A Climate of Change: An Economic Strategy for Addressing Climate Change in the United States

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On behalf of The Brookings Institution, I want to thank you for the opportunity to speak to you this morning about what an economically sound strategy for addressing climate change should look like. Before I begin, I also want to thank the Keizai Koho Center for so generously hosting us this week and for the opportunity to learn so much about Japan's approach to this critical problem.

The Prominence of Energy Policy in the U.S. Policy Debate

It has no doubt been evident to all of you here today that the related topics of climate change and energy security have escalated rapidly in their importance to the American public, prominence in the policy debate, and political durability. I would ascribe at least three reasons to this intensified focus on the issue. First, there is

widespread agreement now that human activity is contributing to global warming and growing consensus that action needs to be taken immediately. There are a variety of reasons for this shift, but I don't think one can overestimate the importance of Former Vice President Al Gore's recent documentary, the awarding of the Nobel Peace Prize to Gore and the International Panel on Climate Change, and recent news stories about record-breaking temperatures and the collapse of arctic ice shelves.

Second, the U.S. economy faces serious risk of recession, if it is not indeed already in recession. American families are thus particularly unnerved by news reports that oil prices hit the $100 mark. One analyst (Mark Zandi at Moody's economy.com) calculates that the recent oil price increases will translate into another $1 dollar rise in U.S. gasoline prices, costing consumers an extra $100 billion over 2008.

And third, U.S. consumers see that the benefits of rising oil prices are accruing to OPEC nations and others many in the U.S. perceive as hostile, at the very same time that Americans are worried about the threat of Islamic fundamentalism and that America's military is bogged down in a protracted conflict in a key

oil-producing state—leaving for another day questions about the wisdom or folly of the Iraq conflict.

Together, these factors have created a sort of "perfect storm" to bring the topic of energy toward the top of the policy debate.

So the question then is what do we do about these problems? Of course, the U.S. alone can't fully address these problems. Climate Change is the ultimate tragedy of the commons problem because a ton of carbon emitted in Washington DC harms both the U.S. and Japan just as much as a ton of carbon emitted in Tokyo does. Moreover, oil is a global commodity, so supply disruptions or growing demand in one part of the world affect the price of oil everywhere. But I will leave aside the international dimension, since others are going to speak to that, and focus my remarks on what an efficient and effective response to climate change should look like.

The Relationship Between Climate Change and Energy Security

Though my focus is on climate change, I want to just say a word about the relationship between climate change and the related topics of energy security and energy prices. People often lump

these issues together and assume these policy goals are largely overlapping in their implications. And in many ways they do overlap. Oil is responsible for 44 percent of energy consumption, so lowering America's oil use would help on multiple fronts: mitigating climate change, improving energy security, and minimizing our economic vulnerability to oil price shocks.

But in some important and underappreciated ways, these issues are distinct. For example, while climate change is a long term issue because carbon stays in the atmosphere for up to 200 years, energy security and price shocks are much more immediate. Also, effective climate policies won't do much to curb oil use because a carbon price will have a much larger impact on coal than on oil since coal is much more carbon intensive. For example, a $27 per ton CO_2 tax would triple the price of coal but would only increase the price of oil by only 30 percent. Finally, some policies are actually directly in conflict with each other. The most notable example is to coal-to-liquid technology, which would reduce oil consumption but would emit much more carbon in the process. It's also worth noting that, as I will discuss, effective and efficient policies to address climate change will have the effect of increasing, not decreasing, energy prices, which will exacerbate the adverse economic impacts of higher energy prices—though this

can be minimized by using the revenue generated from pricing carbon to offset the impact on consumers, as I will discuss.

A Three-Part Strategy to Reduce Climate Change and Promote Energy Security

So given these competing concerns, let me talk about what the most effective and efficient strategy is to address climate change and promote energy security. The first, and most important, step is to use a market mechanism to put a price on carbon emissions, either through a cap-and-trade system or carbon tax—and I'll say a bit about the relative merits of each and the tradeoff between them. Second, government needs to increase and redirect public investments on basic research and on long-run speculative energy technologies.

Pricing Carbon: The Key to A Successful Climate Policy

I will focus on the cornerstone of any effective climate policy, which is to put a price on the emission of greenhouse gases. If we were having this debate 15 or 20 years ago in the U.S., I think there would be much more disagreement about whether we should be using market mechanisms or command-and-control

regulations, whereby the government says we're going to reduce emissions from these sources or consumption in this way, or requires the adoption of particular technologies.

And we still see support for government picking winners and losers, such as increasing efficiency standards. That's not to say these are bad policies. They may be quite helpful in addressing climate change and energy security. But the right question policymakers need to start asking themselves is not whether these policies are good for the climate, but once we put a market mechanism in place, should we *also* have command-and-control regulations in addition? After all, the whole justification for market mechanisms is that private firms and individuals know better than the government how to most cheaply reduce carbon emissions.

I don't think the policy debate has framed the question this way as much as it should. Consider it this way: If we create a cap-and-trade system and distribute permits for x billion tons of carbon, there's nothing else any of those other policies can do to lower the amount of carbon emitted into the atmosphere. We're going to get x billion tons of carbon in the atmosphere. So the question we should ask ourselves is not whether command-and-

control regulations are good for the environment, but can they *reduce the cost* of achieving that cap. For example, even with a market mechanism, there may be principal-agent problems between builders of buildings and those who inhabit them. Or there may be cases where individuals are not as far-sighted as the ideal rational actor should be. But a price mechanism gets you most of the way there.

The same arguments apply to a sectoral approach, about which we have heard a great deal this past week. Sector-by-sector intensity targets may be effective at achieving emissions reductions, but will do so at a greater cost than will a carbon price. A sectoral approach leaves out much of the economy and so misses many opportunities for cost-effective emissions reductions. It also does not consider whether it may be cheaper for one industry rather than another to make emissions reductions, or take individual preferences into consideration.

So if Japan or the U.S. or any other country decides that it wants to reduce emissions by x billion tons, you can put a price on carbon and let firms and individuals figure out what the most cost-effective way is to do so. Maybe it's more nuclear, maybe it's more CCS. Maybe it will be for the steel industry to use less

carbon, maybe some other industry. Maybe some consumers will use more energy efficient lightbulbs, maybe others want to take public transportation rather than drive. This approach, achieved either through a carbon tax or a properly designed cap and trade system, lets the market rather than government figure out how to achieve the carbon reductions.

Alternatively, you can prescribe in advance where these reductions will come from—x percent from this industry and y percent from this industry. This approach raises the same problems as command and control regulations. You let government specify where the reductions should come from—higher fuel efficiency standards, a certain percentage of renewable fuels from solar or wind, tighter efficiency standards for air conditioners or dishwashers, or subsidies for specific technologies. The problem is that government has limited knowledge about the best ways to reduce carbon emissions. Choosing among the many options requires a sophisticated understanding of technology, economics, and individual preferences. In the United States, for example, one study shows that trying to reduce fuel consumption through CAFÉ standards would cost 20 times more than reducing the same amount of fuel through gas taxes or other market

mechanisms.[1] The higher costs of command-and-control not only hurt the U.S. and global economy unnecessarily, but they place a particularly large burden on low-income consumers. Also, we know from experience that government picking the next set of technologies to invest in is usually unsuccessful, as my fellow panelist Peter Ogden and coauthors explained in a recent paper.

So let me turn to the question of what sort of market mechanism to use—a price mechanism or a quantity mechanism. Under a carbon tax, government sets a price for emission of carbon equal to its social damage. Under a cap-and-trade system, government would set a quantity target and allow the market to determine the price of carbon.

If there were complete certainty about the costs and benefits of a carbon price, the two policies would result in nearly identical costs, price impacts and GHG reductions. If the government were to issue the precise number of permits so that the market settled on a value of $15 to emit a ton of carbon, that would be the same as setting a $15 per ton carbon tax.

[1] Kleit, Andrew. 2002. "Impacts of Long-Range Increases in Corporate Average Fuel Economy Standards." Brookings-AEI. Abstract excerpt: "In particular, a long-run 3.0 MPG increase in the CAFE standard would impose social welfare losses of $5.556 billion per year and save 5.1 billion gallons of gasoline per year. This amounts to a hidden tax of $1.09 per gallon conserved. An 11 cent per gallon increase in the gasoline tax would save the same amount of fuel at a welfare cost of $275 million per year. The 3.0 MPG increase is thus 20 times more expensive than the gas tax increase. The marginal welfare costs of long-term increases in the CAFE standard amount to $1.26 per gallon and exceed by a factor of five recent estimates of the marginal societal benefits from avoided externalities. Increasing the CAFE standard is therefore neither cost-effective nor cost-beneficial."

In reality, however, there is considerable uncertainty about the costs of climate change and policies to mitigate it. Quantity instruments like cap-and-trade systems give you certainty about how much emissions will be reduced, but uncertainty about what the price of electricity will be for your factory or what the gasoline price will be at the pump.

On the other hand, price instruments like carbon taxes give you certainty about what the government will be doing to the price that you pay, but uncertainty about just how much progress will be made to combat climate change. In reality, the best option is likely a hybrid approach that minimizes short-run price volatility by issuing more permits at a certain price or allowing firms to bank and borrow permits over time.

Regardless of which pricing mechanism is implemented, the effect will be to raise the cost of carbon-intensive forms of energy. And some people are going to be hit harder than others. Low-income people in particular spend a higher percentage of their income on energy and thus will feel the pain more acutely; in the United States low-income households spend about 14 percent of their incomes on energy, compared to the national average of 3.5

percent. A recent Hamilton Project paper estimates that a $15 per ton CO2 tax would reduce the incomes of the lowest-income earners by 3.4 percent and the highest earners by only 0.8 percent. Thus, I think it's important that government use the revenue generated by a market mechanism to offset the effect of higher energy prices on low-income households, for example by reducing other taxes.

The Role for Technology Investments

Let me briefly mention the second piece of a comprehensive strategy—to increase investment in clean energy technology, which will play a central role in addressing our energy challenges. The most important mechanism to encourage investment in new technology is to price carbon correctly, as just discussed, which creates incentives for private firms to develop less carbon-intensive forms of energy and incentives for individuals to use them.

If we don't price carbon, it may make sense to subsidize specific technologies like hybrid cars or ethanol (though perhaps not corn-based ethanol). But if we do price carbon, then government does not need to subsidize particular technologies or pick winners and losers.

Instead, it should focus on two areas. The first is basic research funding. The most basic reason from the economics literature is that private firms do not capture the full social benefits of their innovations, and so invest too little in R&D.

Second, federal efforts should invest in the sort of blue-sky, long-term research with no immediately evident commercial application. One example of this is geoengineering solutions to deflect sunlight or to drop things into ocean to absorb more carbon. Another might be the idea of Richard Branson and Al Gore to offer a very large prize to anyone who can develop a technology that can remove one billion tons of carbon dioxide from the atmosphere.

In the U.S., at least, this increased government R&D investment need not cost new money. The U.S. could save $9 billion annually be eliminating subsidies that are bad for the environment *and* economically inefficient—everything from cutting tax expenditures for coal, oil and gas to eliminating the subsidy for employer-provided parking. And we could save billions more by eliminating subsidies that would no longer be warranted if we had a price on carbon, such as for ethanol and biodiesel. This money would more than cover an optimal increase

in R&D funding, as recent research suggests once a carbon price is put in place anything more than doubling the current federal energy R&D research budget to $7 billion a year would just crowd out other R&D that is important for the economy.

U.S. Role in International Response to Climate Change

The final necessary piece of any effective climate strategy is to recognize that even if the U.S. did everything I have just described, it would fall well-short of what is needed to combat this global problem. International engagement is thus needed, and I'll let my colleagues speak to that issue.

Conclusion

I was asked to speak a bit about U.S. climate policy and, as you can see, we still have a long way to go. Still, I think it's very promising that the debate has shifted as much as it has to recognize both that *something* needs to be done and that a *price mechanism* is a necessary part of that solution. There is broad consensus among economists and others on this point, and the economic rationale for the superiority of a market mechanism holds true across countries. Whatever the approach though, we need to do much more in the

U.S. to take a leadership role in combating climate change, and I am hopeful that in the near future, we will make more headway in this regard, working together with our friends across the world, such as all of you, to combat this most-global of problems.

Thank you again so much for the opportunity to speak to you today and to learn from you this past week.