S. HRG. 110–523

INTERNATIONAL CLIMATE CHANGE NEGOTIATIONS: RESTORING U.S. LEADERSHIP

HEARING

BEFORE THE

COMMITTEE ON FOREIGN RELATIONS UNITED STATES SENATE

ONE HUNDRED TENTH CONGRESS

FIRST SESSION

NOVEMBER 13, 2007

Printed for the use of the Committee on Foreign Relations

Available via the World Wide Web: http://www.gpoaccess.gov/congress/index.html

U.S. GOVERNMENT PRINTING OFFICE
44–771 PDF WASHINGTON : 2008

For sale by the Superintendent of Documents, U.S. Government Printing Office
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INTERNATIONAL CLIMATE CHANGE NEGOTIATIONS: RESTORING U.S. LEADERSHIP

TUESDAY, NOVEMBER 13, 2007

U.S. SENATE,
COMMITTEE ON FOREIGN RELATIONS,
Washington, DC.

The committee met, pursuant to notice, at 2:34 p.m., in room SD–419, Dirksen Senate Office Building, Hon. John F. Kerry, presiding.

Present: Senators Kerry, Bill Nelson, Menendez, Casey, Lugar, Hagel, Corker, and Murkowski.

OPENING STATEMENT OF HON. JOHN F. KERRY, U.S. SENATOR FROM MASSACHUSETTS

Senator KERRY. This hearing will come to order.

I appreciate, enormously, all of the witnesses for our two panels being here.

This is a topic which some of us have been working on for many years—former Senator Wirth is here, and he will testify. He and I and Al Gore and John Heinz and John Chafee and a group of people were deeply involved in this issue back in the 1980s. In fact, I think Senator Gore and I had the privilege of hosting the first hearings on global climate change in the Commerce Committee back then. And, since then, we, all of us, traveled to Rio for the so-called Earth Summit and the original United Nations Framework Convention on Climate Change. And, subsequently, I attended a number of the COP Conferences—specifically, Buenos Aires and The Hague—and went to Kyoto for those negotiations, which Senator Wirth played such an integral role in with Stu Eizenstat, the Vice President, and others.

So, this is a path well journeyed, so to speak. And what strikes me is as remarkable, in a sense, is that, back in 1992 in Rio, a hundred-and-whatever-it-was, 50-something, 60-something, nations came together and agreed then that we had to do something about it, but agreed that it would be voluntary at that time. And, indeed, there was much to learn about the science, and much to learn about the modeling.

Since then, we have learned a great deal. This topic has earned its way into the G–8 discussions, it's earned its way into the highest level of U.N. discussions. President Bush held a major economies meeting only months ago here. It has seen Al Gore become the recipient of the Nobel Peace Prize. It has seen an enormous awareness grow, on a global basis. Nation after nation after nation, President after President, Prime Minister after Prime Minister, Fi-

nance Minister, Environment Minister, Trade Minister, Economic Ministers—are all in the same place, having made a decision that they buy into the latest conclusion of the IPCC, of the United Nations, that anthropogenic—manmade—causes are the primary—not the exclusive, but the primary cause of the climate impacts that we see, the warming that we see taking place. And there is no question, scientifically, whatsoever, that that warming is taking place.

I have spent a lot of time talking to and meeting with scientists, from Jim Hansen, who is one of our premier scientists on this topic, to Bob Corell, to John Holdren, and others, and to listen to these people whose lives are dedicated to science, who are, by nature, as scientists, conservative, because a scientist is conservative, in that they don't draw conclusions that are speculative, they draw them based on scientific experiment and input, and they are all increasingly alarmed.

The latest report of the United Nations cuts off at 2005. Since 2005, there has been a significant increase of scientific reporting, almost 2 years of it. And, indeed, in Valencia this week, they will be meeting to, sort of, put forward the final summary, if you will, of those reports that will help us all digest where we're heading as we go to the Bali Conference.

I would just quickly comment that each and every one of those reports shows a greater level of alarm by scientists, alarm that is expressed not in their conclusions, but in what Mother Earth is demonstrating to us in what is called "feedback." All of the feedback from Earth itself is occurring at a greater rate and at a higher degree than those scientists had predicted. And, therefore, they are alarmed. Ice is melting faster. The Greenland ice sheet, that was stable in 1990, is now seeing about 100 billion metric tons of melt-off a year. There are astonishing changes in migration patterns. The head of the Audubon recently reported to me that their—gardeners—gardeners from, you know, Nebraska and from Kentucky and from Tennessee and elsewhere—are reporting to them a migration of growth patterns—you know, the crops that grow, the trees, the bushes, the flowers, all those changes that are taking place—a 100-mile swath of migration pattern now evidenced in the United States. Changes in species migration are significant—in South Carolina, there would be no duck hunting today if they didn't have farm ducks. This is one of the great duck-hunting States of our country. Arkansas, population of ducks apparently dropped from 1.23 million down to about 125,000 or so. You can run the list.

Perhaps the most alarming are two reports. One about the increased impact of tropical deforestation, which adds about a quarter of the world's CO_2. A second report by Russian scientists that says that, in Siberia—and we know this in Alaska—the pockets of methane that have been frozen for several hundred thousand years, that are now melting, are releasing, and have the potential of releasing, unbelievable amounts of methane into the atmosphere. Methane, as we know, is 20 to 30 times more potent than CO_2.

And, finally, the CO_2 oceans have been storing CO_2 for as long as they have been there, but most recently in the industrial revolution—they've provided a sink, a storage place, for almost a quarter of the Earth's CO_2. And now we see reports from scientists that—and I was chairman of the Ocean Subcommittee for a number of

years; we used to hear these reports 15 years ago—that there's evidence that that is already happening in the Antarctic and a few other places—that the oceans are at full capacity.

So, we're witnessing dramatic, stunning, unbelievable changes in the atmosphere around us. And, globally, we're going to have a unique opportunity—in a few weeks, at Bali—for the United States to regain a position of global leadership, for the world to come together and do what we were unable to do with Kyoto.

Kyoto, many of us knew, was a flawed agreement at the time that it was drafted. I managed the vote on the floor of the Senate. I was the manager when that 95-to-0 vote took place, which has always been misinterpreted. It was never a rejection of action to address global climate change, as some wanted to interpret, never a rejection of the concept of a multilateral treaty; it was a rejection of the notion that there can be an adequate solution that isn't global, that it could include just industrial countries—given the rapid rate at which the less-developed world is coming online and the Annex B countries, particularly, are coming on line. We all have to be part of the solution, but, as Kyoto recognized and the framework recognized, at different levels, conceivably in different ways. That's the test. That's what we're here to think about.

This treaty expires in 2012. Most European nations—Europe as a whole—is going to be at the 8-percent-below level. Different countries contribute to that in different ways. But we've remained outside it. We didn't ratify it. It isn't a treaty for us. So, the question is, here today, to talk openly about where we go at Bali: What will the position of the United States be? And I will be privileged, together with Senator Boxer on this committee, and who is chair of the Environment and Public Works Committee, to lead a delegation that will go to Bali in order to help contribute the Senate's thinking on these issues. And my hope is that today we can get an outline from both the administration itself, as well as people who have been deeply, deeply involved in this issue for a long period of time, about what we ought to be looking for, what we could hope to achieve there, and how we can advance this cause.

Senator Lugar.

OPENING STATEMENT OF HON. RICHARD G. LUGAR, U.S. SENATOR FROM INDIANA

Senator LUGAR. Well, thank you very much, Mr. Chairman.

I join you in welcoming Secretary Dobriansky and our distinguished witnesses on the second panel.

For too long, the climate-change debate has pitted implacable skeptics against so-called "green idealists," and yet, safeguarding the environment should not be viewed as a zero-sum game, where limited resources and attention compete with programs devoted to more immediate goals. To the contrary, progress on preventing climate change is interlinked with energy security, air quality, technology advancements, rural development, and export opportunities for American business.

I have urged the Bush administration and my colleagues in Congress to return to an international leadership role on the issue of climate change. Along with Senator Biden, I have cosponsored Senate Resolution 30, a resolution that advocates United States par-

ticipation in multilateral forums that attempt to achieve global solutions to the problem of greenhouse gases.

It's critical that the international dialogue on climate change and American participation in those discussions move beyond the disputes over the Kyoto protocols. Even those who are skeptical of prevailing climate-change science should recognize that absenting themselves from climate-change discussions is counterproductive. Many nations and businesses across the globe are moving to respond to climate change in innovative ways. How the United States participates in these efforts will profoundly affect our diplomatic standing, our economic potential, and our national security.

I want to stress the importance of the Senate's unique constitutional authority to give its advice and consent to any treaties negotiated by the executive branch. During the 1980s, President Reagan had the foresight to establish an official Senate Observer Team to monitor arms-control talks and provide advice during the negotiation process. In doing so, he laid the groundwork for strong bipartisan cooperation on these agreements when they came to the Senate. A similarly farsighted approach is needed with regard to international negotiations on climate change.

The United States should recognize that steps to address climate change involve economic opportunities, not just constraints. Thanks to new technology, we can control many greenhouses gases with proactive, progrowth solutions. Such technology represents an enormous opportunity for U.S. exports.

We also need to anticipate the continued growth of financial markets for carbon credits. There is a strong possibility that the United States will join these international markets in some manner before any new climate—change agreements are concluded. We need to start discussions on how to ensure that these markets are transparent and credible.

In that regard, I look forward to hearing from our second panel of distinguished witnesses, including Richard Sandor, chairman and CEO of the Chicago Climate Exchange. I must admit that I've listed the walnut trees on my Indiana farm on the Chicago Climate Exchange. I've tried to highlight for American farmers and foresters the opportunities of participating in the markets for carbon sequestration. The innovative approach of these markets is an important tool in our broader climate-change policy.

I thank Senator Kerry very much for chairing this hearing, and I look forward to the testimony of our witnesses.

Senator KERRY. Senator Lugar, thank you very much for your thoughtful and important contribution to this dialogue.

And I want to just thank Senator Menendez quickly. This topic normally is under the jurisdiction of his subcommittee, but he agreed that this was of sufficient importance to have the full committee hear it, and I want to thank him for his graciousness in understanding that and agreeing to do it this way.

Secretary Dobriansky, we welcome you here. Secretary Dobriansky, as everybody knows, is Secretary for Democracy and Global Affairs, and we look forward to her participation. And Dan Reifsnyder is with her, has briefed some of us up here—myself, I know—and been involved in these discussions and negotiations for a long time. We welcome you. Thank you.

STATEMENT OF HON. PAULA J. DOBRIANSKY, UNDER SECRETARY FOR DEMOCRACY AND GLOBAL AFFAIRS; ACCOMPANIED BY DAN REIFSNYDER, DEPUTY ASSISTANT SECRETARY, BUREAU OF OCEANS ENVIRONMENT SCIENCE, DEPARTMENT OF STATE, WASHINGTON, DC

Ms. DOBRIANSKY. Mr. Chairman, thank you. I've submitted a longer testimony for the record.

Climate change is a serious problem, and humans are contributing to it. We are at a critical moment. Addressing global challenge requires substantial global reductions in greenhouse gas emissions, and we are committed to doing our part.

At this December's climate conference in Bali, we will work with our partners to launch a new phase in climate diplomacy. We seek a Bali roadmap that will advance negotiations under the U.N. Framework Convention on Climate Change and develop a post-2012 framework that effectively addresses climate change and strengthens our energy security. The United States is committed to concluding this effort by 2009.

I recently attended a meeting of key heads of delegation in Bogor, Indonesia, to prepare the way for a successful meeting in Bali. I was very encouraged to hear broad support for a Bali roadmap and for a 2009 end date.

At the Bogor meeting, ministers identified four key elements that a Bali roadmap will need to address: Mitigation, adaptation to the impacts of climate change, finance, and technology. We enter the Bali meeting with an open mind, prepared to consider ideas proposed by our negotiating partners in pursuit of a post-2012 framework that successfully rises to the scale and the scope of this challenge. Our deliberations will be guided by two considerations. A post-2012 framework must be environmentally effective and economically sustainable.

Emissions are global, and the solution, to be effective, will need to be global. We want the world's largest emitters, including the United States, to be part of a global agreement. An approach in which only some are acting is not environmentally effective.

A future framework must be flexible and accommodate a diverse range of national circumstances. A future framework must also be cost effective and economically sustainable. We must develop and bring to market clean energy technologies at a cost that countries can justify to their citizens.

The Major Economies process launched by President Bush in May 2007 is intended to contribute to progress toward a global agreement under the U.N. Framework Convention on Climate Change. Our aim is to find a formula that can work for all major economies and achieve consensus next year on key elements for a post-2012 framework.

The September 27–28 Major Economies Meeting here in Washington marked an excellent start. We brought together 17 economies, representing some 80 percent of the world's economy, energy use, and greenhouse gas emissions. U.N. representatives were also at the table with us. The major economies agreed that we would convene again in the new year informed by our deliberations in Bali.

We believe the Major Economies process will make a positive contribution to efforts under the U.N. Framework Convention by focusing on certain key elements of a future global framework. We can work together to develop a long-term global goal for emissions reductions. We can identify national plans that will put us on the path toward this global goal, with each country designing its own mix of binding, market-based, and voluntary measures. We can identify technology development and deployment strategies for key sectors, such as advanced coal technologies and second-generation biofuels, working with the private sector, civil society, and international partners. We can explore ways to improve our measurement and accounting systems. We can discuss options for financing and eliminating barriers to trade in key energy goods and services. And we could address forestry, adaptation, and technology access.

Let me just highlight these last three issues—forestry, adaptation, and technology access—because they will be critical to our discussions in the U.N. Framework Convention on Climate Change and the major economies.

Avoiding deforestation is a priority for Indonesia and many other developing countries, and it will be a focus of discussions in Bali. The United States is an international leader in promoting forest conservation. For example, under the Tropical Forest Conservation Act, we have concluded, with 12 countries, Debt for Nature Agreements that are generating some $163 million to help conserve up to 20 million hectares of important tropical forests around the world. We are combating illegal logging and the export of illegally harvested forest products in Africa, Asia, and Latin America through the President's Initiative Against Illegal Logging. And through the Congo Basin Forest Partnership, we have contributed some $68 million to better manage 80 million hectares, an area the size of Texas, in the world's second-largest tropical forest.

Adaptation is an increasing priority, both at home and internationally, and we are promoting effective planning as part of broader development strategies. The United States is leading such efforts with Global Earth Observation System of Systems, which gives communities early warning of natural disasters and improves decisionmaking for agriculture, coastal development, and other economic sectors that are affected by climate variability and change.

And to accelerate the uptake of clean energy technologies around the world, President Bush has proposed a new International Clean Technology Fund. Secretary Paulson is working with international partners in developing a new approach for spurring investments in the global energy infrastructure that reduce greenhouse gas emissions.

Another administration initiative that is engaging key economies in dealing with climate change is the Asia Pacific Partnership on Clean Development and Climate. This is a public-private partnership to promote economic growth, enhance energy security, and mitigate greenhouse gas emissions. Under this partnership, countries that account for some 50 percent of the global economy, emissions, and energy use are putting clean technologies into widespread use. Canada just joined China, India, South Korea, Japan, Australia, and the United States in this partnership. Through the APP, American Electric Power, Southern Company, and other lead-

ing U.S. firms have been working, for example, with Chinese electricity producers, to move them toward U.S. levels of efficiency, which reduces emissions and toxic air pollution and fosters new trade relationships. The APP has brought to India state-of-the-art U.S. technologies for mining and preparing coal in ways that reduce sulfur dioxide emissions, cut greenhouse gas emissions, and increase mine safety. And throughout APP countries, we are fostering best practices in the cement, aluminum, and steel sectors that save money, reduce emissions, and increase international investment. Advanced coal technologies are a particular focus within and beyond the APP. The United States has invested more than $2.5 billion to research and develop clean coal, since 2001.

In conclusion, the scale of climate change calls for comprehensive international action for generations to come. We are engaged, serious, pragmatic, and committed to continued leadership, internationally.

Finally, I'd like to introduce Dan Reifsnyder, who is a Deputy Assistant Secretary in the Bureau of Oceans Environment Science at the State Department. He was deputy negotiator of the U.N. Framework Convention on Climate Change in 1989, and has participated in almost every Conference of the Parties. He will be with us in Bali.

Thank you, Mr. Chairman, and I look forward to your questions.

[The prepared statement of Ms. Dobriansky follows:]

PREPARED STATEMENT OF DR. PAULA DOBRIANSKY, UNDER SECRETARY FOR DEMOCRACY AND GLOBAL AFFAIRS, U.S. DEPARTMENT OF STATE, WASHINGTON, DC

Mr. Chairman and members of the committee, thank you for the opportunity to appear before you today.

When President Bush hosted the Major Economies Meeting on Energy Security and Climate Change in September 2007, he stressed that climate change is a real problem, and humans are contributing to it. He also underscored that the United States takes climate change very seriously, for we are both a major economy and a major emitter.

Addressing this global challenge requires substantial global reductions in greenhouse gas emissions. Meeting this long-term challenge requires a long-term commitment by the international community. And we are committed to doing our part.

As a party to the United Nations Framework Convention on Climate Change (UNFCCC), the United States shares with the other 190 Parties to the Convention its ultimate objective of stabilizing greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system in a timeframe that allows ecosystems to adapt, ensures that food production is not threatened, and enables economic development to proceed.

We look forward to the U.N. Climate Conference in Bali, Indonesia, in December, where we will work to advance negotiations. The Bali conference will mark the beginning of an important process toward a new global framework. In developing a new post-2012 framework on climate change, we seek a global approach that is environmentally effective and economically sustainable. This framework should involve a real effort and commitment of major economies in accordance with their national circumstances.

There is broad international consensus that climate change is best addressed as part of an integrated agenda that promotes economic growth, advances energy security, reduces pollution, and eradicates poverty—as well as mitigates greenhouse gas emissions.

The President has put forth a comprehensive climate-change policy. Our robust, flexible approach involves the promotion of international cooperation, near-term policies and measures to slow the growth in greenhouse gas emissions, the advancement of climate change science, and vigorous efforts to accelerate low-carbon and no-carbon technology development and deployment. As Secretary Rice has said, we will need a technological revolution.

The President has requested, and Congress has provided, substantial funding for climate-change science and observations, technology, international assistance, and incentive programs—approximately $37 billion since 2001. The President's fiscal year 2008 budget requests nearly $7.4 billion for climate-related activities.

President Bush has consistently highlighted the importance of international cooperation in developing a global response to the complex and long-term challenge of climate change. On May 31, he called upon the world's major economies, from both the developed and developing world, to work together toward a global goal on long-term greenhouse gas reductions. This initiative recognizes that the major emerging economies must join together in a common effort, and that economic growth, energy security, and climate change must be addressed in an integrated and sustainable way.

The first Major Economies Meeting (MEM) on September 27–28, 2007, in Washington, DC, was attended by the personal representatives of leaders from 17 major economies and the United Nations. In his speech during the MEM, President Bush emphasized, among other things, that these countries would work within the U.N. process to strengthen programs addressing energy efficiency and to advance the global transfer and adoption of clean energy technologies.

Progress toward a global emissions reduction goal will be underpinned by mid-term national targets and programs. In addition, participants will work on sectoral approaches to low carbon power generation, transportation, and land use and steps to disseminate technologies by creating an international clean energy fund and removing trade barriers. The President also proposed strengthening climate-related efforts that benefit all countries, including promoting adaptation to climate change, reversing deforestation, and promoting clean energy technology.

By the end of 2008, the Major Economies process will generate a detailed contribution to a post-2012 framework. Our aim is for the Major Economies process to advance negotiations toward a global agreement under the UNFCCC by 2009. Leaders from all G–8 and APEC countries have embraced the Major Economies process as a constructive input to the global effort.

Under President Bush's leadership, the United States is successfully carrying out a number of international collaborations—including the Asia-Pacific Partnership on Clean Development and Climate (APP), the Carbon Sequestration Leadership Forum (CSLF), the Group on Earth Observations (GEO), the Generation IV International Forum (GIF), the Global Nuclear Energy Partnership (GNEP), the International Partnership for a Hydrogen Economy (IPHE), the Methane to Markets Partnership (M2M)—and our 15 bilateral and regional partnerships which involve 79 nations and the European Union.

Our results at home compare well with those of other industrialized nations. For the years 2001–2005, inclusive, the U.S. population grew by 5 percent and our GDP grew by 12 percent, while greenhouse gas emissions increased by 1.6 percent. Latest estimates show that from 2005–2006, our economy grew 2.9 percent, while energy-related carbon dioxide emissions decreased 1.3 percent.

The Annex to this statement details selected U.S. programs addressing climate change.

As President Bush indicated at the Major Economies Meeting, climate change is one of the great challenges of our time. In taking on this challenge, the United States is engaged, serious, and pragmatic. Leading international efforts to address climate change will continue to be one of our top priorities.

ANNEX

SELECTED INTERNATIONAL AND DOMESTIC COMPONENTS OF THE U.S. APPROACH TO GLOBAL CLIMATE CHANGE

A. Promoting international cooperation

Asia-Pacific Partnership on Clean Development and Climate (APP)[1]*:* The Asia-Pacific Partnership for Clean Development and Climate (APP), launched in January 2006 in Sydney, Australia, by ministers from Australia, China, India, Japan, Republic of Korea, and the United States, is one of our most consequential multilateral initiatives. It is a multi-stakeholder partnership working to generate practical and innovative projects promoting clean development and the mitigation of greenhouse gases. Through engaging private industry as well as government officials, the APP is using public-private partnerships to build local capacity, improve efficiency and reduce greenhouse gas emissions, create new investment opportunities, and remove

[1] See http://www.asiapacificpartnership.org/ and http://www.state.gov/g/oes/climate/app/.

barriers to the introduction of clean energy technologies in the Asia-Pacific region. What makes the approach unique is that APP activities are identified and supported using an innovative "bottom up" approach. Together, APP partner countries account for about half of the world's population, economic output, energy use, and greenhouse gas emissions.

The APP has created eight task forces to achieve the Partnership's goals: (1) Cleaner fossil energy; (2) renewable energy and distributed generation; (3) power generation and transmission; (4) steel; (5) aluminum; (6) cement; (7) coal mining; and (8) buildings and appliances. The Task Forces, with representatives from both the public and private sectors, have each prepared an Action Plan.

At the New Delhi ministerial meeting on October 15, 2007, the original six APP Partners warmly welcomed Canada as the seventh member of the Partnership. Ministers also released a communique[2] which summarizes the accomplishments of the Partnership since its inaugural Ministerial meeting in Sydney. Ministers also recognized the eight Task Force Action Plans and their accompanying 110 projects. Agreement was reached on a Flagship portfolio of 18 projects and activities that best exemplify the achievements of the Partnership.[3] In addition, the Partners endorsed the Asia-Pacific Energy Technology Cooperation Centre. The meeting concluded with an event with industry in which representatives from the private sector discussed opportunities for collaboration with Ministers and high level representatives present.

The President's fiscal year 2008 budget request includes $52 million to support APP.

Major Economies Meeting: On May 31, 2007, the President called upon the world's major economies, both from the developed and developing world, to work together to develop a global goal on long-term greenhouse gas reductions.[4] This international initiative recognizes that the major emerging economies must develop and participate in an effective global strategy, and that economic growth, energy security, and climate change must be addressed in an integrated way. The United States in September hosted the first of a series of meetings with other countries—including rapidly growing economies like India and China—to establish a new framework for the post-2012 world. Progress towards a global emissions reduction goal will be underpinned by midterm national targets and programs that are tailored towards each participant's current and future energy needs, and that will be subject to a robust review process. In addition, participants will work on sectoral approaches to energy intensive industries and concrete steps to promote the development and deployment of clean energy technologies. The President believes that by encouraging and sharing cutting-edge technologies, the major economies will build the capacity to meet realistic reduction goals.

As part of his international initiative, the President also proposed strengthening climate-related initiatives at the U.N. that benefit all countries, including adaptation to climate change, deforestation and technology. Finally, the President's initiative addresses practical action necessary to advance the global development and deployment of clean energy technologies. This could include low-cost capital sources to finance investment in clean energy, mechanisms to share government-developed technology at low cost, or in some cases, no cost at all, and elimination of market barriers.

Carbon Sequestration Leadership Forum (CSLF)[5]*:* CSLF is a U.S.-launched initiative that was established formally at a ministerial meeting held in Washington, DC, in June 2001. The Forum is focused on the development of improved cost-effective technologies for the separation and capture of carbon dioxide (CO_2) for its transport and long-term safe storage. Its purpose is to make these technologies broadly available internationally, to identify and address wider issues relating to carbon capture and storage. CSLF, which includes 21 countries and the European Commission (EC), has endorsed 19 international research projects, 13 of which involve the United States, and approved a technology roadmap to provide future directions for international cooperation.

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[2] See http://www.asiapacificpartnership.org/2ndMinisterial/New%20Delhi%20Communique%20strawman%20%2014%20Oct%2007FINAL.pdf.

[3] See http://www.asiapacificpartnership.org/2ndMinisterial/Flagship%20brochure%20FINAL.pdf.

[4] See http://www.whitehouse.gov/news/releases/2007/05/20070531-9.html.

[5] See http://www.cslforum.org/ and http://www.fe.doe.gov/programs/sequestration/cslf/. CSLF members are the United States, Australia, Brazil, Canada, China, Colombia, Denmark, European Commission (EC), France, Germany, Greece, India, Italy, Japan, Mexico, Netherlands, Norway, Republic of Korea, Russian Federation, Saudi Arabia, South Africa, and the United Kingdom.

Group on Earth Observations (GEO)[6]*:* Of particular importance is the need for a broad global observation system to support measurements of climate and other environmental variables. On July 31, 2003, the United States hosted 33 nations including many developing nations at the inaugural Earth Observation Summit, out of which came a commitment to establish GEO and an intergovernmental, comprehensive, coordinated, and sustained Global Earth Observation System of Systems (GEOSS). While the use and benefits of these observations are extensive, the climate applications of the data collected by the system include the use of the data to create better climate models, to improve our knowledge of the behavior of CO_2 and aerosols in the atmosphere, and to develop strategies for carbon sequestration. The United States was instrumental in drafting a ten-year implementation plan for a GEOSS, which was approved by nearly 60 nations and the EC at the 3rd Earth Observation Summit in Brussels in February 2005. The United States also released its contribution through the Strategic Plan for the U.S. Integrated Earth Observing System in April 2005 to help coordinate a wide range of environmental monitoring platforms, resources, and networks.[7] The 4th GEO Plenary session and Ministerial Summit will be held in Cape Town, South Africa, November 28–30, 2007.

Generation IV International Forum (GIF)[8]*:* GIF, formally established in July 2001, is a multilateral collaboration comprised of 10 countries and EURATOM (the European Atomic Energy Community) to fulfill the objective of the Generation IV Nuclear Energy Systems Initiative. GIF's goal is to develop the fourth generation of advanced, economical, safe, and proliferation-resistant nuclear systems that can be adopted commercially no later than 2030. Six technologies have been selected as the most promising candidates for future designs, some of which could be commercially ready in the 2020 to 2030 timeframe. GIF countries are jointly preparing a collaborative research program to develop and demonstrate the projects.

Global Nuclear Energy Partnership (GNEP)[9]*:* GNEP is a groundbreaking new effort that seeks to develop a worldwide consensus on enabling expanded use of economical, carbon-free nuclear energy to meet growing electricity demand. It has two major goals: (1) To expand carbon-free nuclear energy to meet growing electricity demand worldwide; and (2) to promote nonproliferation objectives through the leasing of nuclear fuel to countries which agree to forgo enrichment and reprocessing. A more fully closed fuel cycle model envisioned by this partnership requires development and deployment of technologies that enable recycling and consumption of long-lived radioactive waste. The GNEP initiative proposes international partnerships and significant cost-sharing to achieve these goals.

On May 21, 2007, U.S. Department of Energy (DOE) and senior energy officials from China, France, Japan, and Russia issued a joint statement in support of GNEP.[10] At the second GNEP Ministerial held September 16, 2007, in Vienna, Austria, U.S. DOE Secretary Bodman and senior international officials from 16 nations agreed to increase international nuclear energy cooperation through the GNEP.[11] China, France, Japan, Russia, and the United States—the original GNEP partners—as well as Australia, Bulgaria, Ghana, Hungary, Jordan, Kazakhstan, Lithuania, Poland, Romania, Slovenia, and Ukraine signed a "Statement of Principles," which addresses the prospects of expanding the peaceful uses of nuclear energy, including enhanced safeguards, international fuel service frameworks, and advanced technologies.[12]

International Partnership for the Hydrogen Economy (IPHE)[13]*:* Recognizing the common interest in hydrogen research that many countries share, the United States called for an international hydrogen partnership in April 2003, and in November 2003, representatives from 16 governments gathered in Washington to launch IPHE. The Partnership's 16 countries and the EC are working together to advance

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[6] GEO has 71 countries and the EC as Members, as well as 46 Participating Organizations (see http://earthobservations.org).

[7] See http://usgeo.gov/docs/EOCStrategic__Plan.pdf.

[8] See http://www.ne.doe.gov/genIV/neGenIV2.html. GIF member countries include the United States, Argentina, Brazil, Canada, France, Japan, Republic of Korea, South Africa, Switzerland, and the United Kingdom, with the OECD-Nuclear Energy Agency and the International Atomic Energy Agency as permanent observers. In July 2006, the GIF voted unanimously to extend offers of membership to China and Russia. These two countries officially signed the GIF Charter in November 2006 at the Policy Group meeting in Paris and have one year to sign the Framework to become full members.

[9] See http://www.gnep.energy.gov/.

[10] See http://www.energy.gov/media/GNEP__Joint__Statement.pdf.

[11] See http://www.gnep.energy.gov/gnepPRs/gnepPR091607a.html.

[12] http://www.gnep.energy.gov/pdfs/gnepSOP__091607.pdf.

[13] See http://www.iphe.net/. IPHE Partner members are the United States, Australia, Brazil, Canada, China, EC, France, Germany, Iceland, India, Italy, Japan, New Zealand, Norway, Republic of Korea, Russian Federation, and the United Kingdom.

research, development, and deployment of hydrogen and fuel-cell technologies, and develop common codes and standards for hydrogen use. The IPHE Steering Committee has officially recognized 23 collaborative projects to advance the Partnership's goals, and through the IPHE, the U.S. has assisted Brazil and China in developing hydrogen roadmaps.

Methane to Markets Partnership[14]*:* In November 2004, the United States and representatives from 13 countries launched the Methane to Markets Partnership, which is led on the U.S. side by EPA, with active participation from the U.S. Department of Agriculture (USDA), U.S. Agency for International Development (USAID), U.S. Trade and Development Agency (TDA), and the State Department. This Partnership, now with 20 member countries and the EC and over 640 public and private sector organizations, focuses on advancing cost-effective, near-term methane recovery and use as a clean energy source to enhance economic growth, promote energy security, improve the environment, and reduce greenhouse gases. The Partnership is targeting four major methane sources: Landfills, underground coal mines, natural gas and oil systems, and agriculture (animal waste management).

The Methane to Markets Partnership Expo was held in Beijing, China, from October 30 to November 1, 2007, to celebrate the third anniversary of the Methane to Markets Partnership.[15] Over 700 participants from 34 countries—representing government, private sector, and nongovernmental organizations—shared expertise and developed strategies to advance cost-effective, near-term projects to reduce methane emissions. The Expo's "International Methane Capture Marketplace" was the first international forum devoted entirely to methane project opportunities and technologies, and showcased 91 potential projects in multiple sectors.

The Partnership has the potential to deliver by 2015 annual reductions in methane emissions of up to 50 MMTCE or recovery of 500 billion cubic feet of natural gas—equivalent to removing 33 million cars from the roadways for one year, planting 55 million acres of trees, or eliminating emissions from fifty 500 megawatt coal-fired power plants; or providing enough energy to heat approximately 7.2 million households for one year. These measurable results, if achieved, could lead to stabilized or even declining levels of global atmospheric concentrations of methane.

Bilateral and Regional Partnerships[16]*:* Since 2001, the United States has established 15 climate partnerships with key countries and regional organizations that, together with the United States, account for almost 80 percent of global greenhouse gas emissions. These partnerships encompass over 400 individual activities, and successful joint projects have been initiated in areas such as climate change research and science, climate observation systems, clean and advanced energy technologies, carbon capture, storage and sequestration, and policy approaches to reducing greenhouse gas emissions.

Clean Energy Initiative[17]*:* At the 2002 World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa, the United States launched a "Clean Energy Initiative," whose mission is to bring together governments, international organizations, industry and civil society in partnerships to alleviate poverty and spur economic growth in the developing world by modernizing energy services. The Initiative consists of four market-oriented, performance-based partnerships:

- *Global Village Energy Partnership (GVEP)*[18] is an international partnership with over 700 public and private sector partners including the World Bank, the U.N. Development Programme, and leading energy companies. The U.S. implementation of GVEP, led by the USAID, is a 10-year initiative that seeks to increase access to modern energy services for those in developing countries in a manner that enhances economic and social development and reduces poverty. Through U.S. Government support for GVEP and other energy access programs, 12.9 million people have received increased access to modern energy services since the 2002 Johannesburg Summit.

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[14] See http://www.epa.gov/methanetomarkets/ and http://www.methanetomarkets.org/. Methane to Markets member governments include the United States, Argentina, Australia, Brazil, Canada, China, Colombia, Ecuador, Germany, India, Italy, Japan, Mexico, Nigeria, Poland, Republic of Korea, Russian Federation, Ukraine, the United Kingdom, and Vietnam. The EC became the 21st Partner in September 2007.

[15] http://yosemite.epa.gov/opa/admpress.nsf/eebfaebc1afd883d85257355005afd19/9574895bfc44bcc852573850047d278!OpenDocument.

[16] Bilateral partners include Australia, Brazil, Canada, China, Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama), European Union, Germany, India, Italy, Japan, Mexico, New Zealand, Republic of Korea, Russian Federation, and South Africa.

[17] See http://www.sdp.gov/sdp/initiative/cei/28304.htm.

[18] See http://www.sdp.gov/sdp/initiative/cei/44949.htm.

- *Partnership for Clean Indoor Air (PCIA)*[19]*:* Poor air quality caused by indoor and outdoor air pollution is related to approximately 1.6 million deaths annually and more than 3 billion people in the developing world face an increased environmental health risk due to breathing elevated levels of indoor smoke from home cooking and heating practices. The PCIA currently has over 140 public and private partners working together to increase the use of affordable, reliable, clean, efficient, and safe home cooking and heating practices to reduce the burden of disease. The partners are contributing their resources and expertise to improve health, livelihood and quality of life by reducing exposure to indoor air pollution, primarily among women and children, from household energy use. Ten U.S.-funded PCIA pilot projects have already resulted in: (1) More than 800,000 households educated about the health impacts of indoor air pollution from household energy use; (2) over 237,000 people with reduced exposure to indoor air pollution from cooking and heating; and (3) in the 58,000 homes in which improved cooking and heating have been adopted, over 440,000 people demonstrated an increased knowledge of indoor air pollution and mitigation solutions.
- *Partnership for Clean Fuels and Vehicles (PCFV)*[20]*:* The PCFV is working with developing countries to reduce vehicular air pollution by promoting the elimination of lead from gasoline, reducing sulfur from fuels, and introducing clean technologies into new and existing vehicle fleets. The U.S. Environmental Protection Agency (EPA) is a founding member and leading supporter of the PCFV, which has over 80 members from governments, industry, and civil society, representing more than 30 countries. Since the 2002 World Summit on Sustainable Development, PCFV has assisted in the elimination of lead in gasoline in the 49 countries of sub-Saharan Africa, providing health benefits for over 733 million people. The Partnership's future targets include the global elimination of lead in gasoline by 2008, and the global reduction of sulfur in fuel to 50 parts per million or below globally.
- *Efficient Energy for Sustainable Development (EESD)*[21]*:* The EESD initiative aims to improve the productivity and efficiency of energy systems in developing countries, while reducing waste and pollution, saving money and improving reliability through energy-efficient and clean processes and technologies and production modernization. With more than 80 organizations committed to furthering the objectives of the EESD, this partnership has focused on project development, public leadership by example, building local commercial infrastructure for self-sustaining financing and developing sustainable integrated energy community systems.

ITER[22]*:* In January 2003, President Bush announced that the United States was joining the negotiations for the construction and operation of the international fusion experiment known as ITER.[23] On November 21, 2006, the representatives of China, EU, the Republic of India, Japan, the Republic of Korea, the Russian Federation and the United States of America signed the ITER Joint Implementation Agreement, which entered into force on October 27, 2007. If successful, this multi-billion-dollar research project, which is to be sited in Cadarache, France, and completed in 2016, would advance progress toward producing clean, renewable, commercially available fusion energy by the middle of the century.

Global Bioenergy Partnership (GBEP)[24]*:* The 2005 G–8 Summit at Gleneagles, Scotland, helped launch the GBEP, an Italian initiative to support wider, cost-effective biomass and biofuels deployment, particularly in developing countries where biomass use is prevalent. The United States is actively supporting GBEP and is leading work on developing common methodologies for measuring the GHG benefits

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[19] See http://www.sdp.gov/sdp/initiative/cei/29808.htm and http://www.pciaonline.org/.

[20] See http://www.unep.org/pcfv/.

[21] See http://www. sdp.gov/sdp/initiative/c17707.htm.

[22] ITER member countries include the United States, China, European Union, Japan, Russian Federation, and the Republic of Korea. (See https://www.iter.org/ and https://www.usiter.org/index.shtml.

[23] See http://www.whitehouse.gov/news/releases/2003/01/20030130-18.html.

[24] See http://www.globalbioenergy.org/. GBEP partners are Canada, China, France, Germany, Italy, Japan, Mexico, Russian Federation, the United Kingdom, and the United States of America, the International Energy Agency, U.N. Food and Agriculture Organization (FAO), U.N. Conference on Trade and Development, U.N. Department of Economic and Social Affairs, U.N. Development Programme, U.N. Environment Programme, U.N. Industrial Development Organization, U.N. Foundation, World Council for Renewable Energy, and the European Biomass Industry Association. The FAO is hosting the GBEP Secretariat in Rome with the support of the Government of Italy.

of biofuels. GBEP partners include ten governments and nine international organizations and the United Nations Foundation.

International Biofuels Forum (IBF): The IBF is a joint project of Brazil, China, India, the United States and the EC, was launched on March 2, 2007, to develop strategies to promote the sustained use and production of biofuels around the globe. The forum has created a mechanism to structure the dialogue among some of the biggest producers and consumers of biofuels to address energy security and global warming issues and to use biofuels as an instrument for development. IBF is working closely with GBEP to create common standards and codes for bioenergy products, which would help facilitate world trade.

Renewable Energy and Energy Efficiency Partnership (REEEP)[25]*:* REEEP seeks to accelerate and expand the global market for renewable energy and energy-efficiency technologies. To date, REEEP has funded over 100 projects in 44 countries that address market barriers to clean energy in the developing world and economies in transition. These projects provide new business models, policy recommendations, risk mitigation instruments, handbooks, and databases for advancing renewable energy and energy efficiency, in addition to delivering measurable greenhouse gas reductions. To further REEEP's agenda, the U.S. has been especially active in developing best practices for financing energy efficiency and renewable energy projects and an open network of affiliated organizations for distributed peer production of models and tools for energy smart community planning and development.

Renewable Energy Policy Network for the 21st century (REN21)[26]*:* REN21 is a global policy network, which connects governments, international institutions and organizations, partnerships and initiatives, and other stakeholders on the political level with those "on the ground," and is aimed at providing a forum for international leadership on renewable energy. Its goal is to allow the rapid expansion of renewable energies in developing and industrial countries by bolstering policy development and decisionmaking on subnational, national, and international levels. To date, REN21 has produced several notable renewable energy analyses, the most noteworthy being its comprehensive "REN21 Global Status Report." The United States serves as one of the 13 national government entities on REN21's Steering Committee.

Washington International Renewable Energy Conference 2008 (WIREC 2008): On May 1, 2007, Secretary of State Condoleezza Rice announced that the State Department will host the WIREC 2008 in March 2008.[27] WIREC 2008, which will held in Washington, DC, March 4–6, 2008, will be the third global ministerial level event on renewable energy and will be a key opportunity for government, industry and civil society leaders to advance the integration of renewable energy and advance shared goals for climate, sustainable development and energy security. The event builds upon outcomes from the 2002 World Summit on Sustainable Development and the Bonn (2004) and Beijing (2005) Renewable Energy Conferences. The timing for WIREC 2008 is optimal, because many countries have established leadership positions in renewable energy technology development, manufacturing and market adoption through innovative policies.

WIREC 2008 will focus on rural development, finance, commercialization/market adoption, research and development, as well as other cross-cutting issues. It includes a ministerial level meeting for governments (federal and local), the private sector and civil society, and a co-located, but separately managed trade show and exhibition. WIREC 2008 will also provide an opportunity to advance renewable energy globally by bringing world leaders together to raise issues, exchange information, share experiences and best practices, and provide a global platform to highlight and promote strategies for significant development and rapid scaleup of renewable energy systems worldwide, including second generation biofuels.

Other examples of our engagement across the globe in advancing climate change science and addressing greenhouse gas emissions include our participation in the Intergovernmental Panel on Climate Change (IPCC), the Global Environment Facility (GEF) and activities under the Tropical Forest Conservation Act.

Intergovernmental Panel on Climate Change (IPCC)[28]*:* The IPCC was established by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) in 1988 to assess scientific, technical and socio-economic information relevant for the understanding of climate change, its potential impacts

[25] See http://www.reeep.org/.
[26] See http://www.ren2l.net/.
[27] See http://www.state.gov/r/pa/prs/ps/2007/may/84115.htm.
[28] See http://www.ipcc.ch/.

and options for adaptation and mitigation. It is open to all members of the United Nations and of WMO.

We are extremely pleased that the IPCC shares this year's Nobel Peace Prize. The United States has played an active role in the IPCC since its establishment and has provided more of its funding than any other nation. Dr. Susan Solomon, a senior scientist at the National Oceanic and Atmospheric Administration's Earth System Research Laboratory in Boulder, Colorado, serves as co-chair of the IPCC Working Group I, which assesses the scientific basis of climate change. The United States hosts the Working Group's Technical Support Unit and hundreds of U.S. scientists have participated in the preparation of the IPCC's Fourth Assessment Report, which is due to be completed next week in Valencia, Spain.

Global Environment Facility (GEF)[29]*:* U.S. participation in the GEF, the financial mechanism under the UNFCCC, is another example of our engagement across the globe of addressing the threat of poverty and greenhouse gas emissions. Launched in 1991, the GEF provides funding (largely grants) for projects that provide global environmental benefits and support sustainable development. Since its inception, it has approved over $6.8 billion in grants, leveraging over $20 billion in pledged cofinancing to support more than 1,600 projects in over 160 countries, with about 33 percent of cumulative allocations supporting the reduction or avoidance of greenhouse gas emissions. For fiscal year 2008, the administration is requesting $80.0 million for the second of four payments toward a total U.S. contribution of $320 million pledged during the fourth replenishment (GEF–4) and $26.8 million to clear a portion of outstanding U.S. arrears.

Tropical Forest Conservation Act (TFCA)[30]*:* Many of our international activities also help to promote the biological sequestration of CO_2, an important tool for addressing climate change that can have benefits both for conservation and climate change. The TFCA authorizes debt relief for low- and middle-income countries with tropical forests to support conservation of endangered forests. Since 2000, the United States has concluded 13 TFCA agreements with 12 countries that will generate more than $163 million to protect tropical forests during the next 10 to 25 years. Under the TFCA debt swap mechanism, a unique public/private partnership has evolved in which environmental NGOs such as The Nature Conservancy, World Wildlife Fund, and Conservation International have provided additional funds totaling approximately $12.1 million for debt reduction, increasing the size of individual agreements, and contributing additional expertise in the management of resulting programs. Seven of the 12 TFCA agreements so far provide for debt swaps. In fiscal year 2008, the administration has requested a total of $20 million for TFCA.

B. Near-Term Polices and Measures to Slow the Growth of Greenhouse Gas Emissions

In February 2002, President Bush set an ambitious national goal to reduce the greenhouse gas intensity—that is, emissions per unit of economic output—of the U.S. economy by 18 percent by 2012, a goal we are on target to meet. When announced, this commitment was estimated to achieve a reduction of 100 million additional metric tons carbon equivalent (MMTCE) emissions in 2012, with more than 500 MMTCE emissions in cumulative savings over the decade. To meet the President's goal, the administration is now implementing numerous programs—including voluntary partnerships, consumer information campaigns, incentives, and mandatory regulation—including the following:

Climate VISION (Voluntary Innovative Sector Initiatives: Opportunities Now)[31]*:* In February 2003, President Bush announced that 12 major industrial sectors and The Business Roundtable had committed to work with four of his Cabinet agencies (the Departments of Energy, Transportation, and Agriculture and the Environmental Protection Agency) to contribute to meeting his 18-percent intensity reduction goal by improving the energy efficiency or greenhouse gas emissions intensity of its sector. Today, business and trade associations representing 14 energy-intensive industry sectors that account for approximately 40 to 45 percent of total U.S.

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[29] U.S. Department of Treasury, Treasury International Programs, Justification for Appropriations, FY 2008 Budget Request, pp. 43–44, and 65 (see http://www.treas.gov/offices/international-affairs/intl/fy2008/fy2008-budget.pdf).

[30] U.S. Department of Treasury, Treasury International Programs, Justification for Appropriations, FY 2008 Budget Request, pp. 1, 23, 27, and 68 (see http://www.treas.gov/offices/international-affairs/intl/fy2008/fy2008-budget.pdf). TFCA agreements have been concluded with Bangladesh, Belize, Botswana, Colombia, Costa Rica, El Salvador, Jamaica, Panama (two agreements), Paraguay, Peru and the Philippines. On July 3, 2007, in response to the Indonesian Government's request, the United States Government announced that Indonesia is also eligible to participate.

[31] See http://www.climatevision.gov/.

greenhouse gas emissions have issued letters of intent to meet specific targets. Participating sectors include: Aluminum, automotive manufacturers, cement, chemical manufacturing, electric power, forest products, iron and steel, lime, magnesium, minerals, mining, oil and gas, railroads, and semiconductors. Climate VISION partners have issued letters of intent to meet specific targets that in 2012 alone could avoid an estimated 90 million metric tons of carbon dioxide equivalent.

Climate Leaders[32]*:* Announced in February 2002, Climate Leaders is an EPA partnership encouraging individual companies to develop long-term, comprehensive climate change strategies. Under this program, partners set corporate-wide greenhouse gas reduction goals and inventory their emissions to measure progress. Climate Leaders has grown to include 147 partners whose revenues add up to almost 10 percent of the United States gross domestic product and whose emissions represent more than 8 percent of total U.S. greenhouse gas emissions. EPA estimates that GHG reductions by Climate Leaders Partners will prevent more than 11 MMCTE per year—equivalent to the annual emissions of more than 7 million cars.

SmartWay Transport Partnership[33]*:* Launched in February 2004, the SmartWay Transport Partnership is a public-private partnership that aims to reduce greenhouse gas emissions, fuel consumption, and criteria pollutants from ground freight transportation operations. Over 600 companies, including some of the nation's largest shippers and carriers, have joined SmartWay. The efforts of these companies, which include the use of fuel efficient technologies and anti-idling devices, improved aerodynamics, and the next generation single-wide tires, will reduce greenhouse gas emissions and fuel consumption. Additionally, there are over 80 diesel truck and locomotive engine idling reduction projects being implemented around the country.

SmartWay is broadening its reach to include other modes of freight transportation throughout the global supply chain, such as ocean shipping and air cargo. EPA estimates that by 2012, the companies that participate in the Partnership will cut CO_2 emissions by up to 66 million metric tons (18.0 MMTCE) per year, and nitrogen oxide emissions by up to 200,000 tons per year. It will save about $9 billion in fuel costs and as much as 150 million barrels of oil per year—enough oil to heat 17 million houses for one year.

ENERGY STAR[34]*:* Recognizing the importance of energy efficiency, EPA established the voluntary ENERGY STAR® program in 1992, and has partnered with DOE since 1996 to accelerate the adoption cost-effective, energy-efficient products and practices in the residential, commercial, and industrial sectors. Since the inception of the program, more than 2 billion ENERGY STAR qualified products across more than 50 categories have been purchased, more than 30,000 commercial buildings have been benchmarked for energy usage, close to 725,000 new homes have been constructed to ENERGY STAR specifications, more than 28,000 existing homes have been retrofitted, and hundreds of industrial partners have lowered their energy use using ENERGY STAR tools.

EPA has recently revised the specifications for many product categories including computers, computer monitors, and imaging equipment; has added new products to the ENERGY STAR family including commercial icemakers, commercial dishwashers, external power supplies and battery chargers; and is in the process of updating the requirements for televisions. In addition, DOE recently updated the qualification requirements for ENERGY STAR residential clothes washers, dishwashers and refrigerators. EPA has also extended its standardized measurement system for energy use in buildings and facilities to include about 75 percent of the commercial square footage in the United States and about 6 industrial sectors. In 2006 alone, Americans, with the help of ENERGY STAR, prevented 37 million metric tons of greenhouse gas emissions roughly equivalent to the annual emissions of 25 million vehicles and saved about $14 billion on their utility bills.

Green Power Partnership[35]*:* Introduced in 2001 as part of the President's National Energy Policy, the EPA's Green Power Partnership is designed to increase the adoption of clean energy supply technologies across the United States. The Partnership assists organizations in demonstrating environmental leadership by choosing electricity products generated from renewable energy sources. It now has more than 750 partners committed to purchasing more than 10 billion kilowatt-hours of green power by the end of 2007, which would be enough electricity to power more than 600,000 average American homes annually. Achieving this goal will avoid the equivalent CO_2 emissions associated with more than 1.1 million passenger cars each year.

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[32] See http://www.epa.gov/climateleaders/.
[33] See http://www.epa.gov/otaq/smartway/index.htm.
[34] See http://www.energystar.gov/.
[35] See http://www.epa.gov/greenpower/.

Combined Heat and Power (CHP) Partnership[36]*:* Launched in 2001, EPA's Combined Heat and Power Partnership provides technical assistance to promote CHP projects along each step of the project development cycle in order to make investments in CHP more attractive. EPA also educates industry about the benefits of CHP, provides networking opportunities, and works with state governments to design air emissions standards and interconnection requirements that recognize the benefits of clean CHP. The Partnership now includes over 200 partners and through 2006 had assisted more than 250 projects representing 3,568 megawatts of new CHP capacity in a variety of sectors, including university campuses, heavy industry, and the hospitality industry, among others. On an annual basis, these projects will prevent the emissions of approximately 2.67 million metric tons CO_2 equivalent. This is equivalent to the annual emissions of more than 1.7 million cars, or the sequestration from more than 2.6 million acres of forest.

EPA State Clean Energy-Environment Partnership[37]*:* In 2005, EPA launched the State Clean Energy-Environment Partnership Program, designed to help states adopt a variety of clean energy policies and deploy clean energy programs, including both energy efficiency and renewable energy initiatives. Through the State Clean Energy-Environment Partnership program, states use comprehensive guidance on successful, cost-effective policies and initiatives; measurement and evaluation tools for co-benefits of the policies; and peer exchange opportunities to explore and advance new policies. The partnership is working with 15 states which represent about 50 percent of the U.S. population and energy consumption and more than half of all U.S. greenhouse gas emissions.

EPA Domestic Methane Programs[38]*:* The EPA works in collaboration with the private sector and state and local governments to implement several voluntary programs that promote profitable opportunities for reducing emissions of methane, a potent greenhouse gas and clean energy source, from landfills, coal mines, oil and gas systems, and agricultural operations. EPA's methane programs, including the Landfill Methane Outreach Program, Coalbed Methane Outreach Program, Natural Gas STAR, and AgSTAR, are designed to overcome a wide range of informational, technical, and institutional barriers to reducing emissions, while creating profitable methane recovery and use opportunities. The collective results of EPA's methane programs have been substantial. U.S methane emissions in 2005 were 11.5 percent below 1990 levels, in spite of economic growth of more than 55 percent over that time period. EPA expects that these programs will maintain emissions below 1990 levels in the future due to expanded industry participation and the continuing commitment of the participating companies to identify and implement cost-effective technologies and practices.

EPA High Global Warming Potential Gas Partnership[39]*:* A set of voluntary partnerships between EPA and industry is substantially reducing U.S. emissions of high global warming potential (high GWP) gases—including perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and sulfur hexafluoride (SF_6). The high GWP partnership programs involve several industries, including HCFC–22 producers, primary aluminum smelters, semiconductor manufacturers, electric power companies, magnesium smelters and die-casters, and mobile air conditioning. These industries are reducing greenhouse gas emissions by developing and implementing cost-effective improvements to their industrial processes. EPA High-GWP Partnership Goals include:

- PFC Reduction/Climate Partnership for the Semiconductor Industry—Reduce PFCs 10 percent below 1995 baseline by year-end 2010.
- Voluntary Aluminum Industrial Partnership—A direct carbon intensity (TCE/ton) reduction of 53 percent from 1990 levels by 2010.
- SF_6 Emissions Reduction Partnership for the Magnesium Industry—Eliminate SF_6 emissions by the end of 2010.
- Mobile Air Conditioning Partnership—Reduce HFCs 50 percent and improve fuel-efficiency by 30 percent.

To date, these voluntary programs have achieved significant emission reductions and industry partners are expected to maintain emissions below 1990 levels beyond the year 2010 despite sizable expansion in many of these industries that would ordinarily be accompanied by higher emission levels.

Targeted Incentives for Greenhouse Gas Sequestration: The USDA provides targeted incentives through its conservation programs to encourage wider use of land

[36] See http://www.epa.gov/chp/.
[37] See www.epa.gov/cleanenergy/stateandlocal/.
[38] See http://www. epa.gov/methane/voluntary.html.
[39] See http://www.epa.gov/highgwp/.

management and production practices that sequester carbon and reduce greenhouse gas emissions. USDA also provides financial and technical assistance to help farmers install renewable energy systems and make improvements in energy efficiency that help reduce greenhouse gas emissions. In 2007, USDA's Farm Bill reauthorization proposals would provide approximately $4.4 billion in conservation activities on agricultural lands, and this level of funding represents an increase of about $1.6 billion from 2002.[40]

Through the Conservation Reserve Program (CRP),[41] USDA encourages farmers to remove environmentally sensitive lands from production, and also encourages installing vegetative covers that sequester carbon. In addition, CRP gives landowners the right to sell carbon credits generated from lands enrolled in the program; current enrollment is 36.8 million acres. In 2006, carbon sequestration on CRP lands was estimated at 50.6 million metric tons CO_2. Additionally, reductions in CO_2 and nitrous oxide (N_2O) emissions associated with reduced field operations and less use of nitrogen fertilizers were estimated at 9.0 million metric tons carbon dioxide equivalent.

The Conservation Security Program (CSP)[42] promotes the conservation and improvement of soil, water, air, energy, plant and animal life on Tribal and private working agricultural lands. CSP has emerged as a significant contributor within the area of carbon management through enhancement activities that promote carbon sequestration. Since its inception in 2004, over 22.4 million collective acres have been engaged in soil management activities to improve carbon levels in soils.

Finally, USDA provides Conservation Innovation Grants (CIG)[43] to fund the application and demonstration of innovative technologies and approaches to conservation issues. Many of the awards made through the program have greenhouse gas benefits. For example, farm-level wind and solar power projects reduce CO_2 emissions, and new technologies for livestock manure management and fertilizer application reduce methane and N_2O emissions.

Improved Corporate Average Fuel Economy (CAFE) Standards: On April 1, 2003, the Bush administration finalized regulations requiring an increase in the fuel economy of light trucks for Model Years 2005 to 2007, the first such increase since 1996. The increase from 20.7 miles per gallon to 22.2 miles per gallon by 2007 more than doubles the increase in the standard that occurred between Model Years 1986 and 1996. The new increased fuel economy standards are expected to save approximately 3.5 billion gallons of gasoline over the lifetime of these trucks, with the corresponding avoidance of more than 30 million metric tons of CO_2 equivalent (8.2 MMTCE). The administration also promulgated a new round of standards in March, 2006. The new standards cover model years 2008–2011 for light trucks and raise fuel economy to 24 miles per gallon for model year 2011. The rule is expected to save 10.7 billion gallons of gasoline over the lifetime of these vehicles, thereby reducing GHG emissions by 73 million metric tons of CO_2 equivalent (19.9 MMTCE).

Energy Policy Act of 2005 Tax Incentives to Reduce Greenhouse Gas Emissions: The Energy Policy Act of 2005 includes over $14.5 billion in tax incentives from 2005 to 2015. Many of these tax incentives and credits will have significant greenhouse gas reduction benefits and are designed to spur investments in clean energy infrastructure, enhance domestic energy security, and promote deployment of conservation and energy efficiency technologies, renewable energy and alternative motor vehicles. The Act also provides authority to DOE to issue loan guarantees for a wide range of advanced technologies that avoid, reduce, or sequester greenhouse gas emissions. Further, it provides standby support coverage to indemnify against certain regulatory and litigation delays for the first six new nuclear plants. In addition, the Act establishes 16 new appliance efficiency mandates and a 7.5 billion gallon renewable fuel requirement by 2012.

Voluntary Greenhouse Gas Emission Registry (1605(b))[44]: The Voluntary Reporting of Greenhouse Gases Program, authorized under Section 1605(b) of the Energy Policy Act of 1992, provides a means for utilities, industries, and other entities to establish a public record of their greenhouse gas emissions and the results of voluntary measures to reduce, avoid, or sequester greenhouse gas emissions. For the 2005 reporting year, 221 U.S. companies and other organizations reported that they

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[40] See Office of Management and Budget, "Fiscal Year 2008 Report to Congress on Federal Climate Change Expenditures," May 2007, p. 25 at http://www.whitehouse.gov/omb/legislative/fy08__climate__change.pdf.

[41] See http://www.nrcs.usda.gov/programs/crp/.

[42] See http://www.nres.usda.gov/programs/csp/.

[43] See http://www.nres.usda.gov/programs/cig/.

[44] See http://www.eia.doe.gov/oiaf/1605/frntvrgg.html and http://www.pi.energy.gov/enhancing GHGregistry/index.html.

had undertaken 2,379 projects and reduced or sequestered 294 million metric tons CO_2 equivalent (80.2 MMTCE) of direct reductions, 67 million metric tons CO_2 equivalent (18.3 MMTCE) of indirect reductions, 8 million metric tons CO_2 equivalent (2.2 MMTCE) of reductions from carbon sequestration, and 13 million metric tons CO_2 equivalent (3.5 MMTCE) of unspecified reductions. In April 2006, new guidelines were issued for the program. The new guidelines, which went into effect in 2007 for the 2006 reporting year, will strengthen the program by encouraging comprehensive, entity-wide reporting of emissions and emission reductions, including sequestration, and by increasing the measurement accuracy, reliability, and verifiability of reports.

American Competitiveness Initiative (ACI)[45]*:* President Bush announced the American Competitiveness Initiative (ACI) in his 2006 State of the Union Address.[46] Its goals are to increase federal investments in research and development, strengthen education, and encourage entrepreneurship. A centerpiece of the ACI is the commitment to doubling the investment in key Federal agencies that support basic research programs in the physical sciences and engineering over the next 10 years. As part of the ACI, the fiscal year 2008 Budget does include $4.4 billion, a 7-percent increase over last year's Budget, for the Department of Energy's (DOE's) Office of Science. The Initiative overall commits $50 billion to increase funding for research and $86 billion for research and development tax incentives, some of which will be directed toward investments in clean energy technology research including solar, bioenergy, wind, hydropower, and hydrogen and fuel cell technology. The ACI will enhance cutting-edge basic research, helping to advance U.S. competitiveness by inspiring a new generation of American innovation through world-leading initiatives in high end computation; bio-energy research centers; fourth generation light sources; and nanotechnology.

Twenty in Ten Initiative[47]*:* President Bush announced his Twenty in Ten Initiative in his 2007 State of the Union Address. The goal is to reduce the Nation's gasoline consumption by 20 percent in 10 years by: (1) Increasing the supply of renewable and other alternative fuels by setting a mandatory fuels standard to require the equivalent of 35 billion gallons of renewable and other alternative fuels in 2017, nearly five times the 2012 Renewable Fuels Standard mandate established by the Energy Policy Act of 2005, to displace 15 percent of projected annual gasoline use in 2017; and (2) reforming and modernizing CAFE standards for cars, and extending the light truck rule to reduce projected annual gasoline use by up to 8.5 billion gallons in 2017, a further 5-percent reduction in gasoline use. As a result of the recent Supreme Court decision in *Massachusetts* v. *EPA*, on May 14, 2007, the President directed EPA and the Departments of Transportation, Energy, and Agriculture to take the first steps toward regulations using the 20-in-10 plan as a starting point and to complete this regulatory process by the end of 2008.[48]

President's Budget[49]*:* As noted earlier, from fiscal year 2001 to the end of fiscal year 2007, the U.S. Government will have devoted nearly $37 billion to climate science and observations, technology, international assistance, and incentive programs. President Bush's fiscal year 2008 budget calls for nearly $7.4 billion for climate-related activities, includes $3.9 billion for the Climate Change Technology Program, over $1.8 billion for the Climate Change Science Program, $212 million for climate change-related international assistance programs, and nearly $1.4 billion for energy tax provisions that may reduce greenhouse gas emissions.

We expect these efforts will contribute to meeting the President's 10-year goal to reduce the Nation's greenhouse gas intensity by 18 percent, which represents an average annual rate of improvement of about 1.96 percent. According to EPA data reported to the UNFCCC Secretariat, U.S. greenhouse gas intensity declined by 1.9 percent in 2003, by 2.4 percent in 2004, and by 2.4 percent in 2005. Put another way, from 2004 to 2005, the U.S. economy increased by 3.2 percent while greenhouse gas emissions increased by only 0.8 percent. Further, a May 21, 2007, preliminary "flash estimate" by the Energy Information Administration of energy-related CO_2 emissions—which account for more than four-fifths of total greenhouse gas emissions—shows an absolute drop in these emissions of 1.3 percent and an improvement in CO_2 emissions intensity of 4.5 percent in 2006.[50] Although we are only a few years into the effort, we are on track to meet the President's goal.

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[45] See http://www.whitehouse.gov/stateoftheunion/2006/aci/ and http://www.ostp.gov/html/budget/2008/ACIUpdateStatus.pdf.
[46] See http://www.whitehouse.gov/stateoftheunion/2006/.
[47] See http://www.whitehouse.gov/stateoftheunion/2007/initiatives/energy.html.
[48] See http://www.whitehouse.gov/news/releases/2007/05/20070514-2.html.
[49] See http://www.whitehouse.gov/omb/legislative/fy08__climate__change.pdf.
[50] See http://www.eia.doe.gov/neic/press/press284.html.

Progress in the U.S. compares favorably with progress being made by other countries. "Greenhouse Gas Emission [GHG] Trends for Developed Country Parties to the U.N. Framework Convention on Climate Change for the Years 2001–2005, Inclusive" (Attachment 2) and "Carbon Dioxide [CO_2] Emission Trends for Developed Country Parties to the U.N. Framework Convention on Climate Change for the Years 2001–2005, Inclusive" (Attachment 3) show how GHG and CO_2 emission trends in the U.S. compare to other industrialized countries based on national data reported to the UNFCCC Secretariat. These data, which include countries that have obligations under the Kyoto Protocol, indicate that for the years 2001–2005, inclusive, the major developed economies of the world are at about the same place in terms of actual greenhouse gas emissions. In some countries, emissions are increasing slightly, in others they are decreasing slightly. No country is yet able to decrease its emissions massively. Note that the U.S. has seen its actual greenhouse gas emissions increase by 1.6 percent—slightly more than that for the EU. In contrast, U.S. CO_2 emissions over the same period increased by 2.5 percent—less than the increase for the EU.

C. Advancing Climate Change Science

The President established the U.S. Climate Change Science Program (CCSP)[51] in 2002 as part of a new ministerial-level management structure to oversee public investments in climate change science and technology. The CCSP incorporates the U.S. Global Change Research Program, established by the Global Change Research Act of 1990, and the Climate Change Research Initiative, established by the President in 2001. The Program coordinates and integrates scientific research on global change and climate change sponsored by 13 participating departments and agencies of the U.S. Government. It is responsible for facilitating the development of a strategic approach to federally supported climate research, integrated across the participating agencies. The President's budget requests $1.836 billion for CCSP in fiscal year 2008.

Since CCSP was created in 2002, the program has successfully integrated a wide range of the research and climate science priorities of the 13 CCSP agencies. CCSP has taken on some of the most challenging questions in climate science and is developing products to convey the most advanced state of knowledge to be used by federal, state and local decisionmakers, resource managers, the science community, the media, and the general public.

Twenty-one Synthesis and Assessment Products are identified in the Strategic Plan to be produced through 2008. The first of these, "Temperature Trends in the Lower Atmosphere: Steps for Understanding and Reconciling Differences," was released in April of 2006 and answers a set of key questions related to ongoing observations of the Earth's temperature. This report was an important addition to the IPCC Working Group I Fourth Assessment Report. This year, two more reports have been released. In July, the program released "Scenarios of Greenhouse Gas Emissions and Atmospheric Concentrations and Review of Integrated Scenario Development and Application," which in part used computer-based models to assess the economic and technological impacts of limiting greenhouse gas emissions. In October, a report was released that summarized our current understanding regarding the effects of climate change on energy production and use in the United States. The report, "Effects of Climate Change on Energy Production and Use in the United States," focused on three questions:

1. How might climate change affect energy consumption;
2. How might climate change affect energy production and supply; and
3. How might climate change have other effects that indirectly shape energy production and consumption?

The reports, overall, are designed to address a full range of science questions and evaluate options for responses that are of the greatest relevance to decision and policymakers and planners. The products are intended to provide the best possible state of science information, developed by a diverse group of climate experts, for the decision community.

D. Accelerating Climate Change Technology Development and Deployment

While acting to slow the pace of greenhouse gas emissions intensity in the near term, the administration is laying a strong technological foundation to develop realistic mitigation options to meet energy security, economic development, and climate change objectives.

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[51] See http://www.climatescience.gov.

The Bush administration is moving ahead on advanced technology options that have the potential to substantially reduce, avoid, or sequester future greenhouse gas emissions. Over 80 percent of current global anthropogenic greenhouse gas emissions are energy related, and although projections vary considerably, a tripling of global energy demand by 2100 is not unimaginable.[52] Therefore, to provide the energy necessary for continued economic growth while we reduce greenhouse gas emissions, we will have to develop and deploy cost-effective technologies that alter the way we produce and use energy.

The United States is leading the development of many advanced technology options that have the potential to reduce, avoid, or sequester greenhouse gas emissions. The Climate Change Technology Program (CCTP)[53] was created in 2002, and subsequently authorized in the Energy Policy Act of 2005, to coordinate and prioritize the Federal Government's annual investment in climate-related technology—a proposed $3.9 billion in Fiscal Year 2008—and to further the President's National Climate Change Technology Initiative (NCCTI). Ten Federal agencies support a broad portfolio of activities within this framework.

Basic guidance for the program is provided through CCTP's Strategic Plan, released in September 2006. CCTP's strategic vision has six complementary goals: (1) Reducing emissions from energy use and infrastructure; (2) reducing emissions from energy supply; (3) capturing and sequestering carbon dioxide; (4) reducing emissions of other greenhouse gases; (5) measuring and monitoring emissions; and (6) bolstering the contributions of basic science.

CCTP's principal aim is to accelerate the development and reduce the cost of new and advanced technologies. It provides strategic direction for the climate-related elements of the overall Federal technology portfolio. CCTP also is assessing different technology options and their potential contributions to reducing greenhouse gas emissions over the short, mid, and long term. CCTP's boasts a diverse R&D portfolio that covers a wide range of technology options in energy efficiency, renewable energy, nuclear power, and clean coal, and non-CO_2 gases.

Many CCTP activities build on existing work, but the Bush administration also has expanded and realigned some activities and launched new initiatives in key technology areas to support the CCTP's goals. The President's NCCTI, for example, includes 12 discrete R&D activities that, if successful, could advance technologies to reduce greenhouse gas emissions on a large scale.

Advanced Energy Initiative (AEI)[54]*:* In his 2006 State of the Union Address,[55] President Bush announced plans for the Advanced Energy Initiative (AEI), which will help reduce America's greenhouse gas emissions, pollution, and dependence on foreign sources of energy by accelerating advanced energy technologies. Examples of AEI investment include: The Solar America Initiative, which aims to make solar energy cost-competitive with conventional forms of electricity by 2015; the Biofuels Initiative, which aims to make cellulosic ethanol cost competitive with gasoline by 2012; the Hydrogen Fuel Initiative, which aims to develop the technology needed for commercially viable hydrogen-powered fuel cells; the Plug-in Hybrid Electric Vehicle (PHEV) research, which aims to develop advanced battery technologies that allow PHEVs to have a 40-mile range operating solely on battery charge; the FutureGen near-zero-emissions coal-fired power plant; and the Nuclear Power 2010 program. By investing in these and other advanced energy technologies, AEI will allow us to alter the way we power our buildings and automobiles within 20 years. The President's budget for fiscal year 2008 includes $2.7 billion in the Department of Energy for the AEI, an increase of 22 percent above the 2007 enacted level.

Energy Efficiency and Renewable Energy[56]*:* Energy efficiency is the single largest investment area under CCTP and it provides tremendous short-term potential to reduce energy use and greenhouse gas emissions. Raising the efficiency level of home appliances and commercial equipment is a high priority. Efficiency standards for products that are subject to regulation are being developed at a pace substantially greater than at any time in the history of regulating these products. In addition, Zero Energy Homes and Buildings have been proven technically achievable, but at significant added cost. The Department of Energy believes that the required technical advances to enable most of the Nation's new homes to be constructed as net zero homes can be achieved in less than a decade via an aggressive private/public

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[52] See "U.S. Climate Change Technology Program Strategic Plan," September 2006, p. 2 at http://www.climatetechnology.gov/stratplan/final/CCTP-StratPlan-Sep-2006.pdf.

[53] See http://www.climatetechnology.gov/.

[54] See http://www.whitehouse.gov/stateoftheunion/2006/energy/energy__booklet.pdf.

[55] See http://www.whitehouse.gov/stateoftheunion/2006/.

[56] See http://www.eere.energy.gov/.

partnership. For commercial buildings, adequate technical capability can be available by 2020.

Renewable energy includes a range of different technologies that can play an important role in reducing greenhouse gas emissions. The United States invests significant resources in wind, solar, geothermal, and biomass, industrial and buildings efficiency and alternative transportation technologies. Many of these technologies have made considerable progress in price competitiveness, but there remain opportunities to reduce manufacturing, operating, and maintenance costs of many of these technologies as well as to reduce barriers to market penetration.

Hydrogen[57]*:* President Bush announced his Hydrogen Fuel Initiative in his 2003 State of the Union Address.[58] The goal is to work closely with the private sector to accelerate our transition to a hydrogen economy, on both the technology of hydrogen fuel cells and a fueling infrastructure. The President's Hydrogen Fuel Initiative and the FreedomCAR Partnership[59] which was launched in 2002 will provide $1.7 billion through 2008 to develop hydrogen-powered fuel cells, hydrogen production and infrastructure technologies, and advanced automotive technologies, with the goal of commercializing fuel-cell vehicles by 2020.

Carbon Sequestration: Carbon capture and sequestration is a central element of CCTP's strategy because for the foreseeable future, fossil fuels will continue to be the world's most reliable and lowest cost form of energy. A realistic approach is to find ways to capture and store the CO_2 produced when these fuels are used at centralized power generation and industrial applications. DOE's core Carbon Sequestration Program[60] emphasizes technologies that capture CO_2 from large point sources and store it in geologic formations. In 2003, DOE launched a nationwide network of seven Regional Carbon Sequestration Partnerships,[61] involving State agencies, universities, and the private sector, to determine the best approaches for sequestration in each geographic region represented and to examine regulatory and infrastructure needs. Today the partnerships include more than 400 organizations in 41 U.S. states, three Indian nations, and four Canadian provinces. The Regional Partnerships have progressed to a validation phase in which they are conducting 25 field tests involving the injection of carbon dioxide into underground formations where it will be stored and monitored. The Regional Partnerships are also planning several large-scale field tests throughout the United States to validate the efficacy of long-term storage of CO_2 in a variety of geologic storage sites.

Additionally, EPA leads U.S. Government efforts to evaluate any risks to human health and the environment associated with underground injection and storage. EPA is responsible for developing regulatory guidance and a risk-management framework under Safe Drinking Water Act. The Agency also designs inventory and accounting methodologies for carbon capture and sequestration.

Coal-Fired, Near-Zero-Emissions Power Generation: The United States has vast reserves of coal, and about half of its electricity is generated from this fuel. Advanced coal-based power and fuels, therefore, is an area of special interest from both an energy security and climate change perspective. The Coal Research Initiative (CRI) consists of research, development, and demonstration of coal-related technologies that will improve coal's competitiveness in future energy supply markets. The Clean Coal Power Initiative (CCPI),[62] within the CRI, is a cost-shared program between the government and industry to demonstrate emerging technologies in coal-based power generation and to accelerate their commercialization. A major priority under the CRI is the FutureGen project,[63] a 10-year, $1 billion international government-industry cost-shared effort to design, build, and operate the world's first near-zero atmospheric emissions coal-fired power plant. This project, which now includes India and the Republic of Korea as partners (with other countries expected to join shortly), will incorporate advanced coal gasification technology integrated with combined cycle electricity generation and the capture and long-term storage of carbon dioxide. Through the CRI, clean coal can remain part of a diverse, secure energy portfolio well into the future.

Nuclear Fission: Concerns over resource availability, energy security, and air quality as well as climate change suggest a larger role for nuclear power as an energy supply choice. While current generations of nuclear energy systems are adequate in many markets today, new construction of advanced light-water reactors in

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[57] 57See www.hydrogen.gov.
[58] See http://www.whitehouse.gov/news/releases/2003/01/20030128-19.html.
[59] See http://www.eere.energy.gov/vehiclesandfuels/.
[60] See http://www.fe.doe.gov/programs/sequestration/index.html.
[61] See http://www.fe.doe.gov/programs/sequestration/partnerships/.
[62] See http://www.fe.doe.gov/programs/powersystems/cleancoal/index.html.
[63] See http://www.fe.doe.gov/programs/powersystems/futuregen/index.html.

the near term and of even more advanced systems in the longer term can broaden opportunities for nuclear energy, both in industrialized and developing countries. The Nuclear Power 2010 program[64] is working with industry to demonstrate the Nuclear Regulatory Commission's new licensing process, and earlier this year the Nuclear Regulatory Commission approved the Early Site Permits for two new nuclear power plants.

The Generation IV Nuclear Energy Systems Initiative[65] is investigating the more advanced reactor and fuel cycle systems that represent a significant leap in economic performance, safety, and proliferation-resistance. One promising system being developed under the Nuclear Hydrogen Initiative[66] would pair very-high-temperature reactor technology with advanced hydrogen production capabilities that could produce both electricity and hydrogen on a scale to meet transportation needs. Complementing these programs is the Advanced Fuel Cycle Initiative,[67] which is developing advanced, proliferation resistant nuclear fuel technologies that can improve the fuel cycle, reduce costs, and increase the safety of handling nuclear wastes.

Fusion[68]*:* Fusion energy is a potential major new source of energy that, if successfully developed, could be used to produce electricity and possibly hydrogen. Fusion has features that make it is an attractive option from both an environmental and safety perspective. However, the technical hurdles of fusion energy are very high, and with a commercialization objective of 2050, its impact would not be felt until the second half of the century, if at all. Nevertheless, the promise of fusion energy is simply too great to ignore.

Advances in these and other technology areas in the CCTP portfolio could put us on a path to ensuring access to clean, affordable energy supplies while dramatically reducing the greenhouse gas profile of our economy over the long term. Moreover, the deployment of cleaner energy technologies in developing economies like China and India can make a huge difference in altering the future global energy picture.

[64] See http://www.ne.doe.gov/np2010/neNP2010a.html.
[65] See http://www.ne.doe.gov/genIV/neGenlV1.html.
[66] See http://www.ne.doe.gov/NHI/neNHI.html.
[67] See http://www.ne.doe.gov/AFCI/neAFCI.html.
[68] See http://www.energy.gov/sciencetech/fusion.htm.

Attachment 1: U.S.-Initiated Multilateral and Bilateral/Regional Partnerships—1 of 2

	APP	CSLF	GEO	GIF	GNEP	IPHE	M2M	Bilateral/ Regional
Algeria			■					
Argentina			■	■			■	
Australia	■	■	■			■	■	■
Bahrain			■					
Bangladesh			■					
Belgium			■					
Belize			■					■
Brazil		■	■	■		■	■	■
Cameroon			■					
Canada	■	■	■	■		■	■	■
Central African Republic			■					
Chile			■					
China	■	■	■		■	■	■	■
Colombia		■					■	
Congo, Republic of			■					
Costa Rica			■					■
Croatia			■					
Cyprus			■					
Czech Republic			■					
Denmark		■	■					
Ecuador							■	
Egypt			■					
El Salvador								■
European Union/ Commission		■	■	■		■	■	■
Finland			■					
France		■	■	■	■	■		
Germany		■	■			■	■	■
Greece		■	■					
Guatemala								■
Guinea-Bissau			■					
Honduras			■					■
Hungary			■					
Iceland			■			■		
India	■	■	■			■	■	■
Indonesia			■					
Iran			■					
Ireland			■					
Israel			■					
Italy		■	■			■	■	■
Japan	■	■	■	■	■	■	■	■
Kazakhstan			■					
Korea, Republic of	■	■	■	■		■	■	■
Latvia			■					
Luxembourg			■					
Malaysia			■					

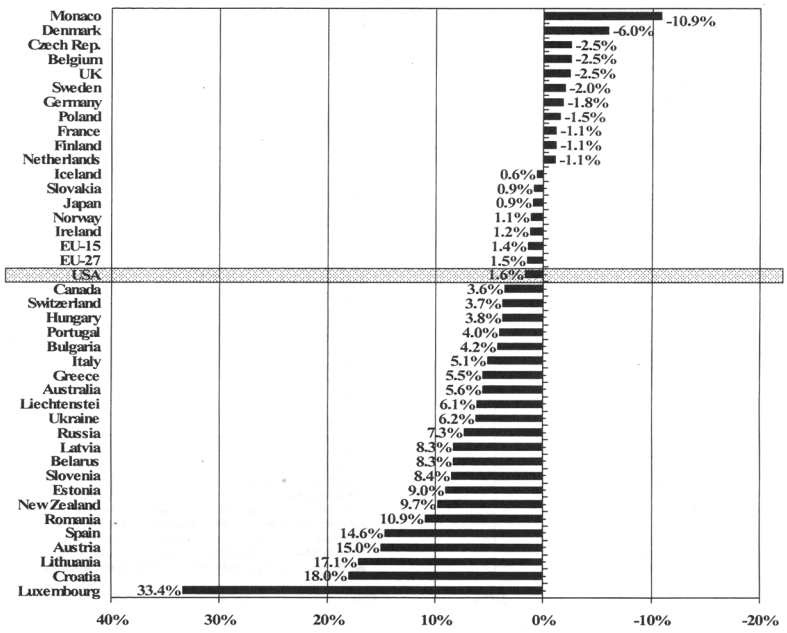
Attachment 1: U.S.-Initiated Multilateral and Bilateral/Regional Partnerships—2 of 2

	APP	CSLF	GEO	GIF	GNEP	IPHE	M2M	Bilateral
Mail			■					
Mauritius			■					
Mexico		■	■				■	■
Moldova			■					
Morocco			■					
Nepal			■					
Netherlands		■	■					
Nicaragua								■
Nigeria							■	
New Zealand			■			■		■
Niger			■					
Nigeria			■					
Norway		■	■			■		
Panama			■					■
Paraguay			■					
Philippines			■					
Poland							■	
Portugal			■					
Romania			■					
Russian Federation		■	■		■	■	■	■
Saudi Arabia		■						
Slovakia			■					
Slovenia			■					
South Africa		■	■	■				■
Spain			■					
Sudan			■					
Sweden			■					
Switzerland			■	■				
Thailand			■					
Tunisia			■					
Uganda			■					
Ukraine			■				■	
UK		■	■	■		■	■	
Uzbekistan			■					
Vietnam							■	

APP: Asia-Pacific Partnership Clean Development and Climate
CSLF: Carbon Sequestration Leadership Forum
GEO: Group on Earth Observations
GIF: Generation IV International Forum
GNEP: Global Nuclear Energy Partnership
IPHE: International Partnership for a Hydrogen Economy
M2M: Methane to Markets Partnership

Attachment 2

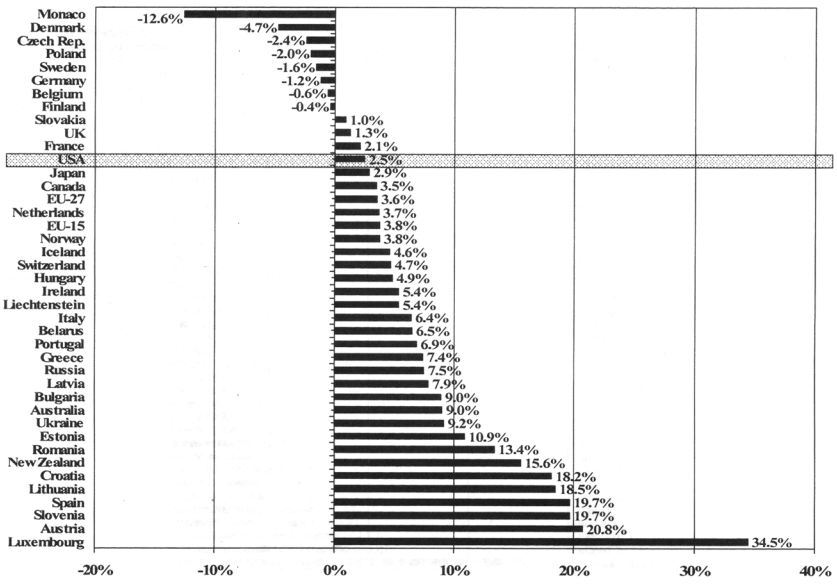
Greenhouse Gas Emission [GHG] Trends for Developed Country Parties to the UN Framework Convention on Climate Change for the Years 2001-2005, Inclusive



Source: 2007 National Inventory Reports and Common Reporting Formats at http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/3929.php

Attachment 3

Carbon Dioxide (CO_2) Emission Trends for Developed Country Parties to the UN Framework Convention on Climate Change for the Years 2001-2005, Inclusive



Source: 2007 National Inventory Reports and Common Reporting Formats at http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/3929.php

Senator KERRY. Thank you very much, Madam Secretary. We really appreciate it.

And what we'll do is have 7-minute rounds, and we'll try to get through as much as we can.

First of all, let me just quickly put on the record that we have heard, through sources, that, in Valencia, the administration is sort of working behind the scenes to tone down, a little bit, the urgency that the IPCC folks want to give to this summary agreement. Can you tell us whether there's any reality to that? Are we somehow—I mean, as you know, there's been an unfortunate record here of EPA and other reports in science being somewhat stomped on over the course of the last few years. So, are you expressing, today, a State Department view or an administration view? And are there any efforts you know of to sort of reduce the impact of what comes out of Valencia?

Ms. DOBRIANSKY. I'm part of the State Department, but I'm part of this administration. With regard to any toning down, I'm not aware of any toning down. We have a delegation that is there; a delegation that also participated in the three working groups that were held previously as part of the IPCC process. The United States welcomed the reports of each working group. Dr. Susan Solomon of NOAA has been cochair of one of the working groups. We certainly have not only welcomed, but strongly supported, her work

and the work of many of the American scientists who have been part of this.

I might just add that the United States has been one of the largest contributors to the work that is done under the IPCC. We welcome the work that has been done. It informs us, and will continue to inform us.

Senator KERRY. To the degree that it informs you, have you accepted—or, do you accept the now-revised scientific consensus that no longer believes we can tolerate a 3-degree increase, Centigrade, in the Earth's temperature, but only a 2-degree, and that we can no longer tolerate a 550-parts-per-million increase, or level, of greenhouse gases, but, rather, we have to stabilize at around 450? Is that the starting working premise of the administration with respect to what we need to do?

Ms. DOBRIANSKY. Senator, we welcome the findings of the IPCC; and specifically, the language that is used in the report is, it doesn't precisely give one figure, one degree, or another degree. It provides a range. And, as you know, as part of the U.N. Framework Convention on Climate Change, we're very committed to this goal. In fact, that's one of the reasons why we have put forth the—and joined other countries in the importance of establishing a long-term global goal that needs to be identified.

Senator KERRY. Well, here's the conundrum, and this is what I'm trying to get at. You—I mean, this is not an issue where you can be half pregnant. You can't accept the science and say, "Yes, it's happening; yes, it's having these consequences; yes, it's moving more rapidly than we had anticipated, with greater consequences than were originally predicted"—you can't accept all of that and then discard, at whim, the accompanying targets that those same scientists give us as to what is tolerable or not, particularly when measured against what is happening at the rate of pulverized coal-fired plant construction in China and India and here. If we proceed as we are in the next few years with those coal-fired power plants being built without capture and sequestration, we're looking at somewhere between 600 and 900 parts per million of a greenhouse concentration, way outside of what the scientists tell us is the tipping point, the catastrophe point for Earth.

So, the question is not a theoretical one. I mean, it's a really practical one. Are we going to Bali accepting these targets? And will that guide what we think have to be the policies? Or are we going to be sort of rhetorically pregnant and kind of play around, here?

Ms. DOBRIANSKY. I would say we're going to Bali accepting, as you've indicated, the findings of the IPCC, and the outcomes and the products of the different working groups. And, toward that end, on the specific question, there was a range that was provided and——

Senator KERRY. And what do you understand the range——

Ms. DOBRIANSKY [continuing]. That the——

Senator KERRY [continuing]. To be?

Ms. DOBRIANSKY [continuing]. Scientists, in fact, put forth. They did not precisely pin down one degree over another.

Senator KERRY. What do you understand the range to be?

Ms. DOBRIANSKY. The range is as was stated in——

Senator KERRY. What is the——

Ms. DOBRIANSKY [continuing]. The report——

Senator KERRY [continuing]. Range?

Ms. DOBRIANSKY [continuing]. Which was—it was a general range. I will let my colleague comment—would you like to—because you were there.

Mr. REIFSNYDER. Well, I don't know, Senator—sorry—I don't know, Senator, what the actual range that the IPCC has projected this go-round has been, but I know that it has been—it's not that dissimilar from that which has been projected for a long time by the IPCC, since the first assessment report in——

Senator KERRY. Well, the range is what I've just laid out, folks. I mean, the range is—in terms of allowable degrees of Centigrade warming and allowable measure of greenhouse gas. It's what I just said.

Ms. DOBRIANSKY. And I think I indicated, Senator, we do embrace that range. That was——

Senator KERRY. OK. Now, if you——

Ms. DOBRIANSKY [continuing]. The range.

Senator KERRY [continuing]. Embrace it——

Ms. DOBRIANSKY. That's a bit different from citing one particular degree. And I know that the report did not, in fact, do that.

Senator KERRY. No; it doesn't do that, but what it does is, it sets out parameters that any reasonable person who accepts science has to look at it and say, "Whoa, we've got a big task here." Now, you know, you had a key word in your testimony, the word "voluntary." We've had voluntary for the last 20 years. It hasn't worked. How do you heed the warning of a Jim Hansen, who said, "Look, you've got 10 years to get this right"? How do you respond to the notion that one coal-fired pulverized plant per week is going to be built in China, and, if we go ahead with what's happening today without U.S. leadership to sort of put the brakes on and offer alternatives, that we're ever going to meet this challenge? How do you do that in a voluntary scheme?

Ms. DOBRIANSKY. Well, first, in terms of our own domestic policy mix, we've had a mix of mandatory, voluntary, as well as those programs which are supported by tax incentives. There are a variety of mandatory programs. The President put forth the "20-in-10" reduction on gas consumption. There has also been a building and appliance efficiency——

Senator KERRY. Those are goals.

Ms. DOBRIANSKY [continuing]. Goals that have been put forth.

But, on the second, when you look at it globally, one of our goals and objectives, Senator, is—as we go into Bali, is to look at, first and foremost, how we can get a global agreement, a global agreement where all are at the table, ourselves included, as well as big emitters. And a challenge here is: How do you achieve that? A number of countries have put forward long-term goals that are aspirational—Japan, Canada, the European Union. When we met together in the Major Economies Meeting, we had a discussion about this. One of the things that we then talked about was, all right, how can you then look at, on a national basis, the variety and differences among the countries around the table, that we could go forward with medium-term goals, and—in which countries would

put together their portfolios, and in which there would be accountability, of which part of that would be on a country-by-country basis, mandatory approaches, and maybe a mix of mandatory/voluntary. But, basically, all would be at the table, so that we would have an effective approach and that there would be results derived from it.

Senator KERRY. Well, I appreciate what you're saying. My time is up. I just want to—I'll close by saying this, and I want to continue this dialogue. And it's a very important one. Most of the foreign environment ministers and others that we've been meeting with from Europe and elsewhere, have indicated to us that they believe it ought to be mandatory, and they believe the United States has to lead on this. We're a quarter of the world's greenhouse gas emissions, the most industrial country. And when I talk to the Chinese or the Indians or others, it's very clear that, unless we do something with some sort of real goals, they're not going to believe, No. 1, that we're serious, and, No. 2, they know that there's nothing compelling them, therefore, to, sort of, come to the table in any mandatory way. And most people don't believe it can happen without mandatory.

Second, we have done mandatory. We have a great, great example that we all adopted, right here in the Congress. And I was part of those negotiations, as I think Senator Wirth was, and others, back in 1990s, when we did the Clean Air Act. We heard the same kinds of arguments. The industry all came in and said, "Don't do this to us. If you do this to us, we're going to be noncompetitive, we're going to lose jobs, we're going to fall behind, it's going to cost $8 billion, take 10 years." The environment community came in and said, "No; that's all industry, you know, self-interest talk. It's really only going to cost $5 billion, and it's going to take about, you know, 5 years." Well, guess what? George Herbert Walker Bush, Bill Reilly, John Sununu sat at that table with George Mitchell, we put it in place—acid rain, sulfur dioxide emissions in the Clean Air Act—mandatory. And, lo and behold, it took about $2 billion and took about 2½ years. Why? In fact, the pricing in the auction place on the permits went from about $1,000 down to about $60, then bounced back up to 100. The reason it worked is that no one is capable of predicting what happens when the entrepreneurial, innovative spirit of our country is applied economywide to the task of meeting one of those goals, and no one can predict how the technology then takes over in the creation of jobs, cheaper ways of doing it, which is precisely what everybody believes will happen here if we take the lead in doing it.

So, I'd like to pursue that with you a little bit later. I'm sure colleagues will pursue some of that in the dialogue here. But I think we shouldn't ignore our own history of what happens in voluntary versus mandatory.

Senator Lugar.

Senator LUGAR. Thank you very much, Mr. Chairman.

Secretary, as we prepare for the Bali Conference, I'm hopeful that our delegation and the administration are trying to focus on a parallel course of discussions we need on energy requirements for our country, as well as for the world. They have to run at the same time, and they are often divisive, contradictory, and competitive.

To be specific, many talk about gaining a greater degree of energy independence for our country, and they usually phrase it that way, as opposed to saying "energy independence," because it's an awesome goal, given the dependence we have on imported oil and other energy sources. We've been attempting, as a government, to think of ways of replacing imported oil. You've cited some of the President's programs, that over the course of several years, we would substitute imported oil with energy sources that we produce here.

My fear is that, even with our resolve and our programs, this is all moving tediously slowly. It is not without note that even our debate in the Congress this year on energy legislation is bogged down in all sorts of ways that I'll not try to describe. It may be that the market works and that somehow—through idealism—people will do the research that's required; forward the money, loans from government or private industry to develop experimental things, such as cellulosic ethanol. But this is not happening very fast.

What is occurring very fast—and you've cited this, as Senator Kerry has—is the need for greater electric power throughout the country, whether it be our computers or the rest of our electronic society, the impelling problem is how to use coal. The problem then is how to clean up the coal, how to sequester the carbon from the coal. We're taking this seriously, although these are still very, very experimental situations. We are beginning to put a toe in the water again with regard to nuclear power. Even this is bogged down in all sorts of difficult situations, even as we advise India or China or other countries that that probably should be the course for them. As we note, they're opening up coal-fired electric plants, if not one a week in China, as sometimes suggested, maybe one a month at least. And, as Senator Kerry has said, this is occurring even while the debate in Bali proceeds. In real life, people are not going to let the lights go out. They are—in fact, going to demand that their government produce light. Or, worse still, demand that their government produce gasoline at very subsidized prices. Even in Iraq and Iran, we've found gasoline selling for a pittance, because politically it's impossible for the leadership to let the market work, even in a society of that sort, quite apart from our own.

I mentioned all of this because it seems to me that it is not easy to float off into the climate change argument oblivious of real life, but there's a tendency to do this, and this is why it doesn't work. Ultimately, people come back down to earth in a democracy and say, "That's all very interesting, that the elite of the country have these ideas." And clearly there is a problem. The ice floes are melting, and the polar bears are in trouble. And we understand things are coming along poorly. We feel that. But we also, as a matter of fact, in day-by-day living, want jobs. We want the lights to go on. We want heat in the winter. We want electricity to run our computers. As a matter of fact, we want to live during this particular period and not in 2080 or at some other time, granted, that our grandchildren may have a hard time.

Now, I go through all of this rhetoric simply because it appears to me that an approach to Bali or any other conference has to have both of these streams of thought moving along if they're going to be successful. Clearly, we need to recognize that with climate

change there will be very great reticence to take the steps that are important in energy conservation in this country. Why would anybody buy a hybrid car and try to get 50 miles to the gallon unless there is, in fact, a desire, first of all, to conserve energy, and, second, to do something about CO_2? But some people do buy such cars, and we hope that some more will be produced. Why does anybody distribute ethanol, E85? Well, not many do. Despite all the rhetoric in my State, barely 110 stations out of several thousands, despite corn and all the rhetoric on ethanol. In other words, our whole national emphasis here has got to move together.

Now, can you make some comment of reassurance that, as the planning is proceeding, in your shop at least, there are recognition of these factors, and you're prepared to address them in practical ways for our country, as well as other countries that we are talking to?

Ms. DOBRIANSKY. Senator, I think you make a very important point, and let me, in response, make three comments.

First, I think that there has been a shift in the orientation of these global discussions on the environment, where there's an integration of issues that I don't think had really occurred before. The fact that you have countries, not only ourselves, but others, like India, China, Brazil, looking at issues of economic reform and advancement, how you apply your economic growth to these issues, and the critical issue of energy security matters. I think you're quite right in saying, in every discussion we have with countries that are emerging economies, they're very focused on not only growing their economies, but how they get energy sources to, particularly, their rural areas, and what are the most clean and efficient ways of doing that, and which will have consequences and benefits, environmentally? So, the first point I would make is, is that I have noticed that the discourse has shifted, and I think there is an acceptance of the integration of these issues.

Second, I would make the point that, during the Major Economies Meeting, which is geared toward advancing the negotiation process in the U.N. Framework Convention—we brought together not only representatives that represent environmental ministries, but also those in attendance were from Ministries of Energy, my counterparts in Foreign Ministries, and also those dealing with finance. That kind of integrated discussion was absolutely essential—essential as we go forward, not only to Bali, but also it's critical as we come out of Bali.

Also, toward that end, if I may say, the areas that we addressed during this exchange involved not only power generation, but we had a session with also participants from the private sector, focusing on the question of how you deal with transportation, vehicles, and many of the innovative ways that we should be rapidly moving forward on; land use, as well as financing.

Finally, as I referenced in my earlier comments about the Asia Pacific Partnership on Clean Development and Climate, that through the Asia Pacific Partnership, one of the things that we've been striving to do is, particularly in working with China and India, is to try to draw them in and work effectively with them on near-term steps that can be undertaken and that, by the way, don't cost a lot, but adds up.

Do we need to do more? Yes; we do need to do more. These are only a few examples of some of the things that we are doing, but this is an area that absolutely is essential. Our own Major Economies Meeting was entitled "Energy Security and Climate Change" because of that key integration.

Senator LUGAR. Thank you.

Thank you, Mr. Chairman.

Senator KERRY. Thank you, Senator Lugar. Appreciate it.

Senator Nelson.

Senator Bill NELSON. Madam Secretary, you've got a pretty good idea of what we think should be the role that the United States would play in the Bali meeting. What do you think are the international expectations of the United States in these U.N. talks in Bali?

Ms. DOBRIANSKY. Well, I attended, as I've indicated, the preministerial meeting, which was in Bogor, Indonesia, which comprised some 35 nations. And, first, I would say that one expectation was to see how we would embrace the various recommendations that were put on the table, including the importance of having a Bali roadmap. We support that, we want to see that. Two, in terms of having the four areas that I mentioned in my comments—adaptation, mitigation, financing, and technology—be elements comprising our discussion of a framework—a post-2012 framework. Third, we were very vocal, during those discussions, about the importance of forestry and how critical it is to address the issue of deforestation and land misuse, which comprises 20 percent of greenhouse gas emissions. We came forward and supported having a beginning, a middle, and an end. In other words, that we would have an outcome concluded by 2009. I might add that there were others around that table who did not necessarily support what I am sharing with you.

I think we have already indicated, going into this meeting, that we are open-minded. We want to have a constructive approach. We want to see movement. Senator Kerry referenced, before, the importance of the IPCC. That will be a critical component of the discussions in Bali. And we also think that that is going to inform our discussions, as well.

Senator BILL NELSON. Do you think that the rest of the world thinks that the United States should lead in the development of this post-2012 agreement in Bali?

Ms. DOBRIANSKY. In fact, during the preministerial meeting in Bogor, a suggestion was made by the chair in the Indonesian's chairman's summary, that the United States effort—the launch of the Major Economies Meeting—would be helpful to moving the process of negotiations along, and that that effort should report back to the U.N. Framework Convention on Climate Change. Why am I sharing this? This is an important initiative that we have put forward, which seeks to bridge differences. We want to see a global agreement. We want to see a global framework, of which we are part and of which we do our part. At the same time, we want others, who have not also joined, to come to the table, as well. And how do we go about——

Senator BILL NELSON. I'm going to have to cut you off, here, because we're running——

Ms. DOBRIANSKY. I'm sorry.

Senator BILL NELSON [continuing]. Out of time. So, the answer to that question was yes?

Ms. DOBRIANSKY. Yes.

Senator BILL NELSON. The rest of the world expects us to lead in the post-2012——

Ms. DOBRIANSKY. I think——

Senator BILL NELSON [continuing]. Agreement.

Ms. DOBRIANSKY [continuing]. I—first, we plan to lead, and also, I think others would welcome our leadership.

Senator BILL NELSON. So, the answer is yes.

Now, on mandatory reductions, doesn't the rest of the world expect us to lead on mandatory reductions?

Ms. DOBRIANSKY. I would say we have a dilemma here, Senator, and that dilemma is: How do you get a global agreement that's going to be environmentally effective and economically sound? Let me give you an example. We have canvassed a variety of developing countries, and have asked them the question: If the United States goes forward and supports mandatory commitments, would you join us in this effort? The answer has been, "No." Why? Through the Major Economies Meeting, we are striving to bring parties together, we are looking at a way forward that will be robust and that will make a difference. We have put forth, along with others, the need for having a long-term global goal. Second, we have put forth the notion of having national plans, and, in those national plans, the establishment of medium goals, which could be mandatory——

Senator BILL NELSON. So, they——

Ms. DOBRIANSKY [continuing]. And they could be——

Senator BILL NELSON. So——

Ms. DOBRIANSKY [continuing]. Complied——

Senator BILL NELSON. So, the answer is yes—and the question is, the rest of the world expects us to lead in mandatory reductions.

Ms. DOBRIANSKY. In this regard, I would say that they're looking to us for our leadership, and leadership that could bring us all to the table and bridge consensus.

Senator BILL NELSON. All right, let's try to——

Ms. DOBRIANSKY. And toward that end——

Senator BILL NELSON [continuing]. Bridge some of that consensus with China and India as greenhouse gas emitters. Now, you mention that we had taken steps to do that. What specific steps have we taken? You just mentioned we had taken steps. Specifically, what?

Ms. DOBRIANSKY. Meaning, in terms of the Major Economies Meeting——

Senator BILL NELSON. China and India.

Ms. DOBRIANSKY. China and India have been part of our discussions in the Major Economies Meeting. This affords an opportunity for looking at a way forward, a way forward in bringing them into a global agreement and also our having a part in a global agreement. And here, as I've indicated, one of the approaches under discussion—and there are a variety of approaches under discussion—is to have the differences of our national characteristics put on the table, and then to look at, how does one come forward with ap-

proaches that are going to be accountable and that will be, in fact, complied with? If you have midterm goals established, you have national plans, you will have domestic laws, which you can ensure enforcement. This is one of the dilemmas and one of the challenges that we are confronting. And, as I've indicated, this is one approach that we've put on the table, but there are other approaches. In order to be really effective here, and to make a difference, it has to be global, and it has to be environmentally effective.

Senator BILL NELSON. Final question. Are you personally committed to hand off to the next administration, and to work with the next administration, in order to achieve the strongest possible 2012 post agreement?

Ms. DOBRIANSKY. Senator, I'm personally committed. And, may I just add, I have taken the personal time and effort to hear the views of a wide variety of interlocutors from the business community, from civil society, from some of the representatives who are even here today who will be speaking later; our panelists. Having a discussion and trying to come forward with a way that will bring us all around the table and for a global agreement that's effective, we are committed to.

Senator KERRY. Senator Hagel.

Senator HAGEL. Mr. Chairman, thank you.

Madam Secretary, welcome.

Ms. DOBRIANSKY. Thank you.

Senator HAGEL. Secretary Dobriansky, you and I have, on many occasions, had many of these same conversations. And I wanted to refer back to the general theme of Senator Lugar's comments, because I think what he has focused on—and, as you know, through our previous conversations and some of what you talked about in the Asia Pacific Framework and the technology sharing public-private partnerships—came as a direct result of my legislation that was the environmental title of the Energy Act of 2005. I have always believed that we cannot realistically talk about, look at, environmental policy without integrating energy and economic policy. And I think much of the discussion today reflects that point. And so, as Senator Lugar took you through a number of those issues, I want to reflect on, generally, the integration of those three components; specifically, on what you can tell us might be the form that we will see begin to shape in Bali with the integration of those three dynamics. The President of China, for example, I think, in September at the APEC meeting, said—and I think it was rather—this direct—that China would not be held hostage to any mandatory requirements on the issue of emissions—carbon emissions. Now, I assume that the President of China speaks for China and reflects China's position, as was the case in Indonesia, as will be the case in Bali. So, how and what form are you going to integrate all of this so that, at some point, we are going to hopefully come out of Bali with something tangible, productive, and positive?

Ms. DOBRIANSKY. Well, two comments.

First, in terms of Bali, I think that, as I've indicated, our fundamental goal and objective is to identify what are the core elements that we need to address in a post-2012 framework. We need to have a process forward, and we need to identify ways of advancing and pushing that process forward, because, clearly, going to Bali,

there are differing viewpoints about how one is committed. The one fundamental goal and objective that we have going into this is to have a global agreement that is environmentally effective, as I've mentioned, and economically sustainable. And, by putting forward the Major Economies Meeting, we're striving to bring these countries, that are 80 percent the biggest energy users, 80 percent in terms of their economic output, and also 80 percent emitters, to forge the most robust and effective way of reducing emissions. You're quite right in stating—and as I have mentioned previously to Senator Nelson's question to me—we have posed the question to a number of developing countries, "Well, what if we took on certain measures? What would you do?" Here, technology matters greatly. Economic growth matters greatly to the developing world. We think that there's a dire need to look at the most innovative and practical ways of bringing these countries in.

Why I cited the Asia Pacific Partnership earlier and as you've indicated, we've had conversations about this, and given your legislation, we have tried to have practical ways of bringing other countries into this fold to see that there are benefits to be accrued from taking very concrete and tangible steps that have economic consequences. These steps also have consequences in terms of energy security, and at the same time, by the way, will also reduce greenhouse gas emissions, which is part of our goal and objective.

What I can say to you is, is that our effort is to try to get a successful roadmap and to try to work vigorously with all of these partners, particularly the emerging countries, to address the kinds of concerns that they have.

If I may give one more example, we put forth the—President Bush announced the formation of an International Clean Energy Fund. Why? Because there's a need to have others come forward, including developing countries to provide investments in this area. It's not only in their interest, in our interest, it's in the world's interest, it's in the planet's interest, specifically. Those are the kinds of initiatives that we are trying to come forward with.

I would say that there is a dire need for innovation here. We welcome this opportunity to come forward and have this discussion, and to continue it, because innovation is really needed as we go forward.

Senator HAGEL. Thank you, Madam Secretary, Mr. Chairman.

Senator KERRY. Thank you very much, Senator Hagel.

Senator Menendez.

Senator MENENDEZ. Thank you, Mr. Chairman.

Madam Secretary, in the Asia Pacific Partnership Meeting that you've talked about often, this past February, you said, "The U.S. policy is a mix of mandatory/voluntary/tax-incentive measures to address climate change. We believe climate policy should be science-based." And, in that regard, we welcome the recent release of the Intergovernmental Panel on Climate Change's fourth assessment report.

Now, before, in response to Senator Kerry's question, what mandatory aspect of this were you referring to? Because, as far as I know, the administration has never supported any form of mandatory provisions. And certainly not what you were referring to before; those are goals.

Ms. DOBRIANSKY. The administration has supported mandatory measures, domestically. That's what we are referring to in this——

Senator MENENDEZ. Which——

Ms. DOBRIANSKY [continuing]. Case.

Senator MENENDEZ [continuing]. One, specifically.

Ms. DOBRIANSKY. Specifically, President Bush has put forward, here, to the Hill, the "20-in-10" proposal, about having a 20-percent reduction in 10 years on gas consumption. We have building code standards——

Senator MENENDEZ. Those are goals. They're aspirations. The question is: What mandates does the administration support that actually puts the bite to ensure that, in fact, any aspirational goal is achieved? None that I know of. Correct me if I'm wrong.

Ms. DOBRIANSKY. As I said, Senator, even Senator Kerry referred to, before, the Clean Air Act. We just came back from negotiating——

Senator MENENDEZ. Well, the Clean Air——

Ms. DOBRIANSKY [continuing]. The Montreal Protocol——

Senator MENENDEZ [continuing]. The Clean Air Act is the law of the land. I'm asking you——

Ms. DOBRIANSKY. The Montreal Protocol—my colleague just came back from negotiating that, which has binding commitments. There are a number of areas that have been——

Senator MENENDEZ. Well, I——

Ms. DOBRIANSKY [continuing]. Part of our mandate.

Senator MENENDEZ. With all due respect, I think that——

Ms. DOBRIANSKY. We have Federal standards, in terms of building codes——

Senator MENENDEZ. With all due respect, I think that those are aspirations—you know, the——

Ms. DOBRIANSKY. I'm not aware that——

Senator MENENDEZ [continuing]. The bottom line is——

Ms. DOBRIANSKY [continuing]. Those are aspirations. I've seen a significant change, in terms of our building codes——

Senator MENENDEZ. Bottom line, I think it's fast and loose to suggest that mandatory, as you described, is, in fact, mandatory in any consequential way to the ultimate challenge we have.

Let me ask you this. How is it that you talk about science-based, when scientists are telling us that we need to cut emissions 80 percent by 2050, and there's nothing that the administration has put forth that would meet that challenge?

Ms. DOBRIANSKY. Senator, science informs our policy, but we look at a broad range of issues in determining what are the most effective policies. We look at what are economic components of our policy, what might make a difference, where jobs may not be cut or other——

Senator MENENDEZ. So, it's science-conditioned.

Ms. DOBRIANSKY. No; I wouldn't say that. I think that one of the appeals made by science is indicating that the Earth is warming and that also humans are contributing to it.

Senator MENENDEZ. Well, let me ask you this.

Ms. DOBRIANSKY. We're looking at approaches that address those——

Senator MENENDEZ. You consistently——

Ms. DOBRIANSKY [continuing]. Kinds of concerns.

Senator MENENDEZ [continuing]. Refer to costs, but you only talk about the costs of action. Why is it that you fail to talk about the costs of inaction and quantify that as part of the equation?

Ms. DOBRIANSKY. By the way, when the Stern report came out, one of its main appeals was, we need to act now, and that there are costs of inaction. And, by the way, we think that there should be near-term steps taken now, there shouldn't be costs of inaction. We should take near-term steps, medium-term steps, and long-term steps. We commented on the issuance of the Stern report, which made that appeal.

Senator MENENDEZ. Well, if I were to listen to just about every—every time I've heard the administration speak, you would hear the manner of exorbitant costs that would be imposed on business and consumers. There's very little discussion about the costs of failure to act, yet we know rising sea levels will be an enormous expense for all of the coastal States of this country, including my home State of New Jersey. And, we know that Sir Nicholas Stern has estimated that failure to act could actually shrink the global economy by 20 percent. And we know that every dollar spent now would save us five or more later on. That never seems to be something that I hear about in the balance of the equation of costs.

Let me ask you this.

Ms. DOBRIANSKY. Senator, may I——

Senator MENENDEZ. Do you think——

Ms. DOBRIANSKY [continuing]. May I just respond to that, though?

Senator MENENDEZ. I——

Ms. DOBRIANSKY. Because my mandate——

Senator MENENDEZ [continuing]. I heard your——

Ms. DOBRIANSKY [continuing]. Is not——

Senator MENENDEZ [continuing]. Response.

Ms. DOBRIANSKY. My mandate is——

Senator MENENDEZ. Basically, it's not——

Ms. DOBRIANSKY [continuing]. International——

Senator MENENDEZ [continuing]. Part of it.

Ms. DOBRIANSKY. No; but it's important. My mandate is international. And we have put some $37 billion into efforts that support a wide range of initiatives—carbon sequestration, methane, hydrogen, renewables, nuclear—that are international. We are acting now, we are engaging others. My mandate——

Senator MENENDEZ. Let me——

Ms. DOBRIANSKY [continuing]. Is not domestic.

Senator MENENDEZ. Let me ask you this. You keep referring to the developing countries. And you know, carbon dioxide stays in the atmosphere for an average of 100 years or more. Industrialized nations clearly are, by far, more responsible for current greenhouse gas emissions concentrations than developing nations. So, then, why should we expect developing nations to agree to mandatory cuts, when, historically, they are much less responsible for the problem that was created by industrialized countries? In other words, why are we constantly hearing from the administration that we look to developing nations for leadership on an issue that developed nations created?

Ms. DOBRIANSKY. Senator, there are two key points here. One is, in order to really have an impact on the reduction of greenhouse gas emissions, an effort forward must be global; No. 1. No. 2, in terms of obligations—by the way, I've indicated that we should be sensitive to the diverse characteristics of individual countries. And let me just add that, in terms of the character of commitments, all countries have responsibility, but, in terms of the content, I would say to you that that content must be differentiated. There are countries that should take on and shoulder greater responsibility. That will be part of our discussion as we go forward from here.

Senator MENENDEZ. Well, let me just close by saying, we can't, in a sense, lead in so far as the concern that other countries will not act accordingly. You know, it seems to me, if you look at Senator Lieberman and Warner's bill, and any possible cap-and-trade bill, that they will allow for tariffs to be placed on imported goods from major emitters who do not have adequate measures to cut their own emissions. In this way, our own domestic cuts will provide international leadership and incentives for developing countries to act.

What I largely hear, to be very honest with you, is that, as the world heats up, we meander down a cool path in which I hear a lot of wordspeak, but I don't hear a lot of leadership that creates any real action. And, at the end of the day, that leads us to a consequential path in which we will have a fatal result. And that's not something we should be bequeathing to the next generation of Americans. I listened to your answers, but I'm not sure where we're headed under real leadership.

Thank you, Mr. Chairman.

Senator KERRY. Thank you, Senator Menendez.

And, as I turn to Senator Corker, let me just comment on the Montreal Protocol we passed in 1992, I think, if I recall correctly, and DuPont and others were screaming for us to pass it, because they had an alternative, and the companies basically wanted to move there. So, it's reassuring to know you didn't want to move back on it. But it's hardly this administration's mandatory request or requirement.

Senator Corker.

Senator CORKER. Thank you, Mr. Chairman.

And, Madam Secretary, thanks for your testimony.

It is interesting to continually sort of feel this conundrum that we're in, where, you know, we don't want to take a leadership role, because other countries might not play a role. And setting all of that aside, if you could be the czar, if you will, and lay out what an agreement in 2009 should look like, what would be the basic components of that agreement, setting aside this conundrum, if you will, that we continue to talk about?

Ms. DOBRIANSKY. Well, in terms of taking a leadership role, our goal and objective here is to have, as I've indicated——

Senator CORKER. No, no, no; I'm not talking about goal, I'm talking, like, specific——

Ms. DOBRIANSKY. Specific——

Senator CORKER [continuing]. Attributes. Yeah, I mean, I understand about the goals and all that. But what would be the specific

attributes that countries around the world would agree to as it relates to lowering carbon emissions?

Ms. DOBRIANSKY. Well, I was going to say—I wasn't using the term "goal"—goal out of Bali, that's what I was going to say.

Senator CORKER. OK, yeah.

Ms. DOBRIANSKY. Not literally a goal, in the sense that you're referring to.

Look what other countries have focused on. They want to discuss mitigation, adaptation—adaptation is critical in this upcoming meeting. Adaption has not—in previous COP meetings—has not really taken on the significance or the prominence, that is requested by many developing countries. Why does that matter? Because adaptation measures are measures that will especially build capacity and help developing countries in dealing with climatic change. We have embraced that. We have indicated that we would like to see stronger measures taken in the area of adaptation. That is one of the areas that they have——

Senator CORKER. Let me——

Ms. DOBRIANSKY [continuing]. Identified.

Senator CORKER. Let me focus. And I apologize. We just have limited time.

Let's just focus on mitigation only, and let's talk about the attributes there, that if you were the czar and could set all the rules in play that the United States and Europe and Asia and other players would be a part of, what would those attributes be, of mitigation?

Ms. DOBRIANSKY. Well, in terms of attributes of mitigation, we would like to see all countries have responsibility for the character of a framework and its outcome. In terms of the content, we would see it as being differentiated, and that would be contingent upon countries' different circumstances. We would like to see domestic laws. One of the challenges here has been in terms of compliance and accountability. Even if you have a global framework, if a particular country is not meeting its requirements, then how do you enforce particular measures in that country? So, that's the kind of discussion that we are having. How do you get compliance? how do you get accountability? and how do you get countries at the table?

One of my colleagues gave a——

Senator CORKER. Let me just ask you the—so, you would not, then, be talking about some global exchange with carbon, some cap-and-trade system that emerges, where the world is involved in that. That would not be——

Ms. DOBRIANSKY. Some have put forward that suggestion, but let me say that there are those who have spoken to this issue. I know——

Senator CORKER. But I'm asking you——

Ms. DOBRIANSKY. I'm going to——

Senator CORKER [continuing]. Not——

Ms. DOBRIANSKY. I'm going to respond.

Senator CORKER. OK.

Ms. DOBRIANSKY. That some have spoken to this issue, like Jeffrey Sachs who recently has looked at the developmental consequences of such an approach. How can you verify it? How can you ensure that there is accountability? We are looking at a variety

of approaches, which come back to the basic concept of getting results and effectiveness.

Senator CORKER. If we had troubles getting other countries involved, and we decided, as a country ourself, to be involved in a cap-and-trade program, would tariffs on their goods coming into our country be something that you would find that interesting, if they were not a part of a regime like that themselves?

Ms. DOBRIANSKY. I—would you——

Mr. REIFSNYDER. Well, no, if I just could mention, Senator, because it may be illustrative, in the—at the Montreal Protocol meeting in India last year, which India hosted, they were quite critical of those aspects of the Montreal Protocol that provide for trade sanctions. And this kind of—the notion that we could unilaterally take on a cap on our emissions and then threaten people with trade sanctions who didn't comply has not been a very popular approach over the years in the U.N. Framework Convention on Climate Change. I think it's one of the things that makes people quite nervous about meetings like Bali, when they feel that they're being threatened with sanctions if they don't agree to the approach someone else has laid out for them. I think we have to build a cooperative approach to this.

Senator CORKER. Does anybody—do you all work with the Energy Department very closely? I've found a—but on this particular issue as it relates to——

Ms. DOBRIANSKY. Very closely, as I—as I indicated, when we—when we go to COP meetings, we have a Department of Energy representative. When we launched the Major Economies Meeting, the Department of Energy has been a key player. In fact, Senator Menendez mentioned mandates, were many of the mandates here—building codes, Federal appliance efficiency, Federal renewable fuels, Federal fuel economy, CAFE, all of these are mandated—have mandatory standards. The majority of them have mandates that have been brokered through the Department of Energy.

Senator CORKER. Do any of the folks at Energy look at a potential cap-and-trade program? And I only focus on this because I know that's more immediate, if you will, as it relates to our focus, because of some bills that are emerging. Do any of those people look at cap-and-trade as an opportunity for our country as it relates to energy security?

Ms. DOBRIANSKY. There's a discussion and a debate that's going on, as you know, about this, on the issue of cap-and-trade, and there have been reservations and serious concerns expressed by the administration because of the ramifications of cap-and-trade domestically—the ramifications on our economy, and the ramifications for companies putting investments into technologies. There have been a number of issues that have been of concern, that have been expressed by those on the domestic side.

Senator CORKER. Thank you. And I apologize for trying to focus just during this 7 minutes, but thank you very much for your testimony.

Ms. DOBRIANSKY. Thank you.

Senator KERRY. Thank you, Senator Corker. I think it's been good to try to get that focus.

Senator Casey.

Senator CASEY. Mr. Chairman, thank you very much. And thank you for putting this hearing together for us. It's very valuable.

Madam Secretary, I just want to make a brief statement, in summary fashion, but then also get to some questions.

And this is, of course, my opinion, but I think it's widely shared opinion, and I think it—it's the point of departure, when you begin a discussion about climate change internationally or our responsibilities here in the United States.

I think this discussion, with all the details in between, they're all important, and the players are all important. But this discussion begins and ends with the President of the United States, and this President. And, unfortunately, no matter how you—no matter how I look at this issue, when you consider what President Bush has said or not said, actions he has taken or not taken, just look at his calendar for the last couple of years, there's a palpable sense—or, I'd say, a palpable reluctance or a sense that you have of his own reluctance. I don't really get a sense that he believes this at all, that he really believes this is a threat to human life. We can talk about the environment in a very abstract way, but a threat to human life, and that this is a major priority, maybe in the top two, maybe three, of any President of any administration of any Congress. I don't get that sense at all from this President. I don't know what he believes, really. I'm not sure he really believes that it is the threat that I believe it is. There's no sense of urgency. I mean, this is a President who, on many issues where people don't—people disagree with him, there's a clarity when he speaks about some things. You know exactly where he stands.

And on this issue, there's no sense of clarity, there's no sense of commitment or urgency or intensity. Pick your word, it's not there with this President. So, you've got a tough job on your hands, because I don't get the sense at all that this administration is committed to anything you're talking about, unfortunately. And I know that there are administrations of both parties that have that problem, where the people in the trenches, whether you're an Under Secretary of State or whether you're much further down in the pecking order, that you're doing things that are about trying to manage that imbalance or that inconsistency between what should be done and what maybe the Department of State would want to do and what the President doesn't want to do. That's my own opinion. But I think it has a direct connection to what we're talking about here.

I mean, we're talking about an administration—let me just ask you, just a parenthetical management question. Who's the top person in the State Department on this issue? You're that person?

Ms. DOBRIANSKY. Right.

Senator CASEY. Now——

Ms. DOBRIANSKY. Correct.

Senator CASEY [continuing]. Other than you and Secretary Rice—I'll leave the President out of this for a brief moment—other than you and Secretary Rice, who else would you identify as the top people in this administration on climate change internationally. Let's set aside the domestic considerations.

Ms. DOBRIANSKY. On international issues, we also have Deputy Secretary John Negroponte. He was previously the Assistant Secretary for Oceans Environment and Science—he cares a great deal about these issues. There is the Chairman of the Council on Environmental Quality, Jim Connaughton; the Deputy National Security Advisor for International Economic Affairs, Dan Price; and Steve Johnson, the Administrator of the Environmental Protection Agency. We also have worked very closely with the Department of Energy, and its Secretary, Sam Bodman, and his——

Senator CASEY. OK.

Ms. DOBRIANSKY [continuing]. Team; and the President of the United States.

Senator CASEY. OK. How long have you been in this job?

Ms. DOBRIANSKY. I have been in this job since the beginning of this administration. I came in——

Senator CASEY. OK.

Ms. DOBRIANSKY [continuing]. On May 1 of 2001.

Senator CASEY. In all the time that you've had this job, how many times were those individuals listed—how many times were those people in the same room with the President of the United States for a—not just a briefing, but a substantial meeting about these issues?

Ms. DOBRIANSKY. A very significant number of times. In my first year, prior to——

Senator CASEY. How many since you've been there?

Ms. DOBRIANSKY. Oh, I can't quantify, because we've had so many meetings on——

Senator CASEY. With the President of the United States.

Ms. DOBRIANSKY. Some which have included the President of the United States. My first year, the issue of climate change was nonstop, in terms of meetings at the White House, and that was, I was just about to say, before September 11.

Senator CASEY. Well, if you can provide to the committee, as part of our record, the dates on which all those individuals had a meeting with the President of the United States on this issue, I think that's important for the record.

[The written response of Under Secretary Dobriansky to the above question follows;]

Climate change comes up frequently as part of the President's regular business. While I cannot speak to the wide range of officials that you have listed, I can say that I have attended a number of meetings convened by the President on climate-related matters. Most recently, before this hearing, I joined Secretary Rice for a policy discussion with the President on September 20. And, as you know, the President hosted the Major Economies Meeting on Energy Security and Climate Change on September 27–28, 2007. In addition, climate has been discussed in various bilateral and multilateral meetings, for many of which I joined the President. Two of the most significant meetings were the U.S.–EU summits and the G–8 meetings.

Senator CASEY. And I was looking at a—this is a list of principles that our office put together when we talk about this issue, just basic foundational principles on climate change that guide me, because there's a lot of legislation out there and a lot of ideas. But, let me just give you the top three, in this order. No. 1, make mandatory—mandatory greenhouse gas emissions. No. 2, reduce greenhouse gases at rates and levels identified by the international

sciences of 80 percent by 2050. And, No. 3, take immediate action—immediate action to reduce emissions in the short term.

Here's the problem I have. They are three basic goals that I think are widely shared around the country, widely shared in the Senate and the House in both parties. I come from a big, big State, a big, diverse State. And I think those principles are generally agreed to. I don't have any polling to show that, but I can't imagine there isn't broad support for those. And here's the problem. You're asserting here before this committee that the President of the United States, who a lot of people don't believe has a real commitment to this—he doesn't agree, and your administration doesn't agree, with any of those three, or maybe one of those three, I'm not sure which. So, how can the President be an effective international leader on climate change when he isn't leading a consensus on climate change in the United States of America? I don't know how that works. If you can tell me, I'd—I'm—I've got 20 seconds left, I want to ask another question.

Ms. DOBRIANSKY. In 20 seconds, Senator, my mandate is international. I work very closely with my colleagues on the domestic side. And I'd like to respond to your question, actually, for the record with that, and involve my domestic colleagues because there's a very strong effort, domestically, in charting a course for the United States. I've tried to indicate what we're doing internationally, which—a substantial amount has been put into it over these years, and the breadth and the scope is really significant, in terms of carbon sequestration, methane among other areas. My colleague just came back from a meeting in Norway, and he told me that, actually, many of the interlocutors there were even amazed at the kinds of steps being undertaken in dealing with one of the most potent sources of greenhouse gas emissions—methane.

Simply put, I would say to you that, in my longer testimony, if you look through that, you will see the scale and the scope of the kinds of initiatives that we are taking, and that we have been engaging other countries on, and in which we are very committed to this issue.

Senator CASEY. Well, we need Presidential leadership, but we'll—my time is up.

Senator KERRY. Thank you, Senator Casey.

Are we ready to go?

Senator MURKOWSKI. Ready to go? Thank you.

Thank you, Madam Secretary, for your appearance here this afternoon. You know, we've had a fair amount of discussion about the mitigation aspect, a little bit about the technology, certainly Senator Hagel has been involved with that initiative through EPAct 2005. But I want to ask a couple of questions about the adaptation component that you have addressed. And you mentioned, specifically, the forestry adaptation.

Certainly in my State, climate change is happening. We are seeing it, whether it is change in vegetation as it advances northward, whether it is the change in our fisheries—we're seeing different species of fish further north. Certainly, you see all of the articles about the thinning of the ice and the receding of the ice pack and the consequences, the impact, not only to the land, to the animals, to the water fowl that is out there, but the people that rely on

them. So, for us, adaptation is very, very key. It's not some theoretical exercise. Senator Menendez mentioned that, in his State of New Jersey, with the coastline, potentially his constituents could be impacted. Well, my constituents are being impacted. I've got communities that are literally being washed out to sea as we speak. And yet, we—we're trying to advance legislation here within the Congress that addresses things from the domestic perspective, and we really are not focused on the adaptation component.

So, I'm pleased to see that there is a—I guess, a greater focus as we move forward. I'm curious, though, how much has the discussion really centered on adaptation, and how will we be able to provide for this, financially? Take just one coastal village. We're looking at $120 to $140 million to move a little village. This is one small village in Alaska. What is the proposal, as we move forward? I noticed in the Framework for a Post-2012 Agreement on Climate Change, there is reference to—in the adaptation section, "a substantial package of financial support, including public and private funds, should be established." Certainly necessary. We're also going to need considerable capital as we develop the technologies, not only for this country, but the technologies that we will be required to help other countries with, perhaps the less developed nations. They're going to be looking to us for that assistance. To what extent—whether it's the adaptation or the technology, to what extent does the financing piece of this come into play? And what are the proposals out there for how we realistically can deal with these very, very difficult situations?

Ms. DOBRIANSKY. Senator, thank you. I'd like to make several points. First, as I indicated earlier, it is very significant that adaptation is put into the framework, and, at the same level of mitigation. Far too often, we have looked at mitigation, and mitigation alone. And what has been striking, in terms of the discourse in the recent meetings leading up to Bali is that there has been agreement that there is a need to address adaptation. So, first, this is where countries basically are.

Second, in terms of the issue of funding, we have put in, ourselves, a significant amount of resources for practical approaches, starting with the basic approach of being able to determine and help those developing countries forecast and deal with climatic change. And how do you prepare for that? That's through the Global Earth Observation System of Systems, in which you have some 70 countries, and even over that, developing countries, in particular. We've put moneys into this initiative to try to help them in building capacity. That's not enough.

Senator MURKOWSKI. Who else is helping us with that financing——

Ms. DOBRIANSKY. I could provide you the list. It's significant——

Senator MURKOWSKI. Well, I know that——

Ms. DOBRIANSKY [continuing]. Of both——

Senator MURKOWSKI [continuing]. with the——

Ms. DOBRIANSKY [continuing]. Developed and developing of——

Senator MURKOWSKI [continuing]. With the Asia Pacific——

Ms. DOBRIANSKY [continuing]. A wide range——

Senator MURKOWSKI [continuing]. Partnership, the United States had kicked in their share, but there was some issue as to whether

or not every—the other participants had made equal financial contribution.

Ms. DOBRIANSKY. There have been different contributions put in. There's a meeting coming up of the Global Earth Observation System of Systems in South Africa, in 2 weeks' time. Other countries have come forward and have put in resources.

Mr. REIFSNYDER. The European Commission, in particular, has been very supportive of this effort and has put a lot of money into the—GEO, the Group on Earth Observations, I should say.

Ms. DOBRIANSKY. But, third, that's not enough. What is also critical is looking for those most effective development strategies. We have worked very closely with the U.S. Agency for International Development in looking at how we deal, not only with issues of climate change, but how we also deal with development approaches to countries and in a way that's sustainable. One of the most graphic examples is dealing with forestry, because forestry has been looked—at mostly in a mitigation context. But, by the way, there are also these issues you hear from small island states—How can you help us in terms of our livelihood and ensure that we can use forests as part of our livelihood, and, at the same time, also preserve our forests? How do you balance the two? We look at these issues through a broader prism of development strategies in which we've put in significant resources.

I'd like to mention—which I know you have an interest in, Senator—my colleague was in Norway, and they were discussing, in particular, adaptation measures in the Arctic and looking——

Senator MURKOWSKI. Is that going to be part of the Arctic policy that we advance, then?

Mr. REIFSNYDER. Yes; this meeting on Oslo last week was really concerned about not only carbon dioxide emissions as a factor, in terms of warming in the Arctic, but also on emissions of other gases; in particular, methane, volatile organic compounds, and black soot was another key focus. I know that they're concerned about melting of the Greenland ice sheet, about the melting of sea ice, and about release of methane from Arctic tundra.

This was a very interesting opportunity, Senator, because we had countries there—in particular, Sweden and Norway—that knew very little, I found at the meeting, about our Methane-to-Markets Partnership, and I detected a great deal of interest in that, in trying—in terms of addressing methane emissions as a way of trying to slow warming in the Arctic, in particular. So, it was a very positive outcome from the session.

Could I mention, if I could, one other aspect? I've been—I was the person that was in Montreal in September that negotiated, on behalf of the United States, the accelerated phaseout of HCFCs under the Montreal Protocol, which has an enormous impact, 25 percent of Kyoto is what we anticipate is the CO_2 equivalent, 3 gigatons. And it's been kind of disappointing to me to—that people have not really focused on the fact that this was a major step forward on the climate front. It has the potential, if we can find substances that have no global warming potential, or a much lower global warming potential, to be even bigger than the impact of Kyoto.

So, I think it's important to keep in mind—I understand that Montreal Protocol is not the focus of our climate efforts, but the links between actions under Montreal Protocol and the climate that have a great impact on emissions of greenhouse gases.

Senator MURKOWSKI. Thank you.

Senator KERRY. Senator Murkowski, thank you very much.

We could easily have another round, but we don't have time to have another round. We have an excellent second panel that's been waiting patiently.

Senator BILL NELSON. Mr. Chairman, I just want to enter in the record, if I may, a statement made by the Executive Secretary of the U.N. Framework on Climate Change, in response to the question that I had asked the witness on the United States committing to leading the development of the post-2012 agreement in Bali. And this is what the Executive Secretary says. Senator Wirth is going to quote this in his statement, "Bali needs to launch a negotiating agenda, decide that negotiations need to begin on post-2012 climate-change policy, launch that process formally, decide what the main elements that need to be negotiated are, set a timetable for negotiations, and, like every good timetable, set an end date. That end date should be 2009."

Senator KERRY. Well said, Senator. And let me just, as I thank you, Secretary Dobriansky—and I do thank you, we're very appreciative of you being here; it's a very important dialogue, and, you know, this is not a "gotcha" process, it's really a sort of "how do we get there" process, and share our thoughts—but let me just underscore one thing, if I can, to you. You know, it is sometimes forgotten in some ways, because of the power of the Presidency, but we are a separate and coequal branch of government, and I know that the democratic majority of this Congress wants to proceed forward and show leadership on this. And it is my hope that we don't have two separate policies in Bali. We're certainly prepared to sit with you and talk about it, but we are also equally prepared to go there, to make sure that the rest of the world understands how serious America is about this, and how there is leadership in the waiting, if you will.

You will not complete this task; 2009 will have a new administration of one party or the other, and a new President. But many of the people up here will still be here and trying to move forward on it. So, I think that's an important component of how we go at this, No. 1.

No. 2, there really is a kind of disconnect on the leadership issue. I know those countries look to us when we have a discussion with them, and I've heard the Indians, and I've heard the Chinese—for 20 years, I've heard the Chinese tell us it's a conspiracy against their ability to grow, and it's a Western ability to hold them down. And that's now transitioned. They've got a new line on it. In fact, they're changing, quite significantly, on the issue, because they're seeing the consequences of their own sacred glaciers melting and rivers and other agricultural problems that are ensuing. In fact, China just announced some very significant mandatory steps with respect to their businesses. Now, whether they're enforced or not, that's the next measure. But they announced them, and they've set a goal of 36 miles per gallon for their vehicles, which is way ahead

of where the Senate bill is. So, other countries are doing things that, if we were smart, we could just take and measure. Those are the measurements. They can be given credit for those things. This can be worked out in a way that doesn't diminish their ability to grow, and speaks to that fear and sense of conspiracy, all of which can become part of the mosaic of a global agreement that we're moving in the same direction. But if the United States isn't saying to them, "Yes; we know your reservations, but this is what we have to do, this is the direction we've got to move in," it'll be like Senator Lugar said, it's just going to kind of drag on and to go anywhere. They're waiting for us to show that leadership.

And the—I'd just close by saying this to you. You know, if we're all wrong, if every one of those scientists—everybody's wrong, and the figures aren't going to be what they are, and you've made the decisions to go down this road, what's the worst that's going to happen? Well, the worst that's going to happen is, you're going to have a whole bunch of new technologies, you're going to have cleaner air, you're going to have new jobs, the health of your nation will be better, you'll have reduced hospital visits for kids with asthma, you'll have unbelievably better agricultural practices, kids will be able to fish again in some places in America where they can't today—19 States, you can't fish, you're not allowed to eat the fish; 44 States, they have warnings against it. You can run down the list of these things. All those things improve, not to mention the national security of the United States, because, to deal with climate change, you have to deal with energy; and to deal with energy, it makes us more secure, less dependent on foreign sources.

So, in every respect—that's the downside; if we're wrong, we've done all those good things. But if you're wrong, or those who resist this are wrong and don't show leadership, the downside is catastrophe, by everybody's measure.

So, I think, as public people, we've got a big responsibility here, and I hope we're going to see the leadership in Bali—in ensuing days. And we're ready and prepared to meet with you any day, anytime, anywhere, to work through how we do this. But I think—you know, Nicholas Stern made it clear, every economist makes it clear, you've got to measure the downsides of the mitigation. Lisa Murkowski just talked about it: $140 million in Alaska for one village. What happens if that 20 inches to 55 inches of sea rise, at the current rate, that's without the Arctic glacier and without the Antarctic, and so forth, melting—you know, that's 40 million-plus—50 million people displaced on the planet. Just that. Current expectation.

So, I really think the urgency of leadership has got to be felt, and it would be so wonderful to have a sense of how the President feels—everybody knows how the President feels about Iraq, but they sure don't know how he feels about this. In fact, they think it's to the contrary. That's the distinction Senator Casey was talking about.

So, we hope this can change in the next weeks. Maybe it won't, but we sure hope it can.

Ms. DOBRIANSKY. Senator, may I just make two closing comments?

Senator KERRY. Absolutely.

Ms. DOBRIANSKY. I wanted to read—you know, I was previously with the Council on Foreign Relations before coming into this job. You gave a speech at the Council, and you had, "Our primary goal"—at least from your prepared text—"Our primary goal in Bali must be to arrive at a mandate for future negotiations to finally reach a truly global agreement on a truly global effort, not one that leaves the world's largest emitter of the past and the largest emitters of the future outside the system."

I want to say, in the spirit of what you're saying, we completely agree with that goal, that objective, going into Bali. I will look forward to continuing this discussion and thinking about, you know, in trying to reach that objective, how we can go forward in the most effective way. And there are multiple ways of doing that.

The second point I just would like to make is the comment, you know, made before, about the President. The President has, I think, shown leadership in ways that I think need to be underscored; the fact that, at a time when we didn't have a global agreement and all parties at the table, that we did not go forward with that.

In terms of the scale and the scope of the range—full range of what we're doing, my mandate is international. I may not know everything that we're doing domestically. I have colleagues that do that. But we are doing a significant amount that President Bush has blessed, has launched, has encouraged. And we want to continue along that path.

As I said in my longer version of my testimony, it fully documents the scale and the scope of how we're using, and how we've used, some $37 billion toward that end.

Senator KERRY. Well, let me give you an example of the kind of thing you might grab onto. And I appreciate those comments, and I stick by them. I think that's the goal. But I still think we have to lead to get there.

Senator Stevens and I have introduced, on the Commerce Committee, a bill to immediately deploy three to five carbon capture and carbon storage plants. So, we have storage and sequestration, three to five of each—we ought to do this, immediately, commercial scale, as rapidly as possible. Now, I think if you went to Bali and embraced that, and said, "The United States is going to immediately do this, and we're prepared to share the technology and assist China and other countries in order to implement it as rapidly as we know what's best," that would go a long way, in my judgment, to bring people to the table in a serious way. So, we hope you'd consider that and some other steps. We're about to spend $25 billion in the farm bill for a program put in place in the 1980s, called, you know, Freedom to Farm, which allows people who don't even farm to get huge payouts. How much are we going to put on the table in Bali to help with this technology development and these other practices? I think those are the issues of leadership here that we need to see. And so, we hope.

I don't know if—Senator Lugar, I've monopolized. Thank you.

We really thank you. This record will remain open in the event any Senators want to submit some questions.

And we do look forward to testimony of the next panel. We're very grateful to you for coming. I look forward to following up with you before we go there.

Ms. DOBRIANSKY. Likewise. Thank you.

Senator KERRY. Thanks so much.

Thank you.

Ms. DOBRIANSKY. Thank you.

Senator KERRY. Could we ask the second panel to come up? And we're very, very appreciative for your patience. It's a worthwhile engagement, and we look forward to your testimonies: Tim Wirth, who is a good former colleague of all of ours, and friend, and current president of the United Nations Foundation, who, I might add, has been unbelievably diligent and involved, and has traveled near and far in an effort to further these issues and others, and we're very grateful for his work and leadership; Richard Sandor, chairman and CEO of the Chicago Climate Exchange; and Jonathan Pershing, director of the Climate, Energy, Pollution Program at the World Resources Institute.

Thank you all very much for being here.

Senator Wirth, would you—Secretary Wirth.

STATEMENT OF HON. TIMOTHY WIRTH, PRESIDENT, UNITED NATIONS FOUNDATION, WASHINGTON, DC

Senator WIRTH. Thank you very much, Mr. Chairman. And I'm delighted to be here and to see so many old friends.

I must say, having been the climate negotiator for the United States from 1993 to 1997, the idea that there would be eight U.S. Senators showing up for a climate hearing is absolutely wonderful. At that point, we could get no attention, you'll remember, or very, very little attention, to the issue, with the exception of a few of you, and this is great.

I thought, if I might put my statement in full——

Senator KERRY. The full statement will be——

Senator WIRTH [continuing]. In the record, Mr. Chairman——

Senator KERRY [continuing]. Put in the record for everybody. If you want to summarize, then we——

Senator WIRTH. I just would make three points that might be helpful to the committee. The first relates to Bali. Let me go back to the quote that Senator Nelson read from my testimony, which was a quote from Yvo de Boer, who is the executive secretary of the Framework Convention. Bali is a meeting not of substance, but of process. Where you all can be really helpful is in lowering expectations for Bali; this is not a meeting that's going to decide on targets, it's not going to decide on finance, it's not going to decide on the substance of the climate issue—it's a process meeting. And lots of people, including lots of political people, lots of press people, lots of NGOs, are steaming into Bali with enormous expectations about what's going to happen. This is a process meeting, and you all can be very helpful, it seems to me, at reflecting that and helping to lower expectations about what Bali does.

We don't want the success of Bali to be termed, "Oh, nothing happened, it was just another talkfest, they just talked process." Well, that's what it's designed to do, to set up a process. And I would say, while I've been critical of what the administration's

done related to climate, what Paula Dobriansky laid out today has got it right. If they do what they say they're going to do in the administration and support that agenda, that'll be great, and we'll get in and out of Bali with a successful venture.

The second item that might be helpful, Mr. Chairman, would be to reflect upon the Senate Observer Group, of which you were a part in 1992, and which is going to be extremely important for the long-term success of the climate negotiations. These negotiations—and Jonathan Pershing, at the end of the table here, was deeply engaged in them—are going to be extremely difficult, very, very hard, and very, very complex. Kyoto was tough enough. This is going to be even harder. And what happens in 2008–2009, with an enormous amount of material, very complicated material, how to order that material and how to explain that material, the Senate Observer Group can be extremely helpful in coming together to understand what has to be done, and then helping to explain it.

Now, I cite that particularly out of personal experience in the fact that we failed dramatically, going into Kyoto, to have the kind of communication that was necessary between the administration and the negotiation process and the Senate. There was a total gap. There was almost no communication at all. And that occurred for a lot of very complicated reasons. Someday somebody will tell that story. It's not a very pretty story. But that's what did happen. And the result was the 95-to-nothing vote, or whatever it was, which you point out was not a pro-or-con climate vote, it was really a vote on the process and a misunderstanding—nobody really knew what had happened, and there had been no groundwork laid leading up to Kyoto. That was a very, very big mistake. We would be very happy to work with you and others in establishing what could be done, how the Senate Observer Group can be helpful, and working that along—I think it's got to be an inside-outside job. I know there are a lot of people on the private side who would be very pleased to work with the Senate on that; it's a very big job that you have in helping this to happen and helping the negotiations in 2008–2009, when we really get to the substance—in helping those negotiations.

The third point that I would make relates to the substance of the negotiation. The framework, which is now broadly agreed, is that the substance will have four pathways, or four pots, and they've been referred to today. Senator Corker was talking about mitigation, which is the first, and probably the most difficult. The second is adaptation—that is: How are we going to respond and adapt to what we've already built into the system, and anticipate what's coming down the line? The third is technology, which is just a piece of low-hanging fruit, waiting, it seems to me, for very aggressive congressional action. And the fourth is the issue of finance, which loops back around to mitigation. You know, you have to, Senator Corker, put a price on carbon. And when you put a price on carbon, the way those funds get distributed gives you the opportunity then to finance a number of the things that have to be done. And Richard Sandor, who knows an enormous amount about this, will be next on the agenda.

But these four pathways, these four packages, each deserve attention and understanding in this international context. And the

single most important part running all the way through that is a phrase that was referred to by Secretary Dobriansky, but which demands a lot of attention, and that's the idea that we all have responsibilities, but they are differentiated responsibilities. Common, but differentiated. Explaining to people that we all have responsibilities in working on the climate issue, but those are differentiated. Some can do more right now than others; some have a responsibility to do more right now than others.

During Kyoto—and this is the final point that I would make—we were successful in two out of the three procedural pieces that we wanted to get done. The first was trading. Europeans were adamantly opposed to trading, and we got them over the "want to" line, and they agreed to do trading, and they're now, the world's strongest advocates for trading.

The second one was sinks—that we should be talking about sinks. And there was great resistance to that. That is now well understood to be terribly important, particularly in the context of deforestation.

The third, which we were unsuccessful on, was the point that you were raising, Mr. Chairman, and that's: How do we give others credit for what they're already doing and get them onboard as a partner? China is the perfect example, and I cite, in my testimony at some length, how we ought to be working with China as a partner in this negotiation, not viewing them as the enemy, not viewing them as somebody that we are going to be fighting with; but, rather, working to figure out how, with what they've already done on mileage standards, what they've already done on efficiency and so on, they get credit for what they're already doing, and slowly but surely, just as we're going to lead in some ways, they are going to have to lead in other ways as a model for the rapidly developing world, in particular. That should be a positive relationship, and not a negative relationship. And, again, what you all say, from your perspective on this committee with this responsibility and who you are as members of the U.S. Senate, the way in which you talk about "common, but differentiated," and bring them onboard, is going to be extremely important. And that will set a tone, as well, for what the United States does in 2008 and 2009, and, I think, will be extremely important for the outcome of these negotiations.

Those are three summary points that I would make, Mr. Chairman. I hope that's helpful. And we look forward——

Senator KERRY. Very helpful.

Senator WIRTH [continuing]. To working with you.

Thank you.

[The prepared statement of Senator Wirth follows:]

PREPARED STATEMENT OF HON. TIMOTHY E. WIRTH, PRESIDENT, UNITED NATIONS FOUNDATION, WASHINGTON, DC

Thank you, Mr. Chairman, for inviting me to testify and for the outstanding leadership you have shown on this issue for many years.

Climate change and the proliferation of nuclear weapons are the most dangerous challenges confronting humanity; at the United Nations Foundation we are deeply engaged with working toward solutions of the climate crisis, both in the U.S. and globally. The other major institution funded by Ted Turner, the Nuclear Threat Initiative, chaired by former Senator Sam Nunn, is dedicated to finding solutions to the nuclear issue.

We particularly welcome the remarkable leadership that is being shown by United Nations Secretary General Ban Ki-moon, who has made climate change one of his top three priorities, and is relentlessly emphasizing the importance and urgency of action around the world. This week the Secretary General is traveling to Valencia, Spain, for the release of the synthesis report of the Intergovernmental Panel on Climate Change (IPCC). This report will sum up the findings of the three IPCC working groups, whose work has been released over the course of this last year. The clarity and forcefulness of this Fourth Assessment Report and its three important predecessors have clearly described the state of the science, and the consensus on the need for urgent action. The IPCC represents the U.N. system at its best and well deserves the Nobel Peace Prize that it is sharing with former Vice President Al Gore.

The United Nations Framework Convention on Climate Change (UNFCCC), signed in Rio in 1992 by President George H.W. Bush and immediately ratified by the U.S. Senate, defined the treaty's objective as "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." The Kyoto Protocol and the negotiations next month in Bali represent the world's continuing efforts to implement the Framework Convention and make it effective. The first commitment period under the Kyoto Protocol comes to an end in 2012, and the world's urgent task is to negotiate what comes next—preferably a new and comprehensive global agreement that puts us on a path to achieve the Framework Convention's objective.

The negotiations leading to the 1997 Kyoto agreement were prolonged and extremely difficult, and our ambitions then were relatively modest compared to the challenge we face today. It will therefore be even more difficult and complex to reach agreement this time—but world opinion has shifted since 1997 with regard to the urgency of action and the scale of the threat, and we are optimistic that common ground can be found. To have an updated treaty implementation agreement in place by 2012, however, we need to complete negotiations by the end of 2009, and allow time for ratification and implementation. To reach a new agreement by the end of 2009, we have to start immediately, and that is the objective of Bali: Not to conclude any deals, but to agree on a process and timetable that can be completed by the 2009 and 2012 deadlines. Bali is a "process" meeting; its success will be measured by the consensus reached on process and timetable.

Together with the Club of Madrid—a group of 66 democratic former heads of state and government—the United Nations Foundation this year convened a distinguished task force that we called "Global Leadership for Climate Action," comprising former heads of government and other leading figures from 20 countries. The objective of this diverse group (facilitated by the extremely effective former CEO of the Global Environment Facility, Mohamed El-Ashry) was to develop and propose the outlines of a broadly acceptable global climate agreement. The resulting report, "Framework for a Post-2012 Agreement on Climate Change," has been warmly received in international circles, starting with the G–8 Gleneagles Dialogue in Berlin in September. This very useful document, which we commend to your attention (and which I wish to include in the record), breaks the complex subject of climate change down into four key areas or "pathways" to agreement: Mitigation, adaptation, technology, and finance. We recommend that parallel negotiations proceed along each of these pathways during 2008 and 2009, in order to bring the world together on a new agreement and to make further progress in implementing the 1992 climate treaty. We are encouraged that our suggested framework—the four pathways—have become the almost universally agreed method of organizing the many complex issues that contribute to the substance and politics of the climate issue. We were further encouraged that this general framework helped to organize the Secretary General's high-level session on climate at the U.N. in September, and appears to enjoy broad support as we prepare for Bali.

The substance of the debate over climate will not be resolved in Bali next month. Bali will be a success if all the engaged countries devise, agree upon and embark on a process that leads to a comprehensive new agreement for next steps in implementing the climate treaty. Yvo de Boer, the Executive Secretary of the UNFCCC, put it succinctly last week when he said: "Bali needs to launch a negotiating agenda, decide that negotiations need to begin on a post-2012 climate change policy, launch that process formally, decide what the main elements that need to be negotiated are, set a timetable for negotiations, and like every good timetable, set an end date . . . The end date should be 2009."

Ultimately, the agreement which must be negotiated in 2008 and 2009 must be comprehensive. It should include all countries, all sectors, all sources and sinks, mitigation as well as adaptation, technology development and sharing, and adequate and innovative finance mechanisms. However, "comprehensive" does not mean "one

size fits all." Targeted agreements—for example, on industrial energy use, energy efficiency, renewable energy, and technology cooperation—should be encouraged and incorporated within a new comprehensive agreement, and these agreements could encompass a much broader array of countries than those who immediately commit to an emissions cap. Sectoral agreements—also developed within the global U.N. agreement—should also be encouraged: Autos, cement, steel, and utilities should be on everyone's early lists.

The Framework Convention established the principle that countries should address the climate challenge "on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities." Developed countries should take the lead because over many years they have contributed the most to the buildup of greenhouse gases in the atmosphere. Meaningful engagement of developing countries, especially the rapidly industrializing economies, is needed also. But requiring all countries to achieve the same percentage reduction in the same time period would be unfair, and frankly impossible. The developed countries put the carbon into the atmosphere to start with—we were the first to use the atmosphere as our carbon garbage dump. The effects of our dumping are now being felt, and our task is to change our habits and help the world to adapt to the problems we largely have created, while encouraging others—like China and India—to avoid our bad habits and embark over time on the same low-carbon path that we should be pursuing now.

This key issue—who has what responsibility, and when do obligations kick in—is the central issue in the climate negotiations—in Bali and beyond—and it will also be critical to the future Senate ratification of any new climate protocol. We must be flexible enough to recognize and accept the value of diverse approaches to the climate challenge.

For example, China may not accept an immediate cap on its emissions, but should be encouraged and credited with the important actions it has already taken: Setting a target of improving its energy efficiency by 4 percent per year, imposing fuel economy standards that are stricter than those of the U.S., and moving to double its renewable energy capacity (to 15 percent) by the year 2020. Those steps will significantly reduce Chinese emissions in real terms, while putting China on a path toward a lower carbon economy. Like the U.S., China is learning how to cope with the looming climate crisis, but unlike the U.S., China has made relatively little historic contribution to the level of carbon in the atmosphere. Like the U.S., China is a global leader, and in dealing with the climate crisis, should become our partner, not our adversary. The U.S. can help to lead in many areas: Technology, economic transformation, sectoral modernization. China can help to lead in others, serve as a model and challenge, especially to others in the rapidly developing world, and together we can demonstrate that the climate crisis can be an opportunity, and reflect everyone's self-interest.

Mr. Chairman, this committee (and the Senate Observer Group, which I hope will continue to work together well after the climate negotiations in Bali) can make a number of very significant contributions:

- You can help your colleagues, the administration, the press and the country to understand the issue of equity and responsibility that I have just discussed. How we implement the key treaty commitment "Common but Differentiated" will be central to the success of our efforts. This will require patience, understanding, diplomacy, and time, as well as a lot of negotiation, and you can help.
- You can also help to clarify the context of the climate negotiations. Of special note are two elements:

  1. The state of science and the fact that the debate is over about man's effect on the climate. The questions now are how much, where, how fast, and of course, what do we do next?

  2. Pricing carbon: The sooner we get agreement on pricing carbon—the atmosphere should no longer be treated as a free garbage dump—the more rapidly we can make progress on the complex negotiation that lies ahead.

Finally, let me briefly outline some of the key, immediate issues along the pathways for the negotiation, and again commend to you the framework which we have developed in cooperation with the Club of Madrid:

- *Mitigation:* In the area of mitigation, of special concern and opportunity is the treatment of forests, an issue of the greatest importance for the developing world. Will countries be rewarded for protecting the great carbon sinks in their natural forests, for replacing forests and planting new ones? How can we use carbon credits without destabilizing the carbon markets?
- *Adaptation:* Since there is enormous inertia in the climate system, significant effects of our climate-forcing pollution are inevitable and largely irreversible.

The world will have to adapt to a changed climate, and the poorest countries will be hardest hit, with the least resources to cope. New drought-resistant crops will be needed; so will new methods of storing and using water efficiently. How will rich countries step in to help?

- *Technology:* Technology development and deployment is essential to reducing carbon emissions at an acceptable cost. Yet U.S. and global spending on energy research and development is a small fraction of what it was more than 25 years ago. The United States Government should make a major commitment to restoring RD&D investment—an immediate doubling or quadrupling, especially to accelerate the deployment of high-priority technologies in such areas as carbon capture and sequestration, second-generation biofuels, and a modernized electric power system. How can the U.S. and others collaborate effectively with developing countries on the development and deployment of new sustainable energy technologies?
- *Finance:* The world will not transition to a new system of energy technologies without massive investment, in the trillions of dollars over the next 30 years, and how we price carbon is fundamental. Further, with the right public policy signals, the private sector will be central, and the public-private partnerships will be indispensable. Private investors are unlikely to finance protection of the shoreline and other critical infrastructure against rising sea levels, and will be cautious about investing in sustainable energy development in the poorest countries. But private expertise, innovation, and technique will be absolutely essential. What combination of innovative finance, carbon credits, and direct assistance will catalyze the most rapid progress?

Leadership by the United States remains central, and the most important step we can take is at home—by putting a price on carbon, either through a cap-and-trade system or through a carbon tax. The progress on the Lieberman-Warner bill is extremely heartening in that regard. It is important to note that the purpose of a price on carbon is not to bring about higher energy costs to consumers. Rather it is to set the rules of the game in such a way that clean technologies can compete with dirty ones, and indeed, over time, out-compete them. This will lead to a great wave of innovation, investment, economic development and job creation—which the U.S. has historically done better than anyone in the world.

For many years this committee has promoted U.S. reengagement in the global climate negotiations. Constructive reengagement will change the dynamics of the discussion and create the basis for success. Now the committee, and the Senate more broadly, needs to prepare for that success by setting out clear and realistic expectations (on a bipartisan basis) for next steps on implementing the climate treaty, so that a new agreement can be quickly ratified and implemented by the United States. These negotiations will certainly continue at least until the end of 2009, and your guidance and political judgments will be extremely important and valuable. Our negotiators must have a clear understanding of what can be delivered, and early cooperation is very important.

Mr. Chairman, hearings like these, and your leadership and engagement on this subject in Bali and beyond, are essential steps in that process, and we thank you for it.

Senator KERRY. Well, we look forward to discussing it, but that's very, very helpful. Thank you.

Mr. Sandor.

STATEMENT OF RICHARD SANDOR, CHAIRMAN AND CEO, CHICAGO CLIMATE EXCHANGE, CHICAGO, IL

Dr. SANDOR. Yes; thank you, Mr. Chairman, it's a pleasure to be here.

And I'd like to share with you, if I can, some of the experiences that we've had at the Chicago Climate Exchange. Many of you may not know what the organization is, so let me share a few things about it.

The Chicago Climate Exchange (CCX) is a financial institution that administers a cap-and-trade, allowance-and-offset system that is legally binding, but voluntary. Ten percent of Fortune's top 100 companies belong—Ford, Motorola, Bank of America, Safeway, et cetera. Seventeen percent of the Dow Jones Industrial Average be-

longs to the exchange—IBM, DuPont, Intel, United Technologies. Twenty percent of the power companies belong including AEP and Allegheny Energy. In your State, Senator Nelson, TECO is a member. There are CCX members located in every state represented by the members of this committee. Together, these emitters constitute a bigger allocation of emissions than the country of Germany. CCX members make up 16 percent of the United States large stationary sources of greenhouse gas emissions.

In addition to those corporate members, we have others. In your State, Senator Kerry, we have the first university in America to join CCX—Tufts. We're proud to have the Lugar Stock Farm as a member. Other members include Tennessee Timber Consultants, a forestry project aggregators. Miami Dade County and cities from Chicago all the way to Melbourne, Australia, and States like New Mexico and Illinois have all joined. All in all, CCX membership numbers close to 400. The CCX market is more than 25 percent the size of the entire carbon emissions market in the EU. We are independently audited by the NASD—National Association of Securities Dealers—now called FINRA—Financial Industry Regulatory Authority)—which originated from the Maloney Act of 1938, to be the self-regulatory organization for the securities world.

I might mention to you that we are an international organization. We have reforestation projects from Costa Rica. We have seven Brazilian members, all of which, like Aracruz, is a $7 billion New York Stock Exchange company, have taken on the CCX membership commitment to reduce their greenhouse gas remissions by 6 percent by 2010 even though Brazil is not required by international treaty to mandate emissions cuts.

From 2003 through 2006, our members were committed to make a 4-percent cut in their emissions. They've actually achieved a 12-percent reduction, so we're way ahead of schedule.

The CCX program includes everything from German coal mine methane, to AGL, the largest utility in Australia, to five Chinese, five Indian, and one Chilean member. All of this adds up to what we think is a substantial group of members.

Most recently, the House of Representatives of the United States joined CCX, and it offset a portion of the emissions from the operation of the House. We conducted a reverse auction for the House that yielded a basket of offsets from U.S.-based coal mine methane, soils, and forestry projects.

Also, our progress has not gone unnoticed in the developing world. We were surprised, most recently, when we were approached by Tata Motors of India to conduct a dollar-based auction of certified emission reductions that it had tried, unsuccessfully to sell in Europe. Tata, if you don't know, is the Indian equivalent of General Motors. It's that country's largest automaker. We did conduct the auction, with a week's notice, and were 13 times oversubscribed.

The market is here today; the capital is here. And we are exporting our expertise. We also run—just for your information, Senators Kerry and Tim Wirth, who inspired many things from what you did back in the eighties—we run the only transparent regulated market for sulfur dioxide emissions under the U.S. Acid Rain Program. Trading volume has been $3 billion year to date, up from $10 mil-

lion 2 years ago. We also run a mandated NO_x futures market. And I think what may surprise some of you, that the United States, the Chicago Climate Exchange, actually began the European Climate Exchange, which, of nine exchanges in Europe, is the largest. We'll trade about 30 billion dollars' worth of carbon this year in Europe.

So, we've exported our trading technology and our capital market expertise. We also have a joint venture in Canada with the Montreal Bourse to operate the Montreal Climate Exchange, and we're looking at a similar effort in India. Our India advisory committee there is headed by Rajendra Pachauri, of the IPCC. And we're making a very strong effort in China, as well.

In conclusion, from the experience that we've had, both with the sulfur market and the carbon market, this is all not very difficult, it's not von Heisenberg's Uncertainty Principle. You put them up on a screen, and you buy them and sell them. You monitor and verify them, as we do with the million acres of Nebraska, farmland enrolled in our Ag solids program. You take an NASD and you audit the emissions from all 39 of Ford's North American plants. It's doable. And, not only that, as Senator Wirth just said, we put out a price signal. We're seeing inventors out of MIT and other universities who, for a price signal of $2 to $3 a ton, are being motivated to develop new mitigation technologies.

The U.S. can take the leadership role here. We have the financial technology, and the price discovery mechanism that will spawn the most cost-effective ways to reduce greenhouse gas emissions.

Thank you.

[The prepared statement of Dr. Sandor follows:]

PREPARED STATEMENT OF DR. RICHARD L. SANDOR, CHAIRMAN AND CEO, CHICAGO CLIMATE EXCHANGE, CHICAGO, IL

Senator Kerry, Senator Lugar, and members of the committee, I want to thank you for your invitation to be with you today. I congratulate your leadership on the complex problem of climate change, which presents both deep challenges and wide possibilities.

Today the committee is taking up the topic of the United States role in the international negotiations on climate change and how this country can resume its leadership on this critical issue. First, it is incumbent upon the committee to know that a functioning and successful cap-and-trade system already exists in the U.S. The Chicago Climate Exchange (CCX) along with leading U.S. economic enterprises, cities, states, counties, farm organizations and others are using a voluntary but legally binding cap to structure their energy use, enhance their strategic economic planning, and most importantly reduce their greenhouse gas emissions.

To date, CCX members have reduced their emissions, on average, by 12 percent beyond their annual commitments, representing more than 180 million tons of greenhouse gas reductions in the first four compliance years of our program. On the eve of the Bali negotiations, the CCX experience is extremely relevant.

To flesh this out, I will report to you on the work of the Chicago Climate Exchange (CCX) family, the world's only global emissions reduction and trading system handling all six greenhouse gases. CCX had its birth in the U.N. process in 1992 and operates worldwide in both voluntary and mandatory regulatory frameworks. CCX and its members are securing actual greenhouse gas reductions now, using emissions trading, a critical financial mechanism, in a system that is designed to meet the needs of all emerging policies, including the post-Kyoto framework that will be discussed at the forthcoming Bali negotiations

Membership in CCX now numbers in excess of 370 and represents the leading edge of industry, municipal and state government, universities, and nonprofit organizations. Our members include:

- Twenty percent of the largest CO_2 emitting power utilities in the U.S. including American Electric Power, Reliant, Allegheny Energy and DTE.

- Seventeen percent of the companies making up the Dow Industrial Index, including DuPont, Intel, IBM, and United Technologies.
- Ten percent of the Fortune 100, including Ford Motor Company, Bank of America, Motorola, Safeway, and International Paper.
- Six U.S. cities including Chicago and Portland, Oregon.
- Three counties, including King County in Washington, Sacramento in California, and Miami-Dade in Florida.
- The States of New Mexico and Illinois.
- Universities like Tufts, Michigan State, Minnesota, Iowa, Oklahoma, and Idaho.
- Associate members including architectural firms like Mithun, law firms like Sullivan and Cromwell and Foley and Lardner and NGOs like the Rocky Mountain Institute.
- Hedge funds, banks, and professional commodities traders that provide liquidity in our markets.

And, the United States House of Representatives is a CCX Exchange Participant. The House is using the CCX offsets portfolio as a source of verified U.S.-based greenhouse gas mitigation project credits to help it achieve "carbon neutrality," as part of its Greening the Capitol initiative launched in the spring of 2007.

Members join CCX for disparate reasons, but they all share one motive which is to better master their emissions data and gain early mover benefits with price discovery for carbon, and all aspects of risk mitigation, includng financial, operational, and reputational.

The baseline of emissions under the CCX cap is currently 540 million metric tons, which is greater than the National Allocation of Germany, the largest economy participating in the European Union's emissions trading scheme. The current CCX baseline represents more than 16 percent of the total large stationary sources of greenhouse gas emissions in the United States. This means that the U.S. has more emissions under management through CCX than any other country with an active cap-and-trade system.

The CCX Offsets Program is successfully rewarding emissions mitigation through sustainable farming and forestry, while also providing a new income source for U.S. agriculture. Entities such as the Iowa Farm Bureau and the National Farmers Union are leading the way in building the infrastructure for our agricultural offsets program. To date, more than 2 million acres of conservation tillage and grassland in more than 20 States and the Canadian Province of Saskatchewan have been registered, verified, and sold through the Exchange. From 2005 to 2006, farmers earned more than $3 million from the sale of CCX Carbon Financial Instruments. Tonnage enrolled under the CCX agricultural methane program went from 24,100 tons to 207,200 tons during the same period.

These offsets provide a least cost avenue for society to reduce greenhouse gas emissions in addition to enhancing farm profitability and income diversification. American agricultural producers are taking a leadership role in promoting long-term sustainability of U.S. agricultural soils through the CCX program. Earlier this year, the CCX Offsets Committee approved protocols for rangeland management soil carbon offsets, which are now being registered on the Exchange. A member of this committee, Senator Richard Lugar, has registered reforestation credits from trees planted on his family farm in Indiana, and is setting an example to many other farmers for turning otherwise unproductive land into acreage that provides the important environmental service of carbon sequestration.

It is also important to note that the potential for offsets coming from coal mine and coal bed methane is substantial. More than 7 million tons of captured methane from coal mines has been registered on CCX to date. Coal mine methane capture not only reduces greenhouse gases but can contribute to the safety of miners.

CCX is also pleased to inform the committee that it is supported by the U.S. Department of Agriculture to help expand the CCX agricultural offset program. Further research and expansion on agriculturally based greenhouse gas mitigation strategies can provide new sources of revenue for America's farmers, who are providing bona fide environmental services. These revenues can help minimize the need for additional subsidies and lower the tax burden required to finance agricultural security while encouraging innovative practices to address climate change.

CCX Member operations and Offset Projects can be found in every member of this committee's home state as well as in every other state in the U.S., and they span the globe as well. In the Annex I countries of Canada and Australia, CCX members include Abitibi-Consolidated, Manitoba Hydro, Tembec, AGL (the largest power producer in Australia), and the city of Melbourne. In addition there are CCX registered Offset Projects in Canada and New Zealand as well as projects outside of the Kyoto mechanisms in the country of Germany.

In the Non-Annex I countries of Brazil and Chile, the New York Stock Exchange listed, Aracruz ($7.21 billion market cap) and seven other corporations have joined as members, taking on the same reduction commitments as our U.S., Canadian, and Australian members. CCX member Ford Motor Company has included all of its Mexican operations, along with its U.S. and Canadian operations in its reduction commitment. And Motorola recently announced that it will be including all of its global facilities in its reduction commitment beginning this year. CCX's portfolio of offsets include projects in the Non-Annex I countries of China, Costa Rica, India, and Mexico.

CCX members execute legally binding commitments to meet, at a minimum, an emissions reduction goal of 6 percent below baseline by 2010.[1] Members who exceed their reduction commitments may sell allowances; those who do not make the required cuts must buy allowances to come into compliance. CCX rules require that all emission baselines, annual reduction commitments and Offset Projects undergo a standardized third party audit by the Financial Industry Regulatory Authority (FINRA)[2] and authorized experts. This is the only third party standardized audit system for greenhouse gas emissions reductions operating in the United States at this time.

CCX members report that the baselines, audits, and annual commitments represent concrete goals that help them focus on internal efficiencies and attendant financial opportunities. They have reduced their emissions through increased energy efficiency, expanded use of renewable fuels, and realization of low-cost reductions in non-CO_2 greenhouse gases through use of direct abatement equipment. Many members have exceeded their reduction targets. As an important aside, another benefit of the price discovery mechanism provided by an organized market is the ability to spur inventive activity. Developers of various renewable energy technologies including biodiesel production and anaerobic manure digesters have been able to raise capital from the investor community after factoring in CCX prices in their business plans.

CCX has built emissions trading markets under every possible regulatory framework. In the European Union's Kyoto-driven emissions trading program, our sister exchange, the European Climate Exchange (ECX) trades more than $130 million in CO_2 emissions contracts daily. More than 795 million metric tons of CO_2 reductions have been traded on ECX this year to date with more than 1.3 billion tons traded since ECX launched in 2005. Transactions on ECX represents between 80 and 90 percent or all exchange-based trading in the EU trading scheme.

It is important to note that linkages already exist between the European and U.S. carbon trading systems. In 2006, CCX member Baxter International transferred emissions reduction allowances earned by its EU-regulated Irish facility into its CCX account in order to meet its compliance requirements under the CCX program, thus demonstrating the ability to create a compliance market that crosses international borders.

In Canada, CCX is in a joint venture with the Montreal Bourse, that country's leading derivatives exchange to operate the Montreal Climate Exchange (MCeX) which will trade emissions reduction contracts under that country's Kyoto program. MCeX will launch its first contract in early 2008.

It is significant, and ironic to note that American ingenuity and financial know-how are being exported abroad. Despite the absence of a mandated carbon constraint here at home, U.S. financial services provide the infrastructure for emissions trading in the Kyoto-driven cap and trade market.

Through its CFTC regulated subsidiary, the Chicago Climate Futures Exchange (CCFE), CCX has also created a market for SO_2 and NO_x emission allowances regulated under the Clean Air Act Amendments of 1990. That market is now the central point for SO_2 price discovery in the U.S. Acid Rain Program.

Through CCX and its affiliated exchanges, the financial, capital, and regulatory structures needed for an internationally linked carbon trading system are well advanced. The effectiveness of cap and trade is being demonstrated every day by CCX members, now across the globe. The environmental and economic benefits being generated are of national and global significance. There are extensive opportunities for the U.S. to leverage global linkages, and we believe we have pioneered pathways of engagement for all nations to become involved in meaningful greenhouse gas reduction using flexible market mechanisms.

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[1] A member's baseline is calculated as: (i) Its average emissions over the period 1998–2001; or (ii) its total emissions in 2000.

[2] FINRA was formerly known as NASD the leading financial regulator in America and created by an Act of Congress in 1938.

CCX plans to forge ahead with its expansion and development and is ready to operationalize and facilitate any legislation passed in the United States.

We are at the disposal of the Congress to provide advice or answer any further questions.

Senator KERRY. Thank you very much, Mr. Sandor, it was very helpful.

Mr. Pershing.

STATEMENT OF DR. JONATHAN PERSHING, DIRECTOR, CLIMATE, ENERGY, AND POLLUTION PROGRAM, WORLD RESOURCES INSTITUTE, WASHINGTON, DC

Dr. PERSHING. Thanks very much.

I'm Jonathan Pershing. I'm the director of the Climate, Energy, and Pollution Program at the World Resources Institute, which is a nonpartisan think tank here in Washington, but we have partnerships in over 70-odd countries around the world, did a lot of work on the climate-change issue, among others.

I wanted to just make a few points to try to summarize my written testimony, which I've submitted.

The first one, I think, is one that was made by almost everyone who spoke, which is about the urgency of the problem. And I think we can't understate that. And, in fact, that adds to a sense of the importance, not only of this meeting, but of the next couple of years. Unless we move forward really aggressively, the problem is really beyond our control.

The second point I want to make is the need for U.S. leadership. And I think that, at the moment, the United States has got about 5 percent of the world's population, give or take; some 28 percent of the emissions that have entered the atmosphere. So, it's even more than a quarter. That's an historical total, but we also have technology, we have economic capacity. Richard Sandor spoke about the market expertise that we bring. So, we can do an enormous number of things if we put our mind to it. And the point is that we're, so far, not, apparently, doing that, the level we'd like to see.

I would think that, therefore, one of the most important things that you could do would be to think about legislation. And, to a certain extent, what you bring to Bali and the methods that you carry about the willingness to enact legislation will perhaps be the most powerful message that you carry.

I note that we are still operating in a multipolar world. It's not what it was when I first began working in this negotiation, and I, speaking on behalf of the United States, sat next to the Union of Social Soviet Republics. They were right next to us at that point. Now they've moved well down the ranks, and you sit next to Russia; it's a very different dynamic, and we speak to China much more than we speak to our immediate neighbors, who are the United Kingdom. That dynamic has fundamentally shifted how we need to interact in this global set of activities.

China, in particular, which is, I think, a considerable focus, as it should be—they've now assumed the position atop the pyramid as the world's largest emitter—China should be a focus, but China will not act just because we say so. China might act because we do things on our own. China will certainly act because of its own

interests. And those interests clearly, in my mind, reflect the things that you, Senator Kerry, mentioned. It's the questions of energy security. China is expected to import huge shares of its oil by the end of this decade. It will affect local pollution. You can hardly breathe the air in some of the cities. It will reflect water and water damages. It will also reflect climate change. Those things will drive China, and we can bring to them our information and our data and our expertise.

Of course, developed countries have indicated they are prepared to move forward—but developing countries have indicated they are not—through a binding commitment. And so, we need to find other approaches. We need to recognize the fact that the population of China, four times our own, has only one-fifth the per capita income, one-fifth the total emissions. It's not a quid pro quo and an even exchange between one and the next, but there are lessons to learn and lessons to exchange.

I'd like to make the point that Richard Sandor made, that the markets will be enormously powerful. It will raise huge sums of money that we can distribute for things like adaptation, for things like technologies, for the mitigation obligations and the development needs of the least advantaged. But they don't work for everyone. We need strong institutions. We need strong compliance mechanisms. It is not a one-size-fits-all equation. A trade with all countries is not the equivalent of a trade with the United States, and those countries that do not have these institutions have to be treated in a somewhat different way.

Finally, I want to say something about adaptation. I think that was the comment that Senator Murkowski made, and others here on your committee have certainly reflected on. At the moment, according to the World Bank, there are about 2 billion people in countries affected by climate disasters in the 1990s alone. That's a staggering number. It's likely to go up by perhaps as many as doubling, just in this decade. We have the best projections of the IPCC that include things like sea-level rise, but they also include consequences like heat and drought, include consequences like forest fires, and they include consequences like pests. We have to move forward on those kinds of tasks.

So, finally, Senator, what might you bring to Bali, and how do you think about all of these in the context of a Bali agreement? I would say just a few things. The first one, we need a mandate. And I would agree with Senator Wirth, the mandate that was laid out is really not a bad one. The question really is: How will we carry it forward? But it is a process meeting, and a mandate is critical.

The second thing is, it does have to incorporate both developed and developing countries. And, from that perspective, I would strongly urge that we not insist on exact equality, but we insist on equity. And that means a balance.

The third thing is, we must address deforestation. Close to 20 percent of the total emissions, collectively, are from forests. If we don't address that, not only will we not have any forests or biodiversity in Indonesia or Brazil, we have a huge problem.

And, finally, we need to have systems for adaptation to help those vulnerable populations to move forward.

It's a pretty daunting task. The first step, though, is very manageable. And if we take this one step at a time, I certainly believe we can get there in a cooperative spirit, which I think you're trying to lay out. And I think that you and the Senate delegation that comes to Bali could be enormously effective at making that case.

Thank you.

[The prepared statement of Dr. Pershing follows:]

PREPARED STATEMENT OF DR. JONATHAN PERSHING, DIRECTOR, CLIMATE, ENERGY, AND POLLUTION PROGRAM, WORLD RESOURCES INSTITUTE, WASHINGTON, DC

My name is Jonathan Pershing, and I am the Director of the Climate, Energy and Pollution Program at the World Resources Institute. The World Resources Institute is a nonprofit, nonpartisan environmental think tank that goes beyond research to provide practical solutions to the world's most urgent environment and development challenges. We work in partnership with scientists, businesses, governments, and nongovernmental organizations in more than 70 countries to provide information, tools, and analysis to address problems like climate change, the degradation of ecosystems and their capacity to provide for human well-being.

I am very pleased to be here to speak to what I consider the most pressing environmental issues faced by the world—and to what I consider a major opportunity for the United States to assume a role of international leadership.

In this testimony, I would like to make a number of key points, each of which I will expand on below:

1. Emissions are rising much faster than we thought, the ice is melting decades sooner than we expected.
2. The world urgently needs the leading emitters—particularly the U.S. and China—to find a basis for agreement and action. To do so, the U.S. itself must take real and immediate steps to reduce emissions.
3. The U.S. must recognize we are operating in a multi-polar world. We can lead, we can help, but we can't dictate to other great powers. China will act for its own interests.
4. China, India, and Brazil are changing their views, and we must negotiate agreements that help all achieve national goals, even if the means to reach these differ from ours.
5. There will be a huge global market for low carbon goods and services, and we must compete for it. Countries that do not adopt policies to reduce emissions will not compete effectively.
6. Markets will promote the development and support the penetration of new technologies. A robust governmental framework is needed to ensure technology development is focused on priority needs.
7. We are unfortunately starting late and we are not likely to avoid all climate damages. The world must agree to address the problem of the neediest and most vulnerable.

If we start in on an agreement on these issues at the forthcoming U.N. Climate Convention meeting in Bali next month, we will indeed be setting out on a path to success. If we do not, and instead continue to argue for caution and inaction until we have "more information," the world will be a much different, and much less hospitable place.

THE CHALLENGE IS LARGE AND URGENT

The Earth is warming, primarily due to human activities. Fossil fuels (in spite of their contribution to huge increases in human productivity and great improvements in human well-being), together with significant deforestation, have been the most important causes of global warming. The buildup of carbon dioxide and other greenhouse gases (GHGs) is accelerating, and unless we act very soon to control emissions warming, will rise to very dangerous levels. This is no longer a problem only for our children, but increasingly for the present generation.

In February 2007, the Intergovernmental Panel on Climate Change (IPCC—the official science process endorsed and supported by the world's governments and in which the United States was an active participant) released its most recent scientific report. The report states that it is "unequivocal" that Earth's climate is warming, and confirms that the current atmospheric concentration of carbon dioxide and methane, two important GHGs, "exceeds by far the natural range over the last 650,000 years." Further, the IPCC concludes that it is now "very likely" (greater than 90 percent probability) that GHG emissions from human activities have caused

"most of the observed increase in globally averaged temperatures since the mid-20th century."

Indeed, the impacts of warming have become increasingly evident. Sea ice in the Arctic was at a record low this summer, and Greenland's massive ice sheet is receding—far faster even than predicted in the IPCC report released prior to this summer's unprecedented melting. Glaciers are rapidly shrinking from the Rockies to the Alps. There have been fatal heat waves in Northern Europe and extensive droughts in the Western U.S., Australia, and in the Amazon. Farmers and hunters across the United States report changing growing seasons and changing bird migration. If we already see these kinds of impacts with only about 0.6 °C (1 °F) of warming, the nature of future damages, with temperatures ranging to 2 °C and higher, are likely to be catastrophic.

The IPCC also gave us a clear sense of the emissions reductions required to limit the damages—and a timeframe in which to achieve them. The IPCC suggests that world emissions must peak within the next 10–15 years and then decline globally by as much as 50–85 percent below 2,000 levels by 2050 if we wish to see global average temperatures remain below two degrees of warming. Furthermore, global emissions must be stabilized by 2035.

THE U.S. MUST LEAD WITH A DOMESTIC POLICY

The warming occurring today is the result of greenhouse gases emitted over the past half century. The United States, with 4.6 percent of the world's population, has contributed 28 percent of the emissions currently in the atmosphere. Our strong economic growth in the 20th century was fueled by fossil fuel technologies we invented. And it is clear that today the U.S., with the most advanced economic and technological resources and capacity, must take the lead in transforming the global economy to a new, low-carbon future. We cannot expect the rest of the world to act if we do not—or expect countries with per capita incomes one-tenth our own to lead if we will not.

The emissions limits we set for the U.S. matter. Action by the U.S. will be seen as the benchmark against which other countries will measure their commitments. The U.S., with its historical responsibility for the current buildup of greenhouse gases in the atmosphere, will continue to be a key contributor to temperature rise—even as other countries may pass us in annual emissions. With our European allies committing to align with the science in their proposal for a 20-to-30-percent reduction in greenhouse gas emissions by 2020 (and a European Parliament recommendation of a 50-percent cut in global emissions by 2050, identical to the reduction proposed by both Japan and Canada during last year's G–8 discussions), the U.S. role will be pivotal if we are to have concerted OECD action and leadership to advance the efforts of all countries to take action.

U.S. legislation must put a clear and specific limit on aggregate emissions and achieve the emissions-reduction target at the least possible cost. The cap establishes certainty as to the total amount of emissions that will occur under the program. The cap must be broad, including as much of the economy as possible, so as to achieve the greatest efficiency. It must have stringent emissions reductions targets, and include a range of complementary policies to reduce emissions from sectors outside of the cap. In parallel, the U.S. must adopt complementary measures to promote new technology, to assure that we have a complete monitoring and reporting system, and to begin to develop national adaptation programs to protect vulnerable people and ecosystems.

STRUCTURING A GLOBAL CLIMATE CHANGE SOLUTION

U.S. action alone will not be enough to reduce global emissions to the extent required, although it is widely understood that without timely and aggressive U.S. action, a successful international agreement on climate change will be impossible. A number of key elements are required to adequately address the problem of global climate change, and will be critical ongoing aspects of international negotiation: (1) International GHG markets; (2) developing country actions; (3) mechanisms to promote technology development and penetration; (4) minimizing deforestation; and (5) addressing vulnerability to climate change, and taking necessary steps for adaptation. Each is discussed below.

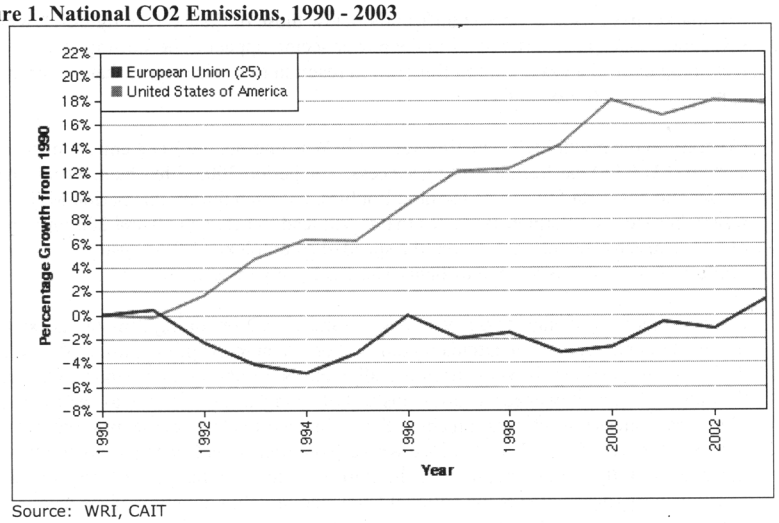
1. GHG markets.—For countries that have the technical and institutional sophistication to embrace them, greenhouse gas markets are a powerful driver for change. The United States is discussing (at least in Congress and at the State level) adopting a cap-and-trade mechanism. Europe has already implemented one. Other key partners such as Canada, Australia, and New Zealand are poised to do so.

Markets are demonstrating success. Their key features—capping emissions and creating a price that stimulates investment—are both observed in the European case. Emissions in that market have risen at rates significantly below those of the U.S. (see figure 1), while investment decisions, particularly in the power sector, appear to be shifting to technologies with a lower carbon footprint in reaction to a price signal that is currently approximately 23€/ton of CO_2[1].

Contrary to the mythology sometimes heard in Washington, the EU's emission trading system (EU ETS) has been a striking success. The period 2005–07 has been a trial first phase, and has certainly had its teething troubles, but even during this period MIT researcher Denny Ellerman estimates that it will lead to between 50 and 200 million tons of CO_2 emission reductions.[2] Given the speed and complexity of the system's implementation, this is an extraordinary success by any measure.

It is true that some design errors were made—and certain operating constraints existed that lead to unavoidable, negative outcomes. For example the pilot phase of the system did not allow carrying forward emissions allowances to subsequent periods—rendering the value of each allowance worthless instead of acting as an incentive to early action. The erratic release of information about the regime led to considerable price spikes—mistakes that could have been avoided with a more transparent system (and one that was in place and fully functioning prior to the start of trading). Finally, the initial allocation of allowances (distributed at the national level, and largely a function of the legal autonomy of Member States within the union) provided companies in some countries with excess tons—leading to both windfall profits and to a devaluation of the currency. Each of these problems can be (and is being) addressed in the subsequent phases of the program. The EU is increasing transparency, providing for banking allowances to future periods, auctioning an increasing share of the allowances and tightening the caps; this will address most of the regimes shortcomings. We in the U.S.—and others around the world—are in a position to learn from the EU's mistakes and avoid them ourselves as we adopt our own programs.

Figure 1. National CO2 Emissions, 1990 - 2003



Source: WRI, CAIT

There is not a "one-size-fits-all" policy for climate change; while markets are critical components of a successful regime, not all countries are prepared to adopt or implement a cap-and-trade market mechanism. Among the prerequisites are a robust legal system that respects property rights and can ensure the integrity of any emissions transactions, a comprehensive and rigorous emissions reporting and monitoring regime, and a strong commitment to ensuring the environmental integrity of

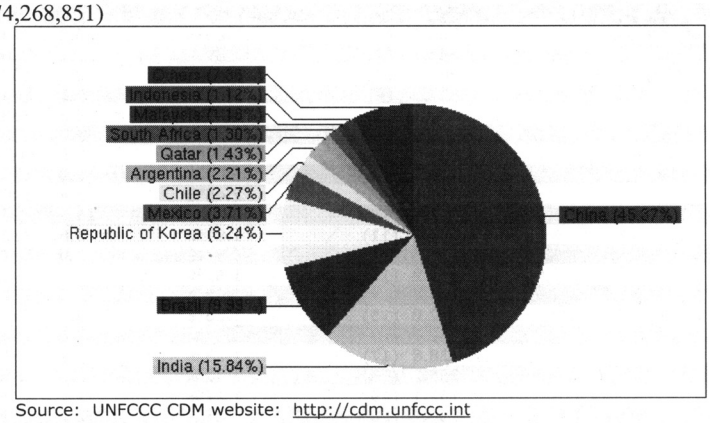
[1] For European emissions trading system prices, see http://www.europeanclimate exchange.com; 23.84€/ton of CO_2 is the price for a December 2102 settlement as of November 8, 2007.

[2] D. Ellerman and B. Buchner, "Over-Allocation or Abatement? A Preliminary Analysis of the Eu Ets Based on the 2005 Emissions Data," Fondazione Eni Enrico Mattei, November 2006.

the trading system. Such criteria are not yet met by too many countries. In particular, countries such as Russia, as well as others in Central Europe and Asia are not yet able to demonstrate with confidence that their emissions records or legal compliance systems are adequate to allow them to trade in a global GHG market. Without confidence in such globally traded allowances, we run the risk of undermining the environmental integrity of the entire global regime. For these countries, as well as other large developing countries, a full emissions trading program may not be the best solution—although participation in global markets, including through "offset programs" like the Kyoto Protocol's Clean Development Mechanism (CDM) or "Joint Implementation" may be possible. Understanding this potential shortcoming, it is clear that one of the long-term goals of the international effort should be to help develop the proper underpinnings for a global market.

The CDM itself is also facing difficulties, although it has generated significant reductions. To date, there have been more than 2,600 CDM projects proposed, of which only 844 are registered[3] (a consequence of both poor methodological development as well as the nature of the overburdened approval process). These 844 projects over their lifetimes should save 1,080,000,000 tons—a level that already outstrips demand under the commitments for developed country parties in under the Kyoto Protocol. Approximately 80 percent of the annual project credits come from only 4 countries (China, India, Brazil, and South Korea); see figure 2. Along with some uncertainty in the integrity of offset credits, this supply/demand ratio as well as limits on the amount of international offset credits Europe will accept for internal compliance has led to a lower price for Certified Emission Reductions (CERs). While European emissions allowances sold for an average of about $23/ton through 2007, offsets sold for less than $11/ton.[4] The relatively low price and lower volumes has also led to only modest funds being available for the kinds of major energy infrastructure projects that might significantly reduce emissions. According to a 2007 World Bank/IETA study,[5] to date, the total of all CDM projects has only been $5 billion. Such prices and volumes are substantially below the costs of supporting potentially critical new technologies, such as carbon capture and storage, which would be required to neutralize emissions from the rapidly growing GHG footprint in the developing world.

Figure 2. Expected average annual CERs from registered projects by host party (Total 174,268,851)



Source: UNFCCC CDM website: http://cdm.unfccc.int

Resolving conflicts over the CDM (or its successor) will be a key feature in the ongoing post-Kyoto discussion, and a central topic at the Bali negotiations. Concerns remain high that projects may not yield "real, measurable, and verifiable" reductions that would be "additional" to those that would have occurred in the absence of the project. At the same time, the burden of proof regarding project eligibility for inclusion into the CDM process is onerous, and may turn many good (albeit some-

[3] See the UNFCCC CDM Web site at: http://cdm.unfccc.int/Statistics/index.html.

[4] See the World Bank/International Emissions Trading Association's "State and Trends of the Carbon Market" 2007, http://carbonfinance.org/docs/Carbon__Trends__2007-__FINAL__-__May__2.pdf.

[5] Ibid.

times small) project proposals away, further widening the gap between projects undertaken in the poor smaller countries and those in the more capable larger countries.

2. Developing country actions.—To address the global climate change problem, major emitters from the developing world will have to bring serious actions to the table. Countries such as China, India, Brazil, and Indonesia are among the world's largest emitters, although both cumulatively and on a per capita basis, they remain much lower than the U.S. (see table 1 and 2).[6] Climate policy cannot ultimately succeed without these countries, any more than it can without America or the rest of the developed world. However, there is room for optimism: in many cases these countries are already taking serious action—more so, in some ways, than the U.S.

TABLE 1.—GREENHOUSE GAS EMISSIONS OF THE 20 LARGEST EMITTING COUNTRIES, 2000

Country	MtC	Rank	Percent of world total	Tons C per person	Rank
United States of America	1,765.5	(1)	15.65	6.3	(14)
China	1,341.7	(2)	11.89	1.1	(122)
European Union (25)	1,288.5	(3)	11.42	2.8	(53)
Indonesia	837.3	(4)	7.42	4.1	(24)
Brazil	606.3	(5)	5.37	3.5	(38)
Russian Federation	537.6	(6)	4.77	3.7	(33)
India	504.6	(7)	4.47	0.5	(163)
Japan	370.1	(8)	3.28	2.9	(50)
German	276.6	(9)	2.45	3.4	(40)
Malaysia	233.5	(10)	2.07	10.2	(4)
Canada	204.3	(11)	1.81	6.6	(12)
United Kingdom	179.3	(12)	1.59	3.0	(47)
Mexico	169.9	(13)	1.51	1.7	(93)
Italy	144.4	(14)	1.28	2.5	(67)
Korea (South)	142.0	(15)	1.26	3.0	(45)
France	139.8	(16)	1.24	2.4	(69)
Myanmar	138.8	(17)	1.23	2.9	(51)
Australia	135.2	(18)	1.20	7.1	(9)
Iran	132.1	(19)	1.17	2.1	(75)
Ukraine (1)	131.6	(20)	1.17	2.7	(61)

Source: WRI, Climate Analysis Indicators Tool, http://cait.wri.org.

TABLE 2.—2005 DATA, CO_2 EMISSIONS ONLY

Country	National total (millions tons C)	Percent Total	Per capita emissions (million tons C)
United States	5,956.98	24.3	20.14
China	5,322.69	21.7	4.07
Russia	1,696.00	6.9	11.88
Japan	1,230.36	5.0	9.65
India	1,165.72	4.7	1.07
Germany	844.17	3.4	10.24
Canada	631.26	2.6	19.24
United Kingdom	577.17	2.4	9.55
Korea, South	499.63	2.0	10.27
Italy	466.64	1.9	8.03
Iran	450.68	1.8	6.96
South Africa	423.81	1.7	9.56
France	415.27	1.7	6.59
Saudi Arabia	412.35	1.7	15.61
Australia	406.64	1.7	20.24
Mexico	398.25	1.6	3.75
Spain	387.11	1.6	9.60

[6] Unfortunately, adequate, up-to-date information on GHG emissions from all countries is missing; while CO_2 data is available for 2005, six gas data is only available for 3 years: 1990, 1995, and 2000. It remains difficult to properly assess recent development in non-CO_2 gas emissions or to assess policy effectiveness in the absence of such data.

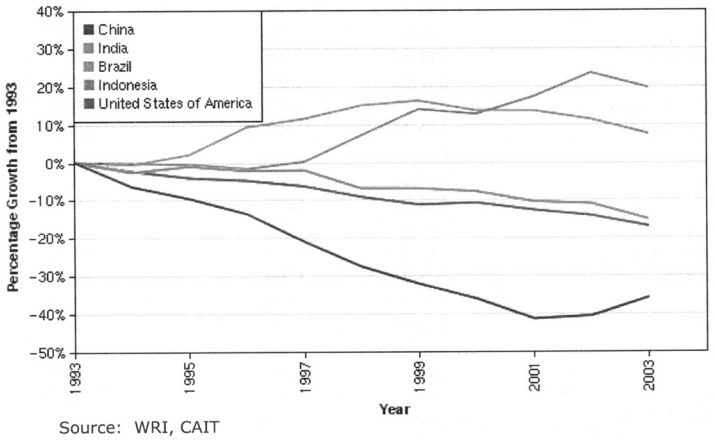
TABLE 2.—2005 DATA, CO_2 EMISSIONS ONLY—Continued

Country	National total (millions tons C)	Percent Total	Per capita emissions (million tons C)
Brazil	360.57	1.5	1.94
Indonesia	359.47	1.5	1.57
Ukraine	342.57	1.4	7.30

Source: DOE EIA, http://www.eia.doe.gov/environment.html.

WRI maintains a database of national climate change policies in key developing countries to supplement a compendium of energy related policies in OECD countries maintained by the International Energy Agency.[7] Policies range widely, from those designed to promote alternative fuels or transport (e.g., the Brazilian ethanol program) to those that promote energy efficiency and conservation in the top 1,000 companies in China. The effectiveness of national policies can be seen in the fact that the CO_2 intensity of major developing country economies is declining—in some cases (e.g., China), even faster than in the U.S. (see figure 3). National circumstances continue to be hugely influential: In Brazil, for example, new energy demand has largely been met by natural gas, which, while the least CO_2 intensive of any fossil fuel, generates enormously more CO_2 than does the zero-emitting hydropower that it has supplemented.

Figure 3. CO2 intensity of national economies, 1993 - 2003



Source: WRI, CAIT

The international framework must include a structure to allow these actions to be recognized and reviewed. This was missing from the Kyoto Protocol, and will need to be added. A number of options exist to promote such developing country efforts. One of the most prominent focuses on the concept of "Sustainable Development Policies and Measures" or SD–PAMS.

Sustainable Development Policies and Measures (SDPAMS)

For many developing countries, the highest priorities are major domestic problems: Health, access to electricity, clean air and water, and a growing economy. The SDPAMs approach starts from the premise that these policies can be implemented in a way that simultaneously reduces GHG emissions.

Two examples help illustrate the point:

(1) Energy security and climate: Meeting energy needs is a growing concern not only for the U.S., but also for China, India, and others. China is expected to import

[7] The WRI database, which includes policies from Argentina, Brazil, China, Costa Rica, India, Indonesia, Iran, Malaysia, Mexico, Nigeria, Pakistan, Philippines, Sauda Arabia, Singapore, South Africa, South Korea, Thailand, and Turkey can be found at: http://cait.wri.org/sdpams/search.php. The IEA database, with information focused on IEA member countries as well as limited information on policies adopted by several developing countries, can be found at: http://www.iea.org/textbase/pm/.

75 percent of the oil it consumes by 2030. Any policy that reduces its demand may have enormous benefits. Thus, fuel efficiency standards, or efforts to switch from oil/diesel electric generation to renewable energy or nuclear power would be valuable. Each of these would also lead to a reduction in associated GHG emissions. China, acting on the basis of an energy security constraint, could also mitigate its climate footprint. Of course, not all security measures would necessarily be beneficial: If China increases its coal liquefaction program without CO_2 sequestration, its emissions would rise precipitously, even though its energy security problems might be diminished.

(2) Clean air and climate: Another serious problem facing many cities in the developing world is increasing air pollution. As vehicle traffic increases and dirty industry and power generation grow, air quality declines, with related consequences for human health and welfare. Solutions to promote clean air—switching from coal to gas, increased automobile efficiency, improved mass transit, and process standards for industry can all improve the local pollution problem while simultaneously reducing the GHG footprint.

A successful SDPAMS approach will need to be country specific, and issue specific. It will need to build on the domestic priorities, and find synergies between development agendas and climate. This will require technical inputs on the U.S. Government side from agencies like DOE, EPA, DOC, and AID, and on the private sector side from both multinationals and from small- and medium-sized enterprises. Congress will need to create systems to encourage such engagement—and push the State Department, DOC, and USTR to open opportunities for trade relationships so that markets in such new technologies and systems can be easily developed and exported.

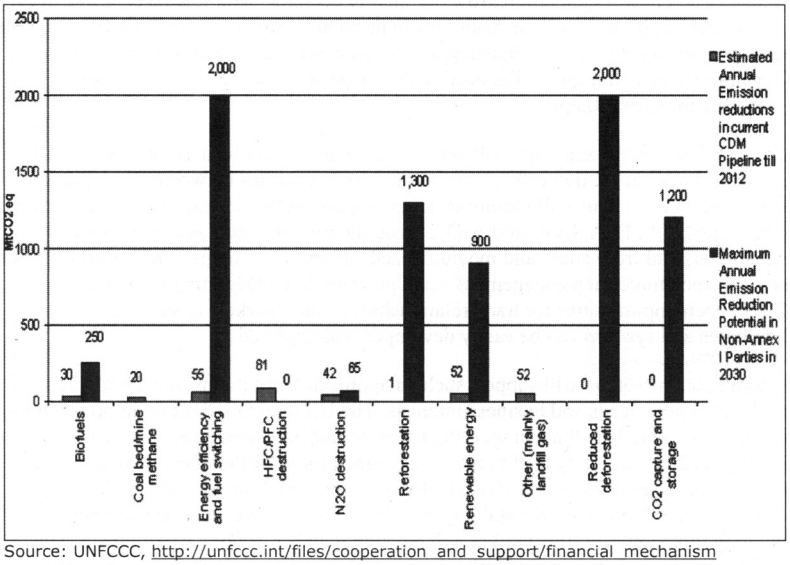
Developing countries, too, will support such an approach—but it must meet both their local development needs and business interests. The U.S. (and OECD) role in promoting SDPAMS is central. It will mean working to create fair trade agreements in new technologies, and will likely lead to increased competition for the manufacturers of such low-cost technological solutions. Historically, U.S. companies have done well in such markets; we need to develop the skills to do well in this new world of environmental technology, too. However, this market will develop whether or not we participate. The issue for the U.S. is whether we will play "catch-up" as we have done for many of the telecoms and automotive applications that were invented in the U.S. but built elsewhere, or whether we will be market leaders, with the concomitant economic wealth creation that such leadership brings.

None of this global developing country engagement effort will come cheaply. According to information presented by UNFCCC Executive Secretary Yvo de Boer at the "Dialogue on Long-Term Cooperative Action" held in Vienna—August 28, 2007, the additional estimated investment and financial flows needed in 2030 is large compared with the funding currently available under the Convention and the Kyoto Protocol, but small in relation to estimated GDP (0.3 to 0.5 percent) and global investment (1.1 to 1.7 percent) in 2030. De Boer suggested that mitigation measures needed to return global GHG emissions to current levels in 2030 would require additional flows between $200–$210 billion in 2030, while additional flows needed for adaptation in 2030 amount to several tens of billions of dollars.[8]

The UNFCCC, in a paper analyzing the technologies and the need for investment to implement those technologies, suggests the potential for emissions reductions is very large—and that only a small fraction is being undertaken through the existing offset projects (see figure 4).

[8] See Yvo de Boer, "Investment and Financial Flows to Address Climate Change," 2007 http://unfccc.int/files/cooperation__and__support/financial__mechanism/application/pdf/presentation__yvo.pdf.

Figure 4. Emissions reduction potential and current CDM pipeline



Source: UNFCCC, http://unfccc.int/files/cooperation_and_support/financial_mechanism

It is clear that this funding will be incremental to what is already expected to be spent on energy and infrastructure over the next several decades. Both national governments and the private sector will play a key role in raising and directing these financial flows. Thus, there is a critical role or the U.S. in "greening" the financial sector—including not only private equity incentives, but also more direct prodding of the multilateral development banks—and the creation and funding of new international mechanisms. This is further discussed below, in the section on technology development and penetration.

One additional point might be made with respect to developing country engagement: Trade measures to compel action may backfire on the U.S. It is generally assumed that major developing countries are much less efficient in their use of energy than the United States and other developed nations, and that production in those countries generates greater emissions. Thus, it has been proposed that the U.S. impose border tax adjustments or other trade measures to assure U.S. industry is not competitively disadvantaged. For the economy as a whole, the U.S. may well be more efficient. However, in some important sectors in which U.S. industry competes with developing country producers it is not the case. For instance, in aluminum production the most efficient plants are in Africa, with U.S. and EU producers the least efficient, largely because their capital stock is the oldest. Conversely, U.S. steel production is low in emissions because it uses scrap metal rather than iron ore as a feedstock. If foreign competitors started bidding up scrap prices in response to carbon constraints the competitive advantage of U.S. producers could disappear. This is worth bearing in mind as we consider trade measures aimed at less efficient producers in global markets. Such measures do not always favor U.S. producers, and in some cases more cooperative action may be possible in specific sectors.

3. Technology development and penetration.—There is a widespread consensus that solving the climate change problem will require the development and rapid penetration of new technology. Innovation will be needed in all sectors—and appropriate policies will be required to ensure rapid diffusion.

While there will be some costs to this technology development and diffusion pathway, there will also be enormous opportunities: The new technologies in a low-carbon world represent a major new set of markets. The Clean Energy Trends report[9] estimates that the markets for renewable and hydrogen technologies will have

[9] For a full report, see the Clean Energy Trends report at http://www.cleanedge.com/reports trends2007.php.

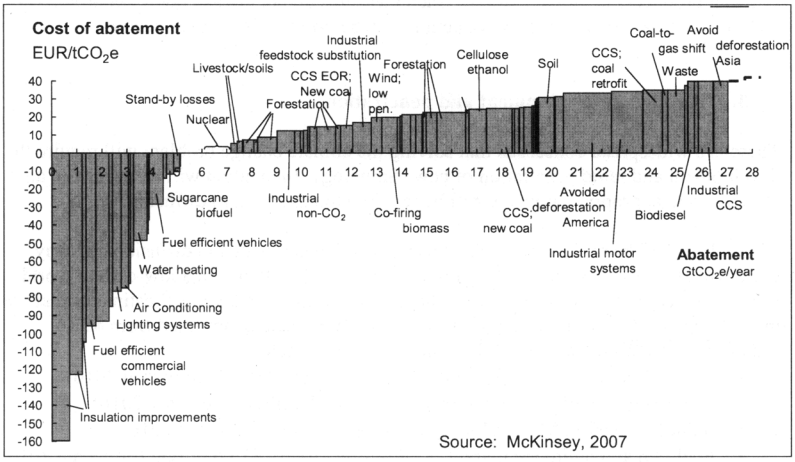
quadrupled from $55.4 billion today to more than $226 billion in 2016. These include:

- Global biofuels market: $20.5 billion (2006)—$81 billion (projected 2016);
- Wind power market: $18 billion (2006)—$60.8 billion (projected 2016);
- Solar PV market: $15.6 billion (2006)—$69 billion (projected 2016);
- Fuel-cell and hydrogen market: $1.4 billion (2006—$15.6 billion (projected 2016).

Fundamental to the development of any new technology is the confidence that there is a market for it; and this principle applies equally to the low-carbon energy technologies needed to fight climate change. Those that present "technology approaches" as an alternative to a market-building mechanism such as cap and trade present a false dichotomy: A cap-and-trade system, if adopted, will be by far the most important driver of new low-carbon technologies. Without it, other technology-based efforts are likely to have minimal effect. It is recognition of this reality that a group of America's most prominent corporations united with leading NGOs in January 2007 to call for mandatory carbon limits in the United States.[10] Leadership in climate policy is not just about moral responsibility: It also places innovative U.S. companies at the heart of these new markets.

Targeting specific technologies is made more challenging by the large range of options. Figure 5 shows one analysis of the technologies that can contribute to reducing emissions. As is apparent, in some cases these can entail costs of more than €40/ton, while in others there is the potential to both reduce emissions and save money through implementation (often through removing a range of nontechnical barriers).

Figure 5: Marginal abatement costs of technologies



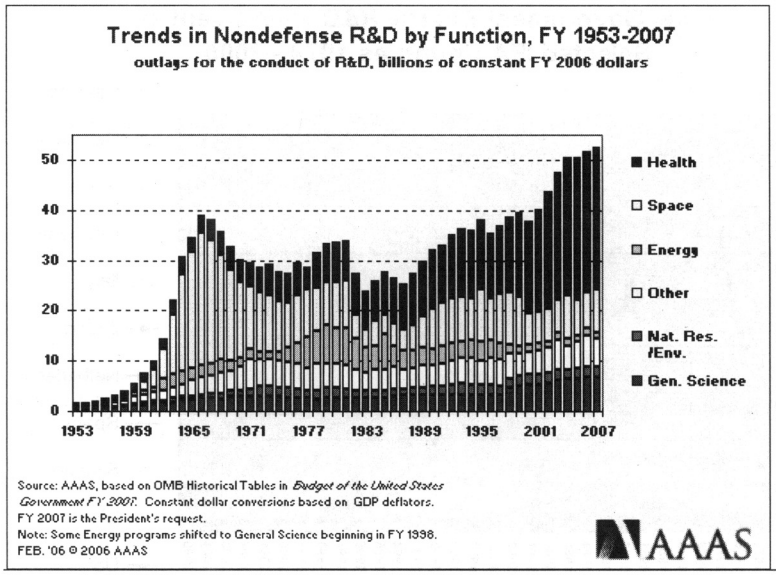
There are a number of complementary measures that can help bring new technologies to the market. Three deserve highlighting: Research and development; precommercial demonstration; and funds and related mechanisms to transfer technology to poorer countries.

Boosting R&D

Energy technology development is, according to the U.S. Administration, a "high-priority national need." Certainly the concerns raised by climate and energy security concerns would support this assessment. But despite this, federal funding for energy research has been steadily falling since 1980. Federal funding for energy R&D has hovered between $2.31 billion and $3.45 billion for the past 20 years,[11] compared to recent expenditures exceeding $20 billion for medical science, for instance (see figure 6).

[10] See U.S. Climate Action Partnership: "A Call for Action." http://www.us-cap.org.
[11] TEA "Energy R&D Database" http://wiww.iea.org/RDD/ReportFolders/ReportFolders.aspx.

Figure 6. Trends in US R&D



Source: AAAS 2006. *AAAS REPORT XXXI: RESEARCH AND DEVELOPMENT FY 2007.* http://www.aaas.org/spp/rd/rd07main.htm.

Nor is this a uniquely American phenomenon. A recent survey of 11 of the biggest energy R&D funders [12] demonstrated that energy R&D spending worldwide has indeed stagnated (See Figure 7). In every country surveyed, the ratio of energy R&D to GDP declined significantly between 1975 and 2003.[13]

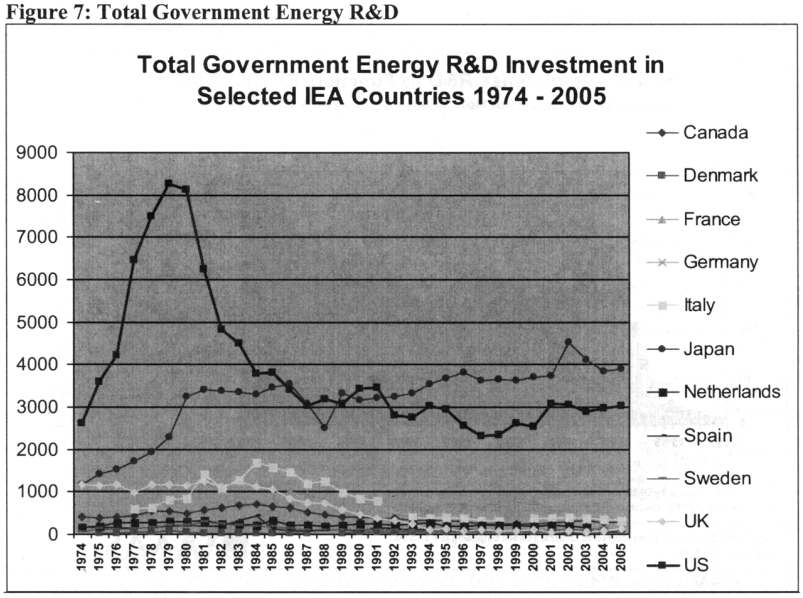
One argument for reducing government R&D is that it allows the private sector to step into its place. However, private sector spending on energy has actually fallen: It is now around a quarter of the 1985 level in absolute terms.[14]

[12] U.S., Japan, Canada, Denmark, France, Germany, Italy, the Netherlands, Spain, Sweden, and the U.K.

[13] Runci, Paul. 5005. "Energy R&D Investment Patters in IEA Countries: An Update." Pacific Northwest National Laboratory/Joint Global Change Research Institute Technical Paper PNWD–3581.

[14] American Association for the Advancement of Science (AAAS). 2006. "A Guide to R&D Funding Data." http://www.aaas.org/spp/rd/guide.htm.

Figure 7: Total Government Energy R&D

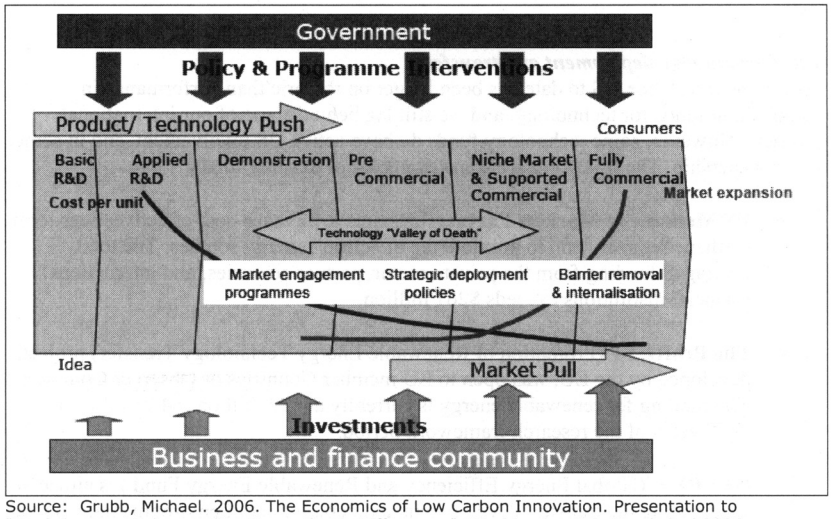


Source: IEA R&D Database/Runci

Precommercial demonstrations: Bridging the "valley of death"

Between the research and development phase and the full commercialization of a technology there is a need for commercial scale demonstrations. Particularly for large, capital-intensive technologies private investors tend to shy away from being the first in class. On the other hand, such commercial-scale demonstrations can be expensive, and require judgment from governments as to when to withdraw from the market and let the private sector take over. This gap is sometimes referred to as the "valley of death" in technology development.

Figure 8: Government and Industry Roles in Technology Development



Source: Grubb, Michael. 2006. The Economics of Low Carbon Innovation. Presentation to "Workshop on Understanding Transatlantic Differences". Washington, DC. March 2nd 2006.

In the case of many technologies there remains a significant role for government to partner with private sector players to build demonstration projects. In some cases technologies suffer from high perceived risks, and demonstration projects can reassure investors that might otherwise shy away from large, capital-intensive technologies that lack a proven track record. In addition, some technologies will be needed under significant carbon constraint but will not be developed until that constraint is clearly impending.

For instance, Integrated Combined Cycle Gasification (IGCC) is a relatively novel technology for power generation from coal and other feedstocks. Since it produces a flue gas that is high pressure and CO_2-rich, it is expected to play a major role in the implementation of carbon capture and storage (CCS). However, in the absence of adequate incentives for CCS it is less attractive than alternatives. Although it emits very low levels of criteria pollutants, without CCS it is no more efficient than other modern technologies such as ultra-supercritical pulverized coal (USCPC), costs roughly 20 percent more to build, and suffers from a limited track record and perceived reliability problems. Establishing a track record for this technology has the potential to accelerate the eventual implementation of CCS. The FutureGen project [15] is one example of government and private sector partnership in producing demonstration projects, but the IEA argues [16] that at least 10 such demonstrations will be necessary, costing from $500 million to $1 billion each.

Fund technology deployment and transfer

As in other areas, the U.S. to date has been longer on rhetoric than performance in establishing funds for technology, and we still lag behind some of our international partners. However, some technology funds do have active U.S. involvement, and in some cases leadership. The following are some examples of existing funds:

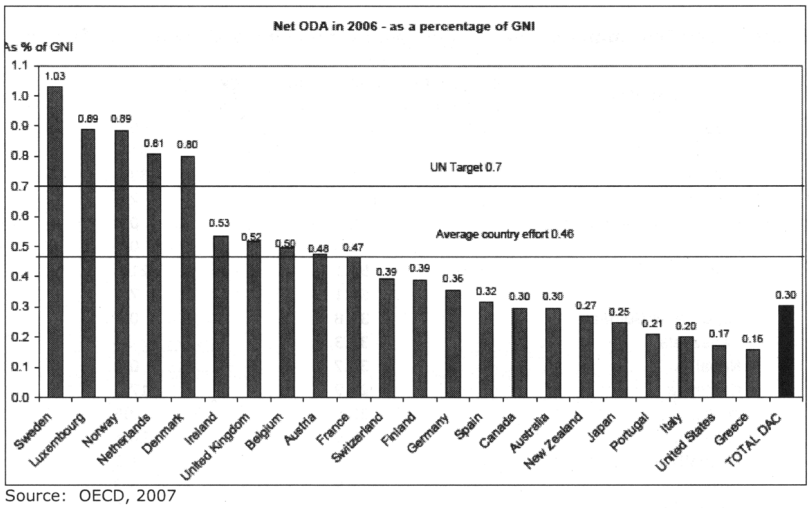
- U.S. Methane to Markets Partnership aims to advance cost-effective, near-term methane recovery and to promote the "clean" energy sources. The total leveraged funding from the private sector, partner countries, and international financial institutions exceeds $261 million.
- The ProRETT (Promotion of Renewable Energy Technology Transfer) project, developed by the EU, was open to EU member countries or observer countries. The funding for renewable energy is currently at €2.9 billion ($4.25 billion) over the 7 years of the research framework period.

[15] FutureGen Alliance, http:/www.futuregenalliance.org/.
[16] International Energy Agency (2006). Energy Technology Perspectives: Scenarios and Strategies to 2050. International Energy Agency, Paris. p. 199.

- GEEREF (Global Energy Efficiency and Renewable Energy Fund) is aimed at accelerating the transfer, development, and deployment of environmentally sound technologies and helping to bring secure energy supplies to people in poorer regions of the world and protecting against climate change and air pollution. The basis of the initial funding is set at €100 million ($145 million) for global coverage, with the aim of leveraging much larger amounts.
- The international clean technology fund proposed by the U.S. will aim to help developing nations harness the power of clean energy technologies. The initial proposal was made just before the G–8 summit in Germany this year and is to be structured around government contributions to help finance clean-energy projects in developing countries. At present the fund has no dedicated resources.

These funds are still small compared to Official Development Assistance (ODA), which in 2006 amounted to about $103.9 billion. It is interesting to note that the U.S. is a large donor in absolute terms, spending $22.7 billion in 2006, but small in proportion to the size of its economy. ODA accounts for just 0.17 percent of Gross National Income, the second lowest percentage after Greece.

Figure 9. ODA as a Percentage of GNI



Source: OECD, 2007

It is clear that the UNFCCC negotiations will provide a forum for only one subset of the technology discussions. In particular, all countries may be prepared to discuss options for the transfer of technology to least developed nations on a preferential basis. However, for the larger discussion on technology development and diffusion, there will be a need to promote more robust markets, as well as cooperative R&D programs. These may be facilitated through language in the UNFCCC, but ultimately will be successful more through bilateral efforts by governments, supported by private sector engagement.

4. Forestry.—Forests, and in particular tropical forests, play an important role in the global carbon budget because they can be either sources or sinks of atmospheric carbon. Annual emissions from land-use change (mainly through deforestation and degradation in tropical developing countries) account for approximately 20–25 percent of the total anthropogenic emissions of greenhouse gases.[17] The top 20 countries ranked according to forest emissions are listed in Table 3. It should be noted that estimates of the magnitude of these emissions are highly uncertain due to several reasons such as a lack of resources, lack of standard methods, lack of capacity at national levels, and lack of data.

[17] See UNFCCC, http://unfccc.int/files/methods__and__science/lulucf/application/pdf/part__i__scientific__issues.pdf.

However, broadly speaking, accurate satellite data and careful ground-truthing can yield considerable accuracy for forest cover CO_2.[18]

TABLE 3.—TOP 20 COUNTRIES RANKED BY EMISSIONS FROM LAND USE CHANGE AND FORESTRY

Country	Emissions from LUCF (MTC)	Non LUCF-Emissions (MTC)
Indonesia	699.5	80.8
Brazil	374.5	91.9
Malaysia	190.7	33.3
Myanmar	116.1	2.6
Congo, Dem. Republic	86.6	0.4
Zambia	64.3	0.5
Nigeria	53.1	21.6
Peru	51.1	7.7
Papua New Guinea	39.8	0.7
Venezuela	39.3	38
Nepal	33.7	0.9
Colombia	28.9	17.3
Mexico	26.5	105
Philippines	25.9	20.5
Côte d'Ivoire	24.9	1.9
Bolivia	22.9	3.3
Cameroon	21.1	1.9
Canada	17.6	144.4
Madagascar	16.5	0.6
Ecuador	16	6.3

Source: WRI, CAIT.

Given the scale of the total forest-related emissions, as well as their importance to a number of key developing country parties, there is an increasingly strong momentum in favor of including reductions of emissions from deforestation and degradation (REDD) in a post-2012 climate agreement. Although there remain considerable uncertainty as to what form the REDD inclusion will take, the most prominent proposals depend on large-scale financial transfers through the international carbon markets in which forest commitments are taken at the national level (referred to as a national level crediting approach for REDD).

However, a number of other approaches also exist, and are likely to be considered, including relying exclusively on national forest regulation—perhaps with additional support from international financial aid mechanisms and bilateral donor assistance; or relying on expansion of the project-based carbon offset programs to include forestry (a reversal of current decisions under the UNFCCC that exclude REDD projects from the CDM).

The World Bank is currently strongly pushing the national crediting approach. The Bank is planning to launch a Forest Carbon Partnership Facility at the Bali session, and has dedicated $300 million to that end.[19] The Bank has recognized the potential pitfalls of such an approach, and is in large measure focusing its pilot effort on addressing the readiness of countries to participate in such a program as well as the methodological and technical problems in the GHG accounting and approval.

Among the most central of these for climate change is the problem of leakage: Displacement of activities from one place to another, often outside the jurisdiction of the project implementer (or even the country itself).[20] While some have argued that leakage is solved by setting a cap at the national level, this may be incorrect. While displacement of activities within a country are largely captured through national approaches, where the demand for timber and other forest products is a principle driver of deforestation, international leakage is very likely to be close to 100 per-

[18] Ibid. While the UNFCCC paper cites an accuracy of 95 percent, this is a theoretical number that does not include either soil carbon or more importantly, forest degradation, which in Indonesia and the Brazilian Amazon, may reduce carbon by 20–25 percent.

[19] Under the current World Bank proposal, approved by the Board but not yet implemented, $100 million would be used to help countries prepare for participation in a REDD market mechanism, and $200 million would be used to pilot REDD projects.

[20] While the Bank has noted the importance of the leakage issue, it will not address the problem through its Forest Carbon Partnership Facility.

cent. As demand within both developed and emerging economies increases, it is likely that supply will simply shift to less controlled jurisdictions.

At present, it does not appear likely that any of the UNFCCC mechanisms in isolation could completely halt deforestation. A solution is likely to require a policy structure that focuses less on aggregated deforestation rates and instead provides support for projects, programs, and policies in specific areas—as well as projects that specifically help promote development (the central priority for forested countries and regions). Some of the options available include carbon market driven policies such as an enhanced CDM structure, under which requirements for measures to prevent leakage could be imposed. The SDPAMS model (discussed above) could also prove to be an excellent solution, both in terms of building capacity and targeting the actual drivers of deforestation.

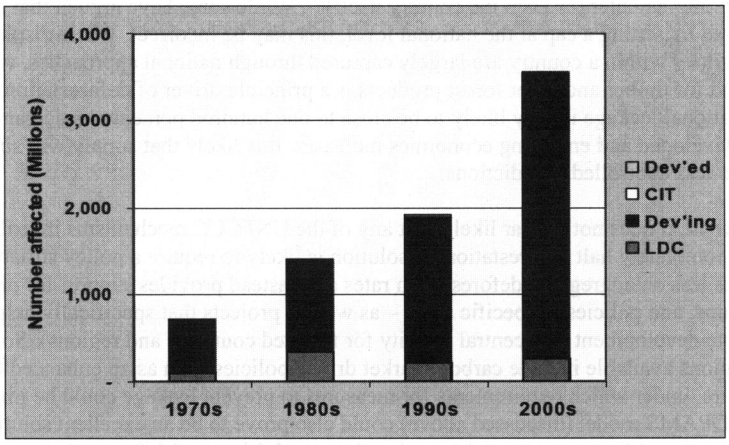
It is clear that any effective mechanism to protect and manage tropical forests will require significant levels of funding. A U.S. policy should thus focus on:

- Recommending to donor and forest countries the testing of a broader range of policy options than just the national crediting approach between now and 2009.
- Working with the multilateral development banks and bilateral lenders to ensure that only a high-quality national crediting approach that links REDD projects with demand reduction efforts in order to reduce leakage moves forward.
- Seeking to build consensus in Bali of the need for a forestry component of the post-2012 agreement to not only address deforestation from a climate perspective, but also to incorporate the nonclimate benefits of forest protection, including for biodiversity, local environment, and development purposes.

Implementing this policy will require both considerable and sustained political will and resources.

5. Adaptation to the Effects of Climate Change.—According to the World Bank, nearly 2 billion people in developing countries were affected by climate-related disasters in the 1990s, and the rate may double this decade (see figure 10). People in developing countries are more than 20 times as likely to be affected by such disaster as those in the developed world.

Figure 10. Vulnerability to climate change



Source: World Bank, Ian Noble, 2006

Unfortunately, our best projections suggest we are not likely to be on a path that will keep our climate unchanged. This will require adapting to the changes we cannot avoid.

A critical question for developing adaptation policy is whether (in any given circumstance) climate change will be slow and incremental or fast and large scale. If the former, we can and must develop a resilience to change that will enable us, collectively, to cope. Thus, we can work so that we can manage a drought that occurs every 10 years instead of every 12, or a change in rainfall that leads to 10 percent less water, or an increase in the disease vectors for malaria, or the need to create corridors in addition to parks to protect diversity. In these cases, we need to do a

bit more of what we are now doing: More careful husbandry of scarce resources, more medicines, and better planning.

On the other hand, if climate really leads to a step change or significant discontinuity, an incremental adaptive strategy may be counterproductive. A potentially catastrophic example of this may be the city of Lima, Peru: If, as predicted, the glacier that waters the city is melted in 25 years, the city does not have an incremental option—small savings in water will be inadequate. Instead, they need to accept a major change: Leave town, begin massive desalination operations, or commence large scale shipping of water into the city.

Clearly, to cope, there will also be a need for massively increased efficiency, and perhaps in the near term, some shifting away from water intensive activities. But over the longer term, these changes will not suffice. The Lima scenario paints a picture less of resiliency than of paradigm change.

A third set of circumstances may occur, in which science is unable to reliably predict whether we face incremental or step change. In these circumstances, the core task of adaptation is not to plan for specific new impacts, but to learn to cope with uncertainty. This calls for investment in robust processes for processing information, making decisions, and responding to the unexpected. The "adaptive" policies and institutions that make such investments effective have yet to be designed, and need substantial creative thought and analysis.

Decisions on how to spend adaptation money thus face the question: "What are we trying to adapt to?" Wasting money on incremental change that could be spent on relocating populations must be avoided; conversely, if incremental shifts are adequate, huge societywide programs would be equally foolish. And if science cannot predict with certainty when we face incremental or step change, measures are needed that take into account a range of possible climate futures.

One key part of any future international regime will therefore need to consider who will pay for the adaptation required, particularly in the developing world. The sums involved are very large: Estimates of climate-related impacts range from $10 billion to more than $100 billion per year, and these are only likely to increase. Meeting these costs poses both a moral and a political dilemma. Most developing countries consider historical responsibility in determining who should pay for damages. Under this model (using WRI data) the OECD countries along with the FSU are responsible for about 73 percent of the contribution to the rise in atmospheric GHG concentrations between 1850 and 2000. This same group of countries also has the capacity to pay: In 2003, OECD and FSU countries produced about 60 percent of the world total GDP.

However, the politics of such payments are much more difficult. Virtually all OECD countries have seen development assistance decline as a percentage of their GDP. Even including private charitable donations (usually forthcoming in times of massive disaster), we have demonstrated a limited willingness to pay for sustained, long-term development priorities.

On the more positive side, there will be business opportunities in disaster preparedness and relief, in the development of technologies that reduce the consequences of climate change such as new drugs, new water savings technologies, and new crops. All of these will reduce the burden that governments must meet. However, Congress has a responsibility too. First and foremost, it must enact a strong climate change program to help minimize global damages. It should consider increasing support for USAID and the various development banks that many of the poorest nations will turn to when disaster strikes. And it should support global agreements, including agreements that include insurance coverage and liability, and financial assistance to alleviate the worst of the suffering that will likely be borne by the world's most vulnerable communities. The U.S., and all donor countries, should work to mainstream adaptation into development assistance, and work to remove barriers to trade to facilitate the development of more resilient economies in developing countries that would be less susceptible to climate impacts. Finally there should be an increase in the global budget devoted to fundamental research on adaptation. We will not otherwise be able to cope with what appear to be increasingly certain damages.

PROCESSES

All this will mean frank, sometimes complex conversations with our international partners. The UNFCCC is, and will continue to be the primary forum for engagement on climate change. Fortunately there is no shortage of additional opportunities for specific exchanges. To cite a few of the most important:

Group of Eight (G–8): While the meetings of the G–8 Heads of State have long provided an opportunity for discussions of climate change and energy policy, the

summit in Gleneagles, Scotland, in 2005 (hosted by then-Prime Minister Tony Blair), marked the beginning of a more aggressive phase of climate discussions. At the most recent session, in Heiligendamm, Germany, in June 2007, the group (including the U.S.) agreed that climate change is one of the major challenges for mankind and it has the potential to seriously damage the natural environment and global economy. They further agreed that urgent and concerted action is needed and accepted their collective responsibility to show leadership in tackling climate change. To that end, the G–8 agreed to consider setting a global goal for emissions reductions, and further agreed to consider seriously the decisions made by the European Union, Canada, and Japan which include at least a halving of global emissions by 2050. Finally, the group agreed that the U.N. climate process would remain the forum for negotiating future global action on climate change, and committed to moving forward in that forum, with a view to achieving a comprehensive post-2012 agreement (post-Kyoto agreement) that should include all major emitters. Japan, host of the next G–8 meeting in June 2009, is committed to continuing to use the sessions as an opportunity to further develop a common policy for limiting climate change, including not only energy-related emissions, but also those related to land-use change and forestry.

Major Economies Meeting (MEM): The United States convened the first Major Economies Meeting in late September 2007. Bringing together senior representatives from 17 major economies (a group nearly identical to the top emitters group as defined in Table 1), the session highlighted the importance of establishing a long-term global goal for greenhouse gas reduction in balance with sustainable development objectives. There was wide agreement that all nations would need to act to advance the global goal. The discussions emphasized the importance of enhancing investments in technology, and the need for financing clean energy technologies in the developing world, with considerable attention also paid to the need to address adaptation in concert with efforts to mitigate climate change. While the MEM session did bring a critical group of countries to the table, it is too soon to tell whether the sessions (of which several more are planned) will bear fruit. A considerable skepticism exists as to whether the sessions are a forum for agreement, or rather, a venue in which rhetoric outweighs action. Some clarity on how the U.S. intends to work with the group may emerge at the session in Bali—where the U.S. efforts to bring the results of the MEM discussion into the UNFCCC process, as agreed in the G–8 dialogues (at the MEM itself) will be tested.

United Nations High Level Event on Climate Change: On September 24, 2007, the U.N. Secretary General convened a high-level session (1 day before the opening of the U.N. General Assembly). The session focused on four themes: Adaptation, mitigation, technology, and financing. While there was no consensus outcome from the session (nor was one sought), it was clear that the delegates were in overwhelming agreement: The climate problem was real and increasingly severe; damages were already being observed and immediate steps were needed to mitigate damages and reduce future climate change. Technology was widely considered a key element for any success, and adequate financing—both to alleviate current impacts, and to mitigate emissions, including through the development and integration of new, low GHG technologies, would be required. Perhaps the strongest conclusion was a general agreement on the need to come together and work through the UNFCCC, beginning with the meeting in Bali, Indonesia, in December 2007, to take appropriate steps toward an agreement that could enter into force no later than 2012.[21]

Asia Pacific Economic Cooperation (APEC): At their most recent session in early September 2007 (held in Sydney, Australia), the leaders of the APEC countries[22] agreed on the need for global action to address climate change, while also reaffirming the need to take account of differentiated responsibilities and capabilities. Emphasis was placed on the need to develop new, low and zero emitting energy technologies, as well as on combating deforestation, while promoting open trade and investment. As with dialogues in the U.N., in the MEM, and in the G–8, there was agreement that the appropriate forum for international negotiation would be the U.N. Climate Convention, and the group called on those negotiations to reach an agreement on a post-2012 arrangement that would reduce global GHG emissions. In a more concrete vein, the group agreed to work together to increase energy intensity 25 percent by 2030 (and called on each member to set national goals), to in-

[21] For a copy of the Secretary General's meeting summary, see: http://www.un.org/climatechange/2007highlevel/summary.shtml.

[22] APEC countries include: Australia; Brunei Darussalam; Canada; Chile; People's Republic of China; Hong Kong, China; Indonesia; Japan; Republic of Korea; Malaysia; Mexico; New Zealand; Papua New Guinea; Peru; Philippines; Russia; Singapore; Chinese Taipei; Thailand; United States; Viet Nam.

crease regional forest cover by 20 million hectares by 2020, and to establish a new network for the exchange or information on low emitting energy technologies. Follow through, both on the general agreement to support the UNFCCC, as well as on specific target efforts is to be reviewed at subsequent APEC sessions.[23]

Asia Pacific Partnership (APP): The APP,[24] created by the U.S. in 2006, is focused on accelerating the development and deployment of clean, low or zero emitting technologies. In particular, the group, composed of representatives of both governmental and private sector partners for the six major Asia Pacific economies, is examining opportunities through eight task forces: (1) Aluminum, (2) Buildings and Appliances, (3) Cement, (4) Cleaner Use of Fossil Energy, (5) Coal Mining, (6) Power Generation and Transmission, (7) Renewable Energy and Distributed Generation, and (8) Steel. The U.S. chairs or cochairs the task forces on power, aluminum, coal and buildings. While the group acknowledged its interest in being consistent with the principles of the UNFCCC, its emphasis is on technology development—with a specific private sector focus. As of the 2nd Annual Meeting (held in New Delhi in October 2007), the group had endorsed 110 specific projects, although details of the extent of implementation of these is difficult to ascertain. In 2006, the U.S. proposed a $50 million budget for the APP, significantly less even than the Australian contribution of $75 million. The APP provides an excellent tool for public-private partnerships and the direct business participation in efforts to reduce GHG emissions. However, while the program promotes business collaboration and technology interchange in a way the purely government fora do not, to date its impact has been limited by the lack of a U.S. commitment to clear leadership and clearly expressed GHG limitation goals and by the differential way the U.S. treats collaboration with the developing country members—China and India.

All these processes and others[25] have a role to play in helping shape a climate deal. However, as indicated above, all of them have repeatedly emphasized, with the agreement of the U.S., that the central process for the development of a post-2012 climate agreement is under the United Nations Framework Convention on Climate Change (UNFCCC). Thus, actions the U.S. and other countries take through that forum will dictate the ultimate stringency and effectiveness of the post-Kyoto regime.

A PATHWAY TO ENGAGING CHINA

As we are all aware, Chinese emissions are rising rapidly. The International Energy Agency projects that China will surpass U.S. in total energy consumption within the next few years[26]—not surprising given reports that indicate China is building a new power plant nearly every week.

However, even though it is characterized (legitimately) as a developing country under the UNFCCC context, China none the less has adopted a significant climate change policy, albeit one that uses a different mix of policy tools than either the European or the U.S. model.[27] In responding to energy security, air pollution, and water and soil degradation issues, China's climate strategy to date has highlighted three key elements:

- *Increasing energy efficiency.* China's target is to reduce energy intensity per unit GDP by 20 percent between 2006 and 2010 (the 11th Five Year Plan Period). This target codifies the national commitment to reverse the trend of the previous 5 years, where China, for the first time since the period of economic reform, lost ground in its energy intensity. As part of its efficiency agenda, China has also adopted strong automobile efficiency standards (stronger even than those proposed by California), and it is concurrently raising gas prices to market levels. The combination should significantly limit the growth in Chinese demand (although not enough to offset the large numbers of new vehicles and vehicle miles traveled).

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[23] For a full copy of the APEC statement on climate change, energy security, and clean development, see: http://203.127.220.67/etc/medialib/apec__media__library/downloads/news__uploads/2007aelm.Par.0001.File.tmp/07__aelm__ClimateChangeEnergySec.pdf.

[24] Current APP members include Australia, Canada, China, India, Japan, Republic of Korea, and the United States.

[25] In addition to the fora discussed here, which are either climate specific or which have a broader political agenda where climate change is only one element, there are several new fora focused on forests, including the Asian Forest Partnership and the Asia Pacific Forest Law Enforcement and Governance Process. In addition, China has proposed a new Asian forest network to examine the link between forest and climate in the context of APEC.

[26] International Energy Agency, World Energy Outlook, 2007.

[27] For details of the Chinese climate policy, see "China's National Climate Change Programme," relased in June 2007, and available at: http://www.ccchina.gov.cn/WebSite/CCChina/UpFile/File188.pdf.

- *Increasing the use of renewable energy.* China's goal is to increase renewables to 15 percent of the overall energy mix by 2020. This goal is coupled with additional measures to reduce the overall amount of coal in the energy mix (where it still accounts for over two-thirds of total energy use and over three-quarters of electricity generation). Complementary policies in the energy sector include increasing the use of nuclear energy, encouraging methane capture for energy, and increasing the use of natural gas.
- *Increasing forest cover and implementing land-use policies that reduce soil degradation and increase carbon capture.* Reforestation efforts within China have long been consistent and impressive. Anyone who compares a recent visit to the tree-surrounded Great Wall to a postcard of a similar vantage from the first half of the 20th century will be surprised at the previous view of bare hills. Since 1990 forest cover in China has grown from 14 to 18 percent—although this has come in no small part as a consequence of rapidly increased imports of forest products from other parts of the world.[28]

Other than reforestation, these goals are very much works in progress. For China to meet its own energy efficiency and renewable energy goals will be extremely challenging. Success will in part be a function of the extent of the technical support China receives to meet these goals. Policymaking in China is typically an iterative process: First a goal is set. Then, if it is not met immediately, implementation is reviewed, new policies are issued and implementation is progressively strengthened.

China is currently developing the tools it needs to meet its goals, including the "1000 Enterprises Program" for energy efficiency; energy conservation and renewable energy laws; new public transportation initiatives; and improvements in efficiency in the building sector. China's industrial energy efficiency goal is to reduce its emissions by 100 million tons coal equivalent between 2006 and 2010 compared with business as usual. This corresponds to about a 15-percent energy intensity improvement and constitutes the equivalent of 240 million tons of CO_2 averted. The program, while quite new, appears to be on track: In 2006, China averted 20 million tons of coal equivalents under this program.

China does not yet use energy in buildings at anywhere near the rate that we or the Europeans do: Residential efficiency efforts are also underway. Chinese use of energy per square meter of building space is about 30 kwh/m^2 in rural areas, and 65 kwh/m^2 in urban areas (less than a third of the U.S. average and less than half of the EU average[29]). While these levels will undoubtedly increase, and the Chinese have put in place a number of measures, including insulation requirements and other building standards, promotion of compact fluorescent lights, improved appliance standards and improvements in the efficiency of building materials production to try to stem the rate of increase. For example, China, which makes 70 percent of the world's light bulbs, has agreed to phase out incandescent bulbs in favor of more energy-efficient ones, part of a push by the Global Environment Facility (GEF) to phase out incandescent bulbs globally. China is the first developing country to agree to join this program, and the facility will invest about $25 million for the Chinese program alone.

China has just begun to implement serious metrics to monitor these programs, and to develop performance benchmarks for progress. Additional tools will be needed in this area, as well as in the financing of clean energy projects, and in innovating new approaches to technology adoption. These offer potential areas where the international community can offer technical assistance. The discussion above, on technology development and penetration, suggests additional opportunities for both U.S. and China in this area.

China's goals are ambitious, and will likely be difficult to meet. A combination of factors will be key for success. Perhaps foremost among these will be a commitment by the developed world to collaborate with China and work jointly to develop the tools it needs to reach these goals. This includes much more active engagement by USG agencies in joint research and implementation of energy conservation and renewable energy technologies in China. The limited engagement thus far by both the USEPA and the Department of Energy's National Laboratories has yielded concrete results in both areas, but the scale has been far lower than what the Chinese need to bring the needed technologies to scale.

To resolve the big question that hangs over the heads of our large developing country counterparts and ourselves—how to use coal without emitting CO_2—we will

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[28] Between 1997 and 2005, the value of Chinese forest product imports rose from $6.4 billion to $16.4 billion, and the volume more than tripled See "China and the Global Market for Forest Products: Transforming Trade to Benefit Forests and Livelihoods" available at http://environment.yale.edu/posts/downloads/a-g/China__and__global__markets__for__forest__products.pdf.

[29] Respectively the EU and the U.S. are 187kwh/m^2 and 146 kwh/m^2.

need heavy investment. Effective uptake of this technology will be enhanced if major research institutes and industry in both the U.S. and China are parts of the teams developing the intellectual property to begin with. Furthermore, U.S. Government-funded projects should be linked to counterpart projects around the world. We need to deploy these technologies everywhere quickly, without complex or expensive premiums.

Ultimately, Chinese climate change policy, like that of the United States, will not be driven by international priority setting, but by a domestic acknowledgement of the urgency of the problem, and a clear internal sense of the importance of acting. China is on the early steps of a road to developing and implementing a strong climate program. While the legitimate question remains as to whether it will be large enough and soon enough to avert the worst of the global damages, it is already at least the equal of the U.S. climate policy effort. Moving forward, the United States, through a strong bilateral engagement with China, through active and constructive participation in the international climate dialogue, as well as through setting our own aggressive domestic agenda, can certainly help foster a continued, effective Chinese climate policy.

WHAT WE NEED FROM BALI

Next month, the Conference of Parties to the UNFCCC will hold its 13th session in Bali, Indonesia. The Bali meeting is perhaps the most critical U.N. climate meeting for many years. Its principal objective is to successfully launch the negotiations for a post-2012 climate agreement. Swift progress on these negotiations will be necessary to ensure that agreement can be reached by 2009 to set the world on a fair and effective road to managing the climate challenge.

The key features of the Bali agreement will need to include:

1. A mandate to negotiate a new international agreement by 2009

Given the time that it takes countries to ratify and implement international agreements, in order to avoid a gap following the first commitment period under the Kyoto Protocol (which ends in 2012) the post-2012 agreement must be negotiated and agreed by 2009. The negotiation of such a framework will not be simple, so it is important to begin immediately. The United States should clearly signal that it will abandon its strategy of obstruction and support a timely and effective agreement.

2. Processes to frame both developed and developing country commitments

The most efficient and effective process would be comprehensive, seeking to deal with all outstanding issues under a single umbrella. To date, the U.S. has called for a two-track process—one for Parties committed to the Kyoto Protocol (with its emissions trading and market mechanisms) and one for everyone else. This insistence on a two-track approach weakens the prospect of eventually getting key developing countries to take actions.

Until the U.S. has a strong domestic cap-and-trade system in place it may be hard for us to reenter the discussion of targets with much confidence, or indeed with much credibility.

However, the world is likely to look favorably on any serious U.S. efforts to rejoin an emerging agreement as soon as it finds the resolve to do so. In Bali, even if we cannot bring ourselves yet to contribute to the discussion on new commitments, we should at least not block them.

In addition a mechanism to pledge and review varied types of actions from developing countries needs to be introduced. This would be a new development compared to the Kyoto Protocol as it now stands. Such mechanisms, which must be introduced in Bali, need not be agreed there; instead, they would be developed over the span of the next 2 years, prior to reaching an agreement in 2009. Provisions should be made for including a comparison of national efforts, so that negotiating countries can satisfy each other that each is taking real and substantive measures to control emissions, commensurate with their capacity and level of development.

3. New mechanisms to reduce the destruction of tropical forests

In some major countries, notably Brazil and Indonesia, the majority of human emissions come from deforestation rather than fossil fuels. Mechanisms are needed to protect these forests, not just for the carbon they contain but because of their inestimable value as havens of biodiversity and home to millions. Again, a final agreement is not required at the Bali session; rather, the meeting must agree to launch a process, to conclude by COP 15 in 2009, to agree on how to handle these critical emissions.

4. New commitments to help the most vulnerable adapt

Both the UNFCCC and the Kyoto Protocol include mechanisms to help vulnerable populations adapt to the impacts of climate change. Only now are these (still very limited) funds about to become operational. The U.S. can lead by example in pledging greater help, both through multilateral mechanisms and through the recommendation of other, new instruments such as USAID programs and other bilateral assistance. Such efforts will be central to ensuring the success of both a climate agreement in 2009 and to long-term efforts to cope with the global damages of climate change.

A CHANCE FOR THE UNITED STATES TO SHOW ITS COLORS

Above all, Bali is an opportunity for the U.S. to reengage. After years of seeing the U.S. standing aloof from, or even obstructing, international progress in the fight against climate change, our international partners are more optimistic. Most are aware of the extensive efforts underway at the State and local level within the U.S. (indeed, many discussions are underway about linking national programs to State efforts [30]). Countries are also paying considerable attention to the active debate over the adoption of strong federal legislation, though all recognize there is still some way to go before such proposals become U.S. law.

The U.S. is also on record as supporting the UNFCCC process. The Major Economies Meeting may have been short on substance, but our international partners left largely upbeat. They heard Secretary Rice repeat President Bush's pledge that the United States will work to ensure a negotiating process from Bali to 2009, leading to a fair and effective post-2012 climate agreement.

Now is the time for the United States to live up to that pledge and to take up the leadership role it has ignored for so long.

Senator KERRY. Thank you very much, Dr. Pershing.

I appreciate the testimony of everybody, and I just want to try to follow up a little bit—while, indeed, Bali is a "process," meeting, I assume you would all agree that—I mean, knowing how these meetings work, you wind up, particularly, with the interparliamentarians sitting there and, sort of, talking substance. And to the degree that they view us as legitimate, genuine, prepared to take on certain tasks, I assume you would agree that will affect how they view a timeframe for a mandate, or what kind of and extent of mandate they're willing to embrace, or the timetables, et cetera. I mean, clearly you can't divorce the process from some of their perception of your attitude about the substance. Is that correct, or not?

Senator WIRTH. Well, I think the reality is that 2008 will be consumed by looking at all the details that have to get filled in, and there'll be a lot of blanks there, because everybody's going to wait for 2009. So, what 2008 can do is to take the framework—and Paula Dobriansky laid it out, and that's the one everybody's agreed to—mitigation, adaptation, technology, and finance—and forestation is a major piece of this—and they will decide that that's going to be the framework that we work on. But they're not going to fill in the blanks until they see a new administration come in.

Senator KERRY. Understood. But, I mean, clearly the brunt of this negotiation is going to be in 2009——

Senator WIRTH. That's right.

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[30] At a meeting held in Lisbon, Portugal on October 29, 2007, leaders of more than 15 governments met to launch the International Carbon Action Partnership (ICAP), a partnership of countries and regions that have implemented or are actively pursuing the implementation of carbon markets through mandatory cap-and-trade systems. The partnership provides a forum to share experiences and knowledge. Members include: European Commission; France; Germany; Greece; Ireland; Italy; Netherlands; New Zealand; Norway; Portugal; Spain; United Kingdom ; Arizona; California; Maine; Maryland; Massachusetts; New Jersey; New Mexico; New York; Oregon; Washington; British Columbia; and Manitoba.

Senator KERRY [continuing]. In a very short period of time, as I said earlier. But I—but would you not think that—for instance, on technology—do you see some of that discussion taking place? Do you think it's important for us to be laying out some constructive, forward thinking about where we're at in this? Obviously, I know, from your testimony, you do, Dr. Pershing, but I'd like to get the others, too, because I——

Dr. PERSHING. Let me suggest just a few points about that, because I would fully subscribe to the theory that—they usually say 90 percent of the agreement happens in the last 10 percent of the time, and that's about right. But it only happens because 90 percent of the work was done at the beginning. And so, in this particular instance, I would suggest two possible courses of action.

The first is, this administration has indicated, while it doesn't, obviously, care a lot about the mitigation side, it's prepared to talk about forests, it's prepared to talk about adaptation, and it's prepared to talk about technology. Take them up on it. Let's see what they do with those things. There is enormous scope for very positive action, which the world could agree, at this meeting, at Warsaw, which is the next meeting, and at Copenhagen, which is the 2009 meeting, all during the administration's tenure and purview. Move on those, and reserve these hard political decisions to that last session, when perhaps a more focused and positive viewpoint is in office.

Senator WIRTH. Let me, if I might, Mr. Chairman, follow up on that.

Secretary Paulson's been charged—I think it's the third time that this charge has been given to somebody—to put together a technology initiative. Take him up on it and say, "Let's move." Now, the response to that will be, "Well, we're putting in X number of billions of dollars more than has ever been done before." Well, get to the bottom of those numbers. The reality is that we're spending about 25 percent today in research, development, and demonstration of what we were spending at the time of the last oil crisis in the 1980s. Our RD&D expenditures have just plummeted. Now, every single outside group—every single one—will say, "This is a set of expenditures that have to be made." As I say, it's a low-hanging fruit, and that's something that could be done with the leadership of the Senate, working with the Department of Energy, and say, "OK, let's go ahead and do this, and let's, over, say, a 4-or-5-year period of time, ramp us back up to a four—or five-times value." That has to be done. The report done by John Holdren in 1997 for the President's Committee of Advisors on Science and Technology is the No. 1 blueprint for what ought to be done. All the material is there. It's now just a matter of fact of doing it. So, take them up on it, and let's do that. We could really demonstrate that we're serious.

Dr. SANDOR. I would say one thing, from a market's point of view, is to try to create as many linkages as possible. We have a case in point where Baxter International reduced emissions at their EU regulated facility in Dublin, Ireland, and delivered them in satisfaction of the requirements of CCX.

I think the goal of any such system has first and foremost, is to get at the disease—to reduce greenhouse gas emissions at the low-

est possible cost. That, to me, is critical. That says—and Jonathan and Tim both know—that there are many emission reduction actions which we find acceptable that other people may not. For example, those at this table have found avoided deforestation to be a very big issue. At CCX, we account for it. There are many, elsewhere, that don't.

There are issues of equity here, in terms of a market. Should it be that Chinese coal-mine methane is allowed into the system when it is additional, but Pennsylvania's is not? Is that a good policy? Or is the Lugar Stock Farm reforestation project OK in CCX, but not OK in an international market, even though those walnut trees soak up a lot of carbon?

So, the only thing I would urge is that, as a student of economics and somebody who for the better part of 35 years has been working on new products, we create linkages and homogeneity and do not bifurcate the market. We managed to homogenize wheat and soybeans, Treasury Bonds, and even the S&P 500. I think the leadership position for us here is to make the market as homogeneous, drive the cost of reducing the greenhouse gases down, and keep focused on that.

Senator WIRTH. Mr. Chairman.

Senator KERRY. Yes, Senator Wirth.

Senator WIRTH. Just one other very specific item which you could do that would have a significant impact: In the Warner-Lieberman legislation—which I applaud, I think it's really headed in the right direction—there was initially a set-aside that 10 percent of the funds yielded by the legislation would go to adaptation purposes. Now, that was of great interest to a lot of people, for reasons Senator Murkowski was suggesting domestically, but also of very significant interest to a lot in the evangelical community and the Catholics bishops who are very concerned about poverty around the world. And this was the item in Warner-Lieberman that really got them enthused about the climate legislation. Unfortunately, someplace along the road, that 10-percent requirement got dropped. It then got added back in again in very much of a watered-down way. It ought to come back in its full robustness. That's a statement to the developing world that, "We are serious about the adaptation issue. We know that you're the ones that are going to get the most impacted by climate change. We caused the climate change. Now we're willing to work with you." That's something that can be done right away, to restore that back into the Warner-Lieberman legislation—I mean, Lieberman-Warner, whatever. It's a perfect little vignette about the kinds of things that you can do and make a statement around, that's extremely important on an issue of adaptation and an issue of international negotiation, and an issue of morality and equity.

Senator KERRY. Senator Lugar.

Senator LUGAR. Let me raise a question, just for information, about markets, in the sense of the discussion that might occur at Bali. As I understand—and I think you've said a little bit about this, Dr. Sandor—in Europe, they've had an active market, based on the Kyoto Protocol and obligations that countries feel they undertook to trade. The price of carbon, from what I've seen in the regular press, quite apart from the financial press, has ranged from

$15 a ton to $40 a ton at various times; a huge range. Why such a range? And, second, could this market in Europe, plus the one you've established at CCX, or maybe others that are established—can this become, potentially a worldwide market? For example, today you can get a price for gold and copper, which is an international market, sold in different prices earlier today in Tokyo, but now, New York or Chicago, a different price now. In other words, is one of the things you might achieve at the Bali conference a sense of how a worldwide market construct could occur, and at least what the rules of the game might be if everybody decided to enter into this?

In our own domestic debate, it often goes that the cap-and-trade business is sort of a softie thing. What you really need is a carbon tax. This is what real people do to—if you want to get at it. On the other hand, it's hard to adopt a carbon tax worldwide, given the sovereignty of many, many countries. But I'm wondering whether the market principle that you've established doesn't violate the sovereignty of countries, but is really the international idea of the trading of commodities, generally. Carbon becomes this type of commodity—so that when the hard negotiations finally transpire; do you enter the market, do you subject all of your processes to the fact that you must buy your way out of a problem, if you have one, and you must have suppliers that are sufficient to get some balance. What comment do you have on, sort of, blue-skying this kind of concept for a world market?

Dr. SANDOR. Well, we, for one—it is my business, shamelessly speaking, Senator—would like to see a worldwide market. We would like to see linkages of some sort. We don't understand from our point of view in administering a market, why a coal mine methane project in Germany should be treated any differently than a coal mine related project in Pennsylvania or China. To the extent that we can forge homogeneous instruments, we will broaden the liquidity and make it much cheaper to transact, just as we do in agricultural commodities like corn or wheat or soybeans. There are lots of different grades, but they are all deliverable. So—and, to the extent that the negotiators can agree upon very critical issues, like those that Jonathan mentioned, and like avoided deforestation—this, to me, is a very, very important issue, and there is a great debate about it.

How do we address the need for equity and make it as cheap as possible to comply? Sometimes these goals conflict with each other.

Which leads me to the third part of your question. In the first or pilot stage of the European trading scheme, there were no domestic offsets allowed. The U.N.'s CDM process was clogged and did not come into play. There wasn't any offset opportunity for domestic agriculture in there, for example. There wasn't a lot of the low-hanging fruit available. The pilot stage dealt with only one gas, CO_2. It didn't include other greenhouse gases like methane. You couldn't do methane capture projects, for example, from dairy farms, coal mines or landfills. I think a well-designed program, with an objective of reducing greenhouse gases at the lowest possible cost can also yield other important co-benefits to society. But one has to be very careful when designing such a program or you're

liable to get a three-wheeled car that doesn't go very fast if you compromise the market instruments.

Regarding the $15 to $40 price range, I think it is reasonable. Depending on how you design the deliverable instruments, you can price a commodity any way.

Senator LUGAR. Let me just pick up on a thought. Ideally, in a world agreement, people are going to be more inclined to vote for that which is the least cost, as opposed to something more rigorous. Some might take that option, but probably not a majority, simply because each of these economies wants to exist and survive this process, and it could be expensive. But what I'm curious about—you mentioned deforestation in Brazil, or wherever we tried to stop it—what if you give credits to the country of Brazil for their forests, as they're sitting there? In other words, in terms of this world equity, there are a lot of forests there now. One reason why somebody wants to cut them down is that they have more value being lumbered than they do sitting there. Or, likewise, people who have farmland and adopt different practices, like the Farmers Union out of North Dakota, or what have you, no-till planting. Maybe people might say, "Well, this is very soft. We're not really sure of the measurement of this. This is getting pretty queasy." Well, there is rigorous measurement—but, if you begin to introduce these worldwide situations, where people have farmland, they have forests, they have other things to put into this equation, this makes them more interesting, it seems to me, in terms of the equities, as well as the cost of it.

Now, what is your judgment about that?

Dr. SANDOR. Well, I think you can do it. I think you can create equities. We've had the measurement challenge, whether it's for the trees on the Lugar Stock Farm or it's for Nebraska soil sequestration, are nowhere near as onerous as one would suspect. And you can deal with avoided deforestation. You can have what economists would call a counterfactual. If, for example, the rate of deforestation in Amazonas is 10 percent and you stop that rate, you don't have to give full credit. You can say 10 percent of it would have been deforested, and if you're stopping the deforestation rate, you're contributing something to the abatement of global warming and, therefore, get partial credit. So, there are technical answers to lots of these questions. And I do think you can get a worldwide system. WRI does an enormous amount of work in the protocol area and they do a fantastic job. As a matter of fact, half of protocols we use come from WRI. I think the U.S. can lead in saying we can measure and we can do the job appropriately. It is not so daunting. And we can develop an equity-driven system which is fair.

Senator LUGAR. Yes. I didn't wish to diminish the whole argument to a business arrangement, but I—in the spirit of——

Dr. SANDOR. Yes.

Senator LUGAR [continuing]. Of what Bali is supposed to do—that is, set up some parameters in which we may have some discussion. This seems to me to offer a potential model that might bear fruit as people decide that they can enter their equities. We're not demeaning the Chinese, or they're not claiming, "You've already dirtied the atmosphere for 50 years, we need a chance." We

get over that sort of thing and get on with the economics currently of the world trading system.

Senator KERRY. Dr. Pershing.

Dr. PERSHING. Just one very brief comment on that exchange, I think it's exactly the heart of part of the issue. The whole structure of the carbon market is little different than the structure of commodities markets. It's created exclusively because governments have gotten together and said there's now a cap, and the cap creates scarcity, and the scarcity creates the price. So, we have to go back to the question of: Will there be a cap, going forward?

But the second thing which we have to do is examine whether, if there were a cap in all countries, we'd believe the implementation, and whether, if we had a contract for exchange of those permits, we'd believe the contract. In some cases the answer is, absolutely, we'd be very confident. I think the European exchange is a perfect example. Your farm is a perfect example. But in the forestry side outside of those areas, we may be more skeptical.

So, for example, I'm decreasing deforestation in Indonesia, but, turns out Brazil's not part of the institution, and so, the wood demand that was down in Indonesia is now up in Brazil. The fact that, in Indonesia, there is a change does not necessarily mean that, globally, the change has happened, because we're not managing or mapping or recording globally. So, those are the dynamics that will be part of the Bali discussion and which we need to facilitate and encourage before we could make a lot of progress.

Senator LUGAR. But we could also pick up some of the business of the World Trade Organization when—for instance, they now condemn certain agricultural subsidies, or various practices, and allow countries to exact their due in whatever the trade is.

Dr. PERSHING. Yes.

Senator LUGAR. I know, presently, of $4 billion that may be due by somebody. The United States, because of our cotton business, unless cotton reforms. There at least is some experience in the world trading community of this type of thing.

Thank you, Mr. Chairman.

Senator KERRY. Thank you very much, Senator Lugar.

Dr. Pershing, you mentioned the three things the administration is willing to talk about, and it didn't include finances, which is on the list. Are they not?

Dr. PERSHING. We haven't seen substantial resources yet attach those financial proposals. There is, as the Under Secretary mentioned, the proposal for the Energy Fund. There is some financing proposed for it, but I haven't seen any authorization, I haven't seen a strong commitment to it. Other funds that might be required—the World Bank estimates anywhere from $10–$100 billion a year for adaptation, I haven't seen a fund there. The proposals are out there on the technology side for things like capture and storage, the administration talks, in the geological side, about putting in a billion dollars over a number of years; well, the current estimates from MIT are about 200 million per plant, so five plants would absorb the entire cost. So, your proposal, Senator, which would ramp up the notion of immediate programs for capture and storage plants, well, that would be something to bring to the table. Cur-

rently, I haven't seen, from them, concrete numbers that would allow me to say yes.

Senator KERRY. Right. Nor have I, which is why I raised it with her. But—

Senator Wirth.

Senator WIRTH. Mr. Chairman——

Senator KERRY. Can you also, as you comment on that, I'd just like you both—and we're going to wrap up very, very quickly here—just—what's the ideal—I mean, I understand the process part of it, but what's the best message that you could say would come out, that you'd be thrilled if Bali did what?

Senator WIRTH. Well, I'm afraid it's relatively mundane. If I were a member of the Senate Observer Group, what I'd be doing is talking about the future and the growing change of commitment, how the private sector is being involved, and really tell people that the United States is moving as rapidly as it is. That is a message that is extremely welcome, and the more it's said—you know, there's a lot of skepticism about it, but, in fact, it's true. That, it seems to me, is the most important thing to do. The process is pretty much going to take care of itself, and it's pretty hard to make that more than what it is.

Senator KERRY. But I assume you believe we could help change the dynamics for what follows as they go through the process.

Senator WIRTH. What follows is terribly important, and understanding what follows. What Jonathan said, I think, is correct—what happens in 2008 will prepare for 2009. We've talked about a number of things here—one, this whole business of what kind of long-term financial commitment is made for adaptation, and what the World Bank's going to do, and the other financial institutions—that's one whole clump of activities. The Clean Development Mechanism that Richard was talking about, and making that work is another; the trade issue which Senator Lugar talked about, and how that plays into climate change; and the biofuels issue is one that's barely been touched. There are a number of opportunities out there that are just ripe for working, and the demonstration that we're willing to do that, I think, is going to be——

Senator KERRY. It would be good if——

Senator WIRTH [continuing]. The bulk of it.

Senator KERRY [continuing]. We could, sort of, follow up with you. I'd love to do that in the next days and sort of talk about it a little more. It would be great.

Yes, Dr. Sandor.

Dr. SANDOR. I would second a lot of what Senator Wirth said, and I would just add to that by saying that Europe is not as far ahead as people think and the U.S. isn't as far behind as people think. There are a lot of things going on at State level and at the local levels. And there is a very big private sector effort as demonstrated by the members of CCX.

Senator KERRY. It's a good point.

Dr. SANDOR. And we will go forth and invent in the capital markets, and take a leadership role there.

Senator KERRY. Well, it's an excellent point. And—

Yes, last point, Dr. Pershing.

Dr. PERSHING. Yes; I'd just add two more things, because I would fully subscribe to both Richard's and Tim's comments.

The two things that I would add is that you need to send out a sense of urgency. And the message that we need to bring is that—it's something like the timetable that I think that Tim negotiated in Geneva, which was the precursor process that set the stage for the negotiation. What we need to have is a sense of timetable, but scale. We need to have a sense of magnitude of effect and substantive elements, but we also need to have inclusiveness. That's the message from Bali. If we don't have that, we're really not on the right track.

Senator KERRY. Well, I thank all of you for your leadership. It's so important to have folks like you, who have been working on this issue for a long time. And I admire each and every one of you enormously. And you'll forgive me if I particularly single out Senator Wirth, who, I think, since he left the Senate, has just been singularly focused on whether it's been in Davos or at the United Nations itself or in all the other meetings he's convened—I've been to several of them here and there, Washington and Harvard and elsewhere. And, boy, does that add up to help build energy and ultimately get us a consensus. And I'm of confident we're going to somehow get there.

Just to underscore the spirit of sacrifice that this Senator has engaged in, I got a BlackBerry about 15 minutes ago that the World Series trophy was in my conference room. [Laughter.]

And I got a BlackBerry 5 minutes ago saying it has moved on to the House and I have missed it. [Laughter.]

So, there you go, ladies and gentlemen. But the Boston Red Sox are going to win it again, so——

[Laughter.]

Senator KERRY [continuing]. It's OK.

Thank you all. Thank you for being here.

We stand adjourned.

[Whereupon, at 5:10 p.m., the hearing was adjourned.]

ADDITIONAL STATEMENT SUBMITTED FOR THE RECORD

PREPARED STATEMENT OF HON. EILEEN CLAUSSEN, PRESIDENT, PEW CENTER ON GLOBAL CLIMATE CHANGE, WASHINGTON, DC

Mr. Chairman and members of the committee, thank you for inviting me to submit written testimony on the need to restore U.S. leadership in the international climate change negotiations. My name is Eileen Claussen, and I am the President of the Pew Center on Global Climate Change.

The Pew Center on Global Climate Change is a nonprofit, nonpartisan, and independent organization dedicated to providing credible information, straight answers and innovative solutions in the effort to address global climate change. Forty-five major companies in the Pew Center's Business Environmental Leadership Council (BELC), most included in the Fortune 500, work with the center to educate the public on the risks, challenges, and solutions to climate change.

Mr. Chairman, I would like to commend you, Senator Lugar, Senator Kerry, and the other members of this committee for convening this hearing today on the international climate change negotiations. As one who has worked for many years to advance efforts on this and other critical environmental challenges, it is very gratifying to me that the U.S. Congress is at long last engaged in a genuine debate on how—not if, but how—the United States should address global climate change. So far, this debate has focused primarily on questions of domestic climate policy, and we are farther along in that debate than ever. But truly meeting the challenge of

climate change will also require global solutions, and these will be possible, I believe, only with strong leadership from the United States. By broadening the scope of debate here in Washington to focus attention on the international dimension of climate change, this hearing will inform constructive U.S. engagement in the upcoming conference in Bali—a conference that hopefully will set the stage for an effective multilateral response to global climate change.

The Bali meeting presents an enormous opportunity for the United States to help move nations toward a fair, effective, comprehensive post-2012 climate agreement, one that serves U.S. interests by ensuring that all major economies are onboard. However, producing such an agreement first requires the launch of a new round of negotiations. That must be the key objective in Bali.

In my testimony today, I would like to set the Bali conference in context by highlighting recent international developments addressing climate change, and by outlining the key objectives a post-2012 climate framework must meet, and the form it should take. Finally, I would like to elaborate on the type of decision needed in Bali to start nations on the path toward such an agreement.

Recent international developments addressing climate change

As the United States moves closer to taking comprehensive action on climate change, it is not alone in its efforts. Last week, British Prime Minister Gordon Brown presented legislation to mandate a 60-percent in U.K. carbon dioxide emissions by 2050. The European Union—which has established the Emissions Trading Scheme, the largest emissions trading market in the world—has now committed to reduce its emissions 20 percent below 1990 levels by 2020. Several EU Member States also have joined with other countries and 10 U.S. States in the International Carbon Action Partnership, which will work toward international linkage of greenhouse gas markets. The Australian Government has declared its intention to establish a nationwide cap-and-trade system. Canada is developing a regulatory framework that the government projects will reduce emissions 20 percent by 2020. China, Mexico, and Brazil all issued national climate change programs within recent months. China's policies include an economywide goal of reducing energy intensity 20 percent by 2010, ambitious renewable energy targets, and vehicle fuel economy standards more stringent than those here in the United States.

Climate change is figuring much more prominently in international fora as well. The potential security implications of climate change drew the attention of the U.N. Security Council earlier this year. In June, G–8 leaders called for a global agreement on a post-2012 framework under the United Nations Framework Convention on Climate Change (UNFCCC) by 2009, and agreed to "consider seriously . . . at least a halving of global emissions by 2050." At the APEC summit in September, leaders agreed on aspirational goals to reduce energy intensity 25 percent by 2030 and increase forest cover by at least 20 million hectares by 2020. Later that month, more than 150 countries, most represented by heads of state or government, participated in a U.N. High-Level Event on Climate Change to urge a breakthrough at the Bali conference. This was followed a few days later by the Major Economies Meeting convened here in Washington by President Bush with the goal of forging a consensus contributing to a global agreement under the UNFCCC in 2009.

Key objectives of a post-2012 climate framework

So what form should such an agreement take? The Pew Center's perspective on the future international framework reflects not only our own detailed analysis but also the collective views of an impressive group of policymakers and stakeholders from around the world. As part of our effort to help build consensus on these issues, we convened the Climate Dialogue at Pocantico, whose report was released in late 2005 at an event here in Congress, hosted by Senators Biden and Lugar. The Pocantico group included senior policymakers from Britain, Germany, China, India, Japan, Australia, Canada, Mexico, Brazil, and the United States; as well as senior executives from companies in several key sectors, including Alcoa, BP, DuPont, Exelon, Eskom (the largest electric utility in Africa), Rio Tinto, and Toyota. Despite this diverse range of interests and perspectives, the Pocantico group succeeded in reaching consensus on a broad vision of a post-2012 climate framework. This vision begins with a set of key objectives that a post-2012 framework must meet, and I would like to emphasize the two most critical of these objectives.

First, the post-2012 framework must engage all of the world's major economies. Twenty-five countries account for about 85 percent of global greenhouse gas emissions. These same countries also account for about 70 percent of global population and 85 percent of global GDP. Participation of all the major economies is critical not only from an environmental perspective, but from a political perspective as well, as we cannot reasonably expect any of these countries to be willing to undertake

a sustained and ambitious effort against climate change without confidence that the others are contributing their fair share. We must agree to proceed together.

At the same time, we must recognize the tremendous diversity among the major economies. This group includes industrialized countries, developing countries, and economies in transition. Their per capita emissions range by a factor of 14 and their per capita incomes by a factor of 18. This leads directly to the second critical objective identified in our Pocantico dialogue: The post-2012 framework must provide flexibility for different national strategies and circumstances. The kinds of policies that effectively address climate change in ways consistent with other national priorities will vary from country to country. If it is to achieve broad participation, the future framework must allow for variation both in the nature of commitments taken by countries and in the timeframes within which these commitments must be fulfilled.

With these key objectives in mind, the Pocantico group then asked: What could be the key elements of a post-2012 framework? The group recommended several policy approaches.

The first of these is targets and trading. This is the approach employed in the Kyoto Protocol, as well as in the European Union's Emissions Trading Scheme and the Regional Greenhouse Gas Initiative being undertaken by 10 States in the northeastern United States. There are very sound reasons why U.S. negotiators insisted so strongly on a market-based architecture for the Kyoto Protocol—and why many of the major climate bills now before Congress adopt the same approach. Emission targets provide a reasonable degree of environmental certainty, while emissions trading harnesses market forces to deliver those reductions at the lowest possible cost.

While targets and trading should remain a core element of the international effort, we must recognize that China, India, and other developing countries are highly unlikely to accept binding economywide emission limits any time in the foreseeable future. Economywide targets also may be technically impractical for them: To accept a binding target, a country must be able to reliably quantify its current emissions and project its future emissions, a capacity that at present few if any developing countries have.

A future framework, therefore, must allow for other approaches as well. These could include policy-based commitments, under which countries would commit to undertake national policies that will moderate or reduce their emissions without being bound to an economywide emissions limit. A country like China, for instance, could commit to strengthen its existing energy efficiency targets, renewable energy goals, and auto fuel economy standards. Tropical forest countries could commit to reduce deforestation. For this to work, the commitments would need to be credible and binding, with mechanisms to ensure close monitoring and compliance. Developed countries also may need to provide incentives for developing countries to adopt and implement stronger policies. One option is policy-based emissions crediting, similar to the Kyoto Protocol's Clean Development Mechanism, granting countries tradable emission credits for meeting or exceeding their policy commitments.

A third potential element is sectoral agreements, in which governments commit to a set of targets, standards, or other measures to reduce emissions from a given sector, rather than economywide. In energy-intensive industries whose goods trade globally, which are the sectors most vulnerable to potential competitiveness impacts from carbon constraints, sectoral agreements can help resolve such concerns by ensuring a more level playing field. Such approaches are being explored by global industry groups in both the aluminum and cement sectors. We believe it is also worth exploring sectoral approaches in other sectors such as power and transportation where competitiveness is less of an issue but where large-scale emission reduction efforts are most urgent.

A fourth potential element is technology cooperation. This could include two types of agreements. The first would provide for joint research and development of "breakthrough" technologies with long investment horizons. Such agreements could build on the Asia Pacific Partnership and other technology initiatives, but commit governments to the higher levels of funding needed to accelerate and better coordinate critical research and development. The second type of agreement could help to provide equitable access to both existing and new technologies by addressing finance, international property rights, and other issues that presently impede the flow of low-carbon technologies to developing countries.

In addition to these approaches to mitigate greenhouse gas emissions, a sound international agreement must address adaptation. The top priority within the framework should be addressing the urgent needs of those countries most vulnerable to climate change, with a broader goal of spurring comprehensive efforts to re-

duce climate vulnerability generally by integrating adaptation across the full range of development activities.

The decision needed in Bali: To begin negotiation

I have described the building blocks of a comprehensive agreement. Precisely how they fit together can be determined only through negotiation. What is needed in Bali is a clear decision by governments to begin that negotiation.

Two years ago, parties to the Kyoto Protocol opened negotiations on post-2012 commitments for those countries that have emission targets under the protocol. In their present form, these negotiations are very unlikely to succeed because those countries are unlikely to commit internationally to stronger action without commitments from the United States and from the major emerging economies. The negotiations must be broadened with the goal of establishing commitments for all the major economies. The best way to accomplish that is to establish a new negotiating process under the Framework Convention, where the United States is party. These new negotiations should either be linked to or encompass those underway under Kyoto, with the aim of producing a comprehensive agreement with elements under both the convention and the protocol. A decision to launch such negotiations must set out a clear process and timeline. Ideally, it also should set clear terms of engagement specifying the types of commitments to be negotiated and for which countries.

At present, while I expect that parties will agree on some type of process in Bali, I am not confident that it will be the type needed to produce a comprehensive and effective set of commitments. Of one thing, however, I am certain—a genuine negotiation will be possible only with the full and committed participation of the United States.

Whether negotiations are launched in Bali or later, one of the most difficult challenges will of course be engaging developing countries. Meeting this challenge requires a firm but balanced approach. To begin with, we must be absolutely clear in our expectation that the major developing countries assume binding commitments in a post-2012 framework. It is true that the United States, the world's largest economy, is also by far the largest historic contributor to climate change. In establishing mandatory limits on domestic emissions, the United States will have begun to fulfill the commitment it made with other industrialized countries to lead the climate change effort. And having done so, it will then be reasonable to expect that countries like China fulfill their responsibilities as well. China's emissions have grown 80 percent since 1990 and could rise another 80 percent by 2020. It is essential that these trends be reversed. Realistically, given the greater capacity and historic responsibility of industrialized countries, China, India, and other developing countries will require incentives to undertake strong climate efforts. However, in return for these incentives, China and the other major developing countries must assume appropriate commitments that will slow and ultimately reverse the growth of their greenhouse gas emissions.

To summarize, I believe it is incumbent upon the United States to lead both by strong action at home and by actively and constructively reengaging in the international climate effort. Only with strong U.S. participation and leadership can we achieve a fair and effective global response to the critical challenge of climate change. I thank the committee for the opportunity to present these views.

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