I would start with my dear friend, John, who

never -- I think a 20-minute period has never gone by where he has reminded me -- failed to remind me that I'm not a scientist and I'm not an engineer, and therefore, most of what I think is not worth discussing.

(Laughter)

SPEAKER: He's candid, isn't he?

MR. DEUTCH: He's at least learned the important point.

I want to make a remark about each --

MR. GREENSTONE: I'm speaking right now.

MR. DEUTCH: Okay. I'm sorry.

(Laughter)

MR. GREENSTONE: So you want -- and I don't know if you're aware there's the gang of six, now it's the gang of five. There's a debt limit. There's a budget deficit and you want to spend $60 billion without congressional oversight. And I think that's a great idea. But I do wonder if you could elaborate in light of my ignorance of technologies and science and things like that what we might get in exchange.

MR. DEUTCH: Well, you would not --

MR. GREENSTONE: What would we learn about?

MR. DEUTCH: You would not have to spend, for example, the money which was put in the Recovery Act for this activity, so the $60 billion is not net. It would be what would be used to finance projects. Not all of it would be result in expenditures, either tax expenditures or direct

expenditures. What you would learn about it if it's done properly, which is by no means certain, is the private sector would have a much clearer idea of the choices that they could make in incremental investments that indeed they would have to do, for example, under Professor Aldy's new scheme where they have to make choices between coal with capture and sequestration, natural gas plants, nuclear and the like. So you are providing information to the private sector that they will need to guide their investments in the future.

It's certainly, in my mind, a very attractive feature compared to what we're doing now, which is spending money hand over fist in ways that we don't understand, and we certainly don't aggregate between federal and state expenditures and between direct expenditures and expenditures on the tax side.

MR. GREENSTONE: Thank you. Will you give me one technology that I can -- the piece of gold that will come out of the piñata that I can keep my mind focused on?

MR. DEUTCH: Will I give you one?

MR. GREENSTONE: Yeah.

MR. DEUTCH: Not for free.

(Laughter)

MR. GREENSTONE: We have not paid your contract yet, John.

Okay. I think the answer was no.

Next I wonder, Joe, I can't keep it all straight. We've got the EPA, who might regulate greenhouse gas emissions. The people talked about a carbon tax but that seemed to have disappeared into kind of a black hole. There was a 1,400 page bill for cap and trade. That didn't work out so well. And now there's a clean energy standard. Can you help me keep all those -- what boxes do each of those belong in? Why should I like this where others have not trod so well?

MR. ALDY: Well, I think part of it is, you know, I'm taking as my premise that there is significant social value to promoting clean energy. So then the question is what are the different tools at our disposal to try to do that? You know, basically at the end of the day there's three ways to do it. One is that we can just pay the power sector to invest in new clean energy technologies. We've been doing that for about 20 years through tax credits. I just don't think given the current fiscal outlook that is going to be a long-term option.

The second is we can actually just tell the utilities what to do. You know, that is in a sense what you can do through regulatory mandates. That's in a sense what one could do through EPA authority. I think there's a fairly robust debate that has continued since I left Washington on that front.

The third is that we can say, look, there are those who

through their actions are imposing costs on others. You talked a lot about this in your comments, Michael, through the carbon pollution, from their generation of power. And so if you're imposing those costs you should actually bear those costs. And there's a variety of ways in which we can do that. We can do that through cap and trade. We can do that through carbon tax. We are implicitly doing that in about 30 states right now that have renewable electricity standards. It's effectively what was in both the Bingaman-Murkowski Energy Bill in the last Congress. It's what was in the Lugar-Graham Diverse Energy Standard. It's what's in this proposal I have here for a clean energy standard.

So there's a variety of ways you can do this. I think this approach is more appealing than either tax credits, because I just don't think that's fiscally a realistic option long-term or regulatory authority under the Clean Air Act because I just don't think the Clean Air Act is well designed to really tackle this problem effectively. You know, there's a variety of ways in which one can try to mimic the market-based attributes through EPA regulation, but I think there are going to be some limits that at the end of the day will undermine the cost effectiveness of that approach and I think at the end of the day will actually make it -- will not reduce the difficulty that zero emission clean energy technologies have in financing their projects. And I think the approach that I've laid out here is one that has a better political shot, if you will, than EPA authority and has

the prospect to be more effective both economically and environmentally.

MR. GREENSTONE: Okay. Ted, so now first let's just stipulate. I write academic papers that sometimes can feed into regulatory impact analyses. So there's going to be a checklist as to which papers the EPA should pay attention to and which ones they shouldn't. Is there a box for papers authored by me?

(Laughter)

MR. GAYER: Yeah, well, we'll discuss whether or not it's on the top or on the bottom.

MR. GREENSTONE: Okay. More broadly, besides my personal interests, I was very intrigued by your idea of -- your discussion of energy efficiency standards. And so I think that merits a little flushing out.

I think what you're saying is that let's just make up a hypothetical energy efficiency standard for window air conditioning units that it comes in and effectively energy inefficient air conditioners can no longer be sold one way or another. And then you've got a bunch of people who are buying that inefficient air conditioning unit and now they can no longer do that. If I followed the logic of what you laid out, current cost-benefit analyses would argue that those people are better off. How does that work?

MR. GAYER: How does it work, the current approach?

MR. GREENSTONE: Yeah.

MR. GRAYER: So the current, okay, so first of all let me back up on checking your box. I should say your work was influential in the quality assessment because go back and read Michael's academic papers, his bread and butter is showing how some of these research studies are not very robust and that research design makes all the difference in coming up with quality findings. So you would be on the top of the list on that one.

Okay. On energy efficiency standards for --

MR. GREENSTONE: Let's make sure Ted gets a little extra money.

MR. GRAYER: I could use it.

On energy efficiency standards. So, the way it's working now, which is not the traditional approach I think is what your question is. And the way it's working now is the assumption is if I have an air conditioning unit that is cheap but fuel inefficient, there's a tradeoff involved when you buy that unit, either you -- at the store when you buy it you get a cheaper, so you save money on the sticker price, but you're going to lose money over the stream of use of -- for the stream of the time that you use it because you're using more energy and the energy bills are higher.

I should back up a second. Your example actually brings up

an issue where it might be -- the current standard might -- it might be actually advantageous to have that person's (inaudible). If, for example, there's a market failure. So I'm living in a building where I don't pay the utility bills, for example. Well, that will throw off my decision making and I won't make the right choices.

But ordinarily what you're looking at here is a question of do I balance the savings that I get in the sticker price against the future costs in higher energy prices? And who is best equipped to do that -- me or whoever is writing the regulation? My presumption is I make lots of mistakes so I'm not infallible. My presumption is I've got the most on the line. I have pretty good information about what the energy use of that product is. I have pretty good information about my energy bills. Example, fuel economy. I bet if I took a poll, everybody here could guess the price of a gallon of gas within a dime probably.

So in situations like that there is not in some sense an obvious behavioral failing. We know what we're doing. It's our bottom line. We have the incentives to make the right decision, and indeed, we may have preferences for one over the other that the regulator doesn't know. So the current approach that they're using is they're essentially assuming I'm making a mistake and my presumption is I'm not making a mistake when I'm doing that.

And I've got to get to the implications of it. The implication is

not we shouldn't do these standards. The implication is we should focus on the external environmental benefits of these standards, weighing those against the personal consumer costs. And my concern if we lean too heavily in this new direction is we're essentially tilting the scales to environmental regulations that focus too much essentially on consumer protection and not enough on environmental protection. And I think we wind up in a world away from what Joe is advocating, a world away from where Michael started advocating in the beginning of this, where we're actually getting a good, clean, crisp price on the external cost to the environment of what our actions are doing.

MR. GREENSTONE: Thanks. John, I have rarely known you not to have a question, a penetrating question about someone else's work. I thought you might want to join in and ask some of our other authors here.

MR. DEUTCH: First, I would like to say, while I won't tell him a good technology, I will tell you I noticed that Michael slammed coal. And that may be easy to do in the United States. It's less popular in China, South Africa, India, and Russia. So we don't want to throw coal away, and the technology which would be ideal for the technology demonstration of the type I was mentioning to you was carbon capture and sequestration because there has to be something done to preserve the coal option. So that's a comment. That's for you, not for him.

The remark I wanted to make is about Joe Aldy's really excellent paper. And I thought there were three parts of it that are really important. One is it is technology neutral, which customarily legislation is not. The second is it wipes out state and regional regulation. We have a global climate bill in the Cambridge City Council, for example. So it wipes that out in favor of a federal program, which is, you know, I think really extremely important and it also, you know, puts you on a direction for.

But what are the things which worry me about it? The first is it is electricity only. And if you're talking about climate change you've got to talk about all emissions. And he doesn't really. He says, well, it's a step towards that. But, of course, steps towards that really with an undefined second step may be a cliff or a straight path. The fact that there's no attention to how does it spread to other areas of transportation especially is very important to me. And secondly, he has not a clue about how it gets to the rest of the world, which is really the problem we face here.

But below is this engineering question. At the margin under his scheme people are going to be making choices about what they put in for new technology at the margin. That's not a three percent effect; it's a 50 percent effect. All of the technologies that will meet his more stringent goals at the end will cost 50 percent more to generate at the busbar than current. So really over time you're moving to an electricity cost to the U.S.

consumer which is 50 percent higher at the busbar, which is fine with me provided that you have a plausible scheme to make the climate benefits, which means you have to go elsewhere in the economy to transportation you have to go global. But I love the paper. I think it's very --

MR. ALDY: Thank you, John.

Let me make a couple of comments about that. First, on the price, I think it's important to recognize in the way I've designed this that with the option to go to the federal government to buy clean energy credits at a preset price that limits what the impact can be.

MR. DEUTCH: And its benefit.

MR. ALDY: Well, I think that kind of certainty is important both if you're trying to make investment decisions, to sort of know what your stream of revenues will be. I think it's important for businesses and families to plan to know that you're not going to see a big, unexpected shock to electricity prices. The nature of this design by saying, you know, in 2015, 0.4 tons of CO_2, that's effectively giving a free pass for that first four-tenths of a ton of CO_2 per megawatt hour. So when you look at something like natural gas combined cycle which, you know, emits maybe something on the order of like .45 tons of CO_2 a megawatt hour, and that means more than 90 percent of that is actually covered by this generation subsidy.

So the actual cost that consumers see is going to be muted

in part by the nature of this design. So I think to say, oh, well, you know, in reality this is going to increase costs 50 percent on the margin, I actually think it's a much smaller impact on the margin and I think it's also important -- that's relevant for about half the country, half the consumers who are in competitive market. Given that we have half the country that's still in regulated markets where average cost pricing effectively is a larger determinant, you know, that has less of an effect there.

I think the other thing that is important besides the cost is how do we expand this to cover more sources of greenhouse gas emissions? I think it's a really important point. I mean, I spent two years in administration trying to push for a comprehensive energy and climate policy. I think just now with the nature of the political environment it's hard to imagine a full economy-wide policy. I would not want to be in Washington trying to push for a policy that would raise the price of gasoline right now, which the legislation in the last two years would have done. So I think this is an attempt to try to be more modest in scope and a little bit more practical politically in the near term. I think it has the ability to actually serve as the basis to transform or transition to an economy-wide policy because you've already established in what is the largest sector of emissions what the price on carbon is effectively going to be going out for the next 25 years.

So that could actually serve then as sort of an anchor for

how you'd want to expand the policy to other sources. You know, my thinking is now in light of where we are fiscally that a carbon tax that can generate revenues and help us deal with our long-term fiscal outlook has some potential. Of course, I now live in the ivory tower so it's easier for me to say that. But I think this can actually serve then as sort of the basis for how one would expand effectively a carbon price to the rest of the economy.

So I recognize it's not sufficient to the challenge. We need to be able to cover all sources, but I think it's a way to try to get the ball moving and going in the right direction in the near term and that can then serve as the foundation for a longer term, more comprehensive policy.

MR. GREENSTONE: So, Joe, could I pick up on the last point that John made? And he gave you a mouthful so let me just raise it a second time. Poor Todd Stern, who is a chief negotiator, has to go and try and convince other countries to come along when so far the United States hasn't done very much, which seems a difficult task. How would this strengthen his hand in a meaningful way?

MR. ALDY: I'll say this. The international community paid a lot of attention to our domestic congressional debate over the last two years. I mean, there are some members of embassy staff here in town who I thought had actually better information on what was going on in Congress than we did at times. So I think to be able to say we've got a

policy that actually is going to fundamentally lower the emissions in the power sector and get us on the right trajectory I think is a good, positive step. From my analysis you would get, at least within the power sector, emission reductions comparable to what the administration committed to in both Copenhagen and Cancun, recognizing that you would need to do a lot more in other sectors to deliver on that.

So I think there's a real positive impact from getting legislation that moves forward in reducing emissions from the perspective that Todd has to combat in international talks. I will be candid. I think there are some aspects of this that will be difficult for him. You know, the way that this is designed it's not going to create a huge demand. In fact, it's not, even as I propose it, have a means by which you could take advantage of so called international offsets. So if you reduce deforestation in Brazil, there's no way in my proposal for you to actually generate credits from that activity. And given the focus on international climate finance, especially among a lot of the developing countries, that's something where I think when they look at this and compare it to legislation over the past two years, they will start to wonder where are you going to create the incentives for those kinds of financial flows that they are expecting.

So it's not -- I wouldn't sell this as a panacea for Todd. Having said that, if Todd has to go out there and say, look, we got a new

piece of legislation, it's going to promote clean energy in the power sector, I think that actually strengthens his hand from where he is today.

MR. GREENSTONE: Thank you. I wonder if either Joe or Ted had comments on anyone else's paper. Or I have some other questions I could ask.

MR. GAYER: I have a comment, just flushing out for Joe if we can stick with your paper. So there are some distinguished people who know much more about politics than I do so I'm not going to even pretend that I could be too informative there. But it strikes me with any climate policy you're looking at this question of whether or not it's a substitute or complement for other approaches. Michael listed kind of a whole array of approaches. And I would say at any given time there's a bunch of approaches out there. For example, now we have kind of the Clean Air Act, the EPA regulating through that mechanism.

And then I -- this is a political question also -- is kind of over time there is that same question. Like you, as John said, you kind of set it up, this is kind of a step towards a future of a comprehensive. I could also make an argument that by doing this, the debate is over. We've done it and it's a step away and it's substituting for a better policy in the future. So whenever you can get at both of those, like the Clean Air Act approach to regulating utilities, is it now superfluous if you have what you have because we're essentially establishing somewhat of a cap? And what is

your concern over time that if you snap your fingers, Congress passed it, what you propose, that we're now kind of end of story, Todd Stern is going to go run with that, and don't expect anything else ever. Like, are we crowding out a better policy in the future?

When one sort of thinks about the opportunity for this to substitute for EPA authority, I think a well-designed clean energy standard can do that. I mean, you would be creating the incentives for reducing emissions of greenhouse gases significantly in the power sector, so I don't think you would need Clean Air Act authority. And, you know, there are a number of different provisions within the Clean Air Act that one could employ to try to tackle greenhouse gas emissions. Some are more problematic than others. So even if one were to say, hey, there's an enlightened regulatory agency that's going to go with just the smartest way under the Clean Air Act, they may face legal challenges that forces their hand to actually consider some of the other even less well-oriented provisions of the act to deal with this problem.

So I think one could, from a substantive standpoint, be comfortable substituting this for EPA authority. And then I think it delivers a potential political benefit because we do have this ongoing debate in Congress what to do about EPA authority. And I think just as there was discussion over the last two years that you could effectively substitute a comprehensive policy for EPA regulatory authority for greenhouse gases, I

think you could have a tailored exemption to the power sector that if you have a clean energy standard for the power sector that would then eliminate the need for EPA authority under the Clean Air Act.

You know, there is this sort of tension of are you actually building momentum to do more or as you noted do you actually say, okay, we've checked the box, we've done something there, we don't really need to move and do more. We could say in the transportation sector, for example, we've got café and we've got biofuels so we can say we've checked transportation and maybe one does more on appliance standards to get at the residential sector and you end up with this sort of hodge-podge of sectorial approaches that at the end of the day perhaps is not as cost effective as a true economy-wide approach.

So I would like us to think that we'd be able to sort of learn from such a policy design that you're not actually wrecking the economy as some critics of comprehensive energy and climate legislation have claimed in the past, that you can actually implement a policy that does actually deliver meaningful emission reductions at a modest cost to consumers, but hopefully that would be the lesson politically that allows one to say, okay, well, let's do something that's more comprehensive. And I think that would then hopefully complement what I think is going to be the fiscal demand that will actually bring the idea of raising revenues through price in carbon to the table. So, you know, that's sort of my

optimistic take. But recognizing that there's a risk of your scenario as well that people will say, okay, we've done enough; let's move on to other problems.

MR. ALDY: Could I just add one plug for my own paper? As you were talking it strikes me that when you have a hodge-podge approach, this question of will that lead to momentum to something economy-wide or lose momentum -- this is my own self-promotion -- it strikes me that the mechanism by which trying to get the right outcome is making sure that you're picking the ones that work best. As you said, this is a test case for something. It's not going to be as bad as people fear and it's not as costly as people fear and it's going to have a positive effect. If you start picking other approaches that don't do that that are burdensome, and that was kind of the motivation of part of my paper. My concern is, like, I understand the temptation to say we need to do something, this is something. But I think if it winds up not working as advertised than it actually in the long run backfires.

MR. GREENSTONE: Okay. I wanted to, you know, it's probably worth noting that when we set out to do this, and I think it remains true -- we set out to do this event six months ago -- the Waxman-Markey Bill didn't work in the Senate and the Copenhagen negotiations didn't work out quite the way everyone had hoped. So we kind of did it with a knowledge that not everyone is dying to deal with the social cost of

energy consumption right now and the political environment may be focused on some other questions.

So let me just put out there what I think is an alternative, which in some sense it would be complementary to what John did. It talked about it would replace what Joe did and I think make what Ted was talking about obsolete, which is not because it wasn't a good idea. (Laughter) But I'm hoping that the panelists will react to this, but I feel like there is, and I think Joe hinted at this, there's the makings of a grand bargain here which are that we really, really like income. We want people to get wealthier. We like people getting richer. In the best case, we're indifferent to carbon but actually we probably dislike carbon. And it just seems like the giant prize standing in front of us is the realization that one could raise revenue instead of raising income taxes or some other form of increase in income through a carbon tax or some kind of carbon charge.

So half of my life is in Washington and half of it is in Cambridge, so I can't quite tell which half makes me think that's a good idea. But I wonder if the three of you would be willing to comment on that.

MR. ALDY: I actually see my colleague, Adele Morris, here. Adele and I submitted a proposal to the Fiscal Commission on just this very idea. So I heartily endorse it. It gets back to the comment I made with Joe about kind of, you know, second best crowding out first best policy down the line. And I don't remember, there's a famous quote. Is it

Herbert Simon? Something that's unsustainable won't be sustained. And I think that usually has described our fiscal situation and now we can also make the similar argument with climate policy.

So again, I'm not as politically astute as many people here but maybe I'm naïve enough to think that any grand compromise would include such a mechanism as sort of a win-win on the revenue side and on the climate side. It should be noted there were two Fiscal Commissions. My colleague, Alice Rivlin was on both and the other one with Senator Domenici I think did come out supporting it if I recall correctly but it did not --

SPEAKER: (Inaudible) very well.

MR. ALDY: Oh, I'm sorry. So my point being is there has been some talk of it. There has been some evidence that there is bipartisan support. I don't know where it goes but I actually think, you know, it's a win-win and it would be a smart policy.

MR. DEUTCH: Well, you know, Roger Altman started out this session by saying we've been unable as a country to adopt a comprehensive, effective energy climate policy for 40 years. And so we're always being pushed back to doing sensible, partial steps that may or may not evolve and usually don't. But if you take what Michael suggests, a comprehensive greenhouse gas emission charge, not just carbon, you would have, in fact, accomplished what Roger says he has been unable to

do. I also greatly sympathize with a carbon tax approach, even in favor of a cap and trade system, in part because I think it has advantageous for the United States international aspects to it.

So I couldn't agree more with a proposal to do a comprehensive greenhouse gas tax. It depends, of course, on how it's designed and I will -- my own experience when we did the windfall profits tax in 1979 and '80, that a large part of this is not the fact of the tax, it's a fact about how you allocate the revenue. So if you put onto a tax proposal like you say a revenue proposal, then you have at least some chance of selling it but I think it's a much better approach than trying to do these designs and saying we hope it leads to a next step. It certainly helps Todd Stern much more in international negotiations.

MR. GREENSTONE: And presumably you would think that some of the revenue could go --

MR. DEUTCH: No, no. I just -- I use his walking around money. Walking around money. We've got to get the legislation passed.

MR. GREENSTONE: All right. Okay. I think I'd like to open the floor to questions. And I believe there are people with microphones. But maybe that's not true.

So why don't we start here in the front row. And if you could state your name and your affiliation. Yes.

MR. MCGINN: Michael, I'm Retired Admiral Denny McGinn.

SPEAKER: Microphone.

MR. MCGINN: Oh, thanks. I'm Retired Admiral Denny McGinn. I spent 35 years in the Navy. I am the brand new president of the American Council on Renewable Energy, all in on this business, and I'm also the co-chairman of the CNA Military Advisory Board which has put out some reports that are relevant.

These are interesting ideas and relevant. Let's stipulate that you're exactly right. These initiatives are exactly what the United States needs for a better energy policy. The question is how do we make them compelling, especially given the kind of political discussion you just had?

Michael, in your paper you talk about the social costs and you talk about the health effects, climate change, and you mention in your paper national security and "Brent Scowcroft" on that. I think this last aspect of national security costs included in the economic externalities of our current energy posture is really, really key to making it compelling to a bipartisan group of elected officials and to the American people.

I'll go back to 2000, in October, the United States' ship Cole blown up by al-Qaeda in Aiden ironically on a refueling stop. That is just one example where we lost 17 sailors and many more injured, a ship out of the line for over a year and a half. One example of the costs not only in treasure but in blood that we spend to protect the world's economy and its lifeblood called oil. Additionally, in 2007, the Military Advisory Board put

out a report on climate change and the threat to national security and the key takeaway was that climate change and the extreme weather events will act as a threat multiplier for instability in critical regions of the world, effectively causing fragile societies and fragile governments to become failed. That is a recipe for even more cost in treasure and blood and it's these kinds of arguments that we need to put forward in addition to these excellent policy recommendations to make it compelling.

Thank you very much.

(Applause)

MR. GREENSTONE: Thank you. I think if anyone is an expert at the intersection of security and defense and energy it's John Deutch. I wonder if you had anything you wanted to add to that.

MR. DEUTCH: I can't tell you how far back I go on this issue of energy security, the connection between certainly oil and national security and certainly Jim Schlesinger, my boss and former colleague, we've written extensively about this. Michael had it exactly right, in fact you have it, too, Admiral. Our foreign policy options are constrained by our dependence on imported oil. And it's a very important issue to address and it requires -- well, we're not even close to doing it. There's not much more to say about it. Spending treasure though, U.S. Government, at a time when we have are so fiscally constrained really requires thought about how to do it, what pace to do it and how much you

really want to go after.

MR. GREENSTONE: Mark Gallogly has a question.

MR. GALLOGLY: I'm Mark Gallogly from Centerbridge Partners.

Given the comments that you've made, I agree with a lot of what you said. It's a global problem. You've got to think about new technologies and then open them to the world but you've got real fiscal constraints. What about making the corporation that you recommended a global effort and one where you get the G20 or other parties to participate and perhaps open it to corporations so you get the large obvious players who would be interested in this to kick in and maybe, you know, crazy idea, maybe even take the largest universities in the world and some portion of their money so that you try to coordinate this and then allocate available information that's resulting from this effort to the parties who participate. So whether it's the Chinese or the Brazilians or whoever it is, since the problem is global and since, for example, carbon sequestration is happening in pockets all over the world, little test cases are going on in Australia and China and the United States and elsewhere but they're not coordinated. And we're not getting any best practices that are commensurate with the global nature of the threat.

MR. DEUTCH: Those are tremendously good points and they are in a way maybe not central but they're embellishments to this

idea of an energy technology corporation. Certainly, industry involvement would be, so to speak, automatic depending upon the technology you're talking about. How industry would cost share, whether you would have groups of companies or a single company depends upon whether you're talking about carbon capture sequestration or the grid. So I think that the way industry would get involved depends upon the particular technology.

The international collaboration has lots of problems with it but let me just give you one that is very much been an irritant on me for a long time and that has to do with technology transfer restrictions and ambiguity. If you had a liberalization, both of technology transfer and capital flow and investment options, then you would have, for example with China, a really interesting possibility. Bu the way it is now with barriers to technology investments in China by U.S. firms or quite frankly Chinese firms investing in the U.S. and a myriad of technology transfer restrictions which I know the administration is yet again tempting to shift, it really constrains those possibilities. But I wouldn't go to the E.U. I would go to India and China as a first step here but it would have to be part of a more -- a reform-minded way of thinking about, you know, capital flows and technology transfer restrictions. I've had hundreds of conversations with the Chinese and they would, I think, be amenable to it but right now this just general view, well, we'll have technology transfer by itself is not enough to engage those countries. They're good points you make, sir.

MR. GREENSTONE: We have a question here.

MS. KING: Thank you. Heidi King. My sleeves are rolled up because I've been working for years on the very dirty frontlines of policy, formerly at Elvira, now at House Energy and Commerce.

I wonder in particular, John and Joe, if you would speak to the recent proposals to combine the Departments of Energy and the EPA given that we're talking about trying to establish a comprehensive national clean energy policy.

MR. GREENSTONE: Well, that's a good question. John?

MR. DEUTCH: You know, I come from -- the principal business of the Department of Energy is bombs. (Laughter) The next is, you know, basic science and technology which we talk about as being really important here before demonstration. The EPA, which I have great regard for, does not have -- I mean, it's not easy to marry it. So my own view is no. You don't want to have the place where you are really pushing new technology be the place which is the regulator of it. I think sometimes the EPA may go a little bit too far imagining what new technology is but I think it doesn't sing to me. Now maybe I don't know anything about the politics of it but it wouldn't be, having lived through the other side where the AC and the NRC are separated, I guess I think the regulatory function and the technology-pushing function should be in separate places.

MR. ALDY: I should note one of the details of my proposal

which I didn't mention in my remarks is that I would actually have this national clean energy standard implemented by both EPA and DOE, in part because they are both monitoring key elements of this. The emissions are already being monitored by EPA. The power generation is already monitored by DOE. EPA has a lot of experience implementing market-based regulatory approaches like this and DOE obviously has the experience on the R&D side. You know, part of it is I feel like, you know, there's a lot of what EPA does that actually isn't really related to energy. There's a lot of what DOE does, as John already noted, that really doesn't have much to do with how we might think about the environment.

And so to me it doesn't make a lot of sense to actually just push them together because right now we've got this big environmental energy issue called climate change and then try to sort of force all these other elements to come together. I agree with John that in a sense EPA has become very effective in how they design and implement regulations and DOE is much better on sort of the science and management side. And you know, trying to sort of put all these missions together, I'm not sure that would necessarily make for more effective government which I think is sort of the bottom line by which we'd assess any kind of reform along these lines.

MR. GREENSTONE: I think we have time for two more questions.

MR. KING: Thank you. I'm Llewellyn King. I'm the host of White House Chronicle on PBS and I'm a syndicated columnist and a friend of John Deutch of many years which leads me to ask him a question.

Over the 40 years or so, John, we've been pushing new technologies and you've come up with one of the problems. We can push them in a lab but we can't get them into the market because we can't demonstrate them. I'm wondering whether we're not working on the wrong dynamic, that we shouldn't establish a pull rather than a push dynamic so that we don't litter the labs with wonderful ideas that never get anywhere. Or even demonstration projects. We both know that Europe is littered with wonderful prototype airplanes that never flew again. Could we change the dynamic to a pull one so that we probably use less enthusiasm for the wrong idea and we're more akin with government stimulus for the market? That's my thought or question if it could be phased that way.

MR. DEUTCH: It's a great pleasure to see you, Llewellyn King. I remind everyone in this room if you go into government, don't talk to Llewellyn King.

(Laughter)

MR. DEUTCH: I would say you've got it exactly right. In fact, underlying --

MR. KING: You actually agree with me.

MR. DEUTCH: One hundred percent. Because this is not a technology-push business. The Department of Energy labs are great at technology push and defense aerospace is dominated by technology push. This has got to be something that works in the private sector so you have to seek mechanisms where the selection of the projects and how they're managed have market pull aspects. And so in fact I would suggest to you that the design of the energy technology corporation is to move you much further in that direction than the old projects that you remember and lambasted so well, the synthetic fuels -- the pre-synthetic fuels program like solvent-refined coal and things like that. So you have to get it to a market pull and that's why I say get it a little bit out of the government in order to do it. But you're quite right about what you say.

MR. ALDY: Michael, could I add a point to that? I think that's why it's important to have -- whether it's a clean energy standard, whether it's a carbon tax, something that actually creates in the private sector that incentive to seek out the lowest cost technologies that deliver clean energy and lower emissions. And so, you know, part of that is why I took a technology neutral approach in the design of my standards so that it would actually help provide for those that are commercially ready. Recognizing that's a different class of technologies than I think what John wants to target with his corporation, but you know, you need to have this kind of incentive I think in the private sector if you're really going to see

widespread deployment of these lower carbon technologies. So it's clearly needed if it's going to be effective and I think it's clearly necessary in light of the current fiscal environment.

MR. GREENSTONE: I think that will be our last question. I just want to close with one point before I think our distinguished set of speakers here. It's the point I was trying to make in the beginning. It's true, climate and energy policy -- big changes in energy and climate policy are not very popular these days. But there's no question that as we continue not to confront them, it's not for free. Every day we are paying these costs. We're choosing to ignore the costs, the constraints on our national security. We're choosing willfully to ignore the health costs -- the shortened lives, the increased rates of infant mortality, the higher rates of sickness -- and we're choosing to ignore the costs of a changing climate. And it is true that they don't show up at the pump and they don't show up at the utility bill but those are choices that we are making.

And so with that sobering, stirring speech, would you join me in thanking what were really just three excellent authors.

(Applause)

* * * * *

CERTIFICATE OF NOTARY PUBLIC

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

/s/Carleton J. Anderson, III

Notary Public in and for the Commonwealth of Virginia

Commission No. 351998

Expires: November 30, 2012