Question 1: Consumption and Efficiency

Christopher Field: Time for a couple of questions from the audience, but before we do that I'd like to challenge the panel with the question that Ambassador Estrada began with, and that's the question of whether and how we should be thinking about two things that didn't really come up as a big feature on the agenda we talked about, one is decreasing consumption and the other is increasing efficiency in processes that we're already undertaking? I'll pass that to all of the speakers.

David Keith: I believe there may in fact be principled reasons to say that we might be over-consuming in the rich world that is, that it's not, say, bringing us enough happiness. But I believe that those are really quite independent from this question. We can reduce, greatly reduce, CO₂ emissions at costs that are order of a percent or two of GDP, which for sake of reference is about the total aggregate cost of all other environmental regulations today. And I think it's simply silly to harness that to the idea that people must reduce their consumption of goods and services. Arguments about reduction of consumption of goods and services need to be made on their own merits, independent from the question of how we should use tools available to reduce CO₂ to protect us from damaging climate change.

Ambassador Raul Estrada-Oyuela: I'm not talking about reduction of goods and services. I'm talking of keeping the level of consumption with a more efficient way. You know the waste of the resources in some countries, including this one, and what I think has to be considered is the possibility to reduce that waste. I was living for a semester here at a university, and you go on the street during the night, and you see all the buildings light. And this is true for all the City of New York. And I don't go to make the list of waste because I'm enjoying your cordiality to inviting me here, but there are a number of things to reduce. What about cars?

David Keith: But in fact the efficiency of energy use in industrial processes and in transportation is generally higher in the richer counties than the poorer ones, not lower, so the fact is simply Americans and other people in rich countries are extraordinarily rich. It is incorrect to say that they're extraordinarily wasteful in terms of energy efficiency.
Ambassador Raul Estrada-Oyuela: No, no, no. You could have a big car, a very efficient big car, the most efficient you like with a lady going to the supermarket to bring two bags. Is that efficiency? The car itself is efficient, but the act, the conduct, the behavior is inefficient. That is what I think should be changing.

Christopher Field: I might just conclude this with the thought that our community has the luxury to sort of set goals that aren't necessarily precisely financial in nature and are us as a community setting a goal to make efficiency a priority and, where possible, make decreasing consumption a priority certainly can yield benefits, even if they aren't strictly benefits in economic terms. I'd like to open it just for a few minutes to questions from the audience, if there are any.

G. Michael Purdy: We've just time for maybe just three or four questions. Go ahead, sir.

Question 2: Storing Wind Energy

Man: My name is Douglas Hill. I'm a consulting engineer. I have a question for Dr. Keith. If I understood you correctly, you said that you thought that more than half the electricity on a grid could be provided by wind power, provided that storage, among other things, was provided. What kind of technology could provide energy storage on that scale?

David Keith: Air-energy storage for pumped hydro are the most obvious alternatives, but in fact in at least the simulations I and several others have done, storage is not the preferred alternative. The preferred alternative is long-distance transmission to average over the variable wind in different locations and peaking gas capacity.

Question 3: Catalyzing Government Action

Michael Purdy: Thank you. Let's try and keep the questions short, but let's identify ourselves first, please. Go ahead, sir.

Man: Ted Glick. Just to follow up on the last speaker. Isn't really, when it comes right down to it, the fundamental question really for all of us in the room, How do we generate the movement to get our government to have the political will to do what needs to be done, and soon, and quickly? Without that do we have hope for a change?

Michael Hanemann: Maybe I can jump in and answer in two parts. The first part is yes. And the second part is Pigou. Let me just go back. Pigou's point was where somebody creates an external impact on other people, one logical form of intervention is what's called to internalize the cost, to make people responsible for and pay for the cost of the adverse impacts they impose on others. And we're
refusing to do that so far. And if such a cost is not imposed one way or the other, you have an undesirable outcome. And so we are being selfish and wanting to not pay the costs of some of the effects that we impose on others, both other countries and other generations.

**David Keith:** And I might just conclude that with hope that sessions like this can play a catalytic role in developing of political will that will eventually be necessary.

**G. Michael Purdy:** Thank you. Sir.

**Question 4: After Kyoto**

**Man:** I'm James Wang, atmospheric scientist with Environmental Defense. I was wondering, do people have any concrete ideas for what should happen after the first Kyoto commitment and, you know, how do we get more countries involved, etcetera?

**Ambassador Raul Estrada-Oyuela:** Well next year we should start the negotiation for the [inaudible] and we have been considering different ideas. I think Eileen Claussen tomorrow will comment on that. There are a number of ideas to be developed, these points that I simply mentioned on efficiency are something that can be done, and there are a number of new initiatives to help the process. You could either continue with a second [inaudible] in the same line, or change totally the line, or have two different processes optional to the parties. We need, as I say, to have ingenuity to create possibilities for all, including the USA, to add to the process.

**Questions 5 and 6: Wasted Energy**

**G. Michael Purdy:** Thank you, Ambassador. Okay, we'll just do the three questions there and then we'll call it an evening. Go ahead, sir.

**Man:** I have a question that hasn't received satisfactory answer so far, so I think I'm going to ask it to David Keith. Start with a simple premise. I am lucky enough to be a graduate student at the Lamont-Doherty Observatory, and I'm lucky enough to have a window in my office. And not only does it bring light but it brings also the significant benefit that when it's winter I can open the window so that temperature in the room is not unbearably hot because of the heating, and in summer I do exactly the opposite so that I keep it at a comfortable temperature while the air conditioner would make it unbearably cold. And I've wondered, seeing that it's the case in most of public buildings or New York or every [one] I've been in here, What is the cost of that sheer waste of energy? Raul Estrada has said that some of the environmental policies are often perceived as unpopular because they limit comfort. I don't think it would harm comfort to live at 20 degrees all the time and not live at 15 degrees in summer and 25 degrees in winter. So do
you have any quantitative estimate of how much energy is wasted and how much energy could be saved by avoiding living like this?

David Keith: Well I couldn't agree more with you about the American obsession with having the temperature inside buildings anti-correlated with the temperature outside. It's bizarre. But I think it really is important to realize that while each of us can see individual examples that really are just waste, that when you look across the economy and you ask, How much can we squeeze out without changing goods and services, without changing things we actually want? It's not as easy as you think in the real world. There are always persistent reasons why what technological optimists see as energy efficiency improvements don't tend to work out quite so well in reality. It's always harder. Say for automobiles there really are tradeoffs between weight and safety and power and safety and those tradeoffs are longstanding and will not go away. For lighting there are a series of other related tradeoffs, and there are tradeoffs in people’s actions. So I in my house have some lights where I've installed high-efficiency lighting and some places where I haven't don't it because it was too expensive to do. I would've had to rebuild my house. So I push my family more to turn off the more high-energy lights than the low-energy lights. That means that I achieve less savings than an engineer would predict because my behavior changed, if they predicted based purely on naïve engineering that threw away human interactions with the technology. And in practice we find that the really extraordinary statements that were made about energy efficiency in the ’70s have persistently proved to be overrated, and they were overrated because they ignored people’s actual interactions with the technology.

G. Michael Purdy: Thank you.

Woman: This is just a comment, the follow-up on the previous speaker. I think it's supremely ironic that we're having this conference here on climate on Earth Day, and the room is so cold that a lot of us are putting our jackets on.

Michael Purdy: Would anyone like to comment on that?

Christopher Field: I will say that Dr. Rosenzweig made the really key contribution that there is an effort that's taking shape that involves Columbia, and if everybody lends their support to that it can address issues like this.

David Keith: And the business-as-usual scenarios we see often have twice the historical rate of energy efficiency or intensity improvements built into them.

Question 7: U.S. Electric Power Companies

G. Michael Purdy: Final question.
Woman: I would like to make a comment just going back to the question of lifestyle versus . . . I mean being environmentally conscious implying sacrifices in lifestyle for the U.S. people. And I want to just point out that I follow U.S. electric power companies, and just I think as an illustration of the rule that the economy here has to improve in terms of how efficiently we use resources to produce energy is that the ten largest European power companies produce 35 percent more energy with 35 percent less CO₂ emissions compared to the ten largest U.S. power electric companies. And I think when you compare both the thermal efficiencies of European companies are now we’re comparing to developed countries in terms of power generation, which is a main contributor in terms of GG emissions, there is a lot of room to improve, and maybe one reason why that’s happening is because the electric power companies in the U.S. mostly are . . . they receive the grandfathering, basically meaning they can extend the life of the asset, the coal asset, without having to invest in air-pollution equipment, and that basically means that they can keep using those assets and producing airborne externalities to the citizens, not only here but worldwide, without having to factor in other investments that companies in other parts of the world have to do.

Christopher Field: I think your comment raises two important points that maybe we should leave people with. The first is that turnover times of capital stocks are very, very important, and that if you have a 20-year-old coal-fired power plant, it’s very difficult to tear it down tomorrow to replace it. And the other thing that’s really important is that the natural endowment of countries really differs, and coal-rich countries will have to have real strong incentives to move away from coal or to sequester the carbon from coal if that’s what their natural assets are.

Michael Hanemann: Just one thing, Chris. This is exactly the argument for an emissions tax. If you pay something that reflects in some way the externality you’re causing, then you can decide whether you want it now or wait—it’s your choice. As long as we say, "Oh, I should be grandfathered and I don't have to bear a responsibility that the system is distorted."

G. Michael Purdy: Thank you very much. Shall we thank the panel for an excellent session?

Time to bring things to a close here. Thank you for all your attention during the day. I think we’ve made a good start nibbling at some of the big questions. Tomorrow morning, 9 a.m., our first keynote speaker will be Eileen Claussen, and please remember that tomorrow immediately after lunch, 1 p.m., Governor of the State of New York, George Pataki will be here to talk to us before our final panel. Thank you everyone, and I look forward to seeing you all at nine o’clock tomorrow morning.