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CLIMATE CHANGE: TECHNOLOGY AND POLITICS

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Thank you, Ernesto. I'm glad to be here this morning. Thanks also to John Deutch and the organizers for having invited me to participate.

The subject of this session is labeled as climate change, technology and politics. Certainly, technological change, on the one hand as we heard this morning, and political will, on the other hand, are both key to moving forward. The inescapable reality is that the link between technology and politics in this realm is economics, because it's largely economic incentives that drive technological change, and because political will in this realm is very much affected by economic realities. That's why, rather than the environment ministers negotiating these agreements, it really ought to be the finance ministers who are doing the negotiations.

As an economist, I'm going to provide a decidedly economic perspective, but in doing so, I'm going to argue that there are ways of moving beyond the Kyoto Protocol that are scientifically sound, that are economically rational, and perhaps even politically pragmatic. Those are three attributes that I believe, as you'll see, are not associated with the Kyoto Protocol itself.

In particular, I'm going to talk about an international policy architecture for the post-Kyoto era, because although the Kyoto Protocol has just come into force, it's very soon going to expire. The Kyoto Protocol came into force in February of 2005 without U.S. participation, but the direct effects of the agreement on climate change are going to be trivial at best in terms of impact on concentration of greenhouse gases in the atmosphere. At the same time, my summary of the scientific evidence and of much economic analysis is that it now points to the need for a credible international approach. I say, and I emphasize, international approach, because this is, after all, a global commons problem. In some sense, it is the ultimate global commons problem, and unilateral action by a single country, of even by significant groups of countries, will not be sufficient to address the issue.

Now, the Kyoto Protocol has been criticized. First of all, the costs are much greater than they need be, due to the virtual exclusion of developing countries from taking on obligations. By conservative estimates, the costs are four times what the cost-effective level would be of achieving the same overall targets.

Second, the agreement, as I said, is going to generate really trivial short-term climate benefits during the period in which it really has any teeth, which is 2008 to 2012, but it fails to provide any sort of long-term solution for what is very much a long-term phenomenon. This is a stock environmental problem, not a flow environmental problem. Damages are not caused by emissions per se, but the accumulated emissions, i.e., the stock of greenhouse gases in the atmosphere. That is a

fundamentally important scientific point. Any international agreement that doesn't recognize that is doomed to failure. It links closely, as you'll see, with economics.

Third, it's ironic that these short-term targets are actually excessively ambitious in the sense that because they are so short-term, they would actually foster premature capital obsolescence, a frightening phrase to economists that ought to be a frightening phrase for everyone. They're particularly ambitious and costly for the United States because the Kyoto Protocol uses a base year of 1990 for calculating all emission reductions for those compliance years of 2008 to 2012. Remember, it was the decade of the 1990s in which the United States witnessed absolutely remarkable and consistent economic growth. The result is that what appears in the Kyoto Protocol to be 5 percent reduction targets turns out to be 30 to 35 percent reduction targets compared to what would be "business as usual" emissions.

Now add to that, in terms of differences between the U.S. perspective and the European perspective on this, that costs for Europe tend to be relatively low, not only because of lower economic growth during the 1990s in Europe, but primarily because of German reunification, which means that that baseline for Germany, the most important emitter in Europe, by far, of greenhouse gases, of carbon dioxide, includes the old rust belt industry in East Germany that closed down with the fall of the Wall.

Add to that the privatization of British coal, carried out for reasons obviously that had nothing to do with climate change, the opening up of North Sea gas, and, again, a very generous baseline, the United Kingdom together with Germany then account for a substantial portion—estimates I've seen, in fact, from European colleagues of as much as 85 percent—of what would be the actual burden sharing, not the stated, but the de facto burden sharing in the European Union.

This comes down to the fact that the Kyoto Protocol, from my perspective, and that of other economists, I think, is too little, too fast. That's not a pleasing combination.

The question then is: Is there a better way forward? Well, I think there are actually a variety of better ways forward, and in saying this I am simply adopting two premises: One, that global climate change is a significant threat, and we've heard much about that from the previous two panelists, and two, that an approach for the post-Kyoto 2012 period is really needed, there are a range of policy architectures that exist. When I say architecture, I mean that in the sense of characterizing international agreements in terms of their very basics as in the architecture of a home. Describing it as a center entrance colonial; I'm not worrying about how many bedrooms there are, let alone the window treatments on the second floor.

That's the level of abstraction in which I'm describing policy architectures, in which I'll compare them, and there are three basic types: targets and timetables for specific countries that are negotiated internationally; policies which are fundamentally domestic but are somehow harmonized among countries; and, third, ones that are very loosely associated with another but are somehow coordinated or, indeed, unilateral. The truth is that there are advantages and there are disadvantages of each of these categories and of the numerous proposed architectures within these categories. I would suggest that, despite the tremendous enthusiasm that some of the proponents of various alternatives seem to have, no one, in my view, has cornered the market on wisdom in this realm.

There are a substantial number of alternatives, and there are tradeoffs among them. In fact, I will alert you to the fact, if you're interested, as others are apparently, that we have a book coming from Cambridge University Press in the fall of 2007 in which we're going to lay out alternative policy architectures, critique them, and examine the common threads among them. I mention it because the

forward is by one of your members, Larry Summers, and because one of the contributions is by another one of your members, Dick Cooper.

For now, for discussion, for illustration of policy architectures and those tradeoffs, I'm going to examine one alternative that actually falls within that first category of targets and timetables. I'm going to outline the "bare bones" of a three-part climate policy architecture. The first element is that all nations are involved, at least all key nations. In particular, and in contrast to the Kyoto Protocol, developing countries really must be fully involved. In this case, that would mean they would need to take on targets and timetables, and that's because of, first of all, their rapid economic and energy growth, developing countries will soon overtake the industrialized world in CO2 emissions, as China will soon overtake the United States in terms of CO2 emissions.

What John Deutch said is absolutely correct, that every five days, a large-scale, coal-fired power plant is constructed in China, but that's all about the future. It's also the case that low-cost emissions reductions now exist in developing countries particularly because of the fact that their economies are less efficient, are now less fuel-efficient, and are less carbon-efficient.

One could still argue, I think, quite sensibly on the basis of fairness, or distributional equity, or simply pragmatic politics—after all, international agreements such as this that go through the United Nations are one country, one vote, and developing countries are the vast majority—that, on any of those grounds, industrialized countries ought to go first. This is what the developing world has successfully argued.

Unfortunately, we know from other contexts that if a narrow coalition of countries takes action, in addition to driving up the costs of goods and services in relation to their carbon intensity, which in that narrow coalition of countries would be the purpose, it will also have the effect of shifting comparative advantage in terms of international trade outside of the coalition of countries, directly in proportion to the carbon intensity of the goods. That means that as we reduce emissions within the coalition countries, we provide a direct incentive to increase emissions outside of the coalition countries, which the people involved in this refer to as emissions leakage. That pushes developing countries on to a more carbon-intensive growth path than they otherwise would be on, precisely the opposite of what an international agreement should be doing, and it would make it more costly, not less costly, to expand the agreement later.

So, all nations have to be included. I didn't say all nations have to pay. Developing countries can't be expected to pay in the short term. Again, whether you consider that to be an acceptable proposition in terms of distributional equity, or you consider that to simply be pragmatic international politics at the United Nations, either way, they can't be expected to pay in the short term. That presents a conundrum. On the one hand, for cost-effectiveness, to achieve this and to achieve it in a cost-effective way, economically, rationally, developing countries have to be involved, but for the politics and for the equity, they can't be paying, at least in the short run.

There are approaches to dealing with this, and essentially to "having our cake and eating it too." One solution is growth targets that become more stringent as countries become more wealthy. In other words, a target is not simply a number. A target is an equation that is linked to gross domestic product. If this approach is linked, for example, with international tradable permits, something that I'll talk about in a few minutes, depending upon the nature of the allocation, initially, then one can actually have cost-effectiveness: the reductions taking place in the right areas, no leakage, and yet it's not costing developing countries a lot, or, indeed, anything.

I was talking about this about a year ago in Manila in the Philippines, and I said that developing countries need to get on the global climate policy train, but they don't have to pay for their ticket. But if they're not on the train, it's not leaving the station. In February, we're going to see what was just described in Canada. The train is going to sit in the station. We can take the moral high ground and ratify the agreement or not, but it's not going anywhere.

The second key element of this architecture is a long-term time path of targets, not simply a single target, for what is really the short term, 2008-2012, as in the Kyoto Protocol. In the short term, as I'll show you in a moment, the economic analysis suggests that these targets should be very modest. Indeed, they would not be emission reductions, they would be tolerating emissions increased. But in the long term, the targets would be stringent, much more stringent than what the Kyoto Protocol has. After all, remember, I said it does virtually nothing about the problem, but those long-term targets would need to be very flexible. After all, we're going to learn as we go forward. We're going to learn about the cost of addressing the problem, and we're going to learn about the damages of the problem as we go forward.

Note that these targets that I'm referring to could be quantity-based targets. They could be limits in terms of tons of emissions, which is what one sees in the Kyoto Protocol, or these targets could be price-based targets—in other words, taxes on emissions or taxes on the carbon content of fossil fuels. I'm not specifying one or the other, and there are advantages and disadvantages of each.

Now why this precise time path of targets that begins very moderate and becomes much more stringent? The reason is that technological change can—and I want to emphasize the word can—bring down costs greatly in the long run. I say it can bring down costs, because much technological change is endogenous. That is, it depends upon relative prices, it depends upon price signals, it depends upon what the price of labor is compared with the price of energy, for example.

And relative prices are affected, or can be affected by public policy, so significant emissions reductions can be achieved at relatively low cost in the long run. Contrary to what I heard a few minutes ago, economic analysis actually tells us that it will get cheaper to reduce emissions later rather than now if we put in place the right kind of policies now. It does not necessarily get more expensive to reduce emissions later, it gets cheaper because of technological change, but that's not a laissez-faire statement, that's a statement if the right policies are put in place to bring about the technological change.

What about the models, these so-called integrated assessment models, which are combinations of an underlying scientific model, with an economic model layered on top of it? What do they tell us about this long run? The question is taking account of future technological change, taking account of the existing capital stock, because we're worried about rendering it prematurely obsolete and tearing down coal-fired power plants, or you're having to sell your car tomorrow afternoon, or junk your furnace as soon as you get home.

What, taking all that into account, is the least-cost time path to achieve sensible reductions in atmospheric concentrations of greenhouse gases? Now, for many years, at the intergovernmental panel on climate change, on which I served as a lead author, the discussion has been around the target of stabilizing concentrations at twice the pre-industrial level, which would be 550 parts per million, and those are the numbers I'm going to use here.

The discussion was just brought up that 450 or even 400 parts per million may be a better target. That would not change—indeed, I could substitute the graphs, if I had time—would not change the

basic shape and the basic message that I am presenting to you if you had a more ambitious concentration target within that range.

The least-cost CO₂ emissions path to stabilize concentration involves reduced emissions intensity, that is, reducing carbon dioxide emissions per unit of economic activity in the short run, but because there's economic growth, actually increasing emissions, as you can see, in the short run, but dropping further and further below "business as usual," which is the BAU, going forward. This is not nearly as abrupt as the Kyoto Protocol line, which you can see, we're at an immediate reduction for the Annex I countries, those in the industrialized world. For the non-Annex I, the developing countries, there's no Kyoto Protocol line because they're not included in it.

Eventually, what again is cost-effective to achieve a concentration target like this is for those emissions to reach a peak and then to come down and have much more severe cuts than what are in the Kyoto Protocol. That leads to a stabilization such as, in this case, the 550 parts per million, but it could be done for 450 or 400.

The turning point, by the way, is much sooner for the industrialized world than for the developing world. Please understand, this is not a suggestion to put off policies into the future, because if you just put everything off, you're in exactly the same situation, five, ten, fifteen, twenty years from now. This is a plea to put in place a series of targets, which is an entire time path of targets, to put those in place now, because long-term policies, long-term targets for private industry are needed to motivate long-term technological change, to send signals to the private sector about likely future relative prices.

Yes, a future Congress can change its mind, but nevertheless, next week, when Duke Energy sits down to discuss investment in a power plant, if there's legislation from the Congress as part of an international agreement that says these are the targets that we have in quantities or prices rise into the future, that's taken into account. They're even taking into account right now the Kyoto Protocol with all the uncertainty there is. These signals, these distant signals, even if they're not set in stone, make a huge difference for investment.

This long-term time path of targets, again, short-term, moderate, but long-term stringent but flexible, is consistent with the science: that is, that it's the stock, not the flow of pollution that matters in the case of climate change. It's consistent with the economics, that is, that the least-cost time for achieving particular atmospheric stabilization targets lends itself to this, and it may even—but I'll leave a question mark—be consistent with pragmatic politics.

Normally, we lament the fact that in representative democracies, there is such a strong tendency to place costs on future, not present, citizens or voters. In the case of global climate change, it turns out, to a considerable degree, that that actually happens to be the scientifically reasonable and economically rational thing to do.

The final part of this three-part architecture is what I refer to as market-based policy instruments, approaches that work through the market rather than against it to achieve particular ends. For example, emissions trading or, more likely in this case, carbon rights trading on the three major fossil fuels is an approach that was used previously in the U.S. in the 1980s, when we phased our leaded gasoline from the market. It was done by such a system, and it saved about \$250 million a year in compliance costs. It's been used in the U.S. since 1990 to cut sulfur dioxide emissions as a precursor of acid rain, and it's saving about a billion dollars per year in compliance costs. That's one-third

compared to the baseline costs.

It's an approach, as we heard under the so-called RGGI Program, the Northeast states, most of them anyway, are about to use to try to control CO₂ emissions from power plants, and it's an approach the European Union is striving to use, actually independent of Kyoto, but related to it, to reduce its CO₂ emissions. But there are also carbon taxes, which would be a tax on the carbon content of the three major fossil fuels. This is the price equivalent of a quantity-based tradable permit instrument, and it has significant advantages compared with the trading approach.

It also has some real disadvantages such as the practical politics, as we heard from John Deutch earlier today. There are also hybrids of taxes and permits, which I find a very attractive approach. This is a tradable permit system, but the government promises that if permit prices get to a certain level, it will sell as many as anyone wants to buy. That's combining, really, a tradable permit with a tax. It has the effect of placing a limit on the price of a permit and, hence, a cap on the cost of compliance. It reduces, if not eliminates, the uncertainty that private industry is so worried about in this realm, and it's for that reason that these are labeled as a safety valve mechanism, and one of the pieces of legislation before the U.S. Congress—actually, it's not yet a piece of legislation, this is a white paper of two senators that would include such a mechanism. Now all of these have potential for both domestic and international applications, all of the instruments, market-based, that I just mentioned. As I've said, these market-based instruments can cut the cost to 25 percent of what it would otherwise be.

That's the three-part architecture for an international climate change agreement based on sound science, rational economics, and, I hope, to some degree, even pragmatic politics. My premise is that the global common nature of the problem requires a multinational, if not a fully global, approach. I think a key question remains regarding the approach I've outlined: Can countries credibly commit to a long-run program such as this? My response is that first, once nations have ratified the agreement, legislation within countries would translate long-term price or quantity targets into domestic policy statements or commitments, and when such domestic legislation is enacted, effective pricing or expected price signals are indeed sent to private industry, which would quite surely begin to take action. Ultimately, it's that kind of domestic action that provides the meaningful signals for credibility that other countries want to see. But I want to acknowledge something, and that is that there are great challenges for adoption and implementation. I could probably criticize what I've presented today more than others here could criticize it. I do feel a little bit like Churchill. The more and more I study this, I'm convinced that this is the worst possible approach, except for all the others. The other approaches also have their problems, alas.

To summarize, first, the Kyoto Protocol has come into force without U.S. participation. Its direct effects on climate change are going to be trivial to nonexistent, but I think it's fair to say that the science and the economics point to the need for a credible international approach. Second, there's a pressing need for an international agreement that takes into account the science, the economics, and the real world politics. Third, unfortunately the Kyoto Protocol doesn't do any of those three. But fourth, the good news is that promising alternative international policy architectures do exist. I've suggested just one such architecture, but again, I want to emphasize there are others, as well, that merit serious consideration.

Finally, since I've asserted the importance of new and improved international agreements on climate change, it probably behooves me to close by commenting on what the future holds, in my view, with regards to U.S. participation in an international agreement.

The Bush administration's plan—the Bush administration does have a climate action plan, you can find it at the White House Web site if you're interested—of so-called “slow, stop, and reverse” emissions growth makes sense. In fact, it's consistent with the pattern I've laid out, but there are no dates, and there are no quantities, or there are no prices, but we need dates and targets now for the stop and reserve.

The administration's plan, in principle, is using market-based instruments, which they've also endorsed, and that's good, but we need a real cap and trade system, a real tax approach, not just a voluntary program. What's really missing is that the president and the Bush administration criticize and, in my view, appropriately criticize the Kyoto Protocol as a highly-flawed international approach, but what's needed is the administration's proposed alternative.

Well, what about a future Democratic administration? Is that going to change things? I think it's very important that you keep in mind that in the summer of 1997, there was a vote in the U.S. Senate—remember, the Senate must ratify international agreements—on a Kyoto Protocol-like agreement. It was before the protocol had been negotiated, four months before it. The vote was not along party lines. The vote was 95 to zero, including the two liberal senators from the state of Massachusetts. Ninety-five to nothing. President Clinton did not submit the Kyoto Protocol to the Senate, nor would Vice President Gore, had he been elected president, and Senator Kerry, when he was campaigning, said he did not support the Kyoto Protocol, it was a flawed international agreement, and he wanted to negotiate a more sensible international agreement.

My prediction is that no matter who occupies the White House, a Kyoto Protocol type treaty is not going to be submitted to the U.S. Senate for ratification. As we've heard, state and regional initiatives, such as in New England and California, will probably advance in the U.S. I think they're of questionable merit and may cause more problems than good in the long term. We may possibly even have a unilateral national program at some point, but the really key question is, when will the U.S. begin to work with our North American and our European allies, and others, on a better international agreement? Thank you.

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