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PREPARING FOR COPENHAGEN: HOW DEVELOPING COUNTRIES ARE FIGHTING CLIMATE CHANGE

HEARING

BEFORE THE

SELECT COMMITTEE ON
ENERGY INDEPENDENCE
AND GLOBAL WARMING
HOUSE OF REPRESENTATIVES

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PREPARING FOR COPENHAGEN: HOW DEVELOPING COUNTRIES ARE FIGHTING CLIMATE CHANGE

WEDNESDAY, MARCH 4, 2009

HOUSE OF REPRESENTATIVES,
SELECT COMMITTEE ON ENERGY INDEPENDENCE
AND GLOBAL WARMING,
Washington, DC.

The committee met, pursuant to call, at 9:35 a.m. in room 210, Cannon House Office Building, Hon. Edward J. Markey (chairman of the committee) presiding.

Present: Representatives Markey, Cleaver, Hall, Salazar, Herseth Sandlin, and Sensenbrenner.

Staff present: Joel Beauvais and Camilla Bausch.

The CHAIRMAN. Good morning, and welcome to the Select Committee on Energy Independence and Global Warming. Over the last 2 years the Select Committee has examined closely how the U.S. can fight climate change and improve our energy security. But we are not in this fight alone, and the progress that our country can make is deeply dependent on the progress that developing countries are making.

That is the focus of today's hearing, to take an assessment based on the facts that exist in 2009, not as they existed 5 or 10 years ago, of steps taken by the key developing countries to address global warming. This inquiry is important because Americans rightly want to know that they are not the only ones altering their policies to combat global warming. This inquiry is also important because many Members have rightly expressed concern about maintaining the competitiveness of critical industry sectors, and they want to know that other countries are joining the fight and requiring their industries to move away from business as usual.

Our discussion on what developing countries are doing needs to be fueled by current facts and not by old perceptions. One old perception is that China is unwilling to join the fight against climate change and is wedded to growth at any cost. Our current reality is that China has already adopted an energy efficiency law that far exceeds anything on the law books of our country.

Other examples abound of how developing countries are making progress. I am not suggesting that the developing countries are doing everything they can do, and they are certainly not doing everything that needs to be done. But as we undertake climate change legislation in our country, we should understand the steps taken by key developing countries around the world.

China, India, Brazil, Mexico, South Africa are some of the biggest emitters of the developing world. Over the last years, all of these countries have displayed an increasing awareness of the need to act. Just last week President Obama acknowledged China in his speech to the Joint Session of Congress for having launched the largest effort in history to make their economy energy efficient.

Also last week Greenpeace welcomed India's national climate plan's first step, a market mechanism that could phase out 400 million incandescent bulbs by 2012.

In December last year, Mexico set an aspirational target to cut in half its 2002 carbon emissions by 2050, and the Brazilian Government released its national plan on climate change.

These are encouraging signs of action, but the world has to do more, and the world has to act together. Despite the action and efforts shown around the world, emissions continue to rise. We have to reverse this trend, and certainly developed countries will have to show clear commitment and live up to their promises and developing countries will need the support when accelerating their action.

To ensure that the world achieves the needed reductions, we need a strong agreement in Copenhagen, and we need to monitor and verify the efforts all across the world. We need to be sure that promises lead to action, that plans get implemented, that results live up to expectations. The United States must show that it will lead this effort. Only by doing so will we collectively be able to win the fight against dangerous climate change.

Let me turn now and recognize the ranking member of the Select Committee, the gentleman from Wisconsin, Mr. Sensenbrenner.

[The prepared statement of Mr. Markey follows:]

Chairman Edward J. Markey

"Preparing for Copenhagen: How Developing Countries Are Fighting Climate Change"

Opening Statement, Chairman Edward J. Markey
Wednesday, March 4, 2009

Over the last two years, the Select Committee has examined closely how the U.S. can fight climate change and improve our energy security. But we are not in this fight alone, and the progress that our country can make is deeply dependent on the progress that developing countries are making. That is the focus of today's hearing: to take an assessment based on the facts that exist in 2009 – not as they existed five or ten years ago – of steps taken by the key developing countries to address global warming.

This inquiry is important because Americans rightly want to know that they are not the only ones altering their policies to combat global warming. This inquiry is also important because many Members have rightly expressed concern about maintaining the competitiveness of critical industry sectors, and they want to know that other countries are joining the fight and requiring their industries to move away from business as usual.

A discussion on what developing countries are doing needs to be fuelled by current facts and not by old perceptions. One old perception is that China is unwilling to join the fight against climate change and is wedded to growth at any cost. A current reality is that China has already adopted an energy efficiency law that far exceeds anything on the law books of our country. Other examples abound of how developing countries are making progress.

I am not suggesting that the developing countries are doing everything that they can do, and they are certainly not doing everything that needs to be done. But as we undertake climate change legislation in our country we should understand the steps taken by key developing countries around the world.

China, India, Brazil, Mexico, South Africa are some of the biggest emitters in the developing world. Over the last years, all these countries have displayed an increasing awareness of the need to act. Just last week, President Obama acknowledged China in his speech to the joint session of Congress for having launched "the largest effort in history to make their economy energy efficient." Also last week, Greenpeace welcomed India's national climate plan's first step – a market mechanism that could phase-out 400 million incandescent bulbs until 2012. In December, last year Mexico set an aspirational target to cut in half its 2002 carbon emissions by 2050. And the Brazilian government released its National Plan on Climate Change. These are encouraging signs of action.

But the world has to do more and the world has to act together. Despite the action and efforts shown around the world, emissions continue to rise. We have to reverse this trend. Certainly, developed countries will have to show clear commitment and live up to their promises, and developing countries will need support when accelerating their action. To ensure that the world achieves the needed reductions, we need a strong agreement in Copenhagen. And we need to monitor and verify the efforts all across the world. We need to be sure that promises lead to action, that plans get implemented, that results live up to expectations.

The United States must show that it is will lead this effort. Only by doing so, we will collectively be able to win the fight against dangerous climate change.

Mr. SENSENBRENNER. Well, thank you very much. I guess the cash register is on this side of the aisle because last week we learned how expensive our response to climate change is going to be. President Obama's budget blueprint established potential domestic costs in today's hearing will highlight the mounting international demands. The world is expecting increased energy efficiency from the developing world, and the developing world is demanding compensation in return.

We have known for a while that the cap and tax policy, which is my name for the carbon trading system President Obama is advocating, will significantly harm the U.S. economy. In his budget blueprint last week President Obama sketched out a cap and tax plan that will require approximately $80 billion a year from U.S. taxpayers. By 2020, Americans will have paid $646 billion to fund this scheme. And while $646 billion is a shocking number, or at least it used to be, it pales in comparison to the demands of developing countries.

India's government stated that the developed nations owe billions of dollars to developing nations to compensate for climate change. In its submission to the U.N. Framework Convention on Climate Change, the Indian Government argued that this funding should be a legal obligation for developed countries that cannot be subject to the decisions of developed country governments or legislatures. How that flies in the face of our Constitution's requirement that nothing be paid out of the Treasury except by appropriation, I don't know. They added that this funding should not be in the form of loans and that the providers of finance cannot be discretionary donors but must be legally obligated assessees.

In its own submission, China argued that the developed nations should provide new additional adequate predictable and sustainable funding at least half to 1 percent of the Nation's GDP over and above the existing foreign aid.

The Massachusetts Institute of Technology's Joint Program on the Science and Policy of Global Change, a supporter of cap and tax policies, estimated that welfare costs to developed countries could be over $400 billion per year in 2020, rising to over $3 trillion per year in 2050. And over $1 trillion of this would come from the United States. As the MIT study notes, this scheme goes well beyond compensating for mitigating costs and turns the mitigation policy into an instrument for global income redistribution, unquote.

Several developing countries have made effort to increase their energy efficiency, which is good. But many of these countries have publicly stated their good intentions and aspirational goals to reduce their emissions but it is their willingness and ability to actually implement these policies that will determine the ultimate success of our global efforts.

China has already resisted enforcement of WTO's trade rules. The U.S. Trade Representative found in its 2008 report to Congress on China's WTO compliance that, quote, China has yet to fully implement important commitments and in other areas significant questions have arisen regarding China's adherence to ongoing WTO obligations, including core WTO principles.

In my role as a member and the former chairman of the Judiciary Committee, I sure found that out due to the lack of enforce-

ment by China of intellectual property rights laws even though the Chinese law on the books looks as good as the United States' law or the laws that are in the European Union.

A post-Kyoto Treaty cannot succeed without China's participation, but can we expect China's compliance with the climate change treaty given its history with the WTO? I think the answer is obvious.

Today's witness Lee Lane, a Resident Fellow at the American Enterprise Institute, rightly recognizes that technological development is the crucial long-term priority. Politics is the art of the possible, but current proposals for emissions reductions go beyond not only what is politically possible but also what is actually achievable.

Nations cannot afford to meet greenhouse gas reduction goals without substantial advances in energy technology. The development of technology, not higher taxes or global wealth redistribution schemes, should be where Congress focuses its efforts to confront climate change.

I look forward to hearing from our witnesses today and learning more about what role technology can play in these important climate change negotiations leading to the U.N. conference of the parties in Copenhagen this December. Thank you.

The CHAIRMAN. The gentleman's time has expired. The Chair recognizes the gentleman from Missouri, Mr. Cleaver.

Mr. CLEAVER. Thank you, Mr. Chairman. Thank you for this opportunity.

Mr. Chairman, I am absolutely convinced that the American economy can be retooled to meet the challenge of climate change and that the second industrial revolution of this country can be a revolution that would green our economy in more ways than one. But I think that we are really in a unique position, maybe even an awkward position because of the last decade, almost a decade, of ignoring the science of climate change. And we are faced now with an opportunity for the President to go to Copenhagen in December of this year. And I think that in Copenhagen the President is going to be watched and listened to perhaps in a more serious way than maybe ever a President or American official has dealt with this issue of climate change.

And so I am interested in hearing from the panel the things you think we must do before Copenhagen, before next December, in order to have credibility when the President speaks on the last day of the conference.

So I appreciate your presence. I hope to be able to probe your considerable knowledge of the subject in order to ascertain information that will be helpful as this committee continues to study this issue and make recommendations to the Speaker.

Thank you, Mr.Chairman. I yield back the balance of my time.

The CHAIRMAN. Great. I thank the gentleman.

The Chair recognizes the gentleman from New York, Mr. Hall.

Mr. HALL. Thank you, Mr. Chairman, for holding this hearing, and also for our panel of witnesses today. The world is on the cusp of exciting developments following the Bali meetings of framework for negotiations, developing what could lead to the first real inter-

national climate change ever. At least that is my hope for the Copenhagen meetings.

An international agreement must have enforceable targets, must take care to rein in irresponsible practices by developing countries, particularly China and India. But we must realize that, while large and growing, these nations have much lower standards of living than ours, and we need to be sympathetic to their desire to achieve what we in this country have been calling the American dream for more than two centuries.

At the same time, our economy is suffering and manufacturing is on the decline here at home. Any climate legislation that this Congress needs to consider needs to take into account the impact it will have on people and businesses in the United States. So there are twin challenges. How do we get China and India and the developing world to agree to climate change goals that do not stifle their own growth? And how do we limit our own contribution of greenhouse gases without further crippling the United States economy?

I believe in that answer we can find opportunity. American businesses can lead the way in renewable and energy efficient technology. For example, just last week we had several witnesses testify about the work their companies are doing on energy efficiency and smart growth technology. In the Hudson Valley of New York we have innovators working on waste to energy, solar, biomass, and investors looking to fund renewable projects, and such low-tech solutions as weatherization, which would hopefully capture the 30 to 40 percent heat loss or air conditioning loss, as the case may be, from individual homes. We in our stimulus recovery package passed a large enough amount that New York State this year will be receiving about twice for weatherization what the entire country received last year, and a proportionate effort is being made nationwide. It is a serious conservation effort, and I am very proud of it and proud of the fact that my county, Duchess County, will be hiring five times as many workers to go out and do insulation of storm doors, storm windows, weather stripping. We are not talking high-tech new inventions. We are talking basic good building practices to save those homeowners money.

It is time to harness our ingenuity to solve the climate crisis and export manufactured goods once again. We can fuel the carbon efficient global economy with just a little bit of investment. The economic stimulus was a good start but more can be done, and if we can do that we can help the developing countries meet their targets and make the planet a better place and make some money or save some money for our people at the same time. We should not be afraid of this challenge. We should welcome it.

I thank you, Mr.Chairman, and yield back.

The CHAIRMAN. The gentleman's time has expired.

The Chair recognizes the gentleman from Colorado, Mr. Salazar.

Mr. SALAZAR. Well, thank you, Mr. Chairman. It is an honor to be here with you here today and with you, Mr. Sensenbrenner. I share some of the same values as you do.

I come from the Colorado San Luis Valley, which is very rich in solar. We have 150-day average of sunshine in Colorado. And I believe that, you know, in renewable energy and the world's need for energy conservation and development of renewable sources of en-

ergy, I think that the world has a real need for some type of moderate commonsense legislation and talks and negotiations to move our climate change issues to the forefront.

I also share the concerns of Mr. Sensenbrenner and Mr. Hall when we talk about what our current economic situation is in this country, but I want to talk a little bit today about how I believe that we can actually curb some of our carbon emissions. I want to make sure that agriculture is heard in all this debate. I believe that agriculture can be a part of our carbon sequestration issue.

I am looking forward to today. Today is my first day, and the Speaker asked me to serve on this committee. While I am not an expert in energy issues, I do want to be part of the solution.

So thank you very much, Mr. Chairman. And I yield back.

The CHAIRMAN. I thank the gentleman very much. And whether it be solar or wind or fossil fuels or agriculture, Colorado in a lot of ways is a microcosm of all of the solutions that we can propose.

Mr. SALAZAR. Mr. Chairman, if I may just say that in Colorado and the Colorado San Luis Valley we had up until last year the largest solar farm in the United States, an 80-acre solar farm that produced close to 12 megawatts of solar power. They are looking now at building somewhere in the neighborhood of a 550-megawatt concentrated solar farm in that area. So I am very interested in those issues.

The CHAIRMAN. I thank the gentleman. I thank the gentleman for serving on the committee. It is going to make an invaluable contribution.

Let me now turn to our panel. And our first witness is Mr. Carter Roberts. Mr. Roberts is the President and the CEO of the World Wildlife Fund. WWF is supported by close to 5 million members globally, and its affiliates work in more than 100 countries. Before joining WWF, Mr. Roberts worked on strategic planning and new international programs with the Nature Conservancy.

We welcome you, Mr. Roberts. Whenever you are ready, please begin.

STATEMENT OF CARTER ROBERTS, PRESIDENT AND CEO, WORLD WILDLIFE FUND

Mr. ROBERTS. Thank you, Mr. Chairman. And thank you to the committee for your leadership and educating the American public and Congress about the threat of climate change and what we need to do about it. And I am grateful for the opportunity to provide testimony today on behalf of our 5 million members and on behalf of our programs around the world.

As you point out, we operate in all these countries around the world, often with programs led by nationals, leaders in those countries who have a deep appreciation for the context in these countries, and we have an observer status for the UNFCC process, and often we serve as members of delegations from these countries to the negotiating process. So it is from this vantage point and with this perspective that I offer my testimony today.

Conventional wisdom says that developing countries do not take climate change seriously and that they will be an obstacle to a global deal. Nothing could be further from the truth. Key developing countries are taking concrete steps to reduce emissions at

home. They are also leading in many ways the international negotiations as we speak. For the sake of our climate, our economy, and our international competitiveness, I urge us to follow their lead.

I have three key points today that I want to make. One is that things have changed. The other is that they have changed for good reasons, and finally that the U.S. needs to respond in kind both in our domestic legislation and in our international negotiations.

So first, throughout much of the 1990s the developed world looked to developing countries to take the lead in solving the climate change problem. That was clear. Their posture was understandable. They contribute little in the way of emissions and were suffering some of the greatest impacts, all at the same time that the world's largest emitter was doing very little. Over the past year in particular, developing countries have taken action to reduce their own emissions at home and have been constructing advancing solutions at an international stage.

Two examples: Renewable energy and deforestation or avoided deforestation. Renewable energy standard is a classic part of any country's seriousness in replacing high carbon fuels with ones that produce zero emissions. During the past several years as the U.S. has debated whether or not to have a renewable energy standard, Brazil, India, China, Mexico, the Philippines and many others have adopted their own and have begun implementing it with some success.

Second, deforestation. You know that deforestation is the second largest sector in terms of CO_2 emissions around the world, more than all the cars, trucks, planes, trains and boats in the world, bringing Brazil and Indonesia to the top five emitters around the world. In December, Brazil announced a bold plan to cut their emissions from deforestation by 70 percent in 10 years. This would avoid 4.8 billion tons of CO_2 emissions, equivalent to over two-thirds what the U.S. produces alone.

To back this up, Brazil has made a number of commitments at home. First, they have created one of the most impressive forest conservation programs in the world, creating a series of parks in the Amazon roughly equal to the size of the State of California.

Second, they developed a world class system of monitoring that has few peers around the world and is now regularly reporting on their progress in avoiding deforestation.

And finally, they are creating governance systems, particularly at a state level, that provide the resources and the enforcement with local communities to reduce deforestation right at the edge of the forest frontier.

Meeting all these goals will be tough. Brazil is committed to it, but it can't do it alone. It will need our help. It will need technology. It will need know-how, and it will need some financial flows to make this happen.

The reason these developing countries are taking these steps are pretty obvious. They are very similar to our own, risk and opportunity. The risks that they see are even far greater than ours because they have billions of people who live below the poverty line and they lack the capital and the financial resources to respond, to adapt, and to change. And so for nations with populations living at the a subsistence level, even modest amounts of climate change

change their water supplies, change their food supplies, and runs the risk of severe crop failures. Wait and see is not an option.

They also see that addressing climate change produces the promise of economic security and even growth. Dramatic swings in energy prices are problematic for countries with little financial reserves, and those countries who are able to develop homegrown energy supplies are able to become leaders in areas like renewables.

Right now China leads the world in installed renewable energy capacity and is projected to be the world leader by the end of this year in exports of renewable energy solutions.

Finally, my last point, the U.S. as we enact cap and trade legislation here at home and enter international negotiations, we should do so with developing countries in mind. Why? First, it is a global crisis and it requires a global solution just as the economic crisis requires countries to come together.

Second, a ton emitted in China or a ton emitted in Brazil is just as costly to us at home as a ton emitted in Ohio. We need to ensure just as we are creating green jobs at home and sending funds at home to drive solutions that we also ensure that funds flow to those countries where low-cost solutions can be found. We need to solve the problem by solving it globally.

Third, by building the capacity of other countries, we are building more stable societies. We are also building potential markets for technological solutions. For too long the U.S. has invented renewable technologies only to see other countries own those markets by having the right regulatory framework and by having good relations in markets of other countries.

Last but not least, the U.S. has had a long legacy of reaching out to other countries and solving global problems, bringing our know-how, our capacity, our money and our resources to help countries in need and to create a leadership role for us abroad. We have done it with HIV/AIDS. We have done it on security issues. We need to do it on climate change.

In summary, the developing world has changed as we speak. They are playing a leading role. They are taking action at home. It is time for us as we pass cap and trade legislation here at home and enter international negotiations to respond to their leadership and to respond in kind. It is in our best interest to do so.

Thank you very much.

[The prepared statement of Mr. Roberts follows:]

WWF *for a living planet*®

Testimony of

Carter Roberts
President and CEO
World Wildlife Fund

before the

Select Committee on Energy Independence and Global Warming

U.S. House of Representatives

"Preparing for Copenhagen: How Developing Countries are Fighting Climate Change."

March 4, 2009

Introduction

Chairman Markey, Ranking Member Sensenbrenner, Members of the Committee: On behalf of World Wildlife Fund (WWF), I am pleased to present testimony to this committee. First, let me commend the Chairman and the Select Committee for its important work in bringing much-needed attention within the Congress to so many aspects of climate change. The many hearings held by this committee puts the Congress and the United States as a whole in a much better position to support the domestic legislation and international agreements necessary to respond to this global crisis. So thank you for your important leadership.

As the Congress works with renewed vigor on the critical question of how to construct a domestic framework to reduce emissions within the United States, it is vital that we also remain focused on the need to work together with other nations, particularly developing countries and emerging economies, to produce a framework that ensures that global emissions hit their peak and begin to decline within the decade in order to limit overall temperature increase to below 2 degrees centigrade above pre-industrial levels. The impacts of climate change ignore our political borders; only a global solution will protect the people of the United States and all the nations of the world from the worst effects of climate change.

Conventional wisdom in Washington says that developing countries do not take climate change seriously, that emerging economies are not taking steps to reduce their emissions, and that these countries are an obstacle to reaching a new global agreement to stop climate change. Today, nothing could be further from the truth. Although it has become rare in these difficult times, I am here with good news: Developing countries 'get' climate change and they are taking action to reduce their emissions while constructively leading in the international negotiations.

But let's be clear, just as we are, developing countries are grappling with how best to meet the near-term energy needs of their growing populations, while also responding to the threats of climate change. And this is a much greater challenge for them than it is for us. Even the largest of these countries are poor and struggling by any measure we would use in the United States. For example, approximately 85% of the population of India lives on less than $2/day. This represents three times more people than the entire population of the US. And while their overall economies have grown in recent years, their gross domestic products are partially a function of very large populations, masking deep poverty. In truth, nearly half of the world's abject poor (living on less than $1/day) live in China and India alone; none live here in the United States.

Faced with these challenges, developing countries continue to struggle with how best to reduce emissions while responding to crushing poverty. They have not always succeeded in their attempts to reduce emissions and they are not in a position to make all of the necessary reductions on their own. This is no surprise. Emissions in the developing world continue to grow at a faster rate than in the industrialized world. This is also not a surprise. Many in the

developing world are only now gaining access electricity and they understandably aspire to more of the basic conveniences that we take for granted. Moreover, as the world economy has become increasingly globalized, much of our demand for emission-intensive products, like beef, aluminum, lumber and cement is shifting to the developing world and along with the associated emissions.

What is a surprise, however, at least to some, is that these countries are doing a better job than the United States in taking ambitious action to reduce emissions, while leading the conversation on a new international climate agreement. These nations realize that future economic prosperity lies at the end of the road to a low-carbon economy. They hope to gain a competitive advantage in this new economy by acting now. And they have seen the early impacts of climate change on their people and their economies and realize there is no time to lose.

World Wildlife Fund – A Global and Historical View

With operations in 100 countries and experience that stretches for nearly half a century, WWF has the geographic scope and historical perspective necessary to speak to past and current developing country actions and attitudes toward climate change. Since the late 1980's we have been working with local communities, governments, scientists, and businesses around the world to advocate for climate change solutions that will make the world cleaner, healthier, and safer. WWF's positions and perspectives on climate change are informed by deep technical expertise, and a global view based on knowledge of the domestic political situation in each relevant country and on-the-ground implementation projects at the local scale.

WWF's perspective is truly global. Our offices in China, India, Brazil, South Africa, Indonesia and elsewhere in the developing world are independent organizations, managed and led by local nationals with deep connections and understanding of their domestic context. On the international stage, WWF has been a mainstay in the climate negotiations as an official observer organization within the UN Framework Convention on Climate Change represented by a multinational delegation representing every major country in the negotiations. It is from this vantage point and with these combined voices that we provide testimony today.

International Climate Negotiations: A Changing Landscape

As with most conventional wisdom, the idea that developing countries are reluctant to take action to reduce greenhouse gas (GHG) emissions has some historical basis. By 1994, nearly every country in the world – including the United States – signed and ratified the UN Framework Convention on Climate Change (UNFCCC). Under that agreement, industrialized nations agreed to make commitments to reduce GHG emissions before any developing countries based on the recognition that industrialized country emissions were responsible for the lion's share of climate change.

Throughout much of the 1990s and into this decade, developing countries held fast to this bargain. Many, including China, argued strongly that they would take no action to reduce their emissions until after the United States – the world's largest historical emitter and the world's largest economy – took action. And so began over a decade of finger-pointing and strong rhetoric. For example, in 1997, a member of the Chinese delegation made clear that, at that time, China opposed making any emissions reductions. He said: "The position of the G-77 and China is clear -- no new commitments in whatever guise or disguise... [Developed countries] have to pay to the Earth the debt they owed since the Industrial Revolution."

And while this debate raged, emissions grew. Since 1995, U.S. emissions have increased approximately 14%. And although its emissions per capita remain quite low (99th in the world), in absolute terms, China now is the world's largest emitter of carbon dioxide (CO2). Most importantly, our global emissions have continued to increase.

Overall emissions within these major emerging economies continue to grow at a faster rate than in the developed world and much of that is due to the globalization of trade. Today a larger and larger percentage of the emissions associated with the products we buy and the food we eat are generated outside of the United States. We continue to be a great driver for these emissions, but they are occurring overseas in developing countries.

Why Have Developing Countries Decided To Act?

Just as in the United States, the last few years have brought much greater awareness within the developing world of the great risks of climate change and, most importantly, how quickly the impacts would be upon us. As the evidence mounts that climate change resulting from human activity is well underway and that it is accelerating, developing countries have realized (more quickly than the United States, I'm disappointed to say) that the time for posturing is over, and the time for action has arrived. As importantly, developing countries have begun to understand that future economic prosperity will depend on investments in a clean, modern energy economy.

Seeing The Impacts

The ten warmest years on record have been 1997 through 2008 and during that time, the Intergovernmental Panel on Climate Change (IPCC) issued its third and fourth assessments (in 2001 and 2007). The fourth IPCC assessment report said that "warming is unequivocal" and that most of the observed increase in global average temperatures since the mid-20th century is very likely due to the buildup of greenhouse gases in the atmosphere resulting from human activity. The assessment also concluded that "[o]bservational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, particularly temperature increases."

The IPCC reports made clear that evidence of impacts from climate change on people and their activities is mounting for every region and more disruptive impacts are likely during the course of this century, including in the developing world. For example, the IPCC found:

- In Latin America, food security is likely to be jeopardized by declining productivity of key crops and livestock.
- Agricultural production could be "severely compromised" in many parts of Africa
- More than a billion people in Asia could be adversely affected by decreased freshwater availability

In the two years since the Fourth IPCC Assessment report was released, worrisome evidence has accumulated that climate changes will be larger and faster than the IPCC suggested in 2007.

A second factor motivating developing countries to respond to the threat of climate change is the fact that they already are experiencing climate change and its impacts. According to the IPCC, widespread changes have been observed in average temperatures, precipitation amounts, wind patterns and in extreme events such as droughts, heavy rains, heat waves and the intense tropical storms. These conditions – and their consequences – tend to intensify concerns about climate change and to stimulate efforts to respond to it. As President Obama's science adviser, John Holdren, said in his confirmation hearing several weeks ago, "the major developing country emitters like China and India have recognized that climate change is already harming them and it can't be fixed without them."

In China, for example, the worst drought in a half century is being experienced in eight provinces since November 2008, prompting China to declare its highest level of emergency in early February. Drinking water for over 4 million people has been affected, along with more than 24 million acres of cropland. In June and July 2007, it was the opposite extreme with devastating floods and landslides affecting seven provinces. When warm temperatures came early to China this year – with Nanjing experiencing the highest temperature in a century for the date – the chief forecaster for the Chinese National Meteorological Center (NMC) said "Spring has come early in some areas of East and Central China this year, and it's because of global warming,"

As we begin to see the impacts of climate change in the U.S., including extended drought patterns and wildfire seasons, some have asked whether it might be better to just accept climate change and pay to respond to the coming damage. For all nations, the economic impacts from climate change will likely soon outstrip any ability to simply pay for the impacts after-the-fact. But for poorer developing countries thinking about climate change in this way is not an option. These countries suffer from greater vulnerability to the effects of climate change due to their heavy dependence on natural systems and agriculture for subsistence. Moreover, they have limited capacity to respond and adapt to climate change given their limited financial resources. For nations with populations living at a subsistence level, even modest amounts of climate

change are enough to risk crop failures, food shortages and loss of key water supplies. And for many developing countries, particularly small, island developing states, climate change poses a threat to their cultural survival. Wait-and-see is not an option.

Seeing The Opportunities

The impacts and the evidence of climate change do not tell the whole story of the turnaround by developing countries. Some of the answer comes from a basic recognition that reducing energy and reducing emissions is good for their economic prosperity. As we are beginning to understand in the United States, making short term investments in energy efficiency and modern technology results in reduced energy costs over the long term, more local jobs, and long-term economic growth. Countries just beginning to industrialize are looking to leapfrog our older, polluting approach in favor of newer, cleaner energy.

Moreover, the volatility of the price of foreign energy supplies such as oil and gas, have taught all countries the hard lessons of energy security. Dramatic swings in energy prices are especially problematic for poorer nations with fewer financial reserves. As a result home-grown energy supplies, starting with energy efficiency and including renewable power, offer a much firmer long-term foundation on which to build an emerging economy. At a time of greater economic uncertainty, wise investments in a sound economic future are more important than ever. (Of course, this is as true for the United States as any country. With Europe and the developing world beginning to lead on the new energy economy, the U.S. will continue to find itself at a competitive disadvantage.)

These concepts have become more greatly understood within the developing world; governments have instituted policies and the market place has responded. In some cases, emerging economies have learned these lessons better than we have. For example, a report issued last week by HSBC Global Research evaluated the economic stimulus plans implemented by various governments. Although in the United States the American Recovery and Reinvestment Act was rightly praised as including important investments in energy efficiency and renewable power, the U.S. stimulus act devoted only 12% of its funding for "investments consistent with a low carbon economy." Using the same criteria, China's stimulus plan was over three times more oriented towards promoting a low carbon economy (38%), while investing more money in these sectors in absolute terms.[1]

Developing Countries Are Taking Action

Whatever the motivations, the results are clear: In both the international negotiations and through action taken at home to reduce emissions, developing country governments have stepped down from the absolute demand that countries like the United States must act first to respond to climate change. They understand it is in their economic and national interest to stop waiting and

[1] A Climate for Recovery: The Color of Stimulus Goes Green, HSBC Global Research (25 Feb. 2009) at 2.

move ahead. They are putting concrete proposals for mitigation on the table in the international negotiations, taking a constructive approach to climate and energy issues in bilateral and multilateral venues, and taking unilateral action to reduce greenhouse gas emissions at home.

Political Leadership

Despite bearing relatively little responsibility for the current impacts of climate change, emerging economies have determined that it is in their self interest to be part of the solution. In advance of the UNFCCC negotiations last December in Poznan, several key emerging economies offered comprehensive proposals to reduce their emissions, which included specific targets and timetables. Together with other recently-announced plans, these proposals marked a sea change in the international debate, breaking the log-jam of the previous decade where developing countries had refused to propose action until the United States made commitments to reduce emissions.

These proposals in many cases went beyond what we have been able to achieve in the United States and clearly indicate the leadership and firm commitment of developing counties to shift to low carbon economies. For example:

- South Africa established a plan that would halt its projected increase in emissions and produce a "peak and decline", a critical step towards changing the trajectory of future emissions towards stabilization – a step we hope the United States will take during this Congress. For South Africa, a country highly dependent on energy from coal, their peak and decline date of 2015-2020 was particularly ambitious.
- Mexico established an economy-wide plan to cut its projected emission *in half* by 2050 to be implemented through a cap-and-trade program.
- Brazil committed to reduce annual deforestation by 70% by 2018. Deforestation is the largest source of emissions in Brazil, and when deforestation is included, Brazil is one of the world's top emitters – making this target a significant step towards meeting global emissions trajectories that reduce the greatest impacts of climate change.
- India has committed to an economy-wide 20% increase in energy efficiency by 2016, while continuing its renewable energy program, one of the largest in the world.
- China has committed to reduce energy intensity of its economy by 20% by 2010, as well as an aggressive target to produce 10% of its primary energy through renewable sources by 2010 and 15% by 2020.

Mitigation Efforts Underway

The seriousness with which these key nations have undertaken planning and targeting to reduce emissions is a significant step forward by itself. It has demonstrated recognition of the threat of climate change and an interest in transforming their economies towards a low carbon path, even where that would require new and significant changes.

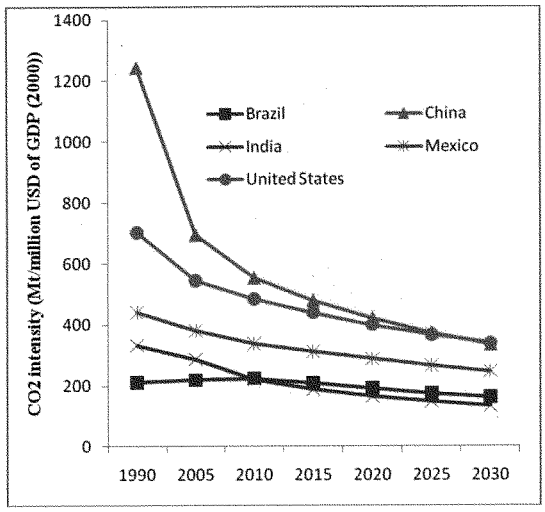
But actions by emerging economies have gone beyond aggressive planning to actual emissions reduction against business-as-usual pathways. By studying indicators of progress in the energy sector, it is clear that developing countries have made notable advances. In two areas, the emissions intensity of economies and the use of renewable power, developing countries progress is equivalent to or exceeding progress in the United States.

Reducing Emissions Intensity

The carbon emissions intensity of an economy is expressed by the level of emissions per unit of economic output. This is a composite indicator determined by the combination of energy intensity and the fuel mix in a particular country. Emissions intensity levels are not linked to the size of a country's economy or population; a large or wealthy country may have a low GHG intensity or vice-versa. So this metric has greater policy relevance than absolute emissions. In other words, emissions intensity allows us to compare a country like India with nearly 1.2 billion people with a country like the United States with nearly 75% fewer people.

Let's be clear: simply reducing the emissions intensity of our economies is not enough. We must reduce the absolute levels of global emissions by at least 80% below 1990 levels by 2050 in order to reduce the greatest risk of dangerous climate change. Comparing the current carbon emissions intensity of various economies, however, demonstrates a nation's trend towards de-carbonizing their economy (switching energy to lower carbon fuels, improving energy efficiencies, and/or restructuring economic activities). And so, this can be a useful way to compare how various nations are progressing towards a goal of absolute emissions reductions.

Figure 1: Carbon Emissions Intensity of Selected Economies



Source: Adapted from EIA Report#: DOE/EIA 0484-2008, Table 13.

Data from the International Energy Agency (IEA) show that China, India and Mexico have made good progress in de-carbonizing their economies (Figure 1), thus reducing emissions quite significantly for each unit of economic activity. In the United States, the de-carbonizing of the economy has been attributed greatly to the movement of higher-emitting sectors to the developing world. In the developing world, reducing the carbon intensity of the economy demonstrates, not the changing of industries, but the movement towards more modern, more efficient use of energy.

This movement is important and shows that policies being implemented by emerging economies are already working, resulting in real emissions reductions. For example, India has reduced the carbon intensity of its economy by over 35% since 1990. This reduction is related to India maintaining sustainable consumption patterns and enacting proactive policies to promote energy efficiency.

The reduction in the carbon intensity of the Chinese economy during this period has been even more dramatic (see figure 1). Since 1990, China has achieved remarkable energy efficiency. In 1990, the carbon intensity of the Chinese economy was about 1200Mt per unit of GDP; by 2005 that had been cut in half. Under its current 5 year plan, China has included a requirement to reduce the emissions intensity of its economy by an additional 20% below 2005 levels by 2010. If reached, this goal is estimated to reduce Chinese emissions by an additional 10% below

business as usual levels.[2] China is making substantial progress toward this goal, reducing emissions intensity in the past three years by: 1.6% in 2006, 3.7% in 2007 and 4.3% in 2008. Although on pace to fall a bit short of this target, the ambition level and progress toward success are important steps indeed.

These improvements demonstrate the greatest reduction in emissions intensity of any major economy during the period and put China on track to match the emissions intensity of the United States in the near term. Although the decline in emissions intensity for China is not as fast as needed to offset China's rapid growth in energy consumption, the trend indicates a high prospect for China's transition to low carbon economy in the middle of the century. It also demonstrates the seriousness and effectiveness of Chinese policies to reduce emissions.

Renewable Energy Standards

As President Obama stated in his address to the nation on February 25th, "We know the country that harnesses the power of clean, renewable energy will lead the 21st century." Many key emerging economies apparently got the message long ago. One strong indicator of a commitment to low carbon energy is adopting a renewable energy standard (RES) and associated policies.

There are several forms of RES, including requiring an increase in total power generation capacity from renewable sources, an increase in the share of renewable energy in the primary energy supply, an increase in the share of electricity generated from renewable sources and an increase in the share of total energy consumption produced from renewable sources. Different developing countries have chosen various RES mechanisms (with some, like China, implementing many of these approaches simultaneously). In whatever form, an RES indicates a country's seriousness in replacing high-carbon fuels with ones that produce zero emissions. A successful RES reflects real emissions reductions below a business-as-usual case.

During the past several years, as the United States has debated whether to adopt any form of a renewable energy standard, Brazil, India, China, Mexico and other developing countries have begun implementing them with success (see Table 1):

- China: China has established an RES requiring 10% of its primary energy to be produced from renewable sources by 2010 and 15% by 2020. By 2006, 8% of its primary energy came from renewable sources and China is expected to meet these targets.
- Mexico: Mexico proposed a RES of 8% of electricity from renewable sources (excluding large hydro) by 2012. The Ministry of Energy has announced that the country is on track to meet that standard, driven mainly by installing wind power projects in the State of Oaxaca, which has an estimated wind power potential of over 10,000 MW.

[2] Climate Change Mitigation Measures in the People's Republic of China, Pew Center on Global Climate Change (April 2007)

- Brazil: Reflecting the highest percentage of renewable energy in the world, 46% of Brazil's primary energy comes from renewable sources, while over 75% of its electricity is produced from renewables. Brazil's high renewable share is largely driven by large hydro-electric facilities. Recognizing the need to shift to solar, wind, geothermal and small hydro, Brazil has implemented a RES of 15% from these sources by 2020.
- India: India has the 4th largest amount of installed wind power generating capacity in the world. In 2009, renewable energy power accounted for 8% of total power generation capacity in India; the country should meet and exceed its 10% RES by 2012. This success is a result of strong incentives from the government for enhancing renewable energy production capacity and power generation and the development of a framework for trading renewable energy certificates.
- Philippines: Another key developing country, the Philippines has the largest renewable target in the world, with a goal of producing 50% of its electricity from renewable sources by 2020. Philippines is currently the world's second largest producer of geothermal power and overall currently produces 33% of its energy from renewable sources.

Table 1: Illustrative renewable energy targets implemented in developing countries[3]

Country	Renewable target	Progress
India	10% by 2012[1]	India is on track to meet or exceed its renewable energy target, having already achieved 8% in 2009[1].
Philippines	50% by 2020[1]	Philippines is on track to achieve its target, and currently has 33% renewable energy in its power generation mix.
Brazil	15% by 2020[2]	Brazil's share of primary energy from renewables is currently 46%, among the highest in the world, relying heavily on large-scale hydro-electrical generation. This RES is focused on expanding wind, small hydro, and solar production from current levels of less than 4%.
Mexico	8% by 2012[3]	Mexico's Ministry of Energy expects to reach the country's goals, driven largely by new wind power projects in the State

[3] Data primarily adapted from Renewables 2007: Global Status Report, REN21:Renewable Energy Policy Network for the 21st Century (2007).

		of Oaxaca
China	10% by 2010 and 15% by 2020[4]	By 2006 China had achieved 8% of its primary energy production from renewable energy, and is now scaling up wind and solar to meet these goals.
US	No National Renewable Target	A nationwide target is under discussion in both the House and the Senate. Current US percentage of electricity from renewables (not including large hydro-electric) is approximately 5% (2006).

1-Percent of total power generation in the country from renewable energy

2- Percent increase in the share of renewable energy in the primary energy supply

3- Percent of renewable electricity generation excluding large hydro

4- Percent of renewable energy in the primary energy supply

Brazil: An Example of Leadership

As discussed, many developing countries are showing leadership in both the climate negotiations and by beginning to reduce their own emissions at home. Because one of the other panelists will focus specifically on China, this testimony will highlight another of these countries: Brazil. Brazil is the world's fifth-most populous country and the world's tenth-largest economy in GDP terms. When viewed at a human scale, however, the Brazilian economy is not as strong: in GDP per capita (PPP), Brazil ranks 82nd in the world.

Although no country has a perfect record in responding to climate change, Brazil has become a leader in reducing the emissions intensity of its economy, in generating renewable power and, perhaps most importantly, in seriously addressing emissions related to deforestation. As previous sections of this testimony discussed the first two of these, this section will discuss the third.

Although often forgotten as a major source of greenhouse gas emissions, deforestation is actually the second largest source of emissions by sector, producing approximately 20% of global emissions – more than every car, truck, plane, train and boat on the planet. In the developing world, deforestation-related emissions constitute an even larger share of the total. For example, when deforestation-related emissions are included, Brazil ranks 7th in the world in absolute emissions, despite producing nearly 50% of its electricity from sources that do not emit GHGs. These high emissions are largely associated with deforestation, which accounts for about 75% of the country's emissions.

Reducing emissions from deforestation in a lasting way requires substantial upfront investment in building monitoring capacity, improving measuring and accounting systems, engaging in

extensive land tenure reforms to ensure that local landowners are properly compensated and increasing investment in law enforcement. These kinds of investments in a national program demonstrate a commitment to ensure that forest programs result in reduced GHG emissions. Absent this type of investment, project-level deforestation reduction activities may not provide reliable benefits to the climate.

The required investment is substantial, but the government of Brazil has committed to building this capacity to reduce deforestation-related emissions, including:

- Establishing 148 protected areas covering 620,000 km2 from 2003-2007. Many of these new protected areas are located in zones under high deforestation pressure.
- Developing and implementing one of the most sophisticated forest change tracking systems in the world, based on remote sensing methods and linked in to land management databases in state-level governments. This system is so widely regarded that it is being made available to other governments.
- Stepped-up enforcement against illegal logging, deforestation and other environmental crimes.
- Prohibiting financing for landholders without clear tenure or in breach of environmental laws.
- Accelerated land reform to establish clear tenure rights in areas subject to intensive social conflict.
- Developing a legal framework for forestry concessions in public forests.

These efforts have helped substantially reduce deforestation in the Brazilian Amazon by 56% in since 2004. This alone represents a decrease of 1.3 billion tons of CO2 emissions in relation to the previous 4-year period, or nearly 20% of the U.S.'s current annual emissions of CO2-e (7.0 billion tons in 2006). Building on these actual reductions, in December the Brazilian government announced a new target of reducing deforestation by 70% below 2006 levels by 2017. This would avoid 4.8 billion tons of CO2 emissions – equivalent to over two-thirds of current annual emissions in the United States.

Meeting this new, ambitious goal will not be easy and Brazil cannot do it alone. But its commitment to making the necessary early investments and continuing to press for even greater reductions shows Brazil to be a leader. And it further helps to replace the old conventional wisdom about developing countries with a new reality: these nations are taking action and looking to partner with the rest of the world to do even more.

Conclusion

For over a decade, the United States has failed to take serious action to address climate change because of the perception that major emerging economies were not acting to reduce their own emissions. This justification for inaction was always flawed, as it ignored the seriousness of the

problem, our historical responsibility, our commitments made under the UNFCCC and the power of American leadership. But flawed or not, today it is gone. Developing countries, in particular the major emerging economies, are taking action to reduce their emissions, even in the absence of U.S. leadership and action. We must quickly follow suit.

These actions are but the first important steps on a long journey. Due to increasing populations and the beginning of industrialization, emissions trends indicate that the majority of new emissions will be produced in the developing world in the coming decades. As they grapple with both climate change and desperate poverty, developing countries will need our help to fully make the transition towards low-carbon economies. Based on our historical responsibility for the climate crisis and our greater economic capacity, this help is justified.

As domestic cap-and-trade legislation is designed and debated within the Congress, it is important to keep this international context in mind. Climate change is a global problem and its impacts can only be slowed through a global response. In addition to helping middle- and low-income Americans transition to a clean energy future, some revenues from a cap-and-trade system are needed to provide predictable finance for emissions reductions and adaptation needs within the developing world. Only by helping developing countries continue to move toward low carbon pathways and reducing emissions from tropical deforestation, can we bring global emissions under control. Importantly, this is not a zero sum game. Improving the global market for clean energy technologies will help spur greater advancements throughout the industry, which will also help the transition to low-carbon pathway in the United States.

Their recent actions show that these emerging economies will be good partners in this global effort. They have demonstrated their serious commitment to addressing climate change and have sent a strong message to the world that they are ready for a new era of international cooperation. They have taken actions and developed plans to begin to decouple their economic growth from their greenhouse gas emissions, so that they can grow sustainably without disrupting the climate system.

The United States should follow their example and begin to assume responsible leadership both at home and abroad to address the climate crisis.

The CHAIRMAN. Thank you, Mr. Roberts, very much.

And our next witness is Ms. Barbara Finamore. She is a senior attorney at the Natural Resources Defense Council and is the founder and Director of NRDC's China Program. She is also co-founder and President of the China-U.S. Energy Efficiency Alliance. She has worked and lived in greater China for nearly 20 years and she has flown in from Beijing for this hearing, for which we are very grateful. Whenever you are ready, please begin.

STATEMENT OF BARBARA FINAMORE, CHINA PROGRAM DIRECTOR, NATURAL RESOURCES DEFENSE COUNCIL

Ms. FINAMORE. Thank you, Chairman Markey, Ranking Member Sensenbrenner, and distinguished members of the committee. It is my pleasure to be here today to discuss China's national greenhouse gas mitigation efforts and achievements and challenges.

I also have three major points. One is that China is currently pursuing an aggressive and ambitious greenhouse gas mitigation program, as indicated by its 11th 5-year plan, which runs from 2006 to 2010. That plan includes a goal of reducing its energy intensity, energy consumption per unit GDP, 20 percent from 2005 levels to 2010, which equals 4 percent reduction per year. It also sets a target of increasing the share of renewables in the energy mix by 10 percent by 2010 and 15 percent by 2020. If China succeeds in achieving this goal and reducing its energy intensity by 20 percent, it will avoid emitting approximately 1.5 billion tons of CO_2, which constitutes the largest single greenhouse gas mitigation program by any country. And I will detail what that progress is on that in a moment.

But I would also like to emphasize that China has reasons for the greenhouse gas mitigation programs that it has already achieved that provide a lot of room for reaching mutually beneficial common ground between the United States and China as they seek to achieve an international climate treaty. And these include, in particular, China's growing awareness of the severe impacts on its own country of climate change.

I think the turning point first came in 2006 when China issued a national climate change assessment program by 40 different ministries, a 400-page report which for the first time detailed the impacts that climate change would have on the areas where China is already most vulnerable. Its water supplies. It has only one-quarter of the average water resources per capita as the world average. They have already seen increasing droughts, increasing flooding in other regions. And just yesterday they announced their plan to build 59 new reservoirs to capture water resources in the west due to rapid melting of the glaciers. So the cost of adaptation is becoming increasingly apparent to China.

Also impacts on their agricultural productivity and also on the economic development which is located primarily along their very long coastline and how it would be impacted by sea level rise.

I would also mention energy security as a primary motivating factor for China in its greenhouse gas mitigation efforts. And also social stability. They are quite concerned about the high cost of its unsustainable energy path on the health of its people and on the environment. The World Bank, as you may have known, has esti-

mated that 750,000 people die each year from environmental air and water pollution in China. Also the economic downturn as it has affected China these days is going to lead to increased social instability if they don't create more green jobs.

So there is a real opportunity here for holding hands across the ocean and finding green technologies that will benefit the global economic recovery.

The third point is, despite all that China is doing, there is a tremendous amount more that needs to be done and that can be done, particularly through strengthening U.S. and China engagement on clean energy issues.

But just to highlight a few of the efforts that China is already making in its greenhouse gas mitigation program, one of their major motivation factors is the desire to restructure their economic system away from the heavy industry that is the cause of the largest percentage of their greenhouse gas emissions, and in fact it is approximately 77 percent of all their energy demand. They have instituted policies already to help move their economy away from high-polluting, highly inefficient steel, chemical, cement industries. Not only that but even though they are continuing to grow their thermal power capacity to the tune of two coal-fired power plants a week, it is important to note that that is accompanied by the shutting down of the smallest, most highly inefficient power plants. So that there is a net increase in the efficiency of their thermal powered generation, which is leading to a dramatic reduction in greenhouse gas emissions from that sector.

In the energy efficiency side, they are also closing backward production capacity, slowing the expansion of high-energy consuming industries through the elimination or reduction of export tax rebates for energy intensive products.

They have a renewed emphasis on energy efficiency, particularly in the industrial sector, focusing on the top 1,000 highest energy-consuming industries, and our evidence indicates that they are on track to meet or surpass their target savings for that particular top 1,000 factories, which would translate into a reduction in CO_2 emissions of 300 to 450 million tons of CO_2.

They are putting money into funding energy efficiency at the national and provincial level. In 2007 they allocated 3.4 billion U.S. dollars to promote energy efficiency and reduce emissions and 41.8 billion renminbi, or $6 billion in 2008 for the same purpose. They are beginning to implement provincial and municipal demand side management programs which use a portion of the revenue that utilities collect from their customers to reduce peak load and overall energy demand through large-scale investments in energy efficiency. And a World Bank study concludes that with the proper policies and incentives, these programs could avoid the need to build more than 100 gigawatts of electric capacity by 2020.

The CHAIRMAN. Could you summarize, please?

Ms. FINAMORE. Yes. Although they have made significant progress, much more can be done. China's energy intensity is currently four times that of the United States and nine times that of Japan. In order to make further progress in meeting their ambitious goals there is a need for increasing technical capacity in energy auditing and energy efficiency retrofit design, monitoring and

enforcing standards in industry power plants and buildings. These are all areas in which the United States and China can profitably cooperate.

So in sum, China is working aggressively to improve its energy efficiency, reduce the carbon intensity of its energy mix. A recent study by McKenzie Global Institute indicates that if China pursued energy efficiency to the full extent possible and cut coal to 34 percent of its power supply, it could cut its projected greenhouse emissions by 2030 nearly in half.

[The prepared statement of Ms. Finamore follows:]

Testimony of Barbara A. Finamore
Senior Attorney and China Program Director, Natural Resources Defense Council
President, China-U.S. Energy Efficiency Alliance

Before the

Select Committee on Energy Independence and Global Warming
United States House of Representatives

Hearing on "Preparing for Copenhagen:
How Developing Countries are Fighting Climate Change"
March 4, 2009

Chairman Markey, Ranking Member Sensenbrenner, and distinguished Members of the Committee, it is my pleasure to be here with you today to discuss China's national greenhouse gas mitigation efforts and achievements. I applaud the committee for calling a hearing on the vitally important topic of how developing countries, including China, are already taking action to fight climate change.

Beginning with its Eleventh Five-Year Plan, which covers 2006 to 2010, China has recognized that it must reduce its rapid growth in energy demand and greenhouse gas emissions and accordingly has embarked on what President Obama in his speech to Congress last week called "the largest effort in history to make their economy energy efficient." It is important that the United States understand what measures China is taking to reduce its greenhouse gas emissions as well as how the United States can strengthen its engagement with China on climate change, because China and the United States together are the two countries that can have the greatest impact on mitigating climate change.[1] The Chinese viewed Secretary of State Clinton's recent visit to Beijing and her message of cooperation extremely favorably and are eager to find areas for mutual cooperation.

[1] For the Committee's benefit, I have attached to this written testimony a set of recommendations by the Natural Resources Defense Council on "Strengthening US-China Climate Change and Energy Engagement."

I am a Senior Attorney and Director of the China Program for the Natural Resources Defense Council (NRDC), and have worked on China energy and environmental issues for nearly twenty years. NRDC is a nonprofit environmental organization with a staff of nearly 400 lawyers, scientists and policy experts, including a staff of 25 working full time in Beijing on energy, climate, and environmental governance issues. Over the last twelve years, recognizing the importance of China to the global environment, we have been working with the Chinese government to help reduce China's CO_2 emissions by developing national energy codes and standards for buildings and equipment, promoting demand side management (DSM) energy efficiency programs and advanced energy technologies, and focusing on ways to improve environmental enforcement and governance. I am also the President of the China-U.S. Energy Efficiency Alliance, a non-profit organization that promotes technical exchanges between U.S. and Chinese government officials, utilities and energy experts to help China design and implement large-scale DSM energy efficiency programs targeted at China's industrial sector.

The Origins of China's Present Greenhouse Gas Mitigation Efforts

China is currently pursuing an aggressive and ambitious greenhouse gas mitigation program—a result of its recognition that its present development model is unsustainable and that climate change is likely to have serious impacts on its agricultural productivity and water resources (causing droughts in the north and flooding in the south and on its coasts), increase the incidence of extreme weather events, and lead to deterioration of its forests and other natural ecosystems. China is also keenly aware of the intimate connection between its enormous growth in energy demand and its energy security, and the serious public health and environmental damage caused by emissions of pollutants such as SO_2, NOx, particulate matter and mercury from its coal-dominated energy system.

China's greenhouse gas mitigation efforts are reflected in its National Assessment Report on Climate Change (December 2006), National Climate Change Action Plan (June 2007), and a Climate Change White Paper (October 2008), but have their roots in China's response to the tremendous and unexpected surge in energy growth that occurred beginning in 2002. From 1980 to 2000, China's GDP quadrupled, but energy demand

only doubled from 603 to 1,386 mtce ("million tons of coal equivalent") as a result of Chinese policymakers' emphasis on energy efficiency. In other words, energy grew at half the rate of GDP growth. Between 2000 and 2005, however, China's primary energy consumption skyrocketed from 1,386 to 2,225 mtce, an annual rate 1.5 times faster than the growth in GDP.[2] This sudden increase in energy demand and hence greenhouse gas emissions was not predicted by either international or domestic energy experts, and led China to rapidly increase its thermal power plant capacity to meet its energy needs. In 2006, for example, China added 90 GW ("gigawatt")[3] of coal-fired power capacity—this addition alone is enough to emit over 500 million tons of CO_2 per year for 40 years.[4] To put this in comparison, the entire European Union's Kyoto reduction commitment is 300 million tons of CO_2.[5] The rapid growth in energy demand occurred primarily because of an increasing dominance of heavy industry in China's economic structure—i.e., cement, iron and steel, and chemicals—which overshadowed improvements in energy efficiency.[6] It is this rapid growth in energy demand that resulted in China overtaking the United States as the largest greenhouse gas emitter some time in 2006 or 2007.[7]

Recognizing the need to rein in energy growth, China's leaders set out in the Eleventh Five Year Plan a goal of reducing energy intensity (energy consumption per unit of GDP) 20 percent from 2005 levels by 2010, *i.e.*, a 4 percent reduction per year. They also set a target of increasing the share of renewables in the energy mix to 10 percent by 2010 and 15 percent by 2020. If China succeeds in reducing its energy intensity by 20 percent by 2010, it will avoid emitting approximately 1.5 billion tons of CO_2,[8] constituting the largest single greenhouse gas mitigation program by any country. I will first address

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[2] World Bank, *Sustainable Energy in China* (2006), pp. 11.
[3] One gigawatt is equivalent to 1 billion watts.
[4] Statement of Stephen Chu, Director, Lawrence Berkeley National Laboratory, before the U.S. Senate Committee on Finance, March 27, 2007.
[5] *Id.*
[6] Trevor Houser, Testimony before the U.S.-China Economic and Security Review Commission, June 14, 2007.
[7] Netherlands Environmental Assessment Agency, "China now no. 1 in CO2 emissions; USA in second position," June 19, 2007, available at www.pbl.nl.
[8] Jiang Lin, Nan Zhou, Mark Levine, and David Fridley, "Taking out 1 billion tons of CO2: The magic of China's 11th Five-Year Plan?", Energy Policy 36 (2008): 954-970.

China's efforts to reduce energy demand, then discuss their efforts to reduce the carbon intensity of their energy supply.

China's Efforts to Improve Energy Efficiency and Reduce Energy Demand

China appears to be making some progress in reaching its energy intensity goals. After reducing energy intensity by only 1.23 percent in 2006, it reduced energy intensity by 3.66 percent in 2007 and 4.59 percent in 2008. It accomplished this primarily through economic restructuring and a renewed emphasis on energy efficiency, although the global economic downturn also played a role starting in the last quarter of 2008. Major initiatives include:

- Replacing smaller, less efficient power plants and closing backwards production capacity,[9] slowing the expansion of high energy-consuming industries through the elimination or reduction of export tax rebates for energy intensive products, and using differential pricing of electricity and a "Green Credit" policy to encourage more efficient enterprises and limit or shut down less efficient enterprises.[10] China is also encouraging growth in the service and high-tech industries.
- A renewed emphasis on energy efficiency, particularly in the industrial sector, which accounted for 77 percent of delivered energy use in China in 2005.[11] One particular project of note is the "Top 1000" program, started in April 2006 to improve the energy efficiency of the top 1,000 energy consuming enterprises in nine sectors,[12] with a goal of saving 100 mtce by 2010. These 1,000 enterprises alone constituted 33 percent of national energy consumption and 47 percent of industrial energy consumption in 2004, and represented approximately 43 percent of China's CO_2 emissions in 2006.[13] Although data is limited, a preliminary

[9] In 2007, for example, China closed 14.38 GW of small thermal power plants, 46.59 million tons of iron smelting capacity, 37.47 million tons of steelmaking capacity and 52 million tons of cement production capacity.
[10] Lynn Price, Xuejun Wang and Jiang Yun, *China's Top-1000 Energy-Consuming Enterprises Program: Reducing Energy Consumption of the 1000 Largest Industrial Enterprises in China*, LBNL-519E, pp. 9.
[11] EIA, *International Energy Outlook 2008*, available at http://www.eia.doe.gov/oiaf/ieo/world.html.
[12] The nine sectors are iron and steel, non-ferrous metal, chemicals, petroleum/petrochemicals, construction material, textiles, paper, coal mining and power generation.
[13] L. Price et al., *China's Top-1000 Energy-Consuming Enterprises Program*, pp. 18.

assessment concluded that the Top 1000 program is on track to meet or surpass its target of saving 100 mtce per year, which would translate into a reduction in CO_2 emissions of 300 to 450 million tons, and could constitute 10 to 25 percent of the savings necessary to meet China's 20 percent energy intensity reduction target.[14]

- Funding energy efficiency at the national and provincial level. The central government allocated 23.5 billion RMB ($3.4 billion) in 2007 and 41.8 billion RMB ($6 billion) in 2008 to promote energy efficiency and reduce emissions.[15] A portion of this funding is used to reward enterprises that can demonstrate aggregate savings of 10,000 tons of coal equivalent per year from energy conservation projects by providing 200-250 RMB ($29-36) for every ton of coal saved.[16] Provincial-level energy efficiency funds also exist; for example, Shandong province has initiated a 2.13 billion RMB ($304 million) fund for local enterprises.[17]
- Beginning to implement provincial and municipal demand side management programs, based on experience in states such as California, in which utilities or another regulated party uses technical assistance, funding (such as a system benefits charge fund) and information programs to reduce peak load and overall energy demand through large-scale investments in energy efficiency. The NRDC and China-U.S. Energy Efficiency Alliance have established a pilot program that has avoided the need to build 300 MW of electric capacity in Jiangsu province, eliminating 1.84 $mtCO_2e$.[18] A World Bank study concluded that with the proper policies and incentives, DSM programs could reduce electricity needs by 220 terawatt hours[19] and avoid the need to build more than 100 GW of electric capacity by 2020.[20] Tapping even half of this potential would reduce coal

[14] *Id.*, pp. 27.
[15] *Id.*, pp. 8.
[16] *Id.*
[17] *Id.*
[18] Million tons of CO_2 equivalent.
[19] A terawatt is equivalent to 1 trillion watts.
[20] Zhaoguang Hu, David Moskowitz, and Jianping Zhao, *Demand Side Management in China's Restructured Power's Industry* (December 2005), World Bank Energy Sector Management Assistance Program.

consumption by about 37 mtce in 2020, avoiding 93 million tons of CO_2 emissions.

- Continuing to develop and implement building energy codes, appliance and equipment energy efficiency standards and labeling programs, and stricter vehicle fuel efficiency standards. China is building 2 billion square meters of floor space each year, half of the world's total. As more and more Chinese move into cities and begin to use modern conveniences and personal automobiles, maintaining efficiency standards will be crucial to slowing greenhouse gas emissions. Between 2000 and 2020, improved efficiency in electric appliances and gas water heaters is projected to reduce carbon emissions by more than 1.1 billion tons of CO_2.[21] However, monitoring and enforcement of these standards will be crucial to ensuring that the potential GHG reductions from these programs are indeed achieved.
- Launching a rebate program last April to subsidize the purchase of energy efficient light bulbs, offering a 30 percent subsidy on wholesale purchases and a 50 percent subsidy on retail sales. Some local governments offered additional subsidies of up to 40 percent. Lighting now accounts for about 12 percent of China's total electricity consumption, and using energy-saving bulbs could cut such power consumption by 60 to 80 percent. By the end of January 2009, 62 million energy-saving light bulbs had been sold under the subsidy program, which will help save 3.2 billion kWh of electricity annually and eliminate 3.2 million tons of CO_2 emissions. China announced last week that it will double the size of the program in 2009, subsidizing 100 million energy-efficient light bulbs this year. China is also beginning to work on a program to phase out the more than 1 billion ordinary bulbs that the country consumes every year.
- Raising fuel economy standards from 36 to 43 mpg this year and instituting graduated sales taxes favoring smaller cars, in order to slow growth in oil consumption fueled by the rapid expansion in personal vehicles.[22] China has also begun to bring its oil prices more in line with international markets, which would

[21] Mark D. Levine and Nathaniel T. Aden, *Global Carbon Emissions in the Coming Decades: The Case of China* (2008), Annual Review of Environment and Resources, pp. 32.
[22] 9.4 million cars were sold in China in 2008.

reduce demand over the long term. In early 2009, Beijing prohibited the driving of all heavily polluting yellow-label vehicles (which account for 10 percent of the total number of motor vehicles but 50 percent of emissions) within the city limits, and provided cash rebates to help ease the transition. The Chinese government also announced two weeks ago that it will offer cash rebates ranging from 50,000 RMB ($7,353) for small hybrid passenger cars to 600,000 RMB ($87,719) for large, fuel cell powered commercial buses in 13 major cities, including Beijing and Shanghai. China plans to put 60,000 new-energy vehicles for trial runs in 11 cities by 2012 for public transportation and public services. And the Ministry of Railways just signed a purchase agreement valued at 27 billion RMB ($3.95 billion) to purchase 500 clean and energy-efficient locomotives to replace diesel-powered engines on various lines. Replacing one diesel locomotive with an electric locomotive is equivalent to eliminating emissions from 4,000 vehicles.

- Finally, the government is raising public awareness of the need to "save energy and reduce emissions" *(jie neng jian pai)*, has amended the energy conservation law, and is using improvements in energy efficiency as one measure by which government officials' performance is evaluated. A recent nationwide public opinion survey found that three out of every four Chinese citizens, or 76 percent, believe that environmental problems in China are "very serious" or "relatively serious."

Although China has made significant progress in improving its energy efficiency, much more can be done. China's energy intensity is currently four times that of the US and nine times that of Japan. According to McKinsey Global Institute estimates, if China were to pursue all cost-effective energy efficiency options, it could reduce energy use by approximately 1,050 mtce in 2020.[23] By doing so, it could cut its projected energy demand by about 23 percent and its CO_2 emissions by at least 20 percent from a business as usual scenario.[24] Many of these investments in energy efficiency are cost-effective, and the International Energy Agency estimates that on average every additional $1 spent

[23] Based on estimates by the McKinsey Global Institute in *Curbing Global Energy Demand Growth: The Energy Productivity Opportunity* (2007), pp. 34.
[24] McKinsey Global Institute, *Leapfrogging to Higher Energy Productivity in China* (2007).

on more efficient electrical equipment, appliances and buildings avoids more than $2 in investment in electricity supply.[25] It is estimated that China will require investments of 150-200 million RMB ($21-29 billion) per year to reduce the growth rate of energy demand to half the growth rate of the economy over the next 15-20 years.[26]

Further progress in reducing energy demand will depend on reforming incentives in the electric industry, so that grid companies and utilities are rewarded for improving energy efficiency (i.e., decoupling), and engaging with commercial banks and the small but growing Energy Service Company market to ensure that energy efficiency investments can be a sizable and sustainable market. There is also a need to increase technical capacity in energy auditing and energy efficiency retrofit design and implementation. Implementation of all of these efforts will require a sustained effort to monitor and enforce energy efficiency standards in industry, power plants, buildings, appliances, equipment and automobiles.

China's Efforts to Reduce the Carbon Intensity of its Energy Supply

China has also sought to reduce the carbon intensity of its energy supply by closing down smaller, inefficient thermal power plants and increasing the share of less carbon-intensive sources of energy, notably hydropower, wind and nuclear:

- At the end of 2008, China had a total installed electric power capacity of 792 GW, constituting 76 percent thermal power capacity, 22 percent hydropower, 1.6 percent wind, and 1.1 percent nuclear. In 2008, it expanded its total thermal power capacity by 66 GW, or about two new 600 MW power plants per week. This is consistent with the pace of expansion in recent years, which saw thermal power additions jump from an increase of 15 GW in 2004 to 86 GW in 2005, 93 GW in 2006 and 70 GW in 2007. China also expanded hydropower by 20 GW and windpower by 6.4 GW in 2008. In terms of actual electricity generated, China generated a total 3,443 TWh in 2008, comprised of 2,779 TWh of thermal

[25] International Energy Agency, *World Energy Outlook 2006.*
[26] L. Price et al., *China's Top-1000 Energy-Consuming Enterprises Program*, pp. 8.

(80.1%), 563 TWh of hydro (16.4%), 68.4 TWh of nuclear (2%) and 12.8 TWh of wind (0.4%).

- China's thermal power expansion, however, is occurring through replacement of smaller, less efficient power plants with larger, more efficient plants. China shut down 34 GW of small, inefficient plants from 2006-08, and plans to close another 31 GW of inefficient plants during the next three years. This has improved average efficiency from about 370 grams of coal per kWh in 2005 to 349 grams of coal per kWh in 2008. China is also pursuing cleaner thermal power generation technologies such as combined heat and power, integrated gasification combined cycle (IGCC) and carbon capture and storage (CCS). GreenGen, a joint venture established by Chinese utilities, is building China's first IGCC power plant in Tianjin, which is slated to come online with 250 MW capacity in 2010 and expand to 650 MW with CCS by 2020. The Chinese utility Huaneng Group started a pilot CCS project in Beijing last summer.
- China passed a Renewable Energy Law in 2005 and a Medium and Long-Term Development Plan for Renewable Energy in 2007 to encourage the growth of renewables. The renewable energy plan calls for the share of renewable energy in primary energy to reach 10 percent by 2010 and 15 percent by 2020. To help meet these targets, China has regulations that encourage the construction of renewable energy facilities and offer financial incentives and reduced taxes for renewable energy projects, including loan discounts and a feed-in program.
- Wind capacity doubled in 2008 from 5.9 GW to 12.3 GW, thus passing China's goal of 10 GW wind capacity by 2010. China plans to continue its rapid expansion of windpower and to improve the quality of its domestically manufactured wind turbines and connection with the grid. China's installed solar capacity is small but growing; it is planning to build a 10 MW solar PV power plant in Dunhuang, which would be the largest in the country. China is the world's largest manufacturer of solar PV panels, although almost all of this is exported. China also produces 80 percent of the world's solar water heaters, which make up 20 percent of its water heating units.

- China presently has 11 nuclear reactors with 9 GW of capacity, accounting for over 1 percent of its energy mix. It is likely to raise its target from 4 percent to 5 percent of energy production by 2020, or about 60 to 70 GW total capacity.

Finally, let me mention a few mitigation measures that do not fall neatly into the categories of energy efficiency or energy supply. China has afforestation efforts and forest management efforts aimed at raising forest coverage to 20 percent by 2010. It is exploring the idea of eco-cities and smart growth and increasing the use of mass transit. It has joined the Methane to Markets Partnership to better utilize coal bed methane. In addition, China's 4 trillion RMB ($585 billion) economic stimulus package includes 600 billion RMB ($88 billion) for building intercity rail lines, 476 billion ($70 billion) for new electricity grid infrastructure and 350 billion RMB ($50 billion) for energy efficiency and environmental protection projects.

In sum, China is working aggressively to improve its energy efficiency and to reduce the carbon intensity of its energy mix. The speed with which its economy is growing means that it faces a challenging task, but a sustained and sizeable effort to reduce its energy demand and the carbon intensity of its energy supply could result in a substantial reduction in the growth of its greenhouse gas emissions. According to a recently issued McKinsey study, if China pursued energy efficiency to the full extent possible and cut coal to 34 percent of its power supply, it could nearly cut in half its projected greenhouse gas emissions in 2030.[27]

China is taking enormous steps to reduce its impact on climate change and it is likely to continue and possibly intensify these efforts in the future. It has devoted significant economic and political resources to achieving the targets it has set for itself and demonstrated a willingness to pursue results. The United States can take China's mitigation actions to date as a strong signal that it intends to take concrete and meaningful steps to address climate change in the future.

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[27] McKinsey & Company, *China's Green Revolution: Prioritizing Technologies to Achieve Energy and Environmental Sustainability* (2009).

I thank the committee for inviting me to participate in this hearing and look forward to answering any questions you may have.

The CHAIRMAN. Thank you, Ms. Finamore, very much.

Our next witness is Mr. Lee Lane. Mr. Lane is a Resident Fellow at the American Enterprise Institute and is Co-Director of AEI's Project on Climate Engineering. Mr. Lane was previously a consultant to Charles River Associates International where he produced analyses of climate and energy issues. He also helped found the Climate Policy Center.

We welcome you, Mr. Lane. Whenever you are ready, please begin.

STATEMENT OF LEE LANE, RESIDENT FELLOW, AMERICAN ENTERPRISE INSTITUTE

Mr. LANE. Thank you, Mr. Chairman, and Mr. Sensenbrenner and other members of the committee, I am delighted to have the opportunity to appear before you today and discuss these issues which I think are extremely important in the overall evolution of climate policy.

My name is Lee Lane, and I am a Resident Fellow, as the chairman just said, at AEI. AEI is an organization that conducts policy analysis and research and education on a broad range of public policy issues. AEI does not take organizational positions on these issues, and the views that I am going to express here this morning are entirely my own, not necessarily those of the institute.

Rising amounts of greenhouse gases in the atmosphere pose, I believe, several worrisome challenges. At the same time, many difficulties seem to rule out quick or easy solutions to the problems that are being posed to us. My statement suggests some ways in which the U.S. might nonetheless make progress. It makes three main points. I noticed that all three speakers who have spoken so far have three main points. So especially on that ground, we have grounds for agreement.

The first point is that I think we need to acknowledge that whereas there seems to be an agreement, a global consensus even, on the need to reduce greenhouse gas emissions, that seeming agreement masks what I think is a distinct lack of consensus about who should pay to make these reductions in greenhouse gases. China, India, Russia and many other countries that have expressed agreement in principle that emissions should be reduced have not been especially forthcoming in incurring costs to actually achieve those emissions reductions.

Now, I certainly hear and I have read the statements of my colleagues on the panel here, and I know that there have been a number of actions taken in China and elsewhere. But fundamentally those steps appear to me to be what we in this country used to call "no regrets" policies. Well, that is fine. We should welcome whatever emissions reductions occur as a result of those policies. But I don't think we should take those actions as suggesting that the world is any place close to being willing to bear the costs that would be required to really reduce greenhouse gas emissions to the level that would be required to halt climate change and actually stabilize concentrations of greenhouse gases in the atmosphere. We are very, very far from even discussing changes of that scale.

My second point is I believe that it is true that the U.S. cannot create global consensus where none exists. Attempts to lead by ex-

ample or to use trade sanctions to change China's behavior are likely to be both costly and ineffective. For developed countries to pay China's abatement cost is not an appealing option either. A recent MIT study, the one that Mr. Sensenbrenner referred to, estimated that carrying this principle to its logical conclusion would for the U.S. alone entail annual income transfers to the developing world of $200 billion by 2020 and nearly $1 trillion by 2050. Each dollar spent in this way is, in effect, a dollar added to the U.S. trade deficit. This would heap a huge additional burden on a U.S. economy that, during this same period, will already be struggling to make many other daunting structural adjustments.

Third, and my final point, is that the U.S. climate policy should candidly consider the likelihood that the needed global consensus on paying for abatement will be long in coming. If so, the world will probably fail to reach today's ambitious targets for stabilizing climate. Rather than striving to do the impossible, U.S. policy should focus on coping with the unavoidable. Adopting a modest, stable and gradually rising price on carbon emissions I believe is one step that we should take.

An attached statement at the back of my statement discusses a number of other options that I think are important, especially focused on technological change, and I think several of these are in fact even more important than putting a price on carbon emissions. But I think a price on carbon emissions of the right kind would be an appropriate step, too.

Finally, I guess I need to conclude with a note of caution. The U.S., like most other nations, has a real stake in curbing global greenhouse gas emissions. But if our good intentions lead us to incur costs that exceed the benefits to the United States, I fear those policies may not prove to be durable. And as many people have noted, climate policy is a marathon, not a sprint, and it is really important to muster a sustained effort.

And I thank you very much, and I ask my statement be included in the record.

[The prepared statement of Mr. Lane follows:]

STATEMENT TO THE SELECT COMMITTEE ON ENERGY INDEPENDENCE AND GLOBAL WARMING

HEARING ON MARCH 4, 2009

By

Lee Lane

Mr. Chairman, Mr. Sensenbrenner, other members of the Committee, thank you for the opportunity to appear before you today. I am Lee Lane, a Resident Fellow at the American Enterprise Institute. AEI is a non-partisan, non-profit organization conducting research and education on public policy issues. AEI does not adopt organizational positions on the issues that it studies, and the views that I express here are mine, not those of AEI.

Rising amounts of greenhouse gases (GHGs) in the atmosphere pose worrisome challenges. While many uncertainties persist, I believe that the potential risks from climate change could be large. At the same time, a thicket of intractable problems blocks quick or easy solutions. Progress on climate policy will require us to wrestle with these problems over many, many decades. My statement suggests some ways in which the US might make progress on this task. It makes three main points.

First, we need to acknowledge that a seeming global consensus on the need to halt the rise in GHG levels masks a distinct lack of consensus on willingness to pay the required costs. Thus, many nations, China, India, and Russia prominent among them, reject all demands that they shoulder this burden. That China is willing to announce some no-regrets climate policies is a good thing. It will be better still if it implements them – something that is far from certain.[1] But a grab bag of marginal policy innovations is not something that will alter the basic realities of the problem.

Second, the dismaying truth is that the US cannot create global consensus where none exists. Efforts to lead by the example of stringent GHG reductions will be self-defeating. They would, in effect, make winning future concessions from China and India even more difficult. Conversely, current proposals to use trade sanctions to bludgeon other nations into adopting controls are too weak to compel such costly action.[2] And such proposals pose significant risks to the global trade regime.

Despite Chinese and Indian demands, having developed countries simply pay the costs of developing country GHG controls is not a viable option. A recent MIT study estimated that carrying this principle to its logical conclusion would, for the US alone, entail *annual* income transfers of $200 billion by 2020 and of nearly $1 trillion by 2050.[3] This would heap a huge additional burden on a US economy that, during this same period, will already be struggling to make many other daunting structural adjustments.

Third, the US government's climate policy should explicitly recognize the substantial likelihood that the needed global consensus on GHG curbs will be long in coming. The world is very likely to miss today's ambitious targets for GHG stabilization. Rather than striving to do the impossible, US policy should place great stress on fostering relevant new technologies. One way of doing so would be place a modest, stable, and gradually rising price on GHG emissions. I include a statement from a recent conference at Stanford University that describes other essential steps toward achieving this goal.

The statement notes the need to expand R&D directed at adjusting to the climate change that is unavoidable. And it notes explicitly that part of that effort should be directed to

exploring so-called geoengineering technologies. Adaptation, by whatever means, needs more attention.

Finally, I would like to conclude with a note of caution. The US, like most other nations, has an important stake in curbing global GHG emissions. But if our good intentions lead us to incur costs that exceed the benefits *to America*, those policies may not prove to be durable. A zigzag course on climate policy is likely to serve neither this nation nor the world.

The missing consensus on willingness to pay for GHG control

Given twenty years of failure to achieve meaningful progress on global GHG controls, one should ask, what structural changes are required to produce a different outcome, and have those changes, in fact, occurred?

A record of futility

The year 2008 was the 20th anniversary of the first meeting of the International Panel on Climate Change (IPCC). The IPCC's goal is to solve the problem of warming. So far, it has failed. According to the US Energy Information Agency, global emissions of CO_2, the most important industrial greenhouse gas, currently exceed the 1988 level by over a third. The IPCC reports that through the last several decades the rise in atmospheric concentrations of CO_2 has sped up.

Many Europeans blame the United States for this failure. They are especially harsh in criticizing the Bush Administration's rejection of the Kyoto Protocol. Even among observers who regarded Kyoto as a bad deal for the United States, the brusque manner in which President Bush rejected the Protocol seems in retrospect to have been unwise.[4]

The fact remains, though, that for America, Kyoto's high abatement costs and imposition of large income transfers from the US to other countries would almost certainly have made the Protocol a net loss. A multi-model assessment found that, in 2010, Kyoto would have cost the US between 0.24 percent and 1.03 percent of GDP.[5] Yet Kyoto would have had virtually no impact on global climate.[6] So whatever cost Kyoto imposed would have brought almost no benefit. On balance, it is less surprising that the US ultimately rejected Kyoto than it is that a US president had signed it in the first place.

Moreover, even in Europe, emissions continue to climb.[7] Where greenhouse gas emissions have fallen, changes in economic structure may have played a bigger role than has climate policy. In light of the record, faith in Europe's oft-repeated promises of swift GHG reductions would seem to demand a certain degree of credulity.

This experience raises a question that is pertinent to this new phase of climate policy. Have the conditions that doomed Kyoto to failure actually changed?

The necessity of curbing GHG growth from China and India

GHG control policies can only succeed if they are based on coordinated multi-national action. A metric tonne of CO_2 has the same effect on warming wherever it originates, and fifteen to twenty nations around the world are major sources of GHG discharges. Economic growth will steadily raise the number of major sources. It is only a slight exaggeration to say that each of these states possesses an effective veto over global GHG control efforts.

Certainly, both China and India have such veto power. It is physically impossible to halt the rise of GHG levels if Chinese and Indian GHG emission growth is not reined in. With unchecked GHG growth from China and India, holding atmospheric GHG levels below 550 ppm would require the industrialized countries to somehow begin to capture more CO_2 than they emitted – and they would have to do so within thirty-five years![8]

China and India have so far flatly refused to incur significant costs in the cause of GHG reduction. To the contrary, their efforts at GHG control have been confined to what are, in effect, "no-regrets" policies. Both countries reject all firm commitments to GHG reduction targets. Rather, they have both demanded that the developed world commit to paying them for any emission reductions that they might undertake.[9] To some degree, the Bali Action Plan has endorsed this principle.[10] Thus, the current stance of the Chinese and Indian governments would seem to pose a rather stark challenge to the credibility of the entire enterprise of global GHG curbs.

The limited net benefits of GHG controls

Part of the difficulty of forging an international GHG control accord can be traced to the high costs of curbing GHG emissions. If GHG cuts are deep and rapid, their costs are likely to exceed their benefits.[11] Studies have repeatedly confirmed that judgment.[12] To yield the greatest possible net benefits, GHG cuts should, therefore, start modestly and increase gradually over time. However, controls structured in this way avoid only part of the expected climate change.

In this regard, GHG controls contrast sharply with the control of ozone-depleting chemicals. With the latter, optimal controls yielded quite large net benefits. The much smaller net gain available from GHG control restricts the range of options for deal making.[13]

The international politics of GHG controls

No third party exists to enforce participation in GHG limitation agreements, to compel performance of agreed actions, or to set standards. International politics is a self-help world; there is no 911 to call.[14] One result is that, in dealing with global problems, nations often have an incentive to free ride on the efforts of others.

In the case of GHG controls, the fact that nations differ so much in the degree to which they have an economic interest in curtailing warming vastly complicates the quest for international cooperation. These differences give rise to two further problems.

First, because nations differ in their level of concern about warming, they also differ in their willingness to incur the costs of restraining GHG discharges. An oil exporting country with a cold climate such as Russia has a lot less to gain from effective GHG controls than would the Maldives or the Sub-Saharan nations. The latter countries are more vulnerable to climate change. While there are quite a few high-GHG emitting countries that are poor and middle income,[15] most poor countries are not major emitters.[16] The latter countries may be threatened by climate change, but, on their own, they can do virtually nothing about it.

Second, in practice, even high-GHG poor countries lack the economic resources either to pay for GHG abatement elsewhere or to compel richer countries to adopt controls. Also, many poorer nations prefer to protect themselves from warming through economic development rather than by seeking to restrict GHG discharges. For middle income countries like China and India, industrialization can boost the ability to adapt to climate change. Of course, it can relieve many more acute problems as well. For these countries, slowing growth in order to control GHG discharges may simply be a bad investment.[17]

Limits on US influence on global GHG control arrangements

For as long as these considerations apply, neither the United States, nor any other country or power bloc, will be able to install an effective global GHG control regime. Many inventive GHG control boosters have propounded schemes for breaking this political impasse. Their efforts have failed. New ones are likely to meet the same fate until the causes of the impasse are removed, and removing those causes is likely to take time.

Unilateral action as a poor means of building international consensus

Congress is considering bills which, if enacted, would subject the US economy to strict GHG controls. Strict US controls, their advocates claim, would cause other nations, China and India among them, to adopt similar measures. Neither the historical record nor a fair reading of these countries' economic self-interest supports these claims.

As to the record, the Chinese government now claims that it will take some steps that will have the effect of lowering GHG discharges. The measures by which it proposes to make these reductions are classic no-regrets policies. Based on its statements at Bali, it has also offered to make further GHG reductions, but it appears to be willing to do so only if other nations pay much of the cost and transfer to China a great deal of advanced technology. India, at Bali, demanded that developed countries pay it for mitigation (and adaptation) as a matter of right. India also wishes to deny developed countries the ability to attach conditions to this aid.[18] This record strongly indicates that China and India place much greater stress on avoiding the costs of GHG abatement (and on gaining access at below cost to foreign technology) than they do on achieving the benefits of lowering emissions.

Economic self-interest, moreover, provides China and India with strong motives for resisting GHG limits. For example, as suggested above, from the standpoint of these countries, rapid economic development may well be a better response to climate change than GHG controls would be. Then too, neither China nor India may feel that its government enjoys enough popular support to be able to afford the political costs of GHG controls. To drive domestic energy prices above world market levels would be a daring political gamble for governments that have often gone to great lengths to hold those prices *below* world levels.[19]

America's unilateral adoption of stringent GHG limits would do nothing to weaken China's or India's motives for resisting controls. To the contrary, it would strengthen those motives. If the US adopts controls, it has thrown away a bargaining chip that it might have used in a future negotiation. Worse, the more other countries adopt GHG limits, the greater the competitive gains that China and India will reap by keeping their economies unencumbered by such controls. Over time, energy-intensive industries will migrate to the nations that resist GHG limits. And the increased concentration of energy-intensive capital and jobs in these countries will bolster the political incentives for resisting controls.[20]

If avoiding abatement costs is, indeed, a strong motive for China and India, the US would have little reason to believe that it could enforce an agreement – even if it made one. The seemingly perpetual problems with WTO enforcement illustrate that point all too well. The 2008 report on China of the US Trade Representative, while noting areas of progress, offered the following observation:

> "… in some areas it appears that China has yet to fully implement important commitments, and in other areas significant questions have arisen regarding China's adherence to ongoing WTO obligations, including core WTO principles. Invariably, these problems can be traced to China's pursuit of industrial policies that rely on excessive, trade distorting government intervention intended to promote or protect China's domestic industries. This government intervention, still evident in many areas of China's economy, is a reflection of China's historic yet unfinished transition from a centrally planned economy to a free market economy governed by rule of law."[21]

Similarly, the US government struggles – without great success – to ensure the safety of imported Chinese toys and food. Yet China clearly regards both the WTO regime and the reputation of its goods for safety as vital to its economic future. If China's *dirigiste* tradition and its weak rule of law disrupt its compliance with these trade-related regimes, how well would it implement GHG limits that it had been adopted only grudgingly?

The answer is not hard to guess. Further, America's record in enforcing product safety on Chinese products does not build much confidence on that side of the issue either. Could

the US government determine, say, if a cap-and-trade scheme had been enforced on state-owned enterprises in Qinghai? Would we be able to tell if the cap had been offset with concealed subsidies? Meanwhile, India seems very concerned to make sure that the developed countries have no real ability to curtail GHG-related transfers for non-performance or for any other reason.[22]

Trade sanctions will not lead to Chinese or Indian GHG controls

One response to the China-India problem has been to propose to allow the US government to clap limited trade sanctions on other countries that fail to cap their GHG discharges. Such sanctions, their proponents maintain, would protect America's most energy-intensive industries from import leakage. They also hope that sanctions would prod China and India to adopt their own controls.

As a means of coercing China, this strategy would face long odds. There are two reasons for doubting that the incentive would work. China provides a perfect example of the grounds for skepticism.

First, China, by adopting domestic GHG controls, would handicap the competitiveness of most of its tradable products. This step would discourage exports and encourage imports. China's only compensation for accepting this result would be to eliminate US trade sanctions on a part of its trade with the United States. Moreover, the trade that might benefit from this substitution is a very small part of the Chinese economy. Less than 1 percent of Chinese steel production is sold to America in a form that would make it liable to sanctions. For aluminum, the number is only 3 percent. It is 2 percent for paper and less than 1 percent for both basic chemicals and cement.[23]

Second, one country adopting trade sanctions, or a few countries doing so, will merely change the geographic pattern of trade flows. It will not have much impact on the total demand for Chinese energy-intensive goods. US sanctions on China would cause countries with low-carbon processes for producing steel, aluminum, or other energy-intensive intermediate goods to increase their exports to the US. These countries could increase their own imports from China to fill the gap left by their higher exports. The Chinese would be largely indifferent to the change in trade flows. This option does not pose a serious economic threat to China, and it would certainly not compel China to adopt GHG controls.[24]

While sanctions would have little effect on China, they might threaten other US interests. For example, the precedent that they would set could further weaken the already fragile global trade regime. The threat is especially real given the tendency of the American political process to expand and escalate the effects of legislation that creates opportunities for restricting imports. The history of anti-dumping laws illustrates the grounds for concern.[25]

It seems likely that the sanctions Congress has considered so far would be ineffectual in compelling other countries to adopt GHG controls. In principle, though, the US might

devise and, if need be, deploy, stronger trade penalties. The problem with that approach is patent. Trade sanctions designed to punish China will also hurt Americans. They will harm consumers, retailers, freight carriers, and manufacturers that use imported parts. The greater the pain imposed abroad, the greater the likely costs at home.[26]

Will the Annex II countries pay to reduce China's GHG discharges?

Alternatively, the US could offer to pay for China's GHG reductions as well as its own. Without question, this strategy is the one preferred by China, India, and the G-77 countries – for obvious reasons. At Bali, China and the G-77 countries demanded that the developed nations pay half of a percent to one percent of GDP to cover the costs of curbing GHG emissions in the developing world. Their demands at the Conference also extended to the transfer of technology at concessionary prices. India's demands, based on the position that it adopted at the Bali Conference, seem, if anything, more open-ended.

From a US standpoint, however, this approach has little to recommend it. A free ride of this kind creates incentives that will retard the process of China and India accepting the need to shoulder a significant share of the costs of controlling their own GHG discharges. Indeed, the more willing the US appears to be to entertain proposals that it will pay to abate other nations' GHG discharges, the more it will change the motives of the would-be recipients of its generosity. Once the principle is strongly established, every poor country with a substantial GHG output will have a strong motive to display a studied indifference to GHG controls. (I fear that this is, in fact, precisely what is happening.)

A less yielding bargaining stance on the part of the developed world would, over time, discover a growing Chinese and Indian self-interest in GHG controls. India, after all, is among the most vulnerable countries in the world to climate change. China, too, may have much to gain from slowing the pace of warming.[27] To be sure, the likely effects of future change remain unpredictable, and judgments vary as to each nation's relative share of the risks. Still, the stronger the evidence becomes suggesting future harm, the stronger the motives of today's most resistant nations to undertake control measures.

Without stiffer bargaining by developed nations, it is difficult to see how a viable global control regime can emerge. Placing on the developed world the full costs of making deep GHG cuts is an implausible option – as the MIT study strongly hints.[28] That study examined the costs of reducing GHG emissions by 50 percent by 2050. It found that the policy of giving the developing countries a full free ride on abatement costs would, for the developed world, entail a loss in economic welfare of 2 percent in 2020 and 10 percent by 2050. US losses could be greater or smaller, depending on how the sacrifices were allocated among developed nations.[29]

The transfer payments alone create a significant burden. The MIT study describes the results of one scenario thusly:

> "This transfer might also be compared to market flows—purchases of allowances will become part of developed

> countries [sic] import bill. To maintain trade balance an increase in imports of permits would need to be balanced by a reduction of other imports or an increase in exports. For the US exports were about $120 to $155 billion per month in 2007-08. Assuming US exports maintained the same relation to (projected) GNP, they would rise to $175 to $225 billion per month in 2020, and $385 to $500 billion in 2050. The US purchase of allowances in those years (taking *Full comp-equal cost* as an example) would require a 10% to 13% increase in exports in 2020 to maintain trade balance, and 29% to 37% in 2050."[30]

These are very large policy-imposed challenges. And they would be imposed on top of the already daunting post-bubble economic challenges to save, produce, and export more. If successfully met, these climate challenges would only restore the US economy to the condition of the *status quo ante.*

These factors would not preclude an agreement in which the US incurred substantial costs in the service of GHG controls. They do suggest that a GHG control agreement in which the US incurs large costs to reduce Chinese GHG emissions may not be politically sustainable.

The risks of exaggerating Chinese efforts on GHG reduction

America has reason to applaud Chinese actions to reduce GHG discharges. This is true even if those actions are of modest significance. At the same time, China has valid reasons to pursue efficiency gains. It may well also have opportunities for some profitable use of renewables. These innovations might produce some GHG reductions. The carbon efficiency of the Chinese economy has been very low. Countless options exist, no doubt, for improving it. Perhaps, many of these could produce net benefits quite independently of any concerns about climate.[31] The Chinese, therefore, have an incentive to make these no-regrets changes while trumpeting them as a sign of good intentions on GHG control.

Some advocates, however, may be tempted to pretend to accept some mix of these Chinese policies and measures as constituting serious action on GHG controls. This willing suspension of disbelief might offer short-run advantages in the task of enacting domestic GHG controls. In the long-run, though, it is dangerous climate policy.

Deep US emission cuts will not be cheap. If they do not produce comparable responses from many fast-developing countries, their impact on climate will be small. For the reasons discussed above, they are unlikely to elicit this response. If they do not, there is a real chance of the US policies being perceived as failures. (Indeed, they most likely would be failures in the sense of producing costs in excess of their benefits.) The last thing that climate policy needs at this point is for America to lurch into hasty GHG reductions and then reverse course when the discovery dawns that other key players have no intention of copying its actions.

A realistic approach to American climate policy

To all appearances, then, a policy of idealistic leading by example on GHG reductions is a risky one. Yet few people at this point would propose to ignore the looming worries about climate change. There is no good alternative to attempting to devise an active climate policy but one that can be pursued within our great, but limited, national means.

The need to set a realistic pace for GHG reductions

A GHG control policy is unlikely to succeed until China, India, and many other fast-developing countries become willing to shoulder a substantial share of the costs. The passage of time is likely to increase these countries' willingness to pay. In the past, as countries have become wealthier, they have been inclined to spend more on environmental quality, a tendency that economists have dubbed the environmental Kuznets curve. This tendency may well apply to China, India, and other similar states.

Also, over time, these nations may develop the legal infrastructure that would allow them to implement more cost-effective forms of GHG limits. Today, they almost certainly could not implement a GHG tax or cap-and-trade scheme. Or, if they did, it might not produce the desired results.[32] Using command-and-control rather than market-based policies can, though, greatly increase the social costs of reaching a given level of GHG reduction.

Finally, new technology is likely, over time, to lower the costs of GHG control. This expectation is one reason that economically optimal GHG control scenarios concentrate emission cuts in the relatively distant future. For this reason, too, China and India are likely to be more willing to make GHG cuts later, when they can get larger returns for their investments.

Take the long view; new technology is central

The high costs of GHG abatement, then, are one key source of climate policy's intractability. Only new technology can offer a way out of this difficulty. US climate policy should act on this insight. It should make the search for relevant new technology its top long-term priority.

This policy choice entails two initiatives. One is a modest carbon tax or, perhaps, a so-called hybrid cap-and-trade system. This measure would encourage the private sector to commercialize new low-cost technologies for abating GHG emissions. Keeping the GHG price low would limit the potential for competitive harm – even if America's trading partners failed to imitate its policy.

Credibility is another value of a modest and gradually increasing carbon price. The adoption of goals based on very steep GHG cuts is likely also to create a different source of unnecessary costs. Legislation that, if fully implemented, would lead to very high future costs may be greeted with skepticism. Investors might speculate that, when the

economic crunch arrives, future officeholders may relax the goals to avoid imposing high costs on influential constituents. In that case, businesses may well adopt a wait-and-see stance with regard to investments in new technology. The result would be to delay new technology's advance into the market rather than to speed it up.[33]

For a low price to have much effect on the course of technology, the controls must be as cost-effective as possible. In the case of GHG controls, a price-based system is more cost-effective than any other policy tool.[34] Thus, a modest carbon tax or, perhaps, a so-called hybrid cap-and-trade system, would be the best available policy tool for creating the desired price.

Achieving the needed large declines in abatement costs, though, will require more than a price on GHG output. Breakthroughs in basic science will be essential.[35] The private sector generally invests little in basic science, and GHG limits will not change that fact.[36] Some form of government support for basic science will be necessary to ensure that this investment occurs.[37]

Government has often been tempted to short-change basic energy science in favor of large demonstration projects. It has also found it difficult to avoid wasteful stops and starts in funding.[38] These challenges will doubtless reappear as government wrestles with the technological aspects of climate change. In the best of circumstances, the innovation process is likely to be a slow one. Prudence would seem to caution against expectations of sudden success.

Give priority to adaptation

A substantial amount of climate change is inevitable. Past emissions have locked it into the climate system. Fortunately, much can be done to minimize the net social costs of this change. America is well-endowed with the resources required to make the needed adjustments.

Many of these adjustments can be left in the hands of the private sector and of state and local governments. They have strong incentives to undertake the needed changes. Today, though, they are hampered by lack of knowledge about how regional climates will change and on what time scale.[39] Generating and diffusing this kind of scientific knowledge should be a top priority of federal climate policy. Developing this knowledge will depend on a strong, non-ideological climate science program. New knowledge in this area would clearly boost the nation's long-term economic productivity.

The federal government may also need to reassess some of its own policies. For example, public subsidies to disaster insurance may promote too much private sector investment in high risk areas. Climate change could worsen the potential resource misallocations. This risk may merit further study. In other instances, federal policies may cause under-pricing of some water resources. Again, the prospect of climate change may well increase the value of the resources being misallocated. Issues like these occasion intense passions. Yet the scale of changes that these policy changes would entail is no greater than some of

those that GHG controls would impose on energy consumers, and the policy changes might yield net benefits rather than net costs.

A family of technologies, known collectively as 'geoengineering', might provide an added tool for adaptation. The idea behind them is simple. When sunlight strikes the Earth's surface, greenhouse gases in the atmosphere trap some of the heat that is generated. A slight decrease in the amount of sunlight reaching the Earth's surface could, in principle, offset the warming. Scientists estimate that deflecting relatively small amounts of the total sunlight that strikes the Earth back into space would be enough to cancel out the warming effect of doubling the pre-industrial levels of greenhouse gases.[40]

Scattering this amount of sunlight may be fairly easy. Past volcanic eruptions have shown that injecting relatively small volumes of matter into the upper atmosphere can scatter enough sunlight back into space to cause discernable cooling. The 1991 eruption of Mt. Pinatubo reduced global mean temperature by about .5 degrees Celsius. This temperature reduction was apparent in just a few months and persisted for about three years.[41]

Some scientists propose, therefore, to use modern technology to create a carefully engineered analogue to this effect. Proposals to seriously study geoengineering are gaining adherents among climate policy experts. In late 2006, NASA and the Carnegie Institution jointly sponsored a high-level expert workshop on the subject. The workshop report observed that such distinguished scientists as Ralph Cicerone, Paul Crutzen, and Tom Wigley and prominent economists such as William Nordhaus and Thomas Schelling have long argued that the concept warranted further exploration.[42] Recently, an expert conference conducted at Stanford added the voices of several more distinguished economists to those who have called for further research on this option.[43]

Seek international agreements where real agreement exists

For climate policy, domestic and international initiatives are both required, and they must be mutually supportive. Thus climate diplomacy should support the kind of initiatives that have just been described. In general, the United States will doubtless engage other nations on climate change. More than a few opportunities exist for useful agreements. It is just that a global pact on GHG caps with full trading of emission allowances is almost certainly not among them.

In the meantime, though, many options for climate-related agreements do remain. On GHG controls, for example, a "targets and timetables" approach within a "pledge and review" framework would seem to make monitoring compliance much easier. This approach would also make penalties of failing to perform agreed actions more credible.[44] Attempts to agree to limited GHG controls of this type might make progress where the more ambitious GHG control plans are doomed to fail. (The downside is that the reductions that they achieve are likely to be small compared to the demands of the most zealous proponents of steep cuts.)

Prospects for technology cooperation may also be good. In addition, the US may wish to coordinate with other industrialized nations in order to help to boost the adaptive capacity of poorer states. It is realistic to pursue these opportunities, and doing so may yield economic, humanitarian, and security benefits.

Conclusion

In conclusion, America needs an activist climate policy, but it also needs a realistic one. Climate change is a serious concern, but it is not our only one, nor even the most pressing. Our responses need to account for the limitations on our resources and our abilities to affect the preferences of other societies.

Realism demands a willingness to engage in hard bargaining, and bargaining, as always, requires an ability to look beyond what others say in order to measure their deeds and to assess their interests. It also requires patience. These qualities are important. If we neglect them, the American people will pay more than they need to and get less climate protection than they could have.

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APPENDIX A

REG-MARKETS CENTER
AEI Center for Regulatory and Market Studies

A Statement on the Appropriate Role for Research and Development in Climate Policy*

Kenneth J. Arrow, Linda Cohen, Paul A. David, Robert W. Hahn, Charles Kolstad, Lee Lane, W. David Montgomery, Richard R. Nelson, Roger Noll and Anne E. Smith

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REG-MARKETS CENTER
AEI Center for Regulatory and Market Studies

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Executive Summary

A group of economists and scientists met at Stanford University on October 18, 2008 to discuss the role of research and development in developing effective policies for addressing the adverse potential consequences of climate change. We believe that climate change is a serious issue that governments need to address. We also believe that it is vitally important that research and development be made a central part of governments' strategies for responding to this challenge.

A Statement on the Appropriate Role for Research and Development in Climate Policy

A group of economists and scientists met at Stanford University on October 18, 2008 to discuss the role of research and development (R&D) in developing effective policies for addressing the adverse potential consequences of climate change. We believe that climate change is a serious issue that governments need to address. We also believe that research and development needs to be a central part of governments' strategies for responding to this challenge. Solutions to manage long-term risks will require the development and global deployment of a range of technologies for energy supply and end-use, land-use, agriculture and adaptation that are not currently commercial. A key potential benefit of focused scientific and technological research and development investment is that it could dramatically reduce the cost of restricting greenhouse gas emissions by encouraging the development of more affordable, better performing technologies.

Broadly speaking, economists identify three ways in which government can constructively address climate change. One is by pricing the damages caused by emissions leading to climate change. Doing so would induce individuals and firms to take better account of these damages in their everyday decisions. A second is through government research and development policy aimed at stimulating the search for new knowledge that could lead to breakthroughs in greenhouse gas reducing technology. A third is by taking and encouraging actions that would reduce the damage caused by greenhouse gas emissions. Here too, R&D can contribute by addressing technological means of damage-mitigation, including adaptation and geo-engineering. However, governments' support for technology R&D should cease at the development stage or in select cases the pilot demonstration phase. Risks and rewards from commercial deployment should be left for markets to determine, including, of course, whatever additional price signals arise from market-based mitigation policies.

The group agreed to the following set of principles as a guide to the design of an effective research and development policy for addressing climate change.

The need for R&D policy in addition to cap and trade, tax, standards or other policies to reduce emissions

- An effective strategy to deal with greenhouse gas emissions requires that individuals and firms have incentives to take action to reduce their emissions. However, adequate control of greenhouse gas emissions almost certainly will require policies beyond pricing greenhouse gas emissions (or regulatory policies with the same end) and needs to include significant levels of direct and indirect support for basic and applied R&D.
- The payoff from effective R&D to reduce the cost of lowering greenhouse gas emissions could be very high.

The need for stable, long-term commitment to R&D support

- Policy commitments must be stable over long periods of time. Climate change is a long-run problem and will not be solved by transitory programs aiming at harvesting available short-run improvements in energy efficiency or of low-carbon energy. A much more stable commitment to funding and incentives for R&D is required to do better than the limited results of energy R&D efforts in the 1970s and 80s.
- Businesses and consumers must have credible and appropriate incentives for innovation if they are to develop new technologies that will be needed to mitigate and adapt to climate change. Challenges include providing adequate funding for basic and fundamental research, encouraging risk-taking, and promoting open access to information.
- Stable long-term commitments to R&D funding and incentives will change the direction of R&D.
- Among the steps governments need to consider in addressing such a long-term challenge are not just those that apply existing capabilities to climate-related research today, but also those that build the fundamental capacity to perform research in the future. This could include steps to promote training of scientists and engineers, rejuvenate laboratory capabilities in universities, and to establish programs to disseminate research information for example through internships, post-doctoral fellowships and exchange programs both nationally and internationally.

Design of R&D programs

- Government R&D policy should encourage more risk-taking and tolerate failures that could provide valuable information. This can be accomplished by adopting parallel project funding and management strategies and by shifting the mix of R&D investment towards more "exploratory" R&D that is characterized by greater uncertainty in the distribution of project payoffs.
- The single greatest impediment to an R&D program that is directed at achieving a commercial objective is that it will be distorted to deliver subsidies to favored firms, industries, and other organized interests. The best institutional protections for minimizing these distortions are multi-year appropriations, agency independence in making grants, use of peer review with clear criteria for project selection, and payments based on progress and outputs rather than cost recovery.

- Technological progress requires both R&D and learning, so that R&D programs should not be planned in isolation from practical application. R&D can be required to make even a relatively well-developed technology suitable for particular applications, and attempts to make practical use of a technology can reveal points where additional R&D would be most productive.
- Climate change cannot be halted without technologies that are applicable to developing countries. Developing these technologies and facilitating their adoption will likely require engagement of R&D networks in developing countries.
- Research on how societies can better adapt to the effects of climate change and research on geoengineering as a measure to moderate temperature increases and climate impacts should be included in a complete research portfolio.

The limited role of technology standards and subsidies

- Mandates and subsidies aimed at supporting the deployment of relatively mature technologies are unlikely to be cost-effective tools for eliciting the major reductions of greenhouse gas emissions that now appear to be called for. In some cases, performance standards have proven effective in promoting engineering improvements and the wider adoption of existing techniques. Since the process of technology innovation and diffusion can require an extended period of time, performance standards with shorter compliance periods cannot be expected to stimulate major breakthroughs.
- Technology-forcing performance standards have had a mixed record in inducing innovation. Regulators can find it difficult to obtain information about the status of technologies that is accurate enough to allow them to set standards that both can be achieved and will induce real innovation. Such standards may be effective when the path to a technological solution is reasonably clear, but are less likely to be effective in stimulating cost-effective and broad-based breakthrough technologies. This is especially relevant in dealing with a multi-decadal issue such as climate change, where the challenge is to evolve standards with time in light of new knowledge and experience.

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The CHAIRMAN. Without objection, it will be included in the record in its entirety.

Our final witness is Mr. Ned Helme. He is the President and Cofounder of the Center for Clean Air Policy. Over the last two decades Mr. Helme has advised not only Congress, State governments, and the European Commission, but also developing countries from Brazil to China.

So we welcome you, Mr. Helme. Whenever you are ready, please begin.

STATEMENT OF NED HELME, PRESIDENT, CENTER FOR CLEAN AIR POLICY

Mr. HELME. Thank you very much, Mr. Chairman, Mr. Sensenbrenner, and other members of the committee. It is certainly a pleasure to have a chance to speak to you this morning. I am Ned Helme, the President of the Center for Clean Air Policy.

My task this morning is to sort of set the stage in terms of where we are in the negotiation process and complement what we have heard from my colleagues. Let me start by putting a slide on the board here, and this sort of summarizes what you have heard from my colleagues to the left and right of me.

This compiles the reductions that will be achieved by 2010 by China, Brazil, and Mexico under laws that are currently on the books in these countries. And as you can see, the red block is more than what we would do here in the U.S. under the Lieberman-Warner bill, as structured last year, by 2015, and it is comparable to the level of reduction we can expect from the Europeans with their minus 30 percent reduction target.

So as my colleagues have shown you with the specifics, the sum total of this is quite substantial, and the world has really changed in terms of where we were in 1997 in Kyoto when very little was being done and where we are today where developing countries have really stepped up and carried their part of the burden here.

Having said that, I want to build on what you said, Mr. Chairman, that this is great stuff but it is not enough. If we look at where we are going, we could zero out all the emissions of the developed nations by 2050 and we wouldn't get to the targets we are talking about. So we clearly need a substantial additional effort by China and other key developing countries, and I think that will be forthcoming in the process.

My second point is really to talk a bit about the Bali Action Plan. I think this is a major breakthrough from where we were in 1997. For the first time we have agreement among developed and developing countries that both sides will commit to specific actions that will reduce, in the case of developing countries, growth and emissions, and that is premised on monitorable and reportable and verifiable actions on both sides, and it is also premised on the thought that we will have support in technology, in finance, and in building capacity from developed nations to developing nations. That is the heart of the Bali Action Plan, And it is a real breakthrough in terms of the thinking and the way in which this process has evolved over the years.

In that action plan we are talking about taking nationally appropriate mitigation actions, and there are three types of these actions

that are kicking around in the debate at this point. The first is unilateral action. And these numbers you see up here, a lot of what is here are actions that developing countries are doing on their own. These are not reductions that are being bought and paid for through the clean development mechanism. In the past, in the Kyoto Protocol, basically the only role was for projects in developing countries, could generate credits and those could be sold to the Europeans, for example, to meet the goals of their reductions by their companies.

In this case we are talking about a real reduction by developing countries on their own that is a contribution to the atmosphere. So in addition to what developed nations do, we are going to see some real action by developing countries with some real costs—I would take issue with Lee's contention that all this is just no regrets—that will really move us forward. So that is the first and most important piece.

The second is a set of actions that would be premised on a conditionality. We will go further if developed nations provide support in the financing and technology and capacity building.

And then third is, if we have set a law, let's say China sets an RPS at 20 percent as they have done, If they do more than 20 percent, that could be turned into carbon credits to sell. So they have to meet the target on their own. If they go beyond it, they could market those on the carbon market.

Let me take you to a specific example. Mr. Chairman, you alluded to this in your opening remarks. Mexico in December in Poznan put together the first really comprehensive approach that would show you what a national appropriate mitigation action on a sectoral approach would look like. Mexico proposed to set targets for reduction in cement, steel, oil refining and electricity, three of those very internationally competitive sectors. They have proposed that they would go further than the initial targets, significantly further, if there was support financially from developed nations to move that forward. And they said they would do this through a cap and trade program, a program that could combine with the U.S. cap and trade or a Canadian cap and trade program on a North American basis. So a very significant effort here. When we are talking about financing, we are not talking about big grants. In their case they are talking about loans that would help them overcome financial barriers. The banks in Mexico don't have the ability to assess energy efficiency programs.

This is the kind of thing we are looking at. So very significant and a concrete proposal for Mexico that could move us forward. I think when we think about mitigation actions, we want to focus really on the 6 to 10 largest developing countries. They're responsible for over 80 to 90 percent of emissions. We don't really care about Zimbabwe and Morocco and so on. We really care about Brazil, China, Mexico, Korea, India, South Africa. Those are the key players. So it is a more workable and doable deal than it might have first appeared.

Let me turn to the question of the United States' role in this. I think the U.S. is critical. We are the linchpin of a Copenhagen agreement. I think the positive reactions you have seen internationally to President Obama's comments on minus 14 percent

below current levels is a very positive sign. I think it can have a very positive impact in terms of moving this debate. I think there will be two tests for us.

The first test is what is our target? Can we get that target together? I am optimistic here with the Congress that we could move something through the House. At least it would give us a real signal to help our negotiators talk about what kind of target can we take.

And the second question is, will we help financially? That is I recognize a tougher question, but it is a key question. To make this ball move, we need to do it. And again, let's be clear. We are talking about help with technology. We are talking about capacity. We are talking about loans and breaking barriers. We are not talking about huge block grants like might be envisioned if you look at the India proposal, which is I think an outlier in terms of the real thinking on the table.

Let me close by addressing—Mr. Hall has left, but he said there are twin challenges, and I think he is right on the money. He said, the twin challenges are: How do we deal with impacts on our companies in the United States? And how do we also encourage China and India to go further? And I think the answer is very clear. On the issue of carbon leakage, in the U.S. we have two choices. We could either give allowances free to key industrial sectors that are in danger, like cement, like steel, like oil refining, or we could do border tax adjustments, as I think one of you referred to this earlier that the—in fact Lee mentioned this in terms of—he said this is a real problem. Basically, any exports coming to the United States would have to buy carbon allowances. I think that is very provocative in the debate. Not very helpful. I think giving allowances out can take care of the carbon part of the problem. So that companies are held harmless in terms of this phase through 2020 until China, Brazil, Mexico have taken similar action in the cement industry and the steel industry, which I think we will see.

The second half of Mr. Hall's challenge was, how do we get China to move? Border tax adjustments is not the way to go. China exports 1 percent of its steel to the United States. Putting a tax on Chinese steel is going to have no impact on their policies internationally. However, incentives like we just talked about, where we help them with the technology, where we take the CCS technology that we are working on and we do it with them in China at the same time we are doing it here. We don't do the old game of develop it here and 20 years later we put it in the developing countries. As my colleague here said, two coal plants a week, we have got to deal with CCS now.

Let me close. My final thought for you is, I think we had a real breakthrough 2 weeks ago when the U.S. in the negotiations on a mercury treaty switched its position. Seven years we have said no international agreement on regulating mercury emissions. In 2 weeks the Obama administration changed direction and that completely dominated discussion. China, India, Argentina, Mexico, all of whom had been opposed to a mercury agreement, switched sides and said yes, we are onboard. I think it shows you what is possible from the kind of leadership we have from you guys and also from our President.

Thank you very much.
[The prepared statement of Mr. Helme follows:]

Testimony of Ned Helme

President, Center for Clean Air Policy

before the

U.S. House of Representatives

Select Committee on Energy Independence and Global Warming

Preparing for Copenhagen: How Developing Countries are Fighting Climate Change

March 4, 2009

Mr. Chairman, Ranking Member Sensenbrenner and Members of the Committee: I would like to thank you for the opportunity to testify before you today. My name is Ned Helme and I am the President of the Center for Clean Air Policy (CCAP), a Washington, DC and Brussels-based environmental think tank with on the ground programs in New York, San Francisco, Mexico City, Beijing, Jakarta and many other places.

Since 1985, CCAP has been a recognized world leader in climate and air quality policy and is the only independent, non-profit think-tank working exclusively on those issues at the local, national and international levels. CCAP helps policymakers around the world to develop, promote and implement innovative, market-based solutions to major climate, air quality and energy problems that balance both environmental and economic interests.

CCAP is actively working on national legislation in the United States (U.S.) and is advising European governments as well as developing countries such as China, Brazil, and Mexico on climate and energy policy. Our behind the scenes dialogues educate policymakers and help them find economically and politically workable solutions. Our Future Actions Dialogue provides in-depth analyses and a "shadow process" for climate negotiators from 30 nations from around the world to help them develop the post-2012 international response to climate change. We also facilitate policy dialogues with leading businesses, environmental groups and governments in the European Union and U.S. on designing the details of future national and transatlantic climate change mitigation, adaptation and transportation policies.

My testimony responds to three questions posed by the Committee:

- How will the climate negotiations in Copenhagen in December 2009 differ from those at Kyoto in 1997?
- What are the key elements of the Bali Action Plan and how will they affect developing country expectations and the negotiations?
- How will leadership by the U.S. influence the emerging economies to scale up their efforts on mitigation?

We are at an exciting and very productive time in the negotiations to reach a global agreement on the framework for reducing global greenhouse gases (GHG) to a level that will prevent dangerous anthropogenic interference with the climate system. Never before have the stakes been so high or the opportunity so great to reach a globally acceptable deal that involves both the developed and the major developing economies.

In my time today, I would like to emphasize a few key points:

- The Bali Roadmap is the breakthrough developed countries have been waiting for that makes the negotiations in Copenhagen very different from those in 1997 and will bring meaningful developing country actions into the agreement.
- Developing countries are taking action already and are prepared to take additional measurable, reportable and verifiable actions.
- U.S. willingness to propose and enact a meaningful domestic national emissions reduction target is a linchpin for a successful outcome in Copenhagen.
- The objective in Copenhagen is to agree on new GHG reduction goals along with a new architecture to govern developing country action in the post-2012 framework, and
- The U.S. can successfully protect domestic, internationally competitive industries from job losses associated with a carbon program, while also creating incentives for developing countries to take greater action than they have underway already.

Our extensive policy work in key developing countries has shown that they are doing more to reduce the growth in their emissions than conventional wisdom here in the United States would suggest. China, Brazil and Mexico have already put in place national laws that collectively, if fully implemented, will reduce the projected growth in emissions by more aggregate tons in 2010 than the reductions the Lieberman-Warner bill (S. 2191 of the 110th Congress) was projected to achieve by 2015 and by almost as many tons as the European Union's 30 percent reduction pledge for 2020 (Figure 1).

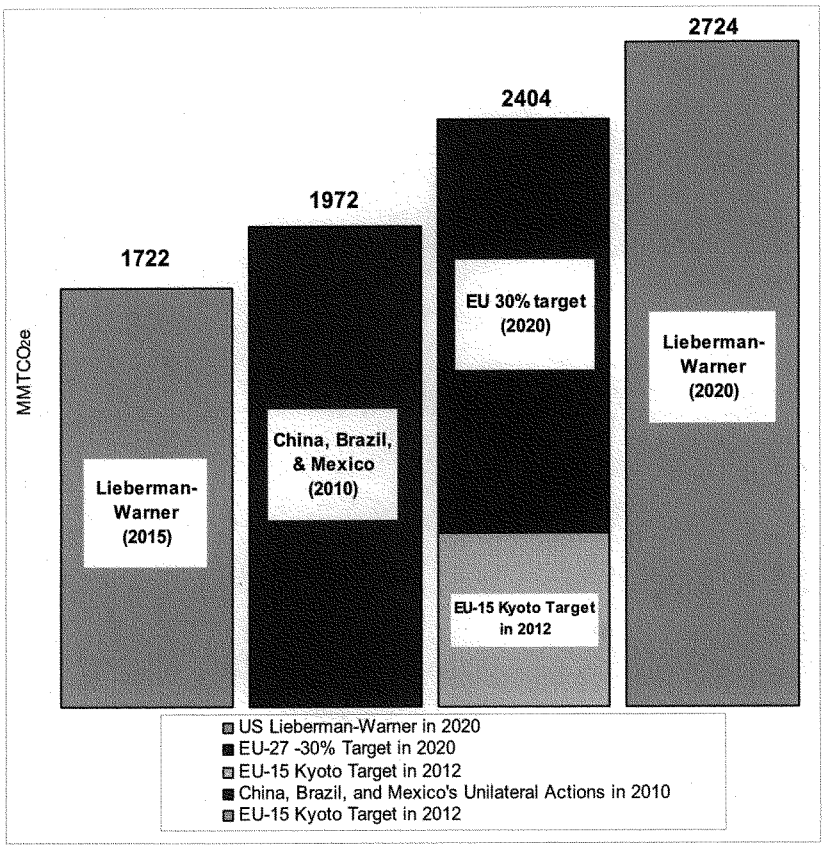


Figure 1. Emissions reductions from BAU for full implementation of proposed measures (CCAP, 2009).

Nevertheless, the outlook for developing country CO_2 emissions growth remains substantial in the aggregate and as a percentage of global emissions (Figure 2). In 2000, developed country emissions from fossil fuels and industrial processes were roughly 40 percent of global emissions. By 2050, developing country emissions are expected to grow to 64 percent of global emissions.

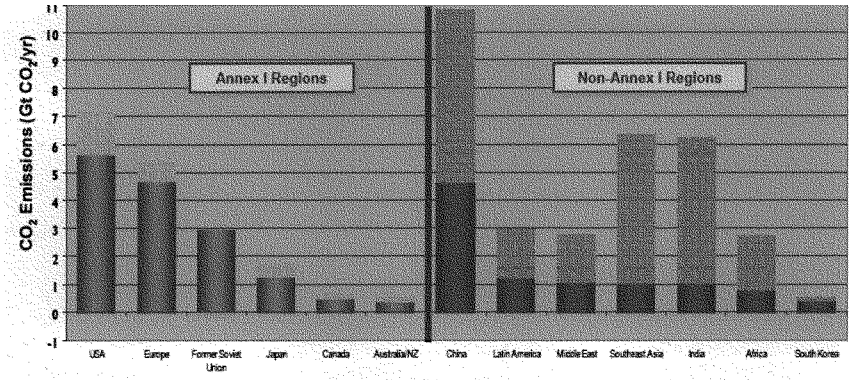


Figure 2. Fossil Fuel and Industrial Process CO_2 Emissions by Region in 2000 (solid bars) and 2050 (checkered bars) (U.S. Climate Change Science Program. 2007. *Scenarios of Greenhouse Gas Emissions and Atmospheric Concentrations*; MINICAM Results).

The negotiations going into Copenhagen are notably different than the 1997 Kyoto negotiations because we now have in place the Bali Action Plan, which the U.S. and other developed and developing countries agreed to in December 2007. The Action Plan builds on the key principle in Article 3 of the United Nations Framework Convention on Climate Change (UNFCCC), "The Parties should protect the climate system…on the basis of equity and in accordance with their *common but differentiated responsibilities and respective capabilities*." However, it goes much farther and establishes for the first time that the negotiation process will cover both developed and developing country actions to mitigate climate change. It also importantly sets up much stronger accountability by calling for developing countries to consider: "Nationally appropriate mitigation actions … in the context of sustainable development, supported and enabled by technology, financing and capacity-building, **in a measurable, reportable and verifiable manner"**. In effect, both the actions and the support are to be measured, reported, and verified.

In keeping with this new framework, the discussions since Bali have begun to define a menu of options for what are referred to as "Nationally Appropriate Mitigation Actions"

(NAMAs). It is expected that each developing country will choose those actions that make the most sense for its own circumstances, just as we will do in the U.S.

NAMAs could take three distinct forms: *unilateral actions* that developing countries will take on their own without any assistance; *conditional actions* they will take conditioned on receiving financial and technology assistance from developed countries; and *emission credit generating policies* — where credits may be earned and sold in the international market if the country exceeds the goal it has set.

Although all developing countries will be encouraged to implement actions, the main focus appropriately will be on the six to ten largest emitting countries in the developing world which are responsible for 80-90 percent of the emissions in key industrial sectors. Reaching agreement on specific actions in these countries and on the support for those actions from developed nations will be the key to the Copenhagen agreement.

The Kyoto Protocol has long been criticized in the U.S. and elsewhere for the fact that it does not require explicit emission reductions by developing countries. Instead, it rewards developing countries who implement specific emission-reducing projects with emission credits through the Clean Development Mechanism (CDM) that can be sold to developed countries or to companies and individuals within such countries. These credits can be used to meet domestic carbon reduction requirements in developed nations. In effect, these reductions are paid for by developed nations.

The Kyoto Protocol does not contain any explicit system for recognizing actions taken by developing countries to reduce GHG emissions outside the CDM. One of the tests of any agreement in Copenhagen will be whether it creates a system for recognizing unilateral actions by developing nations to reduce their emissions that constitute their contribution toward protecting the climate. A large portion of the more than 2 billion tons of projected reductions in emissions growth by China, Brazil, and Mexico that I detailed for you earlier in Figure 1 of my testimony are unilateral reductions that contribute to protection of the climate, not reductions that generate credits for sale to developed

nations. These unilateral actions are one form of a NAMA. Negotiators have proposed creating a formal registry in the UNFCCC that will record these and other NAMAs proposed by developing nations.

Recent actions by key developing countries give us a sense of what some of these actions or NAMAs might look like. For example, in Poznan, Poland, in December 2008, Mexico took a significant step, announcing its plans to set a national aspirational goal to reduce absolute emissions by 50 percent below 2000 levels by 2050. It also announced plans to set emission goals for four key industrial sectors — cement, steel, aluminum and electricity — and to achieve these goals through a domestic cap and trade program. It suggested an initial reduction target that it would undertake unilaterally in each sector and suggested that each sectoral target could be made more stringent if developed nations provided focused loan support (to overcome domestic financing barriers) in the post-2012 agreement. Mexico has also created and financed its own Energy Transition Fund of three billion Mexican pesos a year for three years (about $210 million annually) to provide incentives for more aggressive emissions reduction activities.

There are two key elements here that distinguish this from today's CDM approach: 1) the support for a more stringent sector-wide policy involves loans, not full payment for the incremental emissions reductions, and 2) it does not involve any generation of offset credits for developed nations in meeting the new more stringent target. All of these reductions will help reduce global aggregate emissions to safe levels rather than replacing or offsetting required reductions by developed nations. Offset credits would be generated only if the sector (e.g. Mexican oil refining) reduces its emissions in aggregate below the sectoral cap level. The heart of this program is then to generate a Mexican net contribution to the protection of the climate.

China also has taken bold action to reduce emissions. The government released its climate plan in 2007 and has set an aggressive goal to reduce its energy use per unit of GDP by 20 percent between 2006 and 2010. In the plan's first year in 2006, China fell short of its 4 percent per year goal, but in 2007 and 2008 it has reached the aggregate 8

percent reduction for those two years. If fully achieved, this goal alone would reduce GHG emissions by more than 1.5 billion metric tons of CO_2 from business-as-usual annually by 2010. The plan also includes measures to: increase the use of renewable and nuclear energy; recover and use methane from coal beds, coal mines and landfills; increase the development and use of bio-energy; utilize clean coal technologies; improve agricultural practices; and plant forests.

South Africa has analyzed a number of long-term mitigation scenarios. It has announced its intent to peak its emissions no later then 2025 and expects to have a final domestic climate policy adopted by the end of 2010. South Africa also continues to implement sustainable development policies and measures that will reduce GHG emissions. These policies and measures include moving from traditional coal-fired electricity production to renewables, nuclear power and clean coal technologies, improving energy efficiency and improving the efficiency of the transportation system.

Brazil has released a climate plan that emphasizes energy efficiency and reducing emissions from deforestation. Its goal to reduce the average deforestation rate by 70 percent over the period 2006-2017 would lower CO_2 emissions by about 440 $MtCO_2$ in 2010 and by 4.8 $BtCO_2$ over the life of the program.

South Korea intends to announce a long-term, economy-wide target for emissions reductions later this year.

What will the global climate deal look like and how will international negotiations unfold?

In Copenhagen, developed or Annex I countries, including the U.S., are expected to agree to national, quantified GHG emission reduction targets. The European Union has already committed to reduce emissions 20 percent below 1990 levels in 2020 on its own, and increase its target to 30 percent below 1990 levels if other countries join.

U.S. engagement and commitment is critical for reaching a deal in Copenhagen. One only needs to look at the impact of the United States' recent decision to reverse its position and support the development of a new international agreement to reduce mercury emissions[1] to understand the implications of U.S. engagement. Almost immediately after the U.S. decided to support the development of a new agreement, China and then India in supported the process as well.

Both developed and developing countries will judge U.S. leadership and commitment at Copenhagen on two criteria. First, has the U.S. committed to significant emission reduction targets? The stronger the proposed U.S. target, the greater the likelihood of stronger developing country actions. Although it would be ideal if the U.S. could pass domestic legislation setting out its emissions reduction targets before Copenhagen, in my view that is not necessary to reach a deal in Copenhagen. What is needed is sufficient action in both the House and Senate to give our negotiators a good sense of where our national cap is likely to be set.

The debate on acid rain legislation and the original cap and trade program for sulfur dioxide in 1990 may offer some useful historical insight. Senate and House legislative proposals quickly converged on the President's proposed cap level in 1989, the first year of President George H.W. Bush's term. The real battle raged over distribution of the allowance value among companies and regions which required another full year of debate, a pattern that could be repeated in the carbon debate this year. But the bottom line is that the critical piece for the international process is a consistent signal from the Congress on the cap level for U.S. negotiators to bring to the rest of the world to help reach the needed agreement in Copenhagen.

Second, has the U.S. committed to providing meaningful financing, technology and capacity building assistance to developed countries as it agreed to consider in the Bali Action Plan? As discussed earlier, each developing country is expected to take NAMAs

[1] "Final Omnibus Decision on Chemicals Management" (UNEP/GC/25/CW/L.4) adopted by Twenty-fifth session of the Governing Council/Global Ministerial Environment Forum.

— some unilateral and others conditioned on assistance. The specific details of what actions they will take in exchange for assistance will be addressed after the agreement in Copenhagen. The agreement in Copenhagen will establish the framework and policy architecture for developing country actions.

Some observers incorrectly assume that any financing agreement in the Bali Action Plan must mean large unrestricted amounts of funding. However, the behind the scenes negotiations are more likely to focus on specific and tailored financial mechanisms like support to "write down" the cost of advanced but not yet commercial technologies like carbon capture and storage, and financing for special purpose entities that can help overcome resistance from banks in developing countries to make financing available for energy efficiency. The European Commission has proposed the creation of a "facilitative mechanism" by which developing country proposals for action and specific requests for assistance can be evaluated based on objective criteria. The idea of "block grants" and the like are not under serious consideration.

Two additional issues will play an important role in the negotiations of the post-2012 framework: Reduced Emissions from Deforestation and Degradation (REDD) and adaptation. These issues will be important because they touch a much larger group of developing countries compared to industrial mitigation, where six to ten of the largest emitters will likely dominate the field. In addition, emissions related to deforestation and degradation are responsible for approximately 20 percent of global GHG emissions. Addressing these problems in a constructive way in the post-2012 climate agreement will be critical to solving the climate problem and will provide an important avenue for many developing countries to participate in the international effort to fight global warming. Likewise, adaptation affects virtually all countries, but has a particularly large impact on the poorest developing countries since they face the largest adverse impacts and have the least capacity to adapt to climate change. At Poznan, negotiators made progress on both REDD and adaptation. Reaching early agreement on the approach to these two issues early in 2009 will be an important building block for the larger Copenhagen agreement.

The level and extent of actions to reduce GHGs by developing nations in the post-2012 agreement is not only a critical question for the international debate, but also central to the outcome of the domestic debate here in the U.S. There is a great deal of concern in the U.S. with ensuring that U.S. companies are not placed at a competitive disadvantage if the U.S. takes action and other countries do not. The European Union has similar concerns.

There are two approaches under consideration in the U.S. and in Europe to address competitiveness. One would require border allowance purchase requirements (essentially a border tax) on imports from countries or sectors that have not taken comparable action to regulate GHG emissions. The other involves giving free allocations of allowances to those domestic companies in sectors facing considerable international competition, such as iron and steel, cement, pulp and paper and aluminum. The most interesting of these approaches in the U.S. is a proposal, H.R. 7146, that Congressmen Inslee and Doyle introduced in the 110th Congress, which would compensate domestic industries for the direct and indirect (energy) cost increases from carbon regulation they face until developing countries require the same industries in their countries to take comparable action to reduce GHGs. One benefit of this approach is the positive incentive it sends to cleaner companies within the U.S.

I believe both of these approaches could level the carbon cost playing field and can be viewed as complimentary, though under WTO rules we need to insure that the use of these measures either in combination or sequentially does not overcompensate U.S. industry and constitute protectionism. It is probably best to think about using the output based free allocation as the first line of defense with the border adjustment as a backstop. This is how the European Union is approaching these two strategies, as the border tax adjustment is seen as provocative and could potentially trigger larger trade disputes.

I believe that it could make sense to operate such a program on a sector basis. The program would begin with output based rebates covering both the direct and indirect energy price increases facing our domestic industries in internationally competitive

sectors. The portion of the rebate associated with direct costs of carbon would be phased out on a sector basis as a majority of the major emitting countries in that sector took comparable action. At that point, the border allowance adjustment would phase in for those other countries whose sectors had not taken similar action. The indirect energy cost portion of the output based rebate would continue until developing countries take action to reduce GHGs from their electricity sector or to establish a carbon price across the economy.

Although both of these strategies individually or in tandem could effectively level the carbon playing field, they will not create incentives for developing countries to reduce their domestic emissions or to cooperate in the negotiations. For example, according to a recent World Resources Institute and Peterson Institute Study[2], China exports approximately 8 percent of its steel production and exports only 1 percent to the U.S. It is unrealistic to expect that a border adjustment on 1 percent of Chinese steel would be a sufficient motivator for China to regulate the emissions from its domestic steel industry.

In my view, U.S. domestic legislation must also include provisions to encourage developing countries to take additional actions. Initially, this will involve creating incentives for them to reduce the rate of growth of their emissions to lay the foundation for absolute emissions reductions in the future.

One framework for providing incentives that has been garnering support internationally would rely on establishing the NAMAs discussed earlier in my testimony in key internationally competitive industrial sectors. This concept is included in the Bali Action Plan as "cooperative sectoral approaches and sector-specific actions" which are part of the actions suggested for mitigation of climate change. Under such sectoral approaches, developing countries would be asked to take a new commitment to reduce GHG emissions in a given industry sector beyond any recent unilateral actions they may have

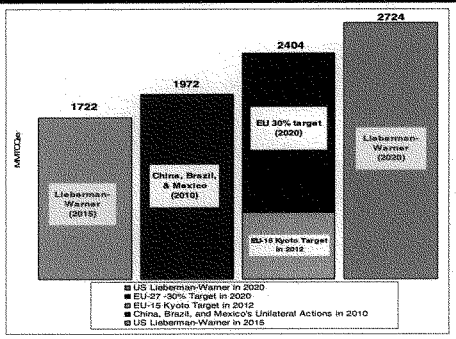
[2] Source: Peterson Institute and World Resources Institute 2008. *Leveling the Carbon Playing Field.*

already adopted. They could receive up-front financial and/or technology incentives from developed countries in return. Mexico's announcement in Poznan of sectoral targets for key industrial sectors coupled with a 4-sector cap and trade program is the first concrete example of how such an effort might proceed.

Technology and finance assistance could be provided to developing countries by developed countries for a number of purposes. For example, assistance could be dedicated to build first-of-a-kind advanced technologies, such as carbon capture and storage, which are not yet cost effective, to accelerate technology deployment by bringing down the cost of advanced technologies, and as an incentive for participating developing countries to establish more aggressive "performance goals." This approach also creates opportunities for leading U.S. companies to gain access to growing new markets (creating jobs at home) and moves toward leveling the playing field for carbon in internationally competitive sectors.

In conclusion, with timing running short to avoid the worst effects of a warming planet, reaching an agreement on a post-2012 global framework for reducing emissions is crucial. Never before has the opportunity for a true global accord, involving all nations, been so close. It is clear that developing countries are already taking significant actions and that for the first time they are willing to take additional actions as part of an international agreement. What is needed is strong U.S. leadership demonstrated by a significant commitment to reducing emissions and providing assistance to developing countries. One should not underestimate how firm U.S. action will induce strong developing country action. The U.S. holds the power to unleash a race to the top that could overcome years of international inertia and leave a legacy to future generations for which all of us can be proud.

Developing countries are already doing more than many believe



Reductions from BAU

Source: CCAP, updated

Center for Clean Air Policy

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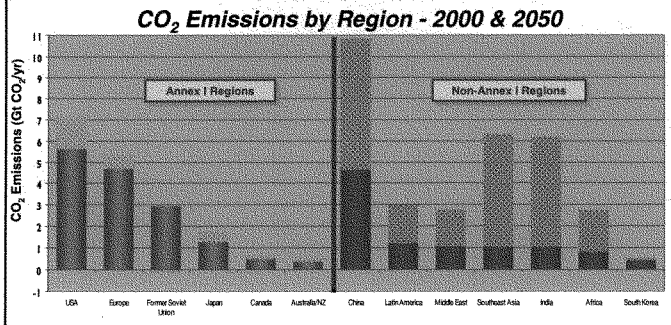
… But outlook for Developing Country emissions growth remains substantial



[1] Includes Fossil and other industrial CO_2.

Source: U.S. Climate Change Science Program. 2007. *Scenarios of Greenhouse Gas Emissions and Atmospheric Concentrations* (MINICAM Results).

Center for Clean Air Policy

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The CHAIRMAN. Thank you, Mr. Helme, very much. We will now turn to questions from our committee members, and we will begin with the gentleman from Missouri, Mr. Cleaver.

Mr. CLEAVER. Thank you, Mr. Chairman. Mr. Lane, on page 10 of your testimony, in the fifth paragraph, you said, America is well endowed with the resources required to make the needed adjustments. On page 12 you said, our responses need to account for the limitations on our resources and our abilities to affect the preferences of other societies. Can you help me fix the difference?

Mr. LANE. Sure. I think that the United States—and I think this is generally agreed—because it is a very big country, because it is quite a wealthy country, has—and because it is developed and has a well-developed public health service, and so forth, has a lot of human and material capital, is probably better able to adapt to climate change than most poorer countries are likely to be. It also has a more temperate climate to begin with, so that say in comparison with India or a country that is located much closer to the equator, we are less likely to experience in the early decades of climate change really severe harm.

At the same time, all of that being true, it is still true that we don't have infinite resources to help the entire world convert from fossil fuels to alternative energy and conservation, and so forth.

Mr. CLEAVER. On that point—excuse the interruption but I only have 5 minutes.

Mr. LANE. That is fine.

Mr. CLEAVER. On that point I would like to engage all the panelists.

Do you believe that it is possible for the United States in Copenhagen to create, for China and India in particular but all of the—many of the developing nations, the belief that there is a real connection between sustainable economic strength and hampering the environment?

Mr. HELME. I certainly agree. I think that is very much in line with the kinds of things you see in the submissions from those countries. South Africa has been the leader, but this idea of dealing with carbon and at the same time promoting sustainable development is a key element of the G–77 of developing countries' perspective, and I think they are already on that page. What they are looking for is help with the technologies and with some of the new opportunities to really pursue that ideal. I think we are on the same page on that issue.

Mr. CLEAVER. Mr. Roberts.

Mr. ROBERTS. I think for most developing countries the environment is clearly in their minds where their food comes from, where their water comes from, and they see the risks of that environment changing because of climate change. They see it more clearly than we do because in places like Indonesia, they walk out their back yard and catch the fish. Now as the ocean is becoming more acidified, they are seeing the coral reefs and fisheries change in front of their eyes. And they are seeing the sea level rise in their backyards, and they don't have the ability to move like we do.

I find in those countries a profound awareness of the relationship between their livelihoods and keeping their environment intact, and that is the main motivation for moving forward. I see that as

a powerful impetus for having that conversation in Copenhagen. I think it is going to happen.

Mr. CLEAVER. Thank you.

I want to find out whether the three witnesses agree with Mr. Lane's testimony that a global agreement, a global pact on greenhouse gases, gas caps, with full trading of emissions allowances is probably not possible in Copenhagen. Do you believe there is an agreement to be made in Copenhagen?

Mr. HELME. I think there is. I suggested in my testimony that we will have agreement on the targets for the developed nations. I think we will have agreement on this architecture of how we proceed with developing countries. So we will have agreement on developing countries putting a series of nationally appropriate mitigation actions on the table and conditioning that on the financing. And I think we will see the Annex 1 countries coming forward and saying here is the range of financing we might be able to put forward. And in 2010 I think we will really negotiate the final deal in terms of we will do this, and you will help us here, and here is what it amounts to.

We are talking about a registry where developing countries will record what they are proposing, what they are looking for, and, at the end of the day, exactly what we have agreed to. So I think it doable. I think it is a two-step. I think in Copenhagen we get the structure done, and after Copenhagen, after we have passed our law and we know what financing we can help with, I think we get into the details. Clearly, with U.S. leadership, it is quite possible.

Mr. CLEAVER. It is possible to go to Copenhagen shooting for the stars, and we may hit the Moon?

Mr. ROBERTS. I think Copenhagen is an important step along the way. I think right now we are seeing these important bilateral conversations occur between the U.S. and China and the U.S. and Brazil and the U.S. and Europe. That lays the groundwork for differentiated commitments and the kind of exchange and financing and technology that we have talked about.

I believe in Copenhagen we will see breakthroughs in framing issues like forests and deforestation and making them credible in the context of a global deal. We will see the creation and the framing of financing mechanisms, from funds to markets. I also believe that we will make some progress in terms of framing differentiated commitments.

But I agree with my colleague to my right that it is a step along the way. We will also see follow-up in 2010. We are on the right path. Copenhagen is an important moment, but it is going to be a combination of bilateral discussions and agreements, in addition to the UNFCCC process.

The CHAIRMAN. The gentleman's time has expired. The Chair recognizes the gentleman from Wisconsin, Mr. Sensenbrenner.

Mr. SENSENBRENNER. Thank you very much, Mr. Chairman. Ms. Finamore, welcome back home from Beijing.

My first question is what makes you believe that the Chinese are going to act any different in keeping commitments in this area than they have failed to do in keeping commitments under the WTO, particularly in the area of intellectual property rights?

Ms. FINAMORE. I think there is a big difference between the WTO Agreement and the Climate Change Agreement. As I said earlier and detailed it in my testimony, there are strong motivations and driving forces compelling China to agree to some sort of international climate negotiation that are unrelated to just growing its economy or competitiveness concerns. In fact, they believe that improving their energy efficiency is going to increase their global competitiveness. And I would also say that there is a lot of common ground here that I think needs to be explored in China's desire to move away from its high-energy-consuming industries which are responsible for the largest percentage of their energy carbon emissions.

Mr. SENSENBRENNER. I can quote the head of China's National Development and Reform Commission who said our general stance is that China will not commit to any quantified emissions reduction target. That is what the chief Chinese negotiator told me when I met with him in Poznam.

Energy efficiency in reducing greenhouse gas emissions are two separate and distinct issues, and China is now emitting more greenhouse gases than the United States. Maybe the Chinese are believing their own press releases, but given their track record, I can say that I read their press releases and I don't believe them.

That being said, given the unanimous vote in the Senate before Kyoto in 1997 and the fact that the treaty requires a two-thirds vote to ratify, what we are talking about here, how do you get it ratified, particularly when China is talking about this wealth transfer as mandatory spending which effectively makes China the recipient of a new foreign aid entitlement program.

Ms. FINAMORE. You quoted the comments made by the chief negotiator in China at the International Climate Agreements. And I would just say to you, for anybody who has spent any time in China, you have to understand that China, at least to my mind, has some of the best negotiators in the world. So what you are seeing is their negotiating position. Of course I would suggest that they are not necessarily going to make concessions at this stage in the negotiations until there is some opportunity for reaching a deal.

Mr. SENSENBRENNER. My time is running out. Let me say that given the last meeting in Poznam that lasted from 6 p.m. to 3 a.m. on Saturday morning, the Third World, led by China, was asking for more money. And this is money that the first world doesn't have. Our economy is in the tank, so is Europe's. So aren't we talking about an academic exercise here, because I don't know who is going to vote for a treaty that ends up transferring a trillion dollars of U.S. money to China and India?

Ms. FINAMORE. I think there has been a real sea change since Poznam that has been brought about by the new administration here.

Mr. SENSENBRENNER. Well, I have a minute left. I am looking at submissions that have been made to the UNFCCC by China and India last month, in February, which was after the change in administration. Maybe the administration has changed its negotiating policy, but certainly China and India haven't.

I think one of the reasons Kyoto failed was because even President Clinton, who signed the Kyoto protocol, recognized that it was unratifiable and thus never submitted it to the Senate for its consideration. I guess my point is to do anything in this area, we are going to have to do something that is politically feasible as well as accomplishing something.

I heard the comment of shooting for the stars and hitting the Moon. I think probably the way we are going now is that this rocket will crash 100 kilometers down range because of overestimations of what can be accomplished. Remember, you do need a two-thirds vote in the Senate. My time has expired.

The CHAIRMAN. The gentleman's time has expired. Although if you would like more——

Mr. SENSENBRENNER. No, that is fine.

The CHAIRMAN. The gentleman is a very good lawyer.

The Chair recognizes the gentleman from Colorado, Mr. Salazar.

Mr. SALAZAR. Thank you, Mr. Chairman.

Mr. Helme, you mentioned that you thought the legislation moving forward in the House was the way to go. I know many of us in the Blue Dog Coalition believe the Senate should move before the House when it comes to climate change legislation that is moving forward. We certainly believe we would be more successful if we could get a bill that would actually pass having the votes in the Senate before it moves to the House.

Mr. HELME. My sense is, given the election results, if you asked me this back in September, I would have said right, let's do the Senate first because that is our high water mark. I think the change has shifted the game. And once we are clear, and Mr. Markey has the key subcommittee, and Energy and Commerce will be the initial battleground, but once we are clear there, we have a good chance of moving a good bill, that is well-thought through, through the House in a timely manner.

I think in the Senate it is a bit more divided. We will have to deal more with the gang of 15, the members who are sort of swing votes. So I think starting out in the House makes sense. It is basically a political calculation. Can we get something done that sets a good marker and a good piece out there? I thought the Dingell-Boucher bill last year raised a lot of key issues. I didn't agree with the target. I thought the target was too weak, but a lot of the other stuff was very helpful. So you are further along; whereas what happened in the Senate was a big battle over the pot of money, and it wasn't very constructive. And I think we are in a better position in the House to move first, so I think it makes sense.

Mr. SALAZAR. I can almost assure you that what comes out of the House won't come out of the Senate. That is our biggest concern.

Mr. Lane, if you had to choose one action before all others to address global warming, what would that be?

Mr. LANE. It would be to develop and implement a really carefully structured energy research and development program. I think that actually Secretary Chu is talking about some of the changes that are exactly on target with what is needed, especially in the area of basic science and doing some of the longer-term more basic scientific research that is necessary to produce real cost breakthroughs for the future.

It is terribly important when we talk about R&D to focus on the earlier parts of the research process that are more basic and that the private sector will not do under any circumstances. Government has to do what only it can do. That is the most important thing, in my judgment, for reaching a solution.

Mr. SALAZAR. Thank you.

Ms. Finamore, given that China is one of the leading solar manufacturers in the world, what do you think we can do to encourage them to use more solar instead of building more coal fire plants, and are they engineering the coal fire plants so that in the future they can be retrofitted to eliminating carbon emissions?

Ms. FINAMORE. You are right that China is a leader in manufacturing and exporting of solar technologies, but it hasn't caught on yet domestically. A large part of that is the need to strengthen the policies and incentives that are listed actually in the renewable energy law that was passed in 2005 to implement them, and to also find ways to make sure that these renewable energy technologies are connected to the grid. So there are policy incentives that need to be strengthened in China because it already has the manufacturing capability.

I would add, it is already the leader in the world in solar hot-water heating technology. I think it captures 80 percent of the world market. Wind power is growing 150 percent a year. Solar has lagged behind, and I think there is a lot more to be done in the policy and incentive areas.

On coal fire plants, number one, all of the plants that are coming on line now are what is considered super critical or ultra super critical. So they are more efficient to begin with. They are actually blowing up the smallest, most highly polluting plants, coal-fired plants, so there is a gradual improvement in the energy efficiency and the emissions of those plants.

But China is already in the process of building its first IGCC plant which is going to be coming online in the next couple of years, and they are going to be designing that so the carbon can be captured and stored. I think this is another area where there is tremendous potential for cooperation between the U.S. and China on these two technologies that are in the beginning processes in both countries.

Mr. SALAZAR. Thank you.

The CHAIRMAN. The gentleman's time has expired. The Chair recognizes the gentlelady from South Dakota, Ms. Herseth Sandlin.

Ms. HERSETH SANDLIN. Thank you, Mr. Chairman.

If I could just follow-up, Ms. Finamore, on Mr. Salazar's question and what you just stated with regard to coal-fired facilities in China. I think including developing nations like China in any international climate change system is an important element and a practical climate change strategy that is going to be broadly acceptable to the American people, as some of the other questions from the Members on the committee have noted. And in your testimony and your response just now to Mr. Salazar, you note that China's thermal power expansion has been accomplished by replacing older plants with more modern plants and that China is pursuing clean coal technologies, including integrated gasification combined cycle.

I represent the State of South Dakota, and South Dakota like many States throughout the Great Plains and the southwest utilize coal power for a very high percentage of our power, and there are some very exciting plans underway, whether it is integrating IGCC technology or other clean coal technology in the region. And as you also I am sure know, the President has spoken favorably of clean coal projects, and I think it is clear that from a practical standpoint, that coal-fired power generation will play a significant role in the United States for years to come. Given that fact and China's interest in more efficient coal-fired facilities and in clean coal technologies, do you agree that the United States should commit the resources needed to be the world's leader in this area?

Ms. FINAMORE. Well, I am not an expert on what the United States should do, so I would defer to some of my colleagues on that.

Ms. HERSETH SANDLIN. Let me ask you, do you know comparatively in terms of what we have committed here in the United States versus what China has committed in terms of financial resources to developing these technologies to date?

Ms. FINAMORE. No, I don't; but I would be happy to follow up with you.

Ms. HERSETH SANDLIN. Please do.

Ms. FINAMORE. I would also say that I think it is important to note that the best way to reduce emissions from coal-fired power plants in China is to improve the energy efficiency. Studies have shown that China can cut its growth in energy demands by half just through becoming more efficient in its industrial technology and its buildings. Half of new building construction in the world is going on in China. So that has to be the first focus; and that is indeed China's primary climate change initiative.

Ms. HERSETH SANDLIN. Perhaps you can get us the statistics on how many financial resources China has devoted to energy efficiency, and we can compare that to what we have done here in the U.S., including what was recently included in the economic recovery plan.

Ms. FINAMORE. I would be happy to.

Mr. HELME. Also, China has been a participant and committed some financing to the Future Gen Project which was shelved, but I guess it has been resuscitated by the stimulus bill. They are also committing financing to the Europeans. Both the U.K. and the European Union have committed to building a demonstration plant in China, and China will contribute to that. And in the MIMM negotiations, the NDRC have basically said we are ready to put the equivalent of the supercritical kind of coal plant that Barbara was talking about. We will pay that part; but what we are looking for is could the U.S. give a tax credit to GE, to the vendor, to help write down the cost? It is 30 percent more expensive, just like it is here, and they would like to have that help on the technology to jointly work together. So there is a lot of interest in this, but they haven't done as much because it is higher cost, as it is here.

Ms. HERSETH SANDLIN. Thank you, that is very helpful. That is the only question I have.

The CHAIRMAN. We are going to a second round so if members have any additional questions, I will be able to recognize them for that purpose.

I am going to recognize myself right now for a question, and that will be for any of you to raise the issue of India for us briefly. If any of you would like to add that to the discussion, China is obviously, you know, the issue of the day, but India is moving rapidly as well. Would one of you like to address that issue?

Mr. HELME. I think in the negotiations, as I said sort of in response to Mr. Sensenbrenner's question, I think India is the outlier. They have been the most hard-line on the rhetoric about we have to have equal per capita emissions. They have been very hard-line on the financing and hard-line on not supporting unilateral actions.

You notice I talked about countries are doing things and not being paid for it. To date, India has done very little that was not paid for in the CDM. If you look at the spectrum of the debate, India is at the far right, along with the Saudis. And we can expect a pattern like we saw in the mercury negotiations where China moved, India was embarrassed, and India had to sort of follow behind China. India is the toughest nut to crack.

We do some work in India. Our perception is Indian industry is quite progressive on these issues, particularly in key sectors, cement, steel and so on. They are pushing the envelope in terms of improving intensity and efficiency. The difficulty is getting the government to come around. I would put them in a special category in terms of where we stand.

The CHAIRMAN. Let's talk a little bit about the implementation problems in these developing countries. There are impressive renewable energy targets in India, Brazil, Mexico, but give me your honest views as to the implementation probability in each of these countries. That would be very helpful to us. Ms. Finamore.

Ms. FINAMORE. I think you have hit upon the key problem in China. And responding to what some of the members asked earlier, I believe there is tremendous political will at the national level to achieve its renewable energy targets and energy efficiency targets.

The problem where they fall down is in implementation at the local level, provincial government leaders, heads of the major enterprises or factories. What I am very heartened to see is movement in this direction as well, although much needs to be done. And I think one of the most effective mechanisms that the government has just put into place is a system whereby the job promotions and actually ability to keep the jobs of the provincial governors is going to depend in part upon how well they meet these ambitious renewable energy, energy efficiency and emission reduction goals. I have found that single initiative has done more to concentrate the minds of the provincial leaders who are responsible.

The CHAIRMAN. So are you saying in Beijing they tell the provincial governors, you are going to be in or out of a job based upon your implementation of renewable energy and efficiency targets?

Ms. FINAMORE. In fact, yes. That is not the only factor that is going to be considered.

The CHAIRMAN. That would be the most important factor, though.

Ms. FINAMORE. Absolutely. But until recently, their job security was only based upon how well they grew their local GDP. Because they have a different political system, we could not do this in the

United States, but they have an integrated political system where provincial governors do in fact report to the central government. So the government has the ability to do so. It has made a huge difference.

The CHAIRMAN. We understand how Tammany Hall politics work. It didn't end that long ago in Boston. We understand how the local bosses, if they don't get the job done, might not hold onto their jobs. Do you think that is something that is likely to be enforced?

Ms. FINAMORE. Yes. When the rubber meets the road, it will be at the end of 2010. At the end of this current 5-year plan. That is when the numbers have to come in. There will be some scapegoats whose heads will roll. However, the concern I have is that the provincial governors are responsible.

The CHAIRMAN. Metaphorically, we hope.

Ms. FINAMORE. Not always.

Mr. ROBERTS. Mr. Chairman, I would like to refer to page 11 in my written testimony which I hope is going to be included in the record.

The CHAIRMAN. It will be, yes.

Mr. ROBERTS. It lists the progress that various countries have made against renewable energy targets. It is an impressive track record. It gives you the indication that they are actually making progress.

I wanted to also comment on, while we are talking about Governors and States, I don't know if any members of this committee attended the Governors Conference in L.A. that Governor Schwarzenegger held this past fall, but the ownership that Governors in States in the Amazon and Indonesia and China and elsewhere are taking of this issue, and the leadership that they want to demonstrate to the people who vote them into office is quite clear and impressive, and particularly their desire to join as part of global agreements and bring technology and solutions to bear to local populations.

The CHAIRMAN. You are saying this might be a tale of two countries. In Brazil, we might be better off with the provincial governors running the program, whereas in China we might be better off with the central government running it rather than the provincial governors. So it all depends upon where the most committed public officials are within the Nation's structure. But at the end of the day, we don't care what their governmental structure is as long as there is a measurable improvement in their production of renewables and their energy efficiency.

Mr. Lane, I am going to give you 1 minute to answer and then I am going to turn to Mr. Cleaver. Then I will come back and follow-up on my questions.

Mr. Lane.

Mr. LANE. My impression is that the provincial communist parties are actually a very important force in the central government, and we shouldn't I think look upon the Chinese Government as an entirely top-down enterprise in which the provincial governments are operating at the behest of the central government. That is why some of the 5-year plan targets in the past about restraining heavy

industry's growth have not been implemented, because the provincial governments have simply overruled the central government.

The CHAIRMAN. Thank you, Mr. Lane.

The Chair recognizes the gentleman from Missouri, Mr. Cleaver.

Mr. CLEAVER. Thank you, Mr. Chairman.

Mr. Helme, you made the comment, and Mr. Roberts as well, there were steps needed before Copenhagen, and that is down the road. But inevitably there is going to be a lot of talk here about how we cap emissions and there are all kinds of opinions on that. The Ranking Member mentioned, as he often does, cap and tax. I am intrigued by a concept that I have not heard a lot about, and it is cap and dividend. Are any of you familiar with this system? I would like your reaction to it if you are familiar with it.

Mr. HELME. I think this goes to the heart of Mr. Obama's budget proposal of last week where he is basically saying we will auction all of the allowances and then we will recycle that revenue in the form of paying for the middle-income tax cut, perhaps assisting people in terms of paying their electric bills and that kind of thing. That is the heart of it. It is very intriguing because you look at it from an economic standpoint, the way to reduce the overall cost of climate regulation, the best way is to recycle money and use it as tax-shifting, eliminate more distortionary taxes. It could cut the cost by 50 percent so we get more environmental bang for our buck by doing a portion of that. That is what we are talking about, the idea of putting it back through the Tax Code and taking it out.

Obviously, we have some other needs. We have some key energy technologies we want to see developed and so on. The administration is starting by saying that is where they would like to go, a small piece is for technology and small piece is for the poor, which is important. It is an opening bid. I think the idea is a very intriguing one and one that makes it possible to do more in terms of climate target for less, which of course we want to do in today's economic context.

Mr. CLEAVER. Essentially, we will be giving permits to pollute, and there are those who would say when those permits to pollute are granted, that many businesses will just consider that the cost of doing business, and that we don't inhibit or prohibit their ability to emit greenhouse gases because they just pay for it and continue. Do you think that is realistic? Maybe the tough economic times today would also have an impact on businesses where they would be a little hesitant about creating another cost of doing business.

Mr. HELME. Remember this auction idea, you are basically setting a cap which requires—in his case he is saying 14 percent reduction below 2005 levels, the President's proposal. So we are going to cap the total pollution that is allowed, and we are only going to sell permits up to that level of cap. So we are going to get a significant emission reduction. We are not going to let them buy as many as they want and then pollute to their heart's delight. We are basically saying we are setting that cap. Wherever you set the cap determines the environmental results. I think it has both in it.

Mr. CLEAVER. Thank you, Mr. Chairman.

The CHAIRMAN. The Chair recognizes the gentleman from Washington State, Mr. Inslee.

Mr. INSLEE. Hello, thank you.

I am sorry I have just been able to join you and you may have talked about this, but I would like your thoughts on what we should ask China on either a bilateral or multilateral agreement. So, should we address a bilateral agreement with China; and second, whether it is bilateral or multilateral, what is a realistic request of China? Is it an intensity number of CO_2 in their economy? Is it an investment number? Is it a cafe number? Is it a combination of those things? I would appreciate any and all of your thoughts on those subjects.

Mr. HELME. My sense is that China, in their climate plan of April last year, laid out reductions they would achieve in various sectors. I think they are very focused on sector-based rather than national targets. So we will do this in cement, this in steel, this in electricity, and this in oil refining. I think that is what we should look for.

What China talks about all of the time is doing this via technology. So in a 5-year plan, they have said to us you want us to make reductions in cement; we can do so many pounds of carbon per ton of cement, but we would rather say in 2020, 80 percent of our plants will have waste-heat recirculation, 70 percent will blend the cement with waste slag and that sort of thing, and 40 percent will do these other things.

So putting this in terms of technology is what China really understands and relates to. Their negotiator said to me, setting that emission target, if there is a lot of growth, we will have a lot of plants and the intensity will improve. If the economy tanks, like it is doing now, we will build less new plants and we will do worse in terms of the intensity target. So we are not sure we can get to that emission number, but we can confidently say to you that we can do this much of this technology, or its equivalent, and this much of that technology.

The discussion with China has to be how big; is it substantial and material in terms of total reduction? But in the specifics of help with technologies, you look at their submissions and their talk in the debate. That is where they are focused. They see this as the piece that is missing. The CDM doesn't help them build new, innovative technology. It just pays for today's technology. And that next round, as Barbara was saying, is what improves their efficiency and makes them more competitive.

Ms. FINAMORE. I do agree with that, and I would like to add two more points. One is that there is a tremendous amount of mistrust that has grown up between the two countries over the years on this issue. I believe there is a lot that can be done outside—both within and outside the context of the international climate negotiations to help prepare for Copenhagen—between the U.S. and China, which together account for 40 percent of all CO_2 emissions in the world. So we have developed a set of recommendations for how to strengthen the U.S.-China climate engagement, and that includes both suggestions for how the two countries should focus their bilateral discussions to come up with common ground on some of the key sticking points in the international climate negotiations such as the financial mechanisms and the technology transfers.

But I also suggest, and this is I think very much in line with Secretary Clinton's statements on her trip to Beijing recently,

which is there is tremendous opportunity here for bilateral cooperation on clean energy in particular, and this has two effects. One is that it can help to reduce the amount of mistrust that has built up. I think it can provide economic benefits for both countries.

Most importantly, no matter what agreement is reached at Copenhagen, you are going to have this implementation problem in China and other developing countries, and whatever bilateral efforts that you jump-start right now are going to help jump-start the implementation process. I believe there is a lot that can be done at a very low cost to the United States in helping to provide technical assistance to China, and that is the key area that should be explored now.

Mr. INSLEE. Mr. Roberts and Mr. Lane, I will take your answers in writing. I have limited time here.

Should there be an international research and development coalition or entity that is funded by the countries of the world? Should there be one unified, which will not be the exclusive place for R&D, but should there be one institute that we all contribute to to generate new technologies in this regard? Mr. Roberts and Mr. Lane, if you have thoughts on that?

Mr. LANE. Yes.

Mr. ROBERTS. Not necessarily. I believe that there needs to be some mechanisms for developing new technologies. Does there need to be one institute that drives that? I am not so sure. I believe what we have seen in bilateral negotiations between countries are a wealth of possibilities for cooperation between the U.S. and China, U.S. and India, and U.S. and Brazil. Does all of that need to be centralized? I am not sure. We need to reach economies of scale and ensure the fastest possible transfer of technology so we are not all trying to reinvent the same wheel at the same time.

Mr. LANE. I just wanted to say as I interrupted your question, sir, you were not indeed saying the opposite, that it didn't have to be the only vehicle, but there should be one.

Mr. INSLEE. Senator Voinovich asked Tony Blair this question the other day. To me there is a certain maybe romantic attraction to this idea that we are going to have some joint global R&D program, and maybe it is only 1 percent of our entire national R&D budget, but to me there is a certain charm of the entire world uniting in an R&D project, even if it is only a small portion of our global research budget. It is just one Congressman speaking.

Mr. ROBERTS. There is no question from our perspective that the more the world can come together and bring technology and finance to bear on these issues in a focused way, the better. So there will be opportunities, in fact an imperative, for us to take the cooperative, consolidated approach. And it will mean creating some new global institutions along the lines of what you described.

Mr. INSLEE. When you think how we eradicated smallpox, these were global, unified efforts. And they were not exclusive, but they were unified.

Thank you.

The CHAIRMAN. If I could follow up on Mr. Inslee's question and go to you, Ms. Finamore, China just passed a new stimulus package.

Ms. FINAMORE. Yes.

The CHAIRMAN. Could you tell us a little bit about how much money they put into energy environments and how much they put into research? Because all of these global stimulus packages are constructed differently, but it would be interesting for us to understand what China did in this one particular field.

Ms. FINAMORE. I would be happy to.

Last November China announced a stimulus package equaling 4 trillion renminbi which is equivalent to almost $600 billion U.S. It is a 2-year program and spreads out over ten sectors. There is a big discussion this week, it is the annual meeting of the National People's Congress and there is a big debate whether or not it should be expanded. So we could be hearing from the Premier on Thursday when he announces the National People's Congress, he may expand the stimulus package.

Almost all of this 4 trillion renminbi is for infrastructure construction, particularly railways. As opposed to developing its highway system, which also gets a lot of funds but not that much, it is good for mass transit purposes for reducing emissions from transportation. There is some concern that it is going to require greater manufacturing of steel and concrete to build out the railway system; 350 billion renminbi, or $50 billion, is earmarked for energy efficiency and environmental protection projects specifically. But I would argue that there is an opportunity here for China to spend a lot of the remaining parts of the stimulus package in a way that is going to promote sustainable development and reduce emissions. In particular, a lot of the money, 1 trillion renminbi is going to go.

The CHAIRMAN. How much is that, again?

Ms. FINAMORE. To get dollars divide by 7, will go towards rehabilitating the areas devastated by the earthquake; in other words, building. If China puts environmental criteria on this building, it could go a long way in reducing emissions.

The CHAIRMAN. Mr. Roberts.

Mr. ROBERTS. Recently a report issued by HSBC Global Research compared stimulus packages across many countries and looked at what percentage of the overall stimulus package was devoted to a low-carbon economy. While it praised the United States for their efforts toward a green economy, it evaluated our package and determined that about 12 percent is going to a low-carbon economy. And by contrast, about 38 percent of the Chinese stimulus package, by the same definition, is going toward a low-carbon economy. So it is much more oriented toward the things we are talking about.

The CHAIRMAN. So you are saying 12 percent of $800 billion is going to a low-carbon economy, but 37 percent of $600 billion is going to a low-carbon economy?

Mr. ROBERTS. According to the HSBC Global Research study, which is a global bank. It is a consumer bank out of London, and it has taken a keen interest in these issues because it is a consumer-based bank with branches throughout China and Europe and the world.

The CHAIRMAN. There is a measure of energy efficiency in China that caught my attention. It is the top 1,000 program. Could any of you elaborate on that program, how it works and how effective it is?

Mr. HELME. I think that was the same one that Ms. Finamore was referring to in her testimony, the energy efficiency program. My recollection of the data is they wanted 4 percent a year, and in the first year they got 1.2; but in the last 2 years, 2007 and 2008, we were close. We were just under 4 in 2007 and over 4 in 2008, so well on track. As Barbara indicated, it is 300 million tons a year which is very significant.

Ms. FINAMORE. Just as Mr. Helme said that we can reach a global climate initiative by focusing on just five or six developing countries, China has found that it can go a long way towards achieving its ambitious energy efficiency goals by focusing on just 1,000 factories, and that's what this top 1,000 factory program is. Together this 1,000 enterprises constitutes 33 percent, one-third of national energy consumption, and nearly half of all of its industrial energy consumption. They have targeted these plants and required every one of them to do an energy audit, hire energy managers. There are quotas, and they are apparently on track to achieve their quotas for each one of these 1,000 facilities.

The CHAIRMAN. Let's move to Mexico. We heard the testimony here that they want to cut their emissions in half by 2050. Some people might doubt the effectiveness of the Mexican Government, given what is going on with the drug cartels down there, and that will be the first issue that the people raise. What is the capacity for the Government of Mexico to implement such a bold plan? Do any of you want to speak to that issue? Mr. Helme.

Mr. HELME. Mexico is the thing I cited in terms of the details. The minus 50 is their aspirational goal. The President has put that in. They are going to release their national climate strategy in the next month or so. And as part of that, they will have specific goals for specific sectors. I cited the four sectors—cement, steel, oil refining and electricity. Importantly, we have looked at those sectors. Steel and cement are fairly efficient, more efficient than U.S. production, for example. The two other sectors, electricity and oil refining, are national companies, if you will. They are nationalized. They are incredibly inefficient. Oil refining, PMEX, is the worst scored refinery in the world, compared to any of the other world oil refining companies.

But the good news is these are nationally run agencies, so we have a good chance, I think, with the government being able to take this on. And President Calderon is very knowledgeable. He was the Energy Secretary before he became President. He knows these agencies inside out. He has brought them in and got a commitment from both of them to play and step up and do some things.

There are some huge opportunities. For example, there are 3,000 megawatts of cogeneration right there on the table today at these oil refineries and chemical plants they could do tomorrow. They haven't been able to do it because Mexican law basically says CFE, the utility, decides what they pay—like we all used to do before you all passed the energy reform in 1992—decides what they pay. And of course they pay nothing and so nobody builds a cogeneration.

So these things can be turned around. They are not costly. That is my point for Mr. Sensenbrenner. This is not buckets of money. This is simple loans to get them over the top to capitalize this

thing. So you are right, there are some real issues there. But I think there is a deep commitment at the President's level, and he has the legal authority. He doesn't have to pass a new law. He has authority to move forward with these efforts.

The CHAIRMAN. My time has expired. I would like to give Mr. Cleaver and Mr. Inslee time for additional questions if they are interested.

Mr. INSLEE. No, thank you.

The CHAIRMAN. Mr. Roberts, did you have a point on Mexico?

Mr. ROBERTS. I have been to Mexico seven times this past year, and I would agree with the assessment that President Calderon is serious about climate change. Mario Molina, the Nobel Prize winning scientist, is adviser on these issues.

The CHAIRMAN. From Lexington, Massachusetts, in my district. That is great.

Mr. ROBERTS. Mario Molina.

The CHAIRMAN. That is great.

Mr. ROBERTS. And the business leaders in Mexico, most of the business leaders in Mexico are quite committed to this and moving their industries in the right direction. I think there is a real opportunity in Mexico.

You raise that the President has his hands full in addressing the drug cartels in Mexico, but at the same time among the leaders of the world, I have seen him make a stronger commitment to this than most.

The CHAIRMAN. Remember that scene in Annie Hall where Woody Allen was listening to somebody critique a movie and Marshall McLuhan turns around to comment. Well, I had a session like that in my district in 1995 with 1,500 people. And I had it in Lexington, to critique all of the analysis of ozone depletion and all of that. And then this other man went over to the microphone and said, "Well, you know, I won the Nobel Prize on that subject." That is what can happen in Lexington when you are having a discussion on issues of this nature.

Let me give each of you then 1 minute to summarize what it is that you want us to remember as we are going forward in terms of these developing countries and what are reasonable expectations for our country and the world, both in 2009 and the years ahead, because I think that is going to be the way in which this debate gets framed. It will be in that long-term economic context of where the burdens are and how they are going to be shared.

So why don't we go in reverse order? We will begin with you, Mr. Helme.

Mr. HELME. This may not be a popular answer, but I think, Chairman, the key issue here in the negotiations is the financing. It is a tough sell here in the Congress, but I think it is, in terms of our good faith—as I said, there are two tests of the U.S.; one is do we have a real target and is it strong? I think we can deliver on that side. And can we step up and show we are willing to help?

The developing countries feel that the 1992 Rio Treaty and the 1997 Kyoto protocol both said Annex 1 will pay incremental costs. They will contribute to this, this and this, and the track record has been dismal and very little to show. Obviously we are in tough eco-

nomic times here, but I think we need to think of targeted ways where we can show good faith and move this ball forward.

I think China is ready to act. Mexico, Korea, Brazil, they are ready. India is in a different category. The others are serious. China will step up and outdo us if we show good faith. I don't think that it is about billions, it is about good faith in saying we will help you with technology and help you with capacity building, as my colleagues have said. I think that is the bottom line.

The CHAIRMAN. Thank you, Mr. Helme.

Mr. Lane.

Mr. LANE. Mr. Markey, I guess I would say that the sign of commitment on the climate issue is really a willingness to impose a price on carbon emissions. I would be inclined to use that as the standard for assessing whether developing countries and developed countries are actually serious about reducing their greenhouse gas emissions. Are there comparable prices being put on greenhouse gas emissions? I don't think it necessarily has to be a high price to begin with, but I think we need to keep an eye on the relative prices and to make sure that ours don't get out of line with the rest of the world.

I guess the only other point I would add to that is it seems to me that this is likely to be an iterative procedure. We need to continue to monitor this and adjust our behavior to make sure that it stays in line with the behavior of our major trading partners.

The CHAIRMAN. Using your measurement of serious, would you say that the price that is being set in the European Community right now is serious?

Mr. LANE. Yes, I would. I would point out that their price applies to only a relatively small percentage of their total greenhouse gas emissions, though. It is important to keep in mind what emissions are covered and how much of a country's total emissions are actually being covered by the control system.

The CHAIRMAN. But they are serious about the proportions that they are covering?

Mr. LANE. I believe, yes. Anything that gets us started toward having a price on emissions, I think is a step in the right direction and a good point for further negotiations.

The CHAIRMAN. Thank you, Mr. Lane.

Mr. Roberts.

Mr. ROBERTS. There is no substitute here at home for putting a price on carbon. All of the things that we are talking about will not go to scale. The investments won't happen without putting a price on carbon. At the same time, we can't expect every other country to make the same kind of commitment that we make. It has clearly been established that there will be differential commitments that reflect different countries' political contexts.

My final comments would be we need global reductions to solve the problems we have here at home. The smart money is not to spend all of our money here in the U.S., but to provide financing and technology to achieve low-cost solutions elsewhere in the world, because a ton in China and a ton in Mexico affects us just as much as a ton created here in the U.S.

So I believe a smart provision of financing, not just to clean technologies but also to adaptation through instruments like the Global

Environmental Fund, are essential to address the problem. And I believe that we need to create partnerships with other countries through bilateral negotiations and through Copenhagen to make this happen.

The CHAIRMAN. Thank you, Mr. Roberts, very much.

Ms. Finamore.

Ms. FINAMORE. I would once again like to urge the committee to look beneath the negotiating posture of China to the tremendous progress that has already been made and the tremendous areas of common ground that exist between the two countries in order to break through the stalemate that has existed for so many years on climate issues.

A lot of the work that can be done should be going on now with bilateral dialogues. Some of the efforts going on now are to bring together legislatures from the U.S. and China to talk about these issues. Whenever we go to China—my executive director is there right now—we get questions about what is the U.S. thinking. There is not a lot of understanding about what is happening with this new administration, but a tremendous amount of interest.

I would also say that the bilateral work that needs to be done has already begun. In fact NRDC has been working for over 13 years in bringing together experts from both the U.S. Government and California and other leading States in the U.S. on these kind of technology transfer technical assistance programs, so this can form the backbone of an expanded effort.

Just last week, for example, we brought the new acting chairman of the Federal Electricity Regulatory Commission to China to speak at a major energy efficiency conference that we sponsored, and we got the new Secretary of Energy to participate by video. We look forward to working with you as we move forward on these issues.

The CHAIRMAN. Thank you, Ms. Finamore, very much and thank you for traveling from Beijing to deliver your testimony today. There is no evidence of any jet lag in your performance here today, and we thank you for that.

So there is good news of a sort. We have learned that China's goal by the end of this year is to be the leading exporter of renewable energy technology in the world. That is good news; and, of course, it is bad news because that should be something that we are touting in the United States. Brazil has established a goal of reducing deforestation by 70 percent, and we have heard the litany.

But at the end of the day, as our witnesses have told us, to construct a global treaty, we are going to need measurable goals that are accepted by all of the developing countries in the world as well. That must be articulated in partnership with the developed nations and the United States in order to achieve this goal must be a leader, not a laggard, when it reaches Copenhagen.

That is the goal the Congress has set for itself this year, to develop legislation that will allow the President to go to that negotiation as a credible negotiating partner with the other nations in the world.

We thank each of you for your testimony.

With that, this hearing is adjourned.

[Whereupon, at 11:20 a.m., the committee was adjourned.]

THE SELECT COMMITTEE ON
ENERGY INDEPENDENCE AND GLOBAL WARMING

Dear Mr. Roberts:
Following your appearance in front of the Select Committee on Energy Independence and Global Warming, members of the committee submitted additional questions for your attention. I have attached the document with those questions to this email. Please respond at your earliest convenience, or within 3 weeks. Responses may be submitted in electronic form, at aliya.brodsky@mail.house.gov. Please call with any questions or concerns.

Thank you,
Ali Brodsky

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1) **Can we see meaningful reductions in global emissions without significant emissions reductions from developing countries?**

Yes. Our greenhouse gas emissions are very high in the US relative to other countries. The reductions we can make by showing leadership on this issue are definitely meaningful. The US and other developed countries are responsible for the vast majority of excess carbon now found in the atmosphere due to two centuries' worth of industrial development, and – because excess carbon emissions accumulate in the atmosphere and can remain present for a century or more – developed countries bear the lion's share of the responsibility for current climate change impacts.

The more carbon that is pumped into the atmosphere, the greater the disruption to the climate system, and the more severe the impacts that we will experience over time. The Intergovernmental Panel on Climate Change (IPCC), which represents the scientific consensus on climate change, has indicated that to have a 50% likelihood of limiting global warming to 2 degrees Celsius or 3.6 degrees Fahrenheit over a pre-industrial baseline, we must reduce emissions 80-95% below 1990 levels by 2020. A global average temperature rise of 2 degrees

Celsius or more is predicted to have catastrophic impacts, such as loss of coral reefs, as well as the globally important fisheries that rely upon them. The further we overshoot this 2 degree Celsius threshold, the more violent the disruption to the climate will be. Any steps that developed countries including the United States take to greatly lower their emissions will improve the situation over a business-as-usual trajectory and have a meaningful effect on keeping atmospheric carbon concentrations as low as possible – and the resulting impacts as manageable as possible.

Given the lack of action by wealthier industrialized nations up until now, at this point we also need to see emissions reductions in relatively poor developing countries – specifically those that have a higher capacity to act and/or a relatively greater responsibility for the problem than other developing countries. Rather than demand those actions take a particular form, we need to do what we can to support the efforts of relatively poor countries to adopt cleaner development pathways than the carbon-intensive ones that we have followed and that have been the source of both our relative prosperity and the climate crisis we now face. It is no small request to ask the countries that are next in line to industrialize to forego the cheap but dirty development pathways that the developed world has benefited from for two centuries. Given our historic responsibility for the problem – one which will have the greatest impacts (in some cases devastating ones) on those countries least responsible for it – the US needs to offer flexibility and humility in the current negotiations over an international agreement. If we are to protect the most vulnerable peoples and cultures, everyone must be willing to do their part according to their common, but differentiated, responsibility for the crisis at hand.

2) **If Congress crafts legislation to place mandatory restrictions on carbon emissions, how do you envision such a bill interacting with an international protocol? Should Congress pass a bill without provisions that require international participation, and if so, how can Congress craft legislative language that will not be ruled illegal by the WTO or instigate global carbon trade wars?**

An international climate treaty is the best way to avoid WTO problems. Rather than requiring international participation, Congressional legislation should contain the elements that will give

the Executive Branch the best possible negotiating position for crafting an international protocol. In order to facilitate and support such an international protocol, the bill needs to address the elements of the so-called 'Bali Action Plan,' which were agreed to by the international community, including in the Bush Administration on behalf of the United States, in December 2007. Addressing these issues in domestic legislation will make it possible for the US to join the international climate change deal and incentivize developing countries to join also.

To adequately address the US commitment under the Bali Action Plan, the US should take the following actions:

1. Mitigation:
    a. Ambitious reductions in emissions for each year, including an economy-wide emissions reduction goal of 25% below 1990 levels by 2020, with steeper targets in subsequent years, and an 80-95% reduction below 1990 levels by 2050.
    b. A target for reducing emissions from deforestation that will create the equivalent of another 10% of emissions reductions below 1990 levels by 2020.

2. Adaptation: An allowance allocation of at least 7% to cover the costs associated with international adaptation, particularly aimed at the least developed countries, small island developing states, and African nations prone to floods and droughts.

3. Technology: An allowance allocation of at least 5% for clean technology cooperation in order to help developing countries shift away from carbon-intensive energy sources and toward clean energy development pathways, and to assist them in providing clean energy access to 1.6 billion people who currently lack access to basic electricity, while creating investment opportunities for renewable energy industries.

3) **As a carbon-free source of energy, do you believe nuclear power needs to be a part of the solution?**

WWF believes that nuclear energy is not a cost-effective solution to the problem of climate change when compared with other truly renewable energy technologies. We believe focus of US energy policy should be on robust support for research and development of carbon-free, renewable and plentiful domestic energy sources, such as wind, solar and geothermal. These renewable energy sources can be scaled up as quickly and with a lower cost to the economy and greater health and safety of Americans than nuclear power.

4) **As you know, deforestation heavily contributes to global greenhouse gas emissions. How can an international framework properly address emissions due to deforestation, particularly when measuring emissions from deforestation is so difficult?**

There is an emerging consensus around an international framework to reduce and ultimately eliminate emissions from deforestation and forest degradation. We now have the tools and methodologies that we need in order to measure forest cover through remote sensing at an increasingly lower cost. When combined with ground truthing, scientists can now assess the carbon content – and associated emissions – of tropical forests to an acceptable degree of uncertainty. With adequate capacity building funding, a growing number of countries should soon be in a position to measure, report and verify through third party sources, emissions reductions associated with avoided deforestation.

Given the very high carbon content of tropical forests, particularly tropical rainforests, when compared to other forests, including those in the United States, it makes good sense to focus attention and resources at reducing this important source of emissions. Moreover, targeting these emissions provide key additional benefits including protecting vanishing biodiversity and helping some of the world's poorest people develop more sustainable economic livelihoods. On top of it all, reductions in emissions from deforestation could likely be produced at a lower cost than the same amount of emissions in the United States. So, when combined with deep domestic reductions, avoided deforestation can provide an important, economically efficient source of additional emissions reductions that are important to reduce the risk of dangerous climate change.

5) **If there is not a final protocol agreed to at Copenhagen, then what?**

Copenhagen is a critical moment in history, and countries must come together there to agree to a deal. That is not to say, however, that all of the final details will be worked out in Copenhagen. Even following a deal in Copenhagen, many details will remain to be negotiated – much as the Marrakesh Accords of 2001 fleshed out the broad underlying agreement of the 1997 Kyoto Protocol. Regardless of the outcome in Copenhagen this December, Congressional leadership will continue to be needed going forward.

Moreover, given the critical need to rebuild the U.S. economy on a more sustainable, prosperous path, we cannot afford to wait for other countries to move toward a clean economy. For our own national, economic interest, we must begin to help the U.S. catch up in the race to build a global clean energy economy.

6) **Even if developing nations agree to emissions caps, varying policies and carbon prices will inevitably lead to leakage. How can the United States ensure the long-term vitality of our economy when facing leakage?**

To ensure the long-term vitality of our economy, the US must aggressively pursue and incentivize climate solutions. In the long term, the United States can address the issue of leakage most effectively by ensuring the nations of the world agree to a global deal on combating climate change. Consistent with the agreed framework of common but differentiated responsibilities, such a deal would eventually bring all nations on board with a shared set of principles, ensuring a level playing field to compete in a low-carbon global economy. In order to ensure such a deal, one of the components Congress should be sure to include in domestic legislation is financing for international clean technology cooperation in developing countries. This financing, which developed countries agreed to provide in the UN Convention on Climate Change (signed and ratified by the United States), will help developing countries to leapfrog over the development of old carbon-intensive infrastructures, move quickly to develop clean energy systems, and provide clean energy access for the 1.6 billion people in the developing world who lack even basic

electricity. By helping developing countries develop, adopt and deploy these technologies, the U.S. will create business opportunities for its own clean energy industries, lower the price of these technologies for everyone, and alleviate competitiveness concerns. In addition, climate and energy legislation being developed in the U.S. House of Representatives contains measures designed to address domestic competitiveness concerns.

7) **The February 1 edition of the India newspaper, *The Economic Times* quoted IPCC Chairman R.K. Pachauri as saying "negotiations are going on for the conference of parties at the Copenhagen where we will have a multilateral worldwide agreement . . . Of course, the developing countries will be exempted from any such restrictions but the developed countries will certainly have to cut down on emissions." And January 29th's issue of the *Financial Times* quoted top U.N. climate change bureaucrat Yvo de Boer as saying: "I don't think developing countries will accept binding targets." What are your reactions to these statements, and what do they portend for this year's negotiations?**

It is clear from the national actions of a number of large developing countries that they are more than ready to do their fair share to reduce global emissions. At present, many of the largest developing countries continue to have much stronger policies and measures relative to ours. Even after the recent announcement of federal plans for improved fuel efficiency, American cars on average still produce greater emissions than Chinese cars. China, Mexico, Brazil, the Philippines and others have all agreed to establish a form of renewable energy standard, while the United States has, so far, refused. New coal-fired power plants in China are more efficient than there American counterparts. The list goes on.

Once the US begins to show leadership on this issue, the race towards investment in clean energy will accelerate. That said, the basic fact remains that most developing countries have very low per capita emissions, and most also have extremely low total emissions as compared to the US. (Average per capita emissions in the US are 4 times greater than those in China and nearly 20 times greater than those in India, for example). At the same time, these countries are struggling with crushing poverty, food security issues, and health crises. Because of these fundamental

realities, the global community has agreed that while developing countries should take actions to reduce emissions, these should be 'nationally appropriate' and help these countries climb out of deep poverty. This basic agreement will mark any successful framework for reducing emissions and achieving a climate deal.

8) **Despite China's aspirational goals and targets, will China's absolute greenhouse gas emissions rise or fall?**

If China implements its aspirational goals and targets, then that country's absolute greenhouse gas emissions will rise in the short term and then decline over time. This is a similar trajectory to what will happen under a US domestic emissions cap, which would peak and then decline.

While China's overall economy has grown in recent years, its gross domestic product is partially a function of a very large population, masking deep poverty. Nearly half of the world's abject poor (living on less than $1/day) live in China and India alone; none live here in the United States. Faced with these challenges, developing countries like China continue to struggle with how best to reduce emissions while responding to crushing poverty. They have not always succeeded in their attempts to reduce emissions and they are not in a position to make all of the necessary reductions on their own. This is no surprise..

Many in the developing world are only now gaining access electricity. This includes China, where in 2006, 27 million people lacked access to basic electricity service according to a report by the UNDP. Impoverished populations in the developing world understandably aspire to attain basic conveniences that we take for granted in the United States. Moreover, as the world economy has become increasingly globalized, much of our demand for emission-intensive products, like beef, aluminum, lumber and cement has shifted to the developing world – and along with the associated emissions.

Even taking China's rapid growth into account, China's per capita emissions remain far below that of the United States. As of 2005, the average Chinese person emitted just under 6 tons of carbon per year compared to the nearly 24 tons of carbon per year emitted by the average

American. Given these factors, China's emissions will undoubtedly rise in the short term as it develops, and the peak and decline in Chinese emissions will inevitably come later than those for U.S. emissions because we do not face the same development challenges, having dealt with them a century ago (largely through the burning of fossil fuels and a corresponding rise in greenhouse gas emissions).

9) **How does China's centrally-planned economy influence its ability to reach national goals, such as its renewable energy standard? Do you think the United States' economy should become centrally planned?**

Countries around the world have successfully used different economic and regulatory means and different governing systems to achieve their national goals, including the adoption and implementation of renewable energy standards. Throughout its history, the United States has successfully used a combination of regulatory and market-based mechanisms to achieve its national goals. This included the implementation of a cap-and-trade system to reduce airborne pollutants responsible for acid rain pollution, which was adopted by the Congress in the 1990 Clean Air Act amendments and signed into law by President George H.W. Bush. This uniquely American regulatory device was preferred by the business community in the United States as a way to comply with needed limits on dangerous air pollution, while allowing industrial sectors to maximize efficiencies.

Countries regularly set standards for products and economic practices without relying on central planning. Responding to climate change is a perfect example. While the central government in the United States failed to act, a growing number of state governments took action to reduce dangerous carbon pollution, while aligning their states to cash in on a clean energy economic future. Partially due to this "bottom up" demand for action on climate change, many business and industrial interests have called on the US federal government to take long-overdue action to reduce carbon pollution and help set the country as a whole onto a sound, long term economic future.

As more and more countries are adopting common goals regarding renewable energy standards and other measures to limit carbon emissions, those individual countries are working within their own particular and diverse governing and economic systems to implement those goals and objectives in the most cost-effective and successful ways. There is no need for the United States economy to become centrally planned in order for it to achieve our national ambitions, and our history of successful achievements as a federal democracy is a testament to this fact.

10) **It is important to highlight the role deforestation plays in total emissions, but recent reports state that deforestation has continued to rise sharply in Brazil. Is there a way to accurately measure deforestation rates in Brazil? How can the Brazilian government actually enforce the problem?**

Brazil's is developing and implementing one of the most sophisticated forest change tracking systems in the world, based on remote sensing methods and linked in to land management databases in state-level governments. This system is so widely regarded that it is being made available to other governments.

We disagree with the characterization that "deforestation has continued to rise sharply" in Brazil. After an increase in 2004, near term trends in deforestation rates in Brazil have been markedly downward. Moreover, the fact that we know that deforestation rates rose a few years ago, as noted in the question, is evidence itself of Brazil ability to monitor changes in forest cover. The long term trend toward decreasing rates of deforestation has been due greatly to the efforts the Brazilian government. These have helped substantially reduce deforestation in the Brazilian Amazon by 56% since 2004. This alone represents a decrease of 1.3 billion tons of CO2 emissions in relation to the previous 4-year period, or nearly 20% of the U.S.'s current annual emissions of CO2-e (7.0 billion tons in 2006). Building on these actual reductions, in December the Brazilian government announced a new target of reducing deforestation by 70% below 2006 levels by 2017. This would avoid 4.8 billion tons of CO2 emissions – equivalent to over two-thirds of current annual emissions in the United States.

Enforcement is an important component of the larger strategy to meet these emissions reduction targets, which is why the Brazilian government is stepping-up enforcement against illegal logging, deforestation and other environmental crimes. Other steps the government is taking include prohibiting financing for landholders without clear tenure or in breach of environmental laws; accelerated land reform to establish clear tenure rights in areas subject to intensive social conflict; and the development of a legal framework for forestry concessions in public forests.

11) **What are the most significant barriers to technology transfer to help developing countries become more energy efficient?**

The World Business Council on Sustainable Development has released a report outlining the specific barriers to energy efficiency technologies (see attached). One significant factor is the length of the payback period for energy efficient technologies.

12) **With a limited pool of funding, which is more important to fund, adaptation measures or mitigation measures?**

It is critical that we fund both mitigation and adaptation. We are locked into a significant amount of climate change and the corresponding negative impacts due to the anthropogenic carbon emissions that have already been and continue to be released into the atmosphere. Adaptation financing is necessary in order to cope with impacts that are already occurring and that will increase in scope and severity over time. Mitigation financing is necessary to reduce the costs of future adaptation and avoid severe impacts for which there is no meaningful way to adapt. Necessarily robust levels of mitigation assistance will help reduce the need for substantial adaptation costs in the future, both at home and abroad. Continuing on a business-as-usual trajectory will ensure severe, irreversible and potentially catastrophic consequences for the climate system, and we must fund measures that will rapidly shift our economy and the economies of developing countries to clean energy development pathways.

13) **You speak of developing countries' recognition of and leadership in addressing climate change issues. Yet, from India and China and Brazil and others, the**

governments and representatives of these countries have come out and said that developed countries, such as the US, are expected to fund a significant percentage of their costs, with China even going so far as to say they expect us to redistribute over 0.5% to 1% of our annual GNP. In the *VERY* likely event that the US is unwilling to mail these countries an annual check of around $200 billion dollars by 2020, what is your assessment of the likelihood of these countries continuing to aggressively pursue an agenda of reduced energy output?

Under the UNFCCC and the Bali Action Plan negotiated by the Bush Administration in 2007, developed and developing countries agreed upon four pillars that would provide the foundation of a new international climate change agreement to be negotiated in 2009. These included commitments by developed countries (including the United States) to set ambitious near-term and long-term emissions reductions targets and to provide financing to assist developing country efforts to mitigate their own emissions by shifting to clean energy technologies and protecting their tropical forests and to adapt to climate change impacts. This framework was based on the fact that developing countries bear relatively little responsibility for climate change but are likely to face the greatest impacts and greatest hardships in a carbon constrained economy. It is the "polluter pays" principle writ globally. Estimates of the annual needs for both adaptation and mitigation financing are in the billions of dollars. Based on the U.S. historical contribution to greenhouse gas pollution, it could be expected to contribute about a quarter of the expected public funding needs. This public funding can be used to cover the incremental cost of transitioning economies to low carbon pathways, while incentivizing private sector investment to bear a substantial share of the mitigation cost.

No public financing mechanism to assist developing countries currently exists, yet even in its absence, these countries are already taking notable steps to respond to the threat of climate change and reduce their emissions. These countries are motivated by concerns similar to those here in the United States: they already are experiencing climate change and its impacts and they see an economic advantage to becoming an early leader in the clean energy economy.

As noted by President Obama's science adviser, John Holdren, "the major developing country emitters like China and India have recognized that climate change is already harming them and it can't be fixed without them." China is experiencing the worst drought in a half century in eight of its provinces, since November 2008, prompting the country to declare its highest level of emergency in early February. Drinking water for over 4 million people has been affected, along with more than 24 million acres of cropland. In June and July 2007, it was the opposite extreme with devastating floods and landslides affecting seven provinces. When warm temperatures came early to China this year – with Nanjing experiencing the highest temperature in a century for the date – the chief forecaster for the Chinese National Meteorological Center (NMC) said "Spring has come early in some areas of East and Central China this year, and it's because of global warming."

Despite bearing relatively little responsibility for the current impacts of climate change, emerging economies have determined that it is in their self interest to be part of the solution. In advance of the UNFCCC negotiations last December in Poznan, several key emerging economies offered comprehensive proposals to reduce their emissions, which included specific targets and timetables. These developing country commitments have come even in the absence of United States making good on its commitments to reduce emissions or to provide significant financing for mitigation as adaptation, as called for under the UNFCCC and the Bali Action Plan.

The seriousness with which these key nations have undertaken planning and targeting to reduce emissions is a significant step that demonstrates their recognition of the threat of climate change and an interest in transforming their economies towards a low carbon path, even where that would require new and significant changes. In the coming years, we expect these actions to continue, but in order to live up to US commitments under the Bali Action Plan and help accelerate needed emissions reductions, we must make wise investments in assisting countries to reduce emissions.

14) **Who established these countries' (China, Mexico, Brazil, India, Philippines) renewable energy standard (RES)? While extremely commendable, considering**

that they are all well on the way to being met, is it possible that some of the countries established standards that they knew they would meet anyway, based on activities planned a long time ago?

The renewable energy standards in these various countries were established by their respective national governments, just as a renewable energy standard for the United States could be established by the United States Congress if a policy choice were made to move the United States towards a clean energy economy. Regardless of whether countries had the foresight to implement renewable energy policies or systems before adopting a nation-wide standard, the ambition of those standards and the benefits accruing to the climate system are the same. If the government mandate affirms and accelerates an existing positive trend toward renewable energy production, then all the better.

One would expect that these governments set standards for renewable energy that they believed they could meet, which in no way diminishes the fact that these are aggressive and ambitious targets requiring effort and commitment when compared to a business-as-usual trajectory. One would expect the United States to also adopt an RES that it would expect to meet in the designated timeframe.

We hope the ambition of that RES will be commensurate with the ambition, ingenuity and drive of the American people, the size of the economic opportunities it will create, and the seriousness of the environmental challenge we face. It is worth noting that at present, the various RES levels being proposed in the debate over House climate and energy legislation are in some instances weaker then those already adopted by a number of individual state governments.

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Thank you,
Ali Brodsky

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1) Can we see meaningful reductions in global emissions without significant emissions reductions from developing countries?

US leadership is crucial to secure a global agreement to address climate change. As the US Climate Action Partnership put it:

> U.S. leadership is essential for establishing an equitable and effective international policy framework for robust action by all major emitting countries. USCAP believes that adoption of mandatory U.S. climate policy is an essential precondition for a full and effective international framework.[1]

Engagement with the major developing countries is crucial because their economies and emissions will continue to grow at a much faster pace than developed countries and will become an increasing portion of global emissions in the future. To minimize this growth in emissions while developing economically, developing countries will need to pursue a low-carbon development path and developed countries will need to provide them with incentives to support this transition. Leadership by the US, along with actions by developing countries and incentives from developed countries, can achieve meaningful reductions in global emissions.

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[1] See the USCAP Blueprint: http://www.us-cap.org/pdf/USCAP_Blueprint.pdf

2) If Congress crafts legislation to place mandatory restrictions on carbon emissions, how do you envision such a bill interacting with an international protocol? Should Congress pass a bill without provisions that require international participation, and if so, how can Congress craft legislative language that will not be ruled illegal by the WTO or instigate global carbon trade wars?

NRDC supports passing a climate bill that provides incentives for countries to participate in multilateral climate agreements. Enacting strong domestic climate legislation, like the American Clean Energy and Security Act (ACES), that places a mandatory cap on GHG emissions in the U.S., would send a strong signal to other countries, including China, that the U.S. is serious about climate change and is taking concrete action to cap and reduce its GHG emissions. The ACES bill includes measures to protect U.S. jobs from unfair competition by countries that fail to cut their emissions and provides strong incentives for developing countries to commit to measurable, nationally appropriate mitigation actions in an international agreement, such as by improving energy efficiency in specific industrial sectors or reducing deforestation, assisted by allowance set-asides and technology cooperation measures.

3) As a carbon-free source of energy, do you believe nuclear power needs to be a part of the solution?

Existing nuclear power plants are already playing a role in GHG mitigation. Capping carbon emissions will send market signals that favor all forms of low- and no-GHG power generation, including nuclear power. NRDC believes, however, that Congress should not adopt new subsidies for construction of new nuclear plants because these plants, with their high capital costs, are not economically competitive with investments in energy efficiency, electricity supplied by renewable sources, or electricity from coal plants equipped with carbon capture and storage. When nuclear power plants' high costs are combined with (1) unresolved concerns about environmental and human safety risks posed by uranium mining, (2) potential accidents at nuclear plants, (3) the problem of waste disposal, and (4) the potential proliferation of weapons-grade nuclear material, the construction of new nuclear power plants ranks low on the list of carbon mitigation options.[2] NRDC applauds the Obama administration's recent decision to end the previous administration's Global Nuclear Energy Partnership program and to drop consideration of building commercial fuel reprocessing plants and fast reactors.

4) As you know, deforestation heavily contributes to global greenhouse gas emissions. How can an international framework properly address emissions due to deforestation, particularly when measuring emissions from deforestation is so difficult?

Emissions from deforestation account for about 20 percent of global CO_2 emissions, so it will be crucial that the international framework provide the proper incentives for developing countries to reduce emissions from deforestation in a way that is measurable and avoids leakage of deforestation emissions to other countries. NRDC has joined with a coalition of businesses and

[2] See Statement of Thomas B. Cochran, Ph.D, on the Environmental, Safety and Economic Implications of Nuclear Power and Its Role in Mitigating Climate Change, before the House of Representatives Science and Technology Committee, April 23, 2008.

NGOs to establish principles for U.S. climate legislation and an international framework to address deforestation.[3] Among these principles, NRDC and this NGO and business coalition recommend that U.S. climate legislation set aside 5% of the allowance value in a cap and trade program for deforestation emissions reductions and allow reductions in deforestation emissions to generate emissions reduction credits for use by US companies to meet their emissions reduction targets. We believe that this framework should also be incorporated in an international framework. We also recommend that there be strong environmental safeguards in place to ensure that forest emission reductions are additional, permanent and address leakage, and that tradable emission reductions be registered and serialized to avoid double-counting.

ACES provides for auctioning five percent of the bill's allowances to support deforestation reduction activities during the years 2012-25, three percent during 2026-30, and two percent during 2031-50. This funding will assist in reducing emissions from deforestation and strengthen forest governance, management and enforcement programs and programs to measure, report and verify reductions and prevent leakage.

5) If there is not a final protocol agreed to at Copenhagen, then what?

It is crucial that the global community reach a robust, comprehensive climate agreement in Copenhagen that is consistent with science. It must include sufficiently aggressive emissions targets for developed countries and measurable, reportable and verifiable mitigation actions appropriate for developing countries. It must address financing and technology development issues, as well as deforestation and adaptation. Countries should be working now to agree on the basic contours of such an agreement rather than waiting until December. If countries are unable to reach agreement in Copenhagen, it is possible that the meeting can be extended to finalize the shape of the post-Kyoto climate agreement. But US leadership to enact a cap on our global warming pollution this year will send a strong signal to the world and enable the US climate negotiators to help secure a strong agreement in Copenhagen.

6) Even if developing nations agree to emissions caps, varying policies and carbon prices will inevitably lead to leakage. How can the United States ensure the long-term vitality of our economy when facing leakage?

Leakage—the relocation of carbon-intensive industries from countries with strong GHG restrictions to countries with no or weak GHG restrictions—can and should be addressed through provisions in the international climate protocol and US climate legislation. Both the international agreement and domestic legislation can encourage the major developing countries to improve the carbon intensity of their major carbon-intensive industries, such as steel, cement, aluminum and electricity. Temporary domestic measures, such as allowance rebates to energy-intensive, trade-exposed domestic firms, or border adjustments on imports of carbon-intensive

[3] Avoided Deforestation Partners Unity Agreement, Consensus Principles on International Forests for U.S. Climate Legislation, available at: http://adpartners.org/pdf/ADP%20Forest-Climate%20Unity%20Agreement-%205-18-09.pdf

goods from countries with weaker GHG restrictions, are other possible ways to address leakage while we pursue stronger international commitments.

7) **The February 1 edition of the India newspaper, *The Economic Times* quoted IPCC Chairman R.K. Pachauri as saying "negotiations are going on for the conference of parties at the Copenhagen where we will have a multilateral worldwide agreement . . . Of course, the developing countries will be exempted from any such restrictions but the developed countries will certainly have to cut down on emissions." And January 29th's issue of the *Financial Times* quoted top U.N. climate change bureaucrat Yvo de Boer as saying: "I don't think developing countries will accept binding targets." What are your reactions to these statements, and what do they portend for this year's negotiations?**

China has indicated that although it will not agree to absolute caps on its greenhouse gas emissions, it may agree to energy and/or carbon intensity targets, i.e., targets to reduce the energy consumed or carbon emitted per unit of GDP.[4] The Bali Action Plan provides that developing countries should undertake nationally appropriate mitigation actions (NAMAs) that are measurable, reportable and verifiable, in exchange for financial and technological assistance from the developed countries. If China were to commit to economy-wide or sectoral carbon intensity targets, this would be an important step by a major developing country to agree to some kind of quantifiable binding target, which the developed countries should encourage through financial and technology assistance. China's leadership would likely be followed by other large developing countries. The ability of the United States to secure commitments from developing countries in the negotiations will be enhanced enormously if we can come to the table with the serious domestic emission reduction program that is contained in the ACES bill.

8) **Despite China's aspirational goals and targets, will China's absolute greenhouse gas emissions rise or fall?**

There is no doubt that China's absolute greenhouse gas emissions will rise in the near term due to the fact that China is still in the process of industrialization and urbanization, and of raising its population out of poverty. Although China has made impressive domestic commitments to increasing energy efficiency and renewable energy, its rapidly growing energy demand is also being met primarily through coal. On the other hand, China has witnessed an enormous increase in the deployment of renewables such as wind. In 2008, China doubled its wind power capacity for the fifth year in a row, reaching a total capacity of 12 GW and exceeding its 2010 development target of 10 GW two years early..[5] Recent news reports have indicated that China may raise its renewables target for 2020 from 15 percent to 20 percent, based on the current pace of development.[6]

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[4] See for example this recent news from China: http://www.chinadaily.com.cn/world/2009green/2009-06/06/content_8256019.htm

[5] Renewable Energy Policy Network for the 21st Century, "Renewables Global Status Report 2009 Update," available at www.ren21.net/pdf/RE_GSR_2009_Update.pdf

[6] "China eyes 20% renewable energy by 2020," China Daily, June 10, 2009.

Studies in China have provided different estimates of when China's absolute greenhouse gas emissions will peak. For example, a recent report issued by the Chinese Academy of Sciences has projected that China's GHG emissions will peak between 2030 and 2040.[7] However, Hu Angang, a prominent economist in China, has predicted that China's GHG emissions will plateau around 2020.[8]

China has instituted many policies and is developing low-carbon technologies to slow emissions growth. So China may well reduce emissions more quickly than analysts are currently forecasting. China's own domestic efforts and its cooperation with other countries will be crucial to determining how quickly its greenhouse gas emissions can peak and then fall.

9) How does China's energy intensity compare to the United States?

According to the Energy Information Administration, China's energy intensity per unit of GDP in 2006 was 4.0 times that of the United States, 4.2 times that of Europe, and 7.8 times that of Japan.[9]

Electricity use in Jiangsu, one of the fastest growing and most dynamic provinces in China and a sister province of California, is four times less efficient than in California.[10] While inefficient industrial processes are a major reason for China's high energy intensity, its current economic structure, which slants toward heavy industries with a relatively small service sector, is also an important contributor.

10) China is known to have many other environmental problems outside of greenhouse gas emissions. How does the Chinese government allocate resources between basic environmental and health issues, such as providing clean water and eliminating smog, with the goal to reduce carbon emissions?

Both conventional environmental problems (local and regional air, water and solid waste pollution) and climate-related problems are the focus of significant Chinese government policies and resources. The Chinese government realizes that its rapid industrialization and deteriorating environment have exacted a high cost in terms of its citizens' health and the environment. (A 2007 study by the World Bank estimated the annual cost of air and water pollution to be about 5.8 percent of China's GDP.) The Chinese government is also very aware of the severe negative impacts that climate change will have on its water resources, agricultural production and coastal cities, and has thus engaged in significant energy efficiency and renewable initiatives with the aim of mitigating its GHG emissions and strengthening its energy security.

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[7] Chinese Academy of Sciences, "Low-Carbon Economic Goal for 2020," March 2, 2009.
[8] Hu, Angang, "Global Abatement Roadmap that Leads to Copenhagen," available at: http://www.weather.com.cn/static/html/article/20090407/29106.shtml
[9] Energy Information Administration, *International Energy Annual 2006*, Table E.1g, available at: http://www.eia.doe.gov/iea/wecbtu.html
[10] California Energy Commission. *The California Energy Almanac 2007*; China Statistical Yearbook, 2008; and State Grid Corporation DSM Instruction Center, "Building Jiangsu's Efficiency Power Plant," 2008.

The Ministry of Environmental Protection is the main body responsible for conventional pollution control, while the National Development and Reform Commission sets energy and climate policy. In terms of government spending, of the 230 billion RMB ($33.8 billion) in stimulus spending in the fourth quarter of 2008 and first quarter of 2009, about 10 percent went toward energy conservation, emission control and environmental protection projects. The government intends to spend 13 billion RMB ($1.9 billion) in the next three years to expand sewage and garbage disposal facilities to most townships. It has also allocated 4 billion RMB ($588 million) for tackling water pollution in major rivers such as the Huaihe and the Songhuajiang. Forest conservation and energy saving projects will get a combined 6 billion RMB ($882 million).[11]

11) Have you examined how China's renewable energy law will affect the price of electricity? As China brings on renewable energy, specifically wind, to their energy grid, are there any lessons that the United States can apply to the siting of our own renewable energy and transmission?

(A) In 2006, in line with the Renewable Energy Law and other policies, China's National Development and Reform Commission (NDRC) instituted a renewable energy tariff surcharge of 0.001 RMB/kWh which was applicable to all customers nationwide except for agriculture production customers, self-generation and direct power purchase customers. The surcharge was increased to 0.002 RMB/kWh in 2008.

The feed-in tariff for renewables or "on grid" price is set by the Chinese government. In 2007, the NDRC issued pricing guidelines for the procurement of wind, biomass, solar, geothermal and ocean energy. The price for wind is to be based on bids, and the prices for solar, geothermal and ocean are to be determined on a cost plus reasonable profit for individual projects, with payback rate similar to that of wind/biomass projects. The price for biomass is set at the price of electricity from a local coal-fired plant with flue gas desulfurization plus 0.25 RMB/kWh. Hydro prices were held at the pre-2006 (i.e. pre-renewable energy law) level, although the 2006 retail electricity price increase did include a 0.006 RMB/kWh surcharge for costs associated with relocation of residents due to construction of medium and large hydro facilities.

There is insufficient publicly available data to determine whether the renewable energy tariff surcharge collected appropriately covers the actual renewable costs, including generation and related grid expansion, interconnection and integration costs. While the total capacity of wind and biomass has increased significantly from a year-on-year percentage basis, the total amount of wind and biomass production is low, at 0.78% and 0.15%, respectively, of total electricity production in China in 2007.

(B) In 2008, the State Electric Regulatory Commission (SERC) conducted a review of China's renewable policy implementation. The SERC found a number of similar issues that the US is facing regarding renewable development. For example:

[11] "China's stimulus helps meet green goals," April 30, 2009, available at: http://news.xinhuanet.com/english/2009-04/30/content_11286045.htm

1. The SERC found that some regions lack coordinated planning regarding generation development and grid interconnection. In some areas, approvals for wind development fall under multiple jurisdictions, thus impeding systematic interconnection and transmission planning. In addition, lack of communication and coordination between generators and the grid company led to delays in interconnection. Duplicate transmission systems exist in some regions which lead to waste of resources and also impact grid operation.

2. In some areas, the speed of transmission capacity expansion lags generation development. The transmission capacity constraint has resulted in limits on renewable energy production (e.g. plants are dispatched in a rotation fashion) and increase in line losses.

3. The integration challenge posed by wind is exacerbated by the large concentration of wind farms in certain remote areas with inadequate transmission, thus further impacting grid reliability and stability.

4. The apportionment of costs between generator and grid companies regarding required grid expansion and interconnection to accommodate renewable resources has not been clearly delineated or followed in some cases. This has generally led to increased generator costs.

The solutions that SERC identified include: long term, coordinated planning and technology development regarding the systematic scale-up of renewables that consider both the resource potential and grid infrastructure development; research regarding safe and reliable grid operation due to seasonal and intermittent nature of renewables; standardization of equipment and technologies in the areas of automation, protection, communication and metering; introduction of advanced wind operation experience and technology from other countries; improvements in wind forecasting; and research regarding the impact of large scale wind production on grid operation and the requirement to curtail wind production during low load periods.

12) Is China capable of fully measuring all of their emissions? How can they be held accountable to the standards and goals the government is setting?

China's systems for measuring its greenhouse gas emissions are in place but need to be strengthened and systematized. China prepared an Initial National Communication on Climate Change for the United Nations Framework Convention on Climate Change in 2004 (which measured and reported on its 1994 emissions), but the Initial National Communication noted that there "still exist large uncertainties" in estimates of GHG emissions due to limitations on data, including the lack of country-specific emissions factors by sector and process. China has begun preparing its Second National Communication, which aims to improve the comprehensiveness and certainty of GHG measurements through country-specific emissions factors and more comprehensive surveys.

With regard to its systems for measuring greenhouse gas data from the power sector and industrial processes, China is able to estimate emissions by collecting data on fuel consumption and industrial output (e.g., cement production) and calculating the resulting greenhouse gas

emissions. However, greenhouse gas emissions can be more accurately measured through real-time, continuous emissions monitoring systems (CEMS). These are in place on about 85 percent of China's power plants, but China still needs to develop protocols for maintaining and operating CEMS to ensure their accuracy and verifying data through cross-checking of SO_2, NO_x, CO_2 and fuel consumption data. The US can play an important role in helping China to establish robust and accurate procedures and systems for reporting and verifying power sector and industrial process emissions data using continuous emissions monitoring systems.

With regard to goals such as reducing energy intensity by 20 percent, the government has established reporting mechanisms by which provinces and the Top 1000 energy-consuming enterprises report on their energy consumption (see response to question 13 below). Provincial officials and heads of the Top 1000 enterprises (many of which are state-owned) are evaluated based on their performance in meeting energy consumption reduction targets.[12]

13) How do provincial governments play a role in China's National Action Plan? Are those governments held accountable to meet national targets? What are the repercussions for regional and local governments if they do not execute the national government's five-year plan?

China's National Climate Change Action Plan (June 2007) sets forth five broad current strategies for reducing greenhouse gas emissions, among which energy conservation/efficiency has top priority. The current goal associated with this strategy is that the GDP energy intensity in 2010 shall decrease by 20% over that of 2005. To help achieve this goal, in November 2007 the State Council of China issued an "Implementation Plan on the Performance Evaluation System Concerning Unit GDP Energy Consumption"[13], which covers all the provincial governments (including municipalities) and China's top 1000 energy-consuming enterprises. The first evaluation year is 2008 and the results were slated to be announced at the end of May 2009.[14]

The evaluation process is designed using a 100-point system, with 60 points assigned to the implementation of a range of required measures, and 40 points related to the degree of achieving a prior approved annual target. The evaluation generates one of four conclusions: over achieved, achieved, basically achieved, or failed.

Scoring less than 60 points or not achieving the annual target means failure, in which case the provincial government is required to submit to the State Council a written proposal within one month explaining how it plans to rectify the situation within a specified period. If it again fails to achieve what has been proposed, the central government's supervision authorities will consider

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[12] *See* Fei Teng, Yu Wang, Alun Gu, Ruina Xu, Hilary McMahon, and Deborah Seligsohn, "Mitigation Actions in China: Measurement, Reporting and Verification," World Resources Institute Working Paper, available at: http://pdf.wri.org/working_papers/china_mrv.pdf; Lynn Price, Xuejun Wang, and Jiang Yun, "The Challenge of Reducing Energy Consumption of the Top-1000 Largest Industrial Enterprises in China" to be published in *Proceedings of the European Council for an Energy-Efficiency Economy 2009 Summer Study.*

[13] Xinhua News (in Chinese): http://news.xinhuanet.com/politics/2007-11/25/content_7139807.htm

[14] The first evaluation has not yet been released. However, the central government's internal meeting on climate change and energy conservation chaired by Premier Wen Jiabao on June 5, 2009 reiterated that provincial governments' performance in 2008 on implementing energy efficiency will be publicized.

imposing punitive measures on the responsible personnel. Falsifying data will be prosecuted, according to the State Council document. For high achievers, their good performance will become one important factor in the promotion process.

Every March, provincial governments are required to finish a self-evaluation of the previous year's performance using the evaluation system and submit a report to the State Council. The National Development and Reform Commission (NDRC) then leads reviews and inspections together with the Ministry of Supervision, the State-Owned Asset Supervision and Administration, the General Administration of Quality Supervision, Inspection and Quarantine, the National Bureau of Statistics (NBS), and the National Energy Administration. Each year, at the end of May, NDRC will announce to the public the annual evaluation results.

NBS has published provincial data on GDP energy intensity annually since 2005, though reduction targets and associated evaluations will be published for the first time in 2008

The evaluation of the top 1000 energy-consuming enterprises on their energy use reduction began in 2007. The first set of results was announced by NDRC in August 2008. It was reported that 998 enterprises signed the "Contract on Energy Saving Target" with the central government, of which 953 participated in performance evaluation (3 went to bankruptcy, 15 were merged with other companies, 26 did not operate, and one underwent a major change in energy use). Of those evaluated, 92.2% achieved their annual target in 2007 and 7.8% did not. The total energy savings from these enterprises in 2007 was 38.17 million metric tons of standard coal (about 79 million metric tons of CO_2).

Enterprises that are part of the Top 1000 program report directly to NBS via an on-line website using a generic spreadsheet, rather than through regional statistical bureaus. The data collection is done in this manner to improve accuracy and reliability, to make it easier for the enterprises, and to reduce the workload of the regional statistical bureau staff members. NBS will release information on average or total energy use or energy use by industry, but not for a specific enterprise. Enterprise-specific data is, however, provided to NDRC. Capacity-building is needed to train enterprises to operate the on-line reporting system, to develop an indicator system, to develop standards for boundary setting, and for data analysis. As currently structured, there is little transparency in the data reporting for the Top 1000 Program. To date, there has only been one officially-released summary report on the progress of the program for 2007. In addition, there is no third party review or verification of the reported results at the enterprise, sector, provincial, or national level.[15]

14) An oft repeated criticism of the Chinese government is its penchant for pirating various technologies without reimbursement to the rightful owners. In your role as president of the China-U.S. Energy Efficiency Alliance, how do you "promote technical exchanges between U.S. and Chinese government officials, utilities and energy experts" while at

[15] Price, Wang, and Yun, "The Challenge of Reducing Energy Consumption of the Top-1000 Largest Industrial Enterprises in China."

the same time ensuring the protection of American intellectual property in the technologies shared by the US with the Chinese?

The technical exchanges organized by the China-U.S. Energy Efficiency Alliance are focused on sharing policy and technical experience in implementing demand side management energy efficiency programs similar to those in California and other states. Areas for exchange include the concepts and policies behind demand side management, the use of energy audits and energy efficiency potential studies, the design and operation of a DSM portfolio of energy efficiency programs, and the need for evaluation, measurement and verification of efficiency programs. As the focus of the exchanges is on policy and technical knowledge related to DSM rather than exchange of hard technology, there are no intellectual property concerns involved.

Lee Lane
Response to Questions for the Record
"The Road to Copenhagen and Beyond:
Elements of a Global Climate Deal Between Developed and Developing Countries"
Select Committee on Energy Independence and Climate Change
March 4, 2009

1) Can we see meaningful reductions in global emissions without significant emissions reductions from developing countries?

Response: Halting climate change demands that global GHG emissions fall to as little as 20% of business-as-usual levels. Emission reductions that fall short of this level lead to further warming. Poorer countries are already responsible for about half of all emissions when non-CO_2 and non-industrial emissions are accounted for as, of course, they should be. And that percentage is increasing. Simple arithmetic dictates that developing countries must make deep cuts if warming is to be stopped.

2) If Congress crafts legislation to place mandatory restrictions on carbon emissions, how do you envision such a bill interacting with an international protocol? Should Congress pass a bill without provisions that require international participation, and if so, how can Congress craft legislative language that will not be ruled illegal by the WTO or instigate global carbon trade wars?

Response: Legislation like H.R. 2454 would emasculate the US climate negotiators. The only way to avoid this outcome would be for Congress to forge a tight, explicit link between the future level of US abatement costs and those which prevail in China, India, and other major sources. Without such linkage, enacting H.R. 2454 would be the equivalent of opening a round of trade talks by lowering all US tariffs to zero. If other nations care about slowing climate change, linkage would allow them to leverage investments in curbing their own GHG discharges. If they do not care, there is little point to making deep US emission cuts. Only strong linkage can avoid both emission leakage *and* the legal and administrative problems that are likely to plague all efforts to curtail it within a system of unequal GHG controls.

3) As a carbon-free source of energy, do you believe nuclear power needs to be a part of the solution?

Response: Nuclear energy must play a central role in climate policy. As already mentioned, stopping climate change entails drastic restrictions on the use of fossil fuels. Various factors limit the growth of all forms of renewables, and relaxing these limits is likely to require large investments of time and resources. Nuclear power, by sheer process of elimination, must play a large role. Yet uranium supply will limit nuclear's growth unless large scale fuel recycling becomes economic. It follows that the development of generation IV reactors is one of the potentially highest payoff tasks of national and global energy policy.

4) As you know, deforestation heavily contributes to global greenhouse gas emissions. How can an international framework properly address emissions due to deforestation, particularly when measuring emissions from deforestation is so difficult?

Response: The task of constructing an international framework to constrain deforestation emissions is likely to be the smaller part of the challenge. The harsh truth is that the governments of many nations in which deforestation is taking place lack the institutional and political maturity to curb this process. In many such states, property rights are poorly defined and are enforced capriciously or not at all. Aid bureaucracies have been attacking similar problems for extended periods of time – with mixed results at best. There is little reason to expect that such efforts will suddenly gain traction. If they do not, attempts to curb deforestation emissions will make no more than halting progress, and hopes that such projects will yield large streams of offset credits for the US market are likely to be sorely disappointed.

5) If there is not a final protocol agreed to at Copenhagen, then what?

Response: It is already perfectly clear that the developing countries will not make significant reductions in their GHG emissions. Without such reductions, an agreement in Copenhagen can only be a symbolic one. A symbolic agreement, may, for a while, conceal failure from the less discerning, but it will not have much impact on the rate of climate change.

6) Even if developing nations agree to emissions caps, varying policies and carbon prices will inevitably lead to leakage. How can the United States ensure the long-term vitality of our economy when facing leakage?

Response: Leakage will threaten some sectors of the economy and many individual firms more than the macro-economy. Indeed, the greatest macro-economic threat posed by GHG controls could prove to stem from subsidies and trade restrictions designed to curtail leakage. These countermeasures might erode the already fragile international trade regime. Yet, once the US has adopted one-sided GHG controls, the resulting protectionist pressures are likely to become nearly irresistible.

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7) The February 1 edition of the India newspaper, *The Economic Times*, quoted IPCC Chairman R.K. Pachauri as saying "negotiations are going on for the conference of parties at the Copenhagen where we will have a multilateral worldwide agreement . . . Of course, the developing countries will be exempted from any such restrictions but the developed countries will certainly have to cut down on emissions." And January 29th's issue of the *Financial Times* quoted top U.N. climate change bureaucrat Yvo de Boer as saying: "I don't think developing countries will accept binding targets." What are your reactions to these statements, and what do they portend for this year's negotiations?

Response: These two statements accurately reflect the positions of the developing countries and foreshadow the severe limitations that will apply to any international GHG control agreement likely to emerge. As indicated in a response to a previous question, these statements imply that either no agreement will emerge from Copenhagen or there will be a purely symbolic one. A symbolic outcome is likely to prove to be unstable in the long run.

8) In your testimony, you highlight the ongoing problems with China's lack of adherence to WTO standards. Based on China's previous actions, is there a reason to believe that China will respect its obligations and commitments under a UNFCCC treaty?

Response: To the contrary, there is good reason to believe that China would be far less meticulous in adhering to a climate agreement than it is in following WTO rules. China has gained a great deal from membership in the WTO, yet it flouts its commitments. The Chinese government has repeatedly stated that China would not gain from any agreement that required it to accept GHG targets. Why, then, would anyone expect that China would adhere to such targets?

9) Do you believe carbon tariffs, energy subsidies, or similar policies would be permitted by the WTO? Do you anticipate extensive challenges from competing countries?

Response: The WTO process is highly politicized. Because it is, its outcomes are unpredictable. However, challenges to new subsidies and tariffs intended to offset the impacts of GHG controls are inevitable. The WTO process will, by its nature, be lengthy, and the fact that the US has already accepted the principle of "differentiated responsibilities" casts a further shadow of doubt on the outcome. Retaliation and recriminations seem inevitable.

10) How large a transformation in the global economy is entailed by the task of stabilizing greenhouse gas levels in the atmosphere?

Response: Halting climate change demands the virtual elimination of fossil fuels or subjecting their use to elaborate and expensive GHG control systems. About one-seventh of the global economy is invested in the energy sector, and the global demand for energy will double or triple during the course of the rest of this century. By inference, most of the capital in this large and fast-growing economic sector would have to be replaced – and replaced quickly. Further, many sources of GHG emissions are outside of the energy sector. Deep reductions in GHG discharges will entail revamping much of society's private and public infrastructure as well as everything from diets and lifestyles to agriculture and forestry. Not least, this transformation would require a vast intrusion of government into areas that have resided in the private sector and, indeed, in our society at least, within the sphere of individual freedom.

11) Given the fact that stabilization of climate entails a complete rebuilding of the entire planet's energy system -- and the infrastructure that surrounds and supports it -- how long have such large scale transformations required in the past?

Response: Electrification of the global energy system began to gather steam in the late 19th Century and is still far from complete today, about 120 years later. The analogy is probably pretty good. On the one hand, electrification provided direct relatively short-term benefits to those who bore its costs and risks. Climate protection does not. On the other hand, the pace of technical change has accelerated. A century time scale is probably a reasonable guess about the time needed for 'decarbonization'

12) From your perspective, what is the biggest obstacle to a comprehensive international treaty?

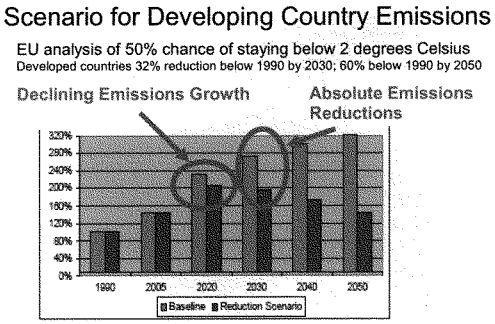
Response: Any one of several factors would doom such an agreement now and for at least several decades. The low return on investments in GHG abatement with current technology is a prime example. The well-established unreliability of commitments from many Third World governments is a second. Perhaps most important, though, is the unwillingness by the governments of China, India, and other industrializing nations to incur the political and economic costs that would accompany steep reductions in global GHG discharges. While these conditions prevail, global GHG reduction efforts will have, at best, marginal impacts.

Ned Helme
Response to Questions for the Record
"The Road to Copenhagen and Beyond:
Elements of a Global Climate Deal Between Developed and Developing Countries"
Select Committee on Energy Independence and Climate Change
March 4, 2009

1) **Can we see meaningful reductions in global emissions without significant emissions reductions from developing countries?**

It is not possible to limit global temperature increases to 2°C above prehistoric levels without significant emissions reductions from developing countries. However, this does not imply that developing countries need to have exactly the same policies developed counties *right now*. Developing countries assert their right to develop and do not have the resources to implement some of the more costly mitigation options. The December 2007 Bali Action Plan, which was signed by the United States, recognizes the principle that countries should take action in reducing emissions according to their "common but differentiated responsibilities and respective capabilities."

Under one scenario where developed countries reduce aggregate emissions to 32 percent below 1990 levels by 2030 and 60 percent below 1990 levels by 2050 (depicted in the graph below), developing countries would need to reduce *emissions growth* by about 2020 and achieve *absolute emissions reductions* by 2030 to achieve a 50 percent chance of keeping temperature increases above prehistoric levels to less than 2°C. We conclude that developing country actions to reduce emissions below business-as-usual levels over the next decade can be consistent with meeting the longer term emissions reductions called for by the scientific community.



Source: European Commission, 2007

2) **If Congress crafts legislation to place mandatory restrictions on carbon emissions, how do you envision such a bill interacting with an international protocol? Should Congress pass a bill without provisions that require international participation, and if so, how can Congress craft legislative language that will not be ruled illegal by the WTO or instigate global carbon trade wars?**

Congressional legislation should be as consistent as possible with the emerging international agreement being negotiated within the UNFCCC process. Use of consistent language and concepts will facilitate the negotiation process and increase the likelihood that a global agreement can be reached while at the same time enabling the U.S. Congress to engage the international debate in a constructive way.

The most important elements of the U.S. legislation in reaching an international agreement are 1) strong national mitigation targets backed by policies and measures that make it likely the targets will be met, and 2) sufficient amounts of international financing to support strong developing country mitigation performance. The U.S. legislation should also recognize the international framework, including the use of measurable, reportable and verifiable sectoral actions and other types of nationally appropriate mitigation actions to reduce emissions in developing countries, and the expectation that developed countries will provide measurable, reportable and verifiable financing.

The U.S. legislation and actions should not be contingent upon actions in other countries. Rather, early action by the U.S. Congress will enable the U.S. to demonstrate leadership on the international stage while at the same time helping to define the U.S. negotiating position. However, while it is desirable to be out in front on this issue, the Congress will also need to ensure that the legislation contains sufficient protection for U.S. industries that could be disadvantaged by unilateral action—industries that are energy/carbon and trade intensive and unable to pass the added costs of compliance to their consumers. Absent special protections, these industries risk losing market share to overseas competitors, resulting in jobs and emissions moving overseas.

It is possible to protect U.S. industries that are most vulnerable to emissions and jobs leakage in a way that is consistent with WTO requirements for equal treatment of imported and domestic products using a combination of an output-based rebate and border allowance purchase requirement. The preferred design from a WTO standpoint would be to first apply a rebate to defray up to 100% of the costs of compliance with the cap-and-trade program. Starting with rebates makes sense as they are less likely to be challenged than border taxes. The rebate would end for a given product once a majority of other countries producing the product are acting to reduce emissions in a way that is consistent with the principles of common but differentiated action. This could mean comparable absolute targets and timetables for other developed countries and sectoral actions for developing countries. Additionally, countries that are already meeting best-in-the-world emissions standards for a given sector would also be treated as having acted. The border tarrif would then be applied narrowly against countries that have not yet acted to reduce their emissions, and would end only after the recalcitrant countries have adopted climate actions.

This imagined structure is mostly consistent with the final version of the American Clean Energy and Security Act of 2009 (ACES) that passed the House of Representatives. The main difference from a WTO compliance standpoint is that the rebate program under ACES does not begin to phase out until 2026, with a complete phase out by 2035, at earliest, regardless of the actions

taken by other countries. If a majority of other countries are acting to reduce emissions, the justification for rebating US industry compliance costs is significantly reduced.

3) **As a carbon-free source of energy, do you believe nuclear power needs to be a part of the solution?**

Yes, to meet the climate challenge, we need nuclear power and all the other tools in the toolbox; we don't want to rule out any potentially promising options. All low- and zero-carbon technologies will benefit from having a price on greenhouse gas emissions, including nuclear power. Additionally, certain technologies may require special assistance to overcome market imperfections and barriers that prevent the carbon price alone from encouraging deployment of otherwise cost-effective mitigation options. For example, in certain cases, using allowance value to help support deployment of the "first-few-of-a-kind" of advanced climate mitigation technologies could help bring technology costs down to levels that will be economic at future carbon prices. However, in the case of nuclear energy, some of the main barriers to deployment—including federal loan guarantees, a production tax credit, and accident insurance coverage—were already addressed in the Energy Policy Act of 2005.

Given limited allowance value and the different barriers to deployment, there should not be a presumption of equal allowance value to each energy technology. To the extent possible, legislators should support free competition in the energy marketplace and avoid picking technology "winners."

4) **As you know, deforestation heavily contributes to global greenhouse gas emissions. How can an international framework properly address emissions due to deforestation, particularly when measuring emissions from deforestation is so difficult?**

The best way to address deforestation is through a "dual markets approach" that prevents deforestation reductions from entering the carbon marketplace until measurement questions are sufficiently resolved and there is adequate capacity in developing countries to adhere to best practices. This way, any reductions from the forestry sector that do not meet standards for being

real and measurable will not weaken the emissions cap. Until the measurement issues can be resolved, we recommend establishment of a separate deforestation market, created by distinct national commitments to reduce deforestation emissions. If desired, countries could buy and sell deforestation reductions within the separate deforestation market to meet their forestry commitments at the lowest cost.

The bill that passed the House includes the dual market concept via the "Supplemental RED" provision, which is a separate emissions reduction commitment additional to the national mitigation emissions limit. Under the Supplemental RED provision, reductions from reduced deforestation in developing countries are paid for using allowance value rather than through purchases from companies participating in the allowance market. The Supplemental RED provision is structured to support capacity building and pilot scale efforts to build experience that would support future participation in the international offset market.

However, while the bill includes the dual market concept, at the same time, it also allows deforestation offsets into the international marketplace with all the inherent measurement uncertainties. Further, the offsets provisions allow for crediting of offsets from project and subnational-level activities that could result in substantial amounts of emissions leakage. This offset provision both competes with and eliminates the advantages of the supplemental RED program in providing a testing ground for forestry measurement and capacity building.

5) **If there is not a final protocol agreed to at Copenhagen, then what?**

We expect that Copenhagen will result in a framework agreement, but the agreement will lack many important details on future nationally appropriate mitigation actions (NAMAs) in developing countries and on how financing will be provided to support these NAMAs. These details will need to be filled in before the agreement can be ratified over the next several years.

While the specific design of the NAMAs will depend on the circumstances of each country, NAMAs are supposed to be measurable, reportable and verifiable, and are expected to include both unilateral actions that go beyond prior commitments, and conditional actions that would be

contingent on financing from developed countries. The actual negotiations will take place in both bilateral and multi-lateral forums and should seek to leverage available dollars to maximize developing country emissions reductions, creating a "race to the top." U.S. influence in these negotiations, including our ability to encourage more aggressive developing country actions, will depend in part on the size of our commitments to measurable, reportable and verifiable international finance.

6) **Even if developing nations agree to emissions caps, varying policies and carbon prices will inevitably lead to leakage. How can the United States ensure the long-term vitality of our economy when facing leakage?**

Modeling by the USEPA finds the ACES climate program will have relatively modest effects on the gross domestic product, or GDP, of the U.S. economy. Compared to a reference case that assumes no national climate policy, EPA analysis of the ACES bill using two different economy-wide models finds that the 2030 reference case GDP is achieved between 2 and 5 months later.

However, while the impacts of ACES on the economy as a whole amounts to a delay of several months, the impacts will be felt more strongly by certain industry sectors that are energy intensive and trade vulnerable. For these sectors, even small increases in marginal cost could lead to losses of market share and leakage of emissions and jobs. It is possible to mitigate the cost impacts stemming from higher carbon prices through the use of output-based rebates to compensate compliance costs for disproportionately affected industry sectors and/or the application of border taxes against recalcitrant countries. These policies are discussed in our answer to question #2, above.

7) **The February 1 edition of the India newspaper, *The Economic Times* quoted IPCC Chairman R.K. Pachauri as saying "negotiations are going on for the conference of parties at the Copenhagen where we will have a multilateral worldwide agreement . . . Of course, the developing countries will be exempted from any such restrictions but the developed countries will certainly have to cut down on emissions." And January 29th's issue of the *Financial Times* quoted top U.N. climate change bureaucrat Yvo de Boer as**

saying: "I don't think developing countries will accept binding targets." What are your reactions to these statements, and what do they portend for this year's negotiations?

We agree that developing countries are unlikely to accept internationally binding and absolute emissions targets; however, this does not mean they will not ante up at the negotiating table. We expect developing countries to offer specific reduction measures in key industry sectors that are domestically binding and in exchange for developed country offers of technology financing and other forms of support. Sector-based actions could take the form of intensity targets, technology goals or absolute emissions limits.

While domestically binding commitments may not seem as forceful as internationally binding commitments, they may be more meaningful. Countries such as China employ domestic penalties and incentives to enforce national energy efficiency policies, helping to ensure robust compliance. At the same time, countries such as Canada are not in compliance with the Kyoto Protocol, and there appears to be few repercussions. The only place where internationally binding commitments have been effective is in the case of WTO compliance.

8) **Despite China's aspirational goals and targets, will China's absolute greenhouse gas emissions rise or fall?**

China has recently implemented a goal to boost national energy intensity by 20% over five years (by 2010), a medium to long-term renewable energy development plan, and automotive fuel emissions standards. And China continues to plan additional unilateral actions. For example, China is now drafting a new Energy Development Plan which will generate significant new investments in low-carbon power generation technologies.

China's unilateral policies will result in very substantial reductions in emissions below business-as-usual levels. The 20% energy intensity plan ALONE would reduce 1,500 MMT of CO_2e in 2010—roughly the same amount of reductions expected in the United States in 2020 (from 2005 levels, assuming achievement of the economy-wide reduction goals) as a result of

implementation of the Waxman-Markey bill. Even with these unilateral policies, we still expect that China's absolute greenhouse gas emissions will continue to rise over the next decade. Effective implementation of sectoral actions could lead to more aggressive national climate mitigation policies that would further deflect emissions growth from business-as-usual levels and support a mitigation pathway that is consistent with absolute emissions reductions by 2030.

9) **You note extensive aspirational goals by various developing countries, which would be unilateral reductions in emissions. Without mandatory, legally verifiable restrictions, how can developed countries have faith that the developing countries will actually follow through on their commitments?**

The Bali agreement calls on all developing country actions to be measurable, reportable and verifiable. Similarly, developed country financing must also be measurable, reportable and verifiable. Developed countries can offer this financing to countries with the strongest plans for action, including domestic enforcement provisions. Further, while it has been anticipated that much of the financing would be provided up-front to support technology investments, some financing could be withheld and doled out upon completion of certain milestones. Further, this financing could be withheld in the event that developing countries are not meeting those milestones.

10) **How do you suggest that the international community holds all nations accountable to reach their mandatory levels of emissions? How would countries that don't meet their levels be penalized? Will countries that don't reach their Kyoto targets face more stringent levels under a new protocol?**

Initially, developed countries should grant technology finance to developing countries in return for nationally appropriate mitigation actions that significantly reduce emissions below business-as-usual levels. Any continuation of such financing could be contingent on meeting interim benchmarks. In addition, in the event that a country still does not implement the agreed measures, the recalcitrant country could be made subject to a border allowance purchase requirement. In fact, we believe that WTO and other trade measures have more "teeth" than

penalties under other international agreements. Some would argue that WTO is the most enforceable of all current international regimes and agreements.

On the last question, the degree to which a given country has met its Kyoto target is not significantly affecting proposed levels of effort in the second commitment period. However, if a country misses its target, it will have a harder time meeting future mitigation targets.

11) Considering the challenges the U.S. would face domestically with meeting emissions limits, do you think it would be a wise decision to dedicate a funding stream to international projects from revenue generated by auctioning permits? Given the uncertain amount of revenue from such an auction, what level of international funding would you advocate? A certain percentage? A specific dollar amount?

International finance is our main leverage to encourage equivalent actions by competitors in developing countries, raising the bar on developing country performance in key industry sectors. Absent such finance, we believe it will be nearly impossible to get a deal that puts the world on track to meet global climate stabilization goals. We advocate setting aside at least 10 billion dollars per year for the combination of RED purchases and capacity building, technology finance, and international adaptation.

The approach to distributing technology finance dollars should leverage private funds and support U.S. jobs and businesses without improving the competitiveness of energy- and trade-intensive industries that compete directly with our own. For example, in countries where technology financing is not readily available, a project could support the creation of a "green bank" to provide loans to carbon mitigation projects. In other cases, there is a need to bring down the incremental costs of advanced technologies. This can be done in a way that boosts U.S. jobs, for example, by paying for the intellectual property costs for technologies produced here in the U.S., and avoids payments for technologies that boost the efficiency of our competitors in trade and energy intensive industries.

12) **How do you account for different long-term goals based on growth rates? Is there a threshold at which point some non-annex I countries will need to have the same emissions targets as annex I countries? How do you account for long-term economic changes over 41 years (till 2050)?**

The second commitment period, running from 2012 to 2020, should be viewed as transitional. During this phase, emerging economies such as China and India are expected to significantly reduce emissions below business-as-usual levels, but not achieve absolute emissions reductions. We would expect that these countries will be asked to adopt absolute targets by 2030. Ultimately, by 2050, the international community will need to reduce emissions to at least 50 percent below 1990 levels. Assuming that developed countries reduce their emissions aggressively to about 60% below 1990 levels in 2050, developing countries will still be required to reduce emissions by more than half from business-as-usual level

Importantly, developed and developing country targets will not be the same, but will adhere to the common but differentiated responsibility language in the Bali agreement. Reductions by developed countries will need to be more aggressive in the near-term to allow for continued growth in developing countries.

13) **Would proposals to subsidize companies for energy costs and other border trade adjustments withstand WTO challenges? Is there a practical way to avoid WTO challenges and an accompanying carbon trade war?**

In principle, both rebates and a border allowance purchase requirement could withstand WTO challenges. See the response to question #2.

14) **Wouldn't agreement to REDD and adaptation measures prior to a comprehensive treaty hurt the United States' negotiating position?**

In fact it is the opposite. Commitments to international finance in advance of a global agreement are seen as critical to the overall "effort" expected from the U.S. and other developed countries.

Further, commitments to international finance may help to compensate for a 2020 target that falls well below the 25-40% below 1990 levels that scientists say is needed from developed countries to limit temperature increases to within two degrees of prehistoric levels. Absent U.S. effort that is viewed as "comparable" by the international community, there is little hope that developing countries will sign onto aggressive targets and actions.

Further, to the degree that the U.S. is supplying technology financing, it will be possible to have more control over the use of these funds, whether they are distributed through an international institution or via bilateral agreements. We can seek to maximize emissions reductions from technology expenditures in ways that are advantageous to national interests.

15) **Does the Clean Development Mechanism (CDM) work? Given that trade in CDM credits has generated about $32 billion in 2008, it is not clear that it's contributing to reducing emissions. Moreover, there are ample examples of projects and countries receiving credit by CDM for work that was already going to be done anyway, thus making these CDM credits an unexpected bonus.**

The CDM has had a mixed record of success. The CDM has been successful in reducing emissions below a business-as-usual baseline, but the additionality criterion has been more difficult to evaluate. Improvements are now being made that are expected to improve the transparency of the CDM process while also setting more standardized emissions benchmarks so that only projects that perform better than the benchmarks can earn tradable credits. Such a system would remove the need to evaluate additionality on a case-by-case basis.

In addition, the scale and scope of CDM is being reevaluated and is expected to be different in the 2012-2020 commitment period. For least developed countries, CDM is likely to continue with minor reforms. Most least developed countries haven't benefited from CDM as the larger countries have dominated CDM. For large developing countries such as china, India and Brazil, developed countries realize CDM will have to change. If larger developing countries must reduce emissions to make a contribution to the environment in the coming years, it no longer makes sense to allow all their emissions reductions to be eligible for CDM credit. Instead, we

will need a system that raises the bar before CDM or other offset crediting is allowed. By raising the bar, developing countries will have to take unilateral actions and some conditional actions (with developed country financial assistance) to be eligible for CDM credits or the sale of credits in developed country offset markets.

Strengthening US-China Climate Change and Energy Engagement

--Recommendations for Leaders and Policymakers in the US and China--

Background

The United States of America (US) and the People's Republic of China (China) are both key players in international efforts to address global warming and global energy security. Indeed, they are by far the two largest emitters of greenhouse gases (GHGs) in the world, together accounting for over 40% of global CO_2 emissions from fossil fuel use,[1] 36% of the world's energy consumption, and 32% of the world's economic output.[2] Therefore, efforts by these two players over the coming decades to cut greenhouse gas emissions and energy consumption will play a large role in determining the ultimate outcome of efforts to combat global warming. They are, of course, not alone in this effort, but they are *the* critical actors, jointly holding the key to either sustainability or catastrophe.

Since 2006, the US and China have engaged in more direct and regular discussions through the Strategic Economic Dialogue, which included the establishment of the Ten Year Energy and Environment Cooperation Framework. The Framework presently has five priority areas for cooperation (electricity generation, transportation, clean water, clean air, and protecting wetlands and other natural areas) and is establishing a sixth goal focused on energy efficiency. Given the urgent need to curb global warming and the key role that the US and China play in this effort, now is the time to accelerate and deepen these vital efforts at cooperation on climate change by translating them into tangible actions on the ground. It is even more important in the context of the global economic crisis, since efficiency saves money as it saves energy. Fortunately, both governments have announced that a sizeable share of their economic stimulus would go to "green" actions.[3]

The Natural Resources Defense Council (NRDC) has been working on environmental issues in China for more than twelve years, with a particular focus on improving energy efficiency in industry and buildings, developing advanced sources of energy, and strengthening environmental law and governance in China. NRDC recently worked with a coalition of nearly 30 environmental, science, and conservation groups on a set of recommendations for the Obama transition team on environment and climate change. The recommendations from this coalition—*"Transition to Green"*—include specific proposals for engaging with China on climate change,

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[1] 2006 data from the Netherlands Environmental Assessment Agency, http://www.mnp.nl/en/dossiers/Climatechange/moreinfo/Chinanowno1inCO2emissionsUSAinsecondposition.html.
[2] All values are 2005 data, according to data complied by the World Resources Institute in their Climate Analysis Indicator Tool, http://cait.wri.org.
[3] An HSBC Global Research report released January 19, 2009 estimated that 16% of the US' stimulus would go to "green investments" and China was planning to invest 34% of their stimulus in these investments.

energy, and other environmental issues.[4] NRDC also recently partnered with a group of 30 major corporations and nonprofit organizations, the United States Climate Action Partnership (USCAP), to release a *"Blueprint for Legislative Action,"* a detailed framework for US legislation on climate change.[5] This blueprint recommends a set of energy and climate policies, many of which could be adapted for China, to move the private sector to develop new and advanced energy technologies, secure economic prosperity, and provide businesses and workers with the opportunity to innovate and succeed.

Building upon the policy recommendations and suggestions for US-China cooperation in these reports and NRDC's experience in China, this paper recommends nine key steps for the incoming Obama administration, US Congress, and leaders in China to strengthen **US-China Climate Change and Energy Engagement**:

1. Engage in serious bilateral meetings on climate change and address the key sticking points to reaching meaningful agreement in Copenhagen in December 2009
2. Establish a US–China forum on climate change strategies that promote green jobs and economic recovery
3. Mobilize the untapped potential of energy efficiency
4. Assist in the deployment of renewable energy sources and technologies
5. Promote low-carbon, high-efficiency vehicles, fuels, transportation systems, and community development
6. Expand research and investment on carbon capture and storage technology
7. Improve greenhouse gas emissions monitoring and data transparency
8. Conduct co-benefit analysis on GHG emissions controls
9. Invest in regular exchanges and sharing of expertise to improve enforcement of environmental law and energy efficiency standards

These recommendations are intended to be a set of actions that can and should be implemented immediately. Some can be completed within one year, while others require longer-term commitments.

Recommendations

1. Engage in serious bilateral meetings on climate change and address the key sticking points to reaching meaningful agreement in Copenhagen in December 2009

President Obama and President Hu Jintao should discuss the efforts of their countries to combat climate change at their first bilateral meeting, preferably to be held in March or April of 2009. This meeting should kick-start a series of high-level bilateral discussions throughout 2009 on the

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[4] American Rivers, Center for International Environmental Law, Natural Resources Defense Council, et al, *Transition to Green: Leading the Way to a Healthy Environment, a Green Economy and a Sustainable Future*, November 2008, http://docs.nrdc.org/legislation/leg_08112401.asp. The international climate portions with commentary here: http://switchboard.nrdc.org/blogs/jschmidt/actions_to_restore_leadership_on_global_warming.html.

[5] United States Climate Action Partnership, *A Blueprint for Legislative Action*, January 2009, http://www.us-cap.org/blueprint.

concrete steps that the US and China can undertake to reduce their greenhouse gas emissions now and in the future, and the key sticking points that need to be overcome for both parties to sign on to a meaningful international climate change agreement in Copenhagen in December 2009. In particular, the US and China should seek to find common ground on important issues such as the Chinese government's desire for greater access to cleaner, more efficient technologies, the US desire to export green technologies while maintaining intellectual property rights, and the need for both countries to commit to measurable, reportable, verifiable, and appropriate reductions in GHG emissions. One avenue for early discussion is the role of sectoral approaches where specific emission reduction actions are taken in key sectors of the economy, such as electricity and major energy-intensive industrial sectors.[6] There has been significant discussion of such approaches under the international climate negotiations and these two countries should engage in a serious discussion on their role and key design features.

These ensuing bilateral meetings should be led by high-level officials from each government to ensure that the discussions and outcomes have strong political backing, and should be aimed at delivering concrete actions, rather than merely issuing symbolic joint statements or press conferences.

Any structures agreed upon in these bilateral discussions should be brought into the United Nations Framework Convention on Climate Change (UNFCCC), as this bilateral engagement is meant to support, not replace, the UNFCCC. Bilateral discussions can thus focus on how joint action by the US and China on climate change can stimulate agreements in global climate negotiations that benefit all countries.

The US can and should accelerate this process by taking unilateral action to demonstrate a good faith effort to reduce GHG emissions, e.g., by setting mandatory limits on GHG emissions through new legislation and implementation of existing laws. US action to implement mandatory measures and incentives for reducing greenhouse gas emissions should not be contingent on simultaneous action by China or any other country. On the other hand, US climate action, especially measures that provide access to US greenhouse gas markets and other performance-based incentives, can be a strong incentive for action by China and other emerging economies.

2. Establish a US–China forum on climate change strategies that promote green jobs and economic recovery

Both the US and China are undergoing unprecedented economic challenges and have recognized the importance of using the present economic downturn to transition to sustainable economic development paths through significant investment in energy efficiency, renewable energy, and other green infrastructure. This creates a unique window to create millions of valuable "green jobs" in each country, which will enable the US and China to lead the world in the creation of new, green industries and clean technologies. Developing green jobs and industries will also strengthen the energy security of each country by reducing reliance on imported fossil fuels.

[6] For example, a forthcoming NRDC discussion paper evaluates some designs of these approaches that could be crucial in ensuring that they are effective and credible.

The proposed economic stimulus packages of both countries include potentially promising "green" components. China disclosed a US$585 billion (RMB 4 trillion) stimulus package that proposes at least US$51 billion (RMB 350 billion) for biological conservation and environmental protection. China's Ministry of Environmental Protection (MEP) has announced that the stimulus will "not be spent in the energy- and resource-intensive industries or high-pollution industries" and will benefit the renewable energy and pollution control industries. President Obama has also proposed a stimulus package that, in part, creates green jobs through business incentives for alternative energy sources and environmentally friendly technologies.

The foundations of an economic model based on green innovation will consist of robust investment in energy efficiency, green buildings, public transit, advanced pollution control technologies, and renewable energy. Studies, such as a 2007 McKinsey study on energy productivity, show that these kinds of investment make good economic sense.[7] In both nations, but in China in particular, this new paradigm will also require heavy investment in effective environmental enforcement, including accurate environmental monitoring and reporting, well-trained environmental regulators and enforcement officials, public supervision, and greater transparency. China has made a good start in this regard by proposing to enhance public participation and transparency in the process of spending the stimulus funds, but such efforts need to be sustained over the long term.

The potential for green innovation in China's economic stimulus package in fact far exceeds what has explicitly been announced, but only if environmental criteria are extended to the whole package. China could, for example, develop criteria to ensure that the 280 billion yuan proposed for housing projects is spent only on green building projects that save water and energy and are located using smart growth principles. The 1.8 trillion yuan proposed for transportation and the power grid should focus on public transit rather than highways, and should ensure that transmission lines are located in areas that will enable China to tap its abundant renewable energy resources. And research and development (R&D) and innovation projects should focus on clean energy, advanced transportation, and energy and water efficiency technologies. The stimulus package could also include funding for a comprehensive program of skills development and worker placement to train unemployed workers for green jobs, such as industrial energy auditors and building energy code inspectors.

Similar efforts should be made to incorporate green innovation into all aspects of the US stimulus package. NRDC and others have proposed, for example, a more than US$30 billion energy savings plan that includes energy efficiency retrofits, construction of an improved electricity grid, strengthened energy efficiency standards, policy reforms, training, and more efficient power plants.[8]

The US and Chinese economies are inextricably intertwined, so any hope of economic recovery requires joint action. There are enormous opportunities for both the US and China to cooperate in the development of strategies that will jump-start the global economy, create green jobs, and

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[7] McKinsey Global Institute, *Curbing Global Energy Demand Growth: The Energy Productivity Opportunity*, May 2007, http://www.mckinsey.com/mgi/publications/Curbing_Global_Energy/index.asp.
[8] A. Wang and B. Finamore, "China US Green Vows Need Action," *China Daily,* January 19, 2009, http://www.chinadaily.com.cn/bw/2009-01/19/content_7407561.htm.

protect the climate. Some immediate steps to leverage both countries' economic stimulus packages could include cooperation on the development of:

- Performance-based criteria for directing economic stimulus investments towards green infrastructure and clean energy;
- Joint Industrial Assessment Centers that provide free energy audits and recommendations to industrial facilities while training people in both countries to perform these skills;
- Programs to train displaced or unemployed workers in both countries to become building efficiency auditors and building code inspectors, coupled with funding for building efficiency retrofit programs;
- Funding programs for state and provincial governments that adopt and implement plans for improved enforcement of building energy codes and for reduction of vehicle miles traveled;
- Incentive mechanisms and policy reforms that will leverage private investment and unleash innovation; and
- Joint programs to improve environmental monitoring and reporting, training of environmental regulators and enforcement officials, public supervision and greater transparency.

More ambitious efforts could include the establishment of "green" special economic zones (SEZs) in China and the US aimed at fostering the growth of companies manufacturing energy efficient products and technologies, renewable energy technologies and other related products. The SEZs would provide tax incentives, infrastructure, and special policies to encourage the growth of these preferred green industries. These would utilize the highly successful model of China's export-oriented SEZs like Shenzhen, which have transformed China into a global manufacturing powerhouse, and harness the model in the service of greater economic prosperity *and* environmental protection. Demand for investment in these green SEZs would be driven by US demand for "green" technologies in turn spurred by Obama's green stimulus. China's green stimulus can also expand the market in China for products produced in these green SEZs. Robust demand in both nations and the rest of the world will help drive these industries to scale, pushing down costs and accelerating the ultimate implementation of low-carbon, green technologies.

China and US bilateral cooperation can spur changes to the global system that increases demand for green technologies in other countries as well. To maximize the potential for such cooperation, China and the US should create:

- A high-level forum to share lessons and explore opportunities for cooperation on promoting green jobs and industries and investment in sustainable infrastructure. This forum should include input from states and provincial government officials, business leaders, scientists and engineers, labor representatives and NGOs.
- City-to-city exchanges on experience in low-carbon practices, including industrial, commercial and residential energy efficiency, green transportation and city planning, and promotion of green jobs. The EcoPartnerships Program established as part of the Strategic Economic Dialogue between China and the US has begun to implement this concept (e.g., Denver, Colorado and Chongqing; Port of Seattle and Dalian Port

Corporation; Wichita, Kansas and Wuxi City, Jiangsu, etc.). These efforts should be continued and expanded.

- Study groups of policymakers and technical experts to share the most effective implementation ideas on a variety of topics, including energy efficiency in buildings, industry, power generation, transmission, and transportation vehicles, as well as transportation and land use planning and the use of economic incentives to reduce the demand for travel. These groups could explore how best to create "green jobs" that can tap into these opportunities.
- Future meetings to focus on the development of large-scale energy efficiency incentive programs (such as demand-side management, which NRDC has pioneered in China); renewable energy technology development and manufacturing; improved electric batteries and storage technologies; mass transit infrastructure and smart growth planning; and smart grids and electricity infrastructure.

3. Mobilize the untapped potential of energy efficiency as a resource

The work of NRDC and others has shown that despite much progress, there is still enormous potential for improving energy efficiency in both the US and China. A McKinsey Global Institute study, for example, found that a global effort to boost efficiency using existing technologies with an internal rate of return of at least 10% could eliminate more than 20% of world energy demand by 2020.[9] Moreover, making businesses, homes, and industries more energy efficient is cheaper and more cost-effective than investment in new power plants. Energy efficiency should thus be a top priority for both countries to reduce GHG emissions because it pays for itself. Too often, however, the long-term benefits to be gained through investments in energy efficiency are unrealized because of financial, market, and regulatory barriers to deployment of energy efficiency at scale.

Both countries have important experience to share on energy efficiency. China has made efficiency a national priority and has developed a number of innovative policies, programs, and incentive mechanisms, though capacity building to implement them is desperately needed. In the United States, the Department of Energy and the Environmental Protection Agency facilitated the *National Action Plan for Energy Efficiency* which presents policy recommendations for creating a sustainable, aggressive national commitment to energy efficiency through gas and electric utilities, utility regulators and partner organizations such as NRDC.[10] These organizations have pledged to take specific actions to make the Action Plan a reality, though much work remains to be done.

To capture the enormous and largely untapped reserves of energy efficiency in both countries, we recommend that the US and Chinese governments work together—and with states, provinces, grid companies, energy service companies, NGOs and other stakeholders—to implement the recommendations in the National Action Plan and share experiences and develop policies and programs that will:

[9] McKinsey Global Institute, *Curbing Global Energy Demand Growth.*
[10] US Department of Energy, US Environmental Protection Agency, *National Action Plan for Energy Efficiency*, http://www.epa.gov/cleanenergy/energy-programs/napee/index.html.

- *Treat energy efficiency as a high priority energy resource.* Both countries should require grid companies to develop and implement cost-effective energy efficiency programs that contribute to national energy efficiency objectives. The delivery of energy savings should be made an important evaluation criterion of grid companies' performance. Pricing reforms, incentive funding, and tariffs should be used to make energy efficiency profitable for grid companies and to place energy efficiency on an equal footing with conventional power production.

- *Integrate energy efficiency in power sector reform, resource planning, and investment decisions.* Governmental jurisdiction over energy efficiency should be consolidated, strengthened, and fully integrated into utility, state/provincial, and regional power supply planning. Long-term energy savings goals should be developed as part of each of these energy planning processes and should be updated frequently. The US and China should work together to develop robust procedures for measuring and verifying energy savings and evaluating energy efficiency programs.

- *Provide sufficient, timely, and stable program funding to deliver energy efficiency where cost-effective.* Demand-side management (DSM) programs, already ongoing on a limited scale in both countries, should be scaled up dramatically to promote large-scale, planned investments in energy efficiency to reduce overall demand for electricity and avoid the need to build new power plants. DSM programs may be funded by a small ratepayer charge on each electric or gas bill, and are targeted to provide financial assistance to businesses and consumers to improve the energy efficiency of their factories, businesses, and homes. These programs can be administered by utilities, state/provincial governments, or independent third parties. Capacity building should be an essential part of this effort.

- *Work to increase opportunities for financing of energy efficiency.* Under the Ten Year Energy and Environmental Framework, the US Trade and Development Agency and the US and Chinese Export-Import Banks are working to increase financing opportunities for energy efficiency investments involving US exports. The US and China should also work to increase dialogue between private sector banks in the US and China that are supporting energy efficiency investments, and help to strengthen the role of energy service companies (ESCOs) in financing and implementing energy efficiency investment.

- *Provide other regulatory and tax incentives.* The US and China should also cooperate in identifying other regulatory tools for encouraging energy efficiency investments, including tax incentives and grants for energy efficiency investments (perhaps funded through the sale of carbon credits) and energy efficiency portfolio standards.

- *Focus on industrial sector energy efficiency improvement measures in order to revitalize US manufacturing while also reducing emissions related to manufactured goods produced in China for both domestic consumption and export to the US.* The

industrial sector consumes two-thirds of China's energy, and adopting successful practices to improve industrial energy efficiency in both countries can result in significant environmental and economic benefits. The focus should be on (1) hands-on capacity building designed to adapt and implement successful industrial energy efficiency policies and programs; (2) development of appropriate protocols and training for energy audits, program evaluation, monitoring, reporting, and verification; (3) incentives and other measures to accelerate large-scale dissemination of energy efficient technologies; and (4) increased R&D investment on advanced energy efficiency technologies and materials.

- *Capture the enormous energy efficiency potential of buildings through interlocking mandatory and market-based programs, and strengthened enforcement.* Since 2000, the floor space of China's new buildings has been growing at a rate of nearly 2 billion square meters every year. At this rate, the energy consumed by buildings in China could reach 1.1 billion tons of standard coal equivalent by 2020, assuming no improvements to building energy performance.[11] In the US, commercial and residential buildings in 2005 accounted for about 40 percent of national energy consumption, 70 percent of electricity consumption, and the largest share of global warming pollution in the United States.[12] We recommend that the US and China explore opportunities for cooperation in the development of comprehensive building and appliance efficiency programs that include the following elements: (1) mandatory building codes and equipment and appliance standards that are updated on a regular and aggressive basis; (2) national performance-based incentives for buildings, equipment and appliances that outperform the minimum mandatory requirements; (3) tax and regulatory policies that encourage consumers to purchase and manufacturers to deploy highly efficient technologies; (4) common protocols for measuring and accounting for energy reductions and associated greenhouse gas benefits, (5) rewards for states/provinces that demonstrate faster progress; (6) expansion of building energy rating and labeling systems so that energy and location efficiency are considered part of the ordinary lending process; and (7) creation of independent, certified third-party energy rating communities to supplement government code enforcement efforts.

- *Share data on the energy performance and cost of key appliances.* Chinese and US manufacturers should voluntarily provide data to the US Department of Energy in rulemakings when requested by DOE or NGOs. Exchanging non-proprietary data in a transparent manner can help each country ensure that its efforts to push appliance efficiency are informed by the "state of the art" available technologies. Part of this effort should involve comparisons of each country's test methods and how they affect rated performance.

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[11] R. Jin and R. Fan, "Building Energy Efficiency in China," *Ecology Law Quarterly*, Vol. 35: 108, October 2008, http://boalt.org/elq/PDF/C35.03_02_JIN_08.10.30.pdf.

[12] L. Burt and J. Presswood, "Unlocking the Power of Energy Efficiency in Buildings," NRDC Issue Paper, December 2008, http://www.nrdc.org/energy/unlocking.pdf.

4. Assist in the deployment of renewable energy sources and technologies

In addition to reducing the demand for energy, the US and China should engage in closer, larger, and wider collaboration to speed up the deployment of renewable energy. Both countries have large untapped resources and technical potentials. The US possesses state-of-the-art renewable energy technologies, including wind, solar, biomass and geothermal. China in recent years has become not only the world's largest supplier of solar panels, but also the largest user of solar hot water systems, installing 80% of all new solar hot water heater systems worldwide in 2005.[13] China has also adopted ambitious renewable energy development goals, but meeting these goals requires more aggressive investment in research and development, and deployment.

To help speed up the deployment of renewable energy technologies in both countries, we recommend that the US and China:

- Increase regular exchange on specific renewable energy development topics, including technical, policy, investment, and manufacturing aspects;
- Cooperate on joint R&D on advanced renewable energy technologies, such as high performance thin-film photovoltaics (PV), enhanced geothermal systems, cellulosic ethanol, and algae-based fuel;
- Facilitate joint venture commercial-scale projects in China on renewable energy production; and
- Share experiences on both successes and lessons learned regarding rapid scale-up of renewable energy technologies. The US, for example, should review China's experience and expand installation of solar hot water heaters through rebates and state and federal tax credits, and by requiring solar hot water heaters on new homes where appropriate. California, for example, has a $250 million rebate program for solar water heaters, and Hawaii requires all new single family homes to install solar hot water heaters starting in 2010.

5. Promote low-carbon, high-efficiency vehicles, fuels, transportation systems, and community development

China and the US both have successes to share on measures to reduce GHG emissions from the transportation sector. China enacted fuel economy standards that are tougher on sport utility vehicles than those in the US, raised pump prices in Beijing to fund cleaner fuel, and recently launched the world's first production plug-in hybrid electric car. In the US, California has led the way with a suite of transportation policies, standards and incentives designed to reduce transportation-related GHG emissions. President Obama has moved quickly to direct the EPA to immediately review requests from California and other states to set global warming pollution standards for new cars. He also directed the Department of Transportation to set higher national fuel efficiency standards.

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[13] Environment California Research and Policy Center, *Solar Water Heating: How California Can Reduce its Dependence on Natural Gas* (April 2007) at 4, http://www.environmentcalifornia.org/uploads/at/56/at563bKwmfrtJI6fKl9U_w/Solar-Water-Heating.pdf.

We recommend that the US and China share lessons and explore opportunities to strengthen cooperation on the development of technologies and programs that will reduce transportation-related GHG emissions. Such cooperation could cover areas including: (1) the development of advanced technologies such as plug-in hybrids, battery electric vehicles, and fuel cell technologies, (2) appropriate methodologies for determining lifecycle carbon intensities of various transportation fuels; (3) strengthened fuel economy standards; (4) incentives for encouraging fuel efficiency retrofit technologies; (5) policies and incentives to reduce vehicle miles traveled through smart growth development that integrates building and transit, and (6) reducing GHG emissions from freight hauling through intermodal efficiencies, clean and efficient ports (such as the LA port model NRDC helped to pioneer), and more efficient long-haul freight trucks.

6. Expand research and investment on carbon capture and storage technology

Coal is a significant source of electricity generation in both countries — accounting for nearly 80% in China[14] and nearly 50% in the US for electric power generation.[15] Coal-based electricity generation accounts for a large share of both countries' CO_2 emissions, yet coal is forecast to be a part of both countries' energy mix in the near term. Efforts are ongoing in both countries to support carbon capture and storage (CCS) research and development, but they are not large enough and fast enough in light of the climate challenge we all face.

For example, reducing current US carbon emissions by 80 percent by 2050 would require CCS of 1.1 billion tons of CO_2 per year just to fulfill 10 percent of that reduction target.[16] And for China, whose carbon emissions are predicted to more than double by 2050 under a business-as-usual scenario, leveling its emissions 40% above its current level would require multiple aggressive measures, including a similar level of CCS as in the US example. Accelerated R&D and field demonstrations on CCS, therefore, need to be significantly sped up and scaled-up if CCS is to become a cost-effective, environmentally credible, and safe option for making deep carbon emissions reduction. We therefore recommend that the US and China:

- Set up a joint CCS Advisory Group or program to lead the studies and development of CCS technical and legal standards for China, learning from the ongoing efforts in the US;
- Launch capacity building efforts in China on site selection, evaluation and monitoring;
- Work together to develop respective roadmaps on CCS deployment;
- Initiate a joint public forum to promote, communicate and educate on CCS; and
- Establish a US-China Fund on CCS aimed at developing and financing large-scale demonstration projects in China for enhanced oil recovery and storage in deep saline aquifer.

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[14] China Electricity Council data for 2008, available at: http://www.cec.org.cn/html/news/2009/1/5/20091511635506199.html.
[15] Energy Information Administration data for 2007, available at http://www.eia.doe.gov/cneaf/electricity/epa/figes1.html.
[16] R. Duke and D. Lashof, "The New Energy Economy: Putting America on the Path to Solving Global Warming," NRDC Issue Paper, June 2008, http://www.nrdc.org/globalwarming/energy/economy.pdf.

7. Improve greenhouse gas emissions monitoring and data transparency

Both the US and China have systems in place to collect data on energy, air pollution, and GHG emissions from key sources such as power plants and major industrial sources. Accurate and transparent reporting of GHG emissions data is necessary to evaluate policies for reducing GHG emissions and to measure progress. However, China does not regularly release GHG emissions data, and there are perceived weaknesses in the quality and transparency of Chinese energy and emissions data. The two countries also have different statistical standards that make data interpretation and comparison relatively difficult.

Improving the transparency, quality, and frequency of GHG emissions inventories will be a cornerstone of a strong international climate agreement to be reached in Copenhagen. Under the UNFCCC, developed countries are required to follow an established set of guidelines for their GHG inventories. These inventories are to be produced yearly, so there is a regular update on the trends in countries and they are subject to international review. A different set of rules are required for developing countries. These developing country inventories are not currently produced as frequently.

Lack of credible and transparent GHG data creates distrust and stymies the ability to implement effective policies to address a number of the areas for improvement identified in these recommendations. In order to improve the quality of available data and enhance mutual trust, we therefore recommend that the US share its experience on collecting, monitoring, and sharing GHG emissions data and the US and China develop ways for both countries to collect, monitor and report data on energy, air pollution, and GHG emissions.

8. Conduct co-benefit analysis on GHG emissions controls

The threats posed by severe climate change include rising sea levels that endanger coastal cities and industries, reduced agricultural productivity, increased risk of disease, increase in severe weather events, damage to ecological systems, loss of habitat and threats to biological diversity. Reducing greenhouse gas emissions can help mitigate the impact of these effects on socio-economic development and human welfare. The US and China should fund research to analyze the co-benefits of reducing GHG emissions in China, including a cost-benefit analysis of the options for mitigating and adapting to the effects of climate change. They should also share strategies for adapting to climate change and identifying the areas and sectors most at risk.

9. Invest in improved enforcement of environmental laws and energy efficiency standards

No nation has successfully tackled its environmental problems without a solid foundation in the basic building blocks of environmental enforcement, including clear environmental legislation, robust information gathering and reporting systems, well-trained enforcement and regulatory staff, sufficient budget, public participation, and measures to promote compliance (such as training, financial incentives, etc.). These elements of an effective environmental enforcement regime can be established relatively quickly with sufficient political will, funding, and technical

resources (as was the case in Japan and the US in the 1970s). The US has faced serious challenges in many aspects of its environmental regulation over the years and can share experiences to help China avoid the mistakes made in the US. We recommend the establishment of regular exchanges and sharing of expertise to provide resources and incentives to help Chinese provincial, municipal, and local governments to build capacity in the enforcement of environmental laws and energy efficiency standards and codes.

The market for environmental technologies requires an effective system for enforcing laws and standards. A sound and reliable environmental enforcement system will spur reliable demand for environmental services. The US and China should share experiences on combining command-and-control mechanisms with market and compliance measures to improve adherence to critical energy efficiency and emissions standards. Both governments should encourage and support collaboration with business in China and the US to incorporate information on energy efficiency compliance into market transactions, such as through making energy ratings (which are already part of the energy code compliance process) part of the permanent record of a building. Serious commitment to rule of law and enforcement of laws, such as intellectual property laws, will help pave the way for greater exchange of technology as well.

The US Environmental Protection Agency and China's Ministry of Environmental Protection have already commenced collaborations on environmental governance and enforcement. These collaborations, and further collaborations with advisory groups such as NRDC, academic institutions and research laboratories should be deepened, encouraged, and financially supported.

Conclusion

The US and China are at a crucial juncture in how they are going to shape their economies, position their companies and technologies for the 21st century, and address global warming. Action must be taken in both countries immediately if these countries and the world are to avoid the worst impacts of climate change.

Fortunately there are huge opportunities for those countries and companies that lead. Making smart investments and changing policy today can create new jobs at a time of economic challenge in both countries. In addition, these choices and actions will position each country to be a leader in the economy of the 21st century.

These nine overarching actions and the many underlying specific steps will not solve by themselves the global warming challenge. Likewise taking these actions won't address all the challenges of getting a strong international agreement to address global warming. But they can make a huge down payment.

The US and China do not have to start from scratch in these efforts. Many of them are already being undertaken with varying levels of effectiveness and support. However, to be effective the US and China will need a stronger political commitment from the heads of government, scaled-up resources, and focused efforts to ensure that the actions are delivered on the ground in each country. It can and must be done. And it needs to begin immediately.

APPENDIX

About NRDC

NRDC (Natural Resources Defense Council) is one of the most effective nonprofit environmental organizations in the United States. Established in 1970, NRDC uses law, science and the support of 1.2 million members and online activists to protect the planet and ensure a safe and healthy environment for all living things. NRDC's staff of more than 350 lawyers, scientists and policy experts work out of offices in New York, Washington, Chicago, Los Angeles, San Francisco and Beijing.

NRDC works to solve the most pressing environmental issues we face today: curbing global warming, getting toxic chemicals out of the environment, moving America beyond oil, reviving our oceans, saving wildlife and wild places, and helping China protect its environment while continuing its strong economic development.

NRDC's Work in China

For more than twelve years, NRDC has been working in China with local partners to address some of the world's greatest environmental challenges and help create innovative solutions for a cleaner, healthier environment and curbing global warming. Our work in China builds on our longstanding expertise in the United States and elsewhere in the areas of energy, health, market transformation and environmental enforcement. NRDC's primary role in China is to support leading domestic efforts on energy conservation and environmental protection. We believe that successful, sustainable efforts at energy conservation and environmental protection must be driven from within China and are proud that NRDC has been on the ground in Beijing and around the country to help accelerate these efforts. To this end, we have partnered with the key actors in China's government, academia, non-governmental organizations, and legal community to help promote cutting-edge energy and environmental solutions for China. NRDC is also partnering with the private sector, including multinational corporations, to help promote supply chain practices that contribute significantly to solving China's environmental problems.

Spurring a Shift to Greener Buildings
NRDC was the first international environmental organization to establish a clean energy program in China, and over the last decade, our team of experts has helped China develop clean, efficient, and affordable environmental strategies. NRDC's long-term partnership with the Lawrence Berkeley National Laboratory led to the development of China's first national commercial building energy-efficiency standard, which requires all new commercial buildings to cut energy use by 50 percent. We're also making sure that residential buildings meet aggressive environmental benchmarks by setting energy standards for two of China's three major climate zones: the Transition Zone, which covers the entire Yangtze River Basin, and the southern Cooling Zone, which includes Guangdong Province [Canton], China's fastest-growing economic region. And because we know that setting standards is only half the battle, NRDC is working with Shanghai- and U.S.-based partners to ensure that these groundbreaking standards are

properly implemented through the use of pathbreaking building energy labeling systems and independent building rater certification systems.

Promoting Energy- Saving Technologies
The cheapest, easiest, and fastest way to reduce the staggering pollution from China's power plants is to increase energy efficiency. That's why NRDC and the China-U.S. Energy Efficiency Alliance are working to develop incentive programs, known as demand side management (DSM), that will help China improve its efficiency. Research shows that DSM programs -- which allow utilities to use a portion of their revenues for rebates and other incentives to encourage customers to take advantage of energy efficiency -- could meet up to half of China's forecast load growth over the next decade. Moreover, these efficiency "negawatts" can be deployed rapidly and typically cost one-quarter to one-half as much as investments in traditional power supplies.

We helped organize the first DSM forum in China, bringing together representatives from national and provincial government agencies and utilities to discuss energy saving opportunities. Our efforts to help Jiangsu Province develop the nation's first large-scale DSM pilot program caught the attention of China's Premier Wen Jiabao and Vice Premier Zeng Peiyan. They not only cited Jiangsu's program with approval, but also submitted it to the State Energy Office with instructions to promote it as a national model. We have now completed a nationwide DSM Implementation Manual under the sponsorship of the National Development and Reform Commission, and will use it as the basis for a nationwide training program that will kick off in late February 2009.

Improving the Energy Efficiency of Chinese- Made Products
With Chinese manufacturers dominating many world markets, improvements in the energy efficiency of products made in China can deliver benefits in the United States and across the globe. For example, more than 75 percent of external power supplies -- those black boxes used to convert incoming AC power to the DC power needed by electronics -- are manufactured in China. Unfortunately, most of these power supplies are relatively inefficient; NRDC estimates that the United States could reduce its electricity consumption by 1 percent to 2 percent simply by moving to more efficient power supplies.

Working on the first-ever joint project between the United States and China to coordinate the testing methods and performance measures for a product, we helped establish a single worldwide specification for external power supplies that has been adopted on a voluntary basis in China, Australia, and the United States. In the next few years, this specification will become mandatory for all external power supplies sold in China.

Promoting IGCC and CCS Development and Deployment in China
Over the past three years, NRDC has worked hard to promote the development of coal gasification capacity building and increase the Chinese government's attention to carbon capture and storage (CCS). We have supported Chinese experts to study the technical, institutional and regulatory barriers to polygeneration development, advocated the government to increase attention to coal gasification-based co-production, and helped the Chinese government draw up a roadmap for the demonstration and commercialization of coal gasification, IGCC, and co-production technologies.

Our work and that of others have catalyzed noticeable progress in China. China's National Medium to Long Term Program for Science and Technology Development (2006-2015) includes coal gasification and co-production as key areas for research, development and demonstration. The roadmap on coal gasification that Chinese experts developed with our support provides timely and major inputs for China's 11th Five-Year Plan (FYP) on Science and Technology Development. In accordance with the plan, China is building the country's first group of industrial scale IGCC/co-production demonstration facilities during the current five-year plan period. These plans for industrial demonstration will be an essential stage for achieving cost reduction, technology maturity, and eventual widespread application of IGCC. The Ministry of Science and Technology of China also has begun to support research projects on CCS, an area in which China did not want to previously focus on due to political considerations, revealing another sign of important progress occurring in China.

We have supported the Institute of Engineering Thermophysics, Chinese Academy of Sciences in a cost analysis of various IGCC/coproduction processes and a baseline study that identified gaps between commercialized power generation systems (ultra-supercritical, circulating fluidized-bed, and pulverized coal systems) and IGCC/co-production systems under Chinese conditions in terms of scale, efficiency, coal requirements, and capital and production costs.

Pushing for Cleaner Cars

Private car sales have been surging in China, leading to increased global warming pollution from emissions and greater oil dependency for the nation. NRDC has been making sure that the trend toward more cars on the road does not come at a steep environmental cost. In Shanghai, we have successfully encouraged the formation of a public-private partnership for clean vehicle commercialization, a relatively new concept for China. The founding members of the partnership include Chinese subsidiaries of major multinational automakers, as well as Chinese companies and academic institutions. This nonprofit partnership is hard at work organizing forums and seminars, supporting college students conducting an energy policy research project, and building China's first hydrogen fueling demonstration station in Shanghai.

Strengthening the Law and Increasing Public Participation

In 2007, the Chinese government began developing an overarching energy law that will provide the foundation for more specific energy laws and regulations. Recognizing this unique opportunity for promoting sustainable energy policies in China, NRDC teamed up with the China Sustainable Energy Program of the Energy Foundation and the Law School of China's Tsinghua University to provide recommendations for this groundbreaking law. Encouragingly, the draft version of the China Energy Law has given energy conservation and efficiency the highest priority and included general provisions on low-carbon fuels, renewable energy, and public participation in energy decision-making.

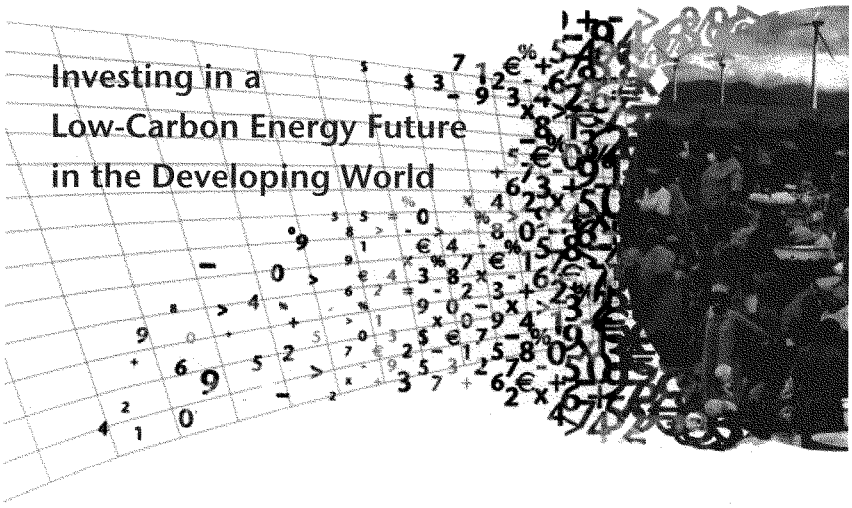
China is also in the process of amending its primary law on air pollution. NRDC is working with the China Sustainable Energy Program of the Energy Foundation and other partners to provide recommendations on this critical piece of legislation. Key areas of focus will be improved coordination between air pollution regulation and China's energy sector, strengthening of

foundational regulatory mechanisms like standards, permitting and total emissions control, and improved enforcement mechanisms.

To encourage the public to play a greater role in environmental protection, our staff in Beijing is working with local partners to conduct environmental law trainings for NGOs, community groups, and journalists. We also helped develop and launch China's first online resource devoted to environmental law, policy and public participation (http://www.greenlaw.org.cn). The website analyzes key developments in China's environmental governance and arms citizens with how-to guides to getting involved, along with localized information about their region's environmental initiatives.

Promoting Responsible Sourcing

NRDC and its partner, The Council of Fashion Designers of America, are spearheading a multiphased initiative called *Clean By Design. Clean By Design* aims to revolutionize the way the textile industry operates, by connecting design choices to manufacturing consequence and fostering innovation at the factory-level. In phase one of the initiative, completed in 2007, NRDC's review of factory performance in China identified textiles as a major polluter. In phase two, in 2008, our experts audited a typical Chinese textile factory, investigating the use of water, materials, and energy to find cost-saving methods that would increase efficiency and lower the factory's footprint. We are conducting additional factory audits before compiling best practices for pollution prevention and efficiency opportunities for the industries. Phase three, slated for spring 2009, will bring together world-class designers to discuss choices for fiber, dye, consumer care, and more, to minimize impacts of manufacturing. Factory performance opportunities will also be reviewed. The final phase will culminate in supply chain recommendations for multinational retailers, brands, designers and policy recommendations to China's government officials to revolutionize the textile supply chain. NRDC is confident that this multifaceted strategy will help the apparel industry keep up with the pressing pace of global industrial growth, while ensuring that sound environmental practices are adopted.



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Introduction

Investing in a Low-Carbon Energy Future in the Developing World

The need to address climate change while facilitating continued economic growth and social progress is one of the key challenges facing world leaders today. Energy is critical to continued economic growth and according to the International Energy Agency (IEA); population growth and increasing industrialization will drive demand for energy upwards by more than 50% between now and 2030.[1]

Fossil fuels are expected to be a major contributor to meet these future energy demands. This will lead to a substantial increase in greenhouse gas (GHG) emissions unless cleaner technologies, such as carbon capture and storage (CCS), renewables, and nuclear power, emerge that are commercially competitive and can be implemented at scale.

The demand for energy will rise most rapidly in developing countries as they develop energy services to drive economic growth and social progress. Without convenient and affordable alternatives, these countries are likely to follow a high-carbon pathway, similar to that of the developed world.

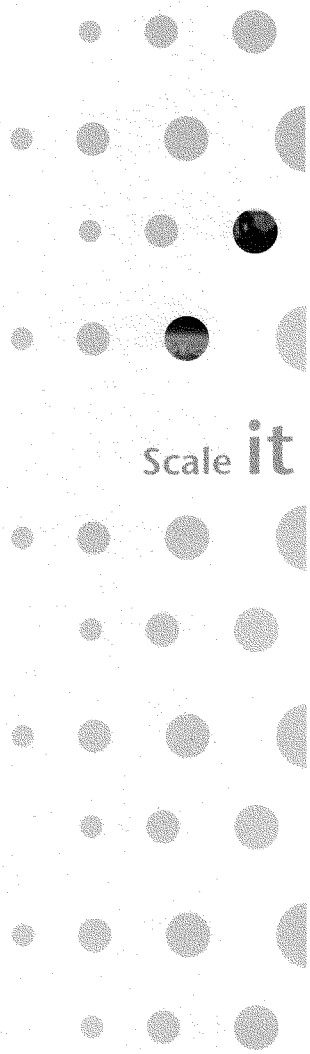
In its trilogy of *Energy and Climate* publications, as well as *Powering a Sustainable Future* and *Doing Business with the World*, the WBCSD explores the highly political issues concerning the challenge of meeting energy needs without causing irreversible damage to the Earth's climate.

The solutions lie in creating framework conditions with the right incentives to cause a large scale technological shift toward a lower carbon and more energy efficient economy that also delivers affordable energy solutions for the 2.4 billion people who are currently without basic energy services. This shift relies on scaling up investment flows into the development and deployment of lower carbon technologies, as well as adapting behaviors and lifestyles to favor these technologies across the developed and developing world.

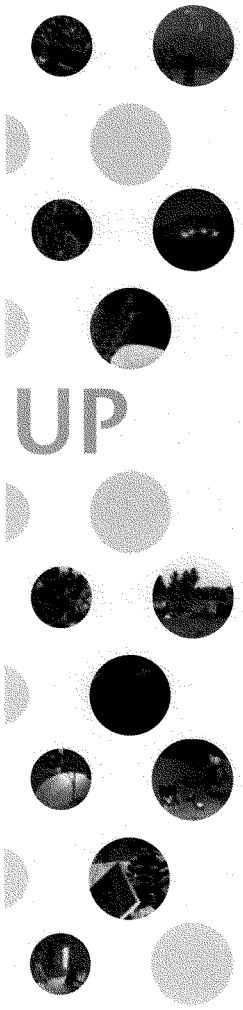
The private sector is a major source of innovation, capital and capacity that, given the right framework, can deliver a low-carbon global economy. For governments to facilitate the release of private sector resources, they need to understand how capital markets and corporate investment strategies can be incentivized to deliver results consistent with sought after goals on carbon mitigation and improved access to energy.

There are however quite different mental models and perceptions among governments and policy-makers of how and why a business might choose to invest in a particular project and/or country. This can result in inefficient policies that hinder rather than support the involvement of the private sector.

In the following pages we explore how governments and business can work together to solve these challenges by aligning policies, mechanisms and tools with the commercial conditions under which a business typically invests. By identifying a few of the critical issues important to business we hope to contribute to the design of efficient policy mechanisms that drive the shift to a low-carbon future, promote investment in new technologies and energy services in developing countries, and contribute to overall sustainable development.



Investment needs



Improve energy availability

Energy is a key driver of economic growth and social progress. It is essential to fueling industry, powering infrastructure, connecting goods, people and services to markets, and delivering basic services such as heating, lighting and cooking. For the billions of people without access to modern energy services to escape poverty and enter into productive economic activities, investments in energy infrastructure (on- and off-grid) are needed.

The IEA estimates that developing countries will need annual electricity supply investments of approximately US$ 165 billion through 2010, increasing at about 3% a year through to 2030.[2]

About half of the necessary financing is readily identifiable, leaving an investment gap in the energy sector of about US$ 80 billion per year. The IEA estimates that international financial institutions, aid donors and the private sector can close this gap by approximately US$ 11 billion per year through additional investments using existing financial instruments.

Mitigate climate change

Scientific evidence and economic analysis confirm the need for radical changes in the global energy system to combat climate change and ensure energy security in the future.

The United Nations Framework Convention on Climate Change (UNFCCC) in its 2007 analysis of financial flows estimates that US$ 200-210 billion will be necessary in 2030 to stabilize GHG emissions at today's levels. The incremental costs of low-carbon investments in developing countries are likely to be at least US$ 20-30 billion per year.[3]

Today private sector investments constitute the largest share (86%) of global investment flows and are expected to be essential to addressing climate change. A large additional flow of tens of billions of dollars will also be needed for adaptation.[4]

Key facts and trends

- Today, the one billion people (16% of the global population) living in developed regions consume half of the world's energy supply. In contrast, one billion of the world's poorest people use 4%.[5]
- Underinvestment in energy reduces GDP growth in some countries by as much as 1-3% annually.[6]
- The demand for primary energy is projected to increase globally by a factor of 1.6-3.5 between now and 2050, and in developing countries by a factor of 2.3-5.2.[7]
- Roughly 1.6 billion people worldwide live without electricity.
- In sub-Saharan Africa, 547 million people have no modern energy services, and as low as only 8% of those living in rural areas have access to any electricity.[8]
- Despite the growth of the energy sector, around 2.4 billion people still rely on traditional biomass (wood, straw, dung, etc.) to cover their basic energy needs. In many developing countries, biomass accounts for over 90% of household energy use. The burning of biomass in simple stoves results in indoor air pollution that causes 1.3 million deaths per year, primarily among young children and mothers.[9]
- The share of GHG emissions from developing countries is expected to rise from 39% today to 52% by 2030, with China responsible for 29% of the predicted rise.[10]
- India is already the fifth biggest emitter of CO_2 emissions, yet approximately 45% of its population does not yet have access to electricity and approximately 85% of the population lives on less than US$2 per day.[11]

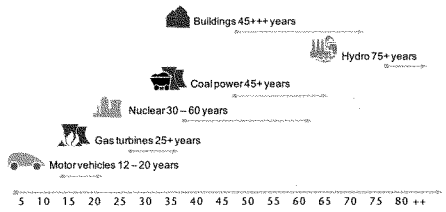
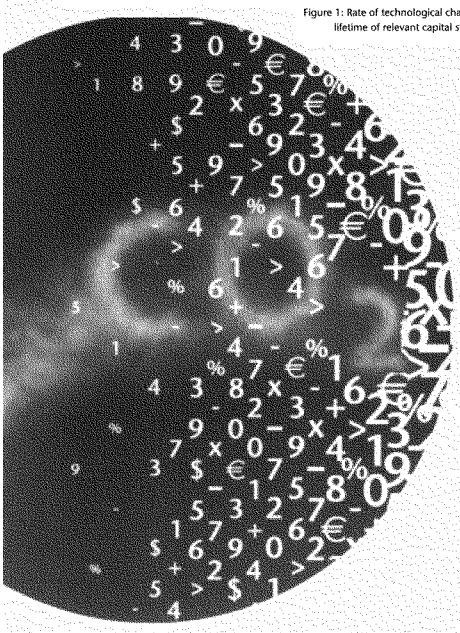


Figure 1: Rate of technological change compared to the lifetime of relevant capital stock and equipment[11]



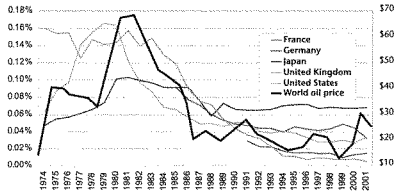


Figure 2: Public energy R&D investments as a share of GDP

Unless policies change and ways are found to facilitate investments in lower carbon technologies at all stages of their development and deployment, developing countries are expected to follow the same carbon-intensive development pathways of today's industrialized nations.[12] This would constitute a lost opportunity of immense proportions, as the consequences of carbon- and energy-intensive investment decisions made today lock in those emissions for decades (see Figure 1).

Raising finance is not necessarily the main problem, implementing framework conditions that direct financial flows toward the development, demonstration and deployment of commercially viable low- and zero-carbon energy technologies is the key.

Addressing the

The track record

If investment in the different stages of technology development is the answer, how is the world doing? The track record is not good. Between 1988 and 2004 total public research and development (R&D) spending increased by nearly 50%, while public spending on energy-related R&D declined by nearly 20%. The rise and fall of public spending on energy R&D correlates directly with the oil price peak and collapse in the 1970s and 1980s respectively. R&D spending by the private sector has also been declining largely due to relatively low energy prices and a lack of market incentives to develop lower carbon technologies. While the future price for oil is unclear, the power of the market to incentivize investment is indisputable.

A new energy technology often faces a number of technical and cost barriers, and requires a substantial time period to progress from the initial R&D stage to full commercial deployment. This significantly increases the risk to investors compared with investments in established energy technologies.[15]

Although large investments in the R&D phase of technology development is much needed, many technologies have made it through and yet failed to overcome barriers in the demonstration phase. Technologies such as CCS and coal gasification (IGCC) are examples of key technologies needing further direct support in this demonstration stage to assist in technology development, accelerate cost reductions and ensure long-term commercial viability.[16]

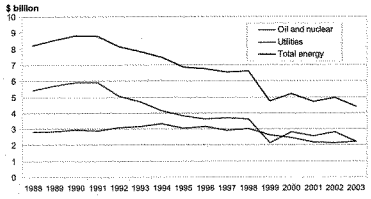
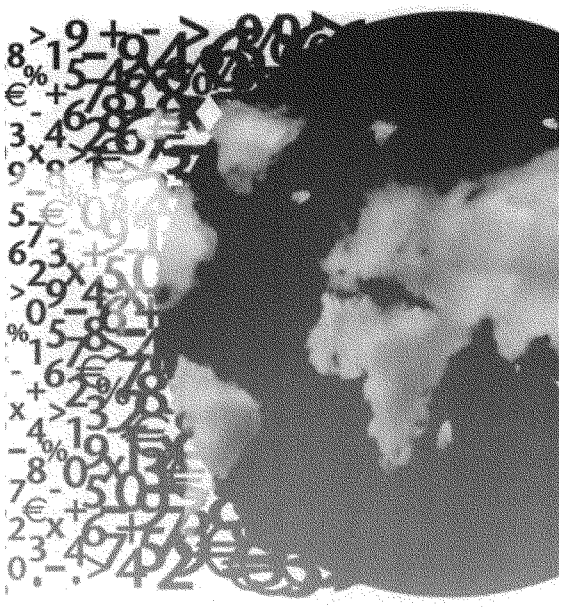


Figure 3: Trends in private sector energy R&D[14]

investment gap

The track record tells us that in the absence of strong policy support mechanisms and incentives, and while fossil fuels are cheap and readily available, public and private funds are unlikely to deliver the necessary technologies at a cost and scale necessary to address climate change unless there are major changes in investment frameworks.



Stages in technology development

R&D
↓
Demonstration
↓
Deployment
↓
Competing technology

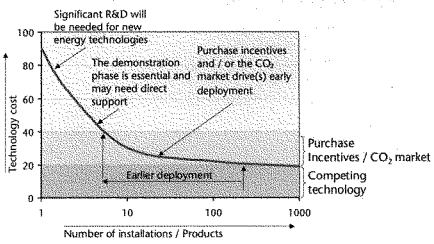


Figure 4: Technology development and deployment

Understanding how and why business invests

Many factors come into play to encourage a business to invest in low-GHG energy solutions, not least the strategy of the company and its ability to attract capital to implement this strategy. For policy-makers to encourage business to invest, they must understand what might incentivize a business to do so. Commercial investments are almost always made in dynamic, highly differentiated, competitive environments, both internal and external to the company.

Each project requires a detailed evaluation of the prospective rates of return, investment and technological risks, as well as sources of competitive advantage.

Companies, financial institutions and investors almost always employ different processes and screening criteria to evaluate the investment.

Risk

Money normally flows to where the highest and quickest returns can be made. Key questions include: How to most efficiently allocate private capital? How long before there is a positive cash flow? What risks are associated with the investment? How, where and when to enter new markets?

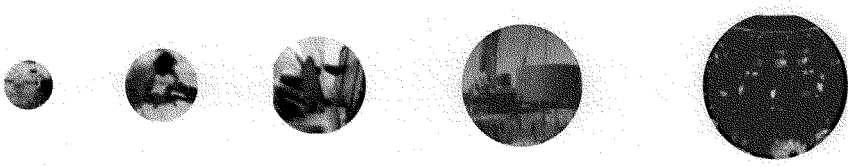
Project-based investments in emerging and lower GHG energy technologies are some of the more complex and risky forms of investment. They are normally highly capital intensive and play into a world where the average consumer is unwilling to pay a premium for low GHG energy services.

Some common appraisal criteria include: net present value (NPV), internal rate of return (IRR), capital efficiency, payback period, return on average capital employed, impact on operating cash flows and budgets, risk assessment and sensitivity analysis, option evaluation and other company-specific performance criteria.

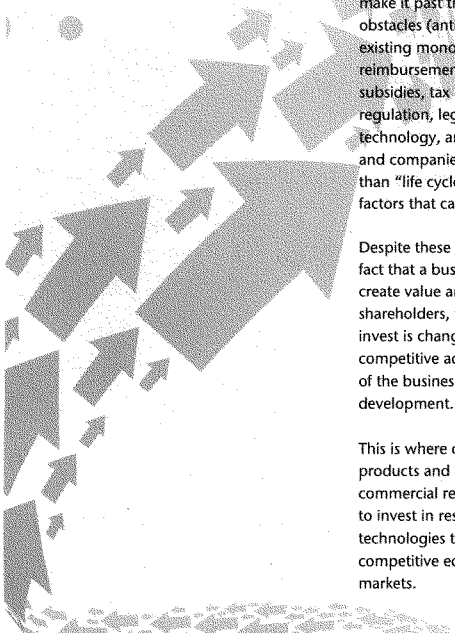
The outcome of the analysis is a forecast of the investment's ability to deliver returns evaluated against a host of risks and other possible uses of that same capital. Every decision relies heavily on the expected commercial return.

Much can depend on market and cost assumptions, as well as perceptions of risk. The basis for such assumptions influences how these are accounted for and will vary from company to company, sector to sector, and country to country. A great opportunity for one company or investor may be a step too far for another.

An absence of incentives, poorly defined investment and regulatory frameworks, uncertain policy signals, and market uncertainty, are just some of the factors that affect overall risk profiles and possible returns.



Reward

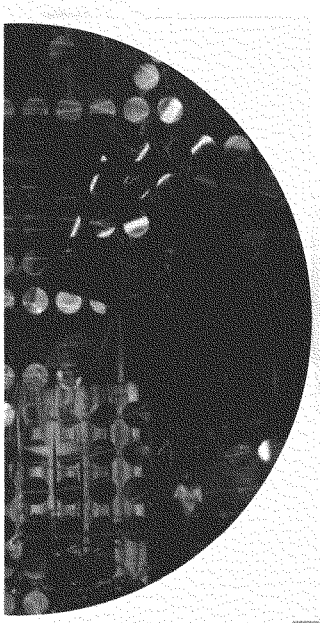


In practice there are many examples where theoretically advantageous projects fail to make it past the idea stage. Structural obstacles (anti-competitive practices of existing monopolies), rigidities (e.g., reimbursement and reward systems, subsidies, tax policies), overly complex regulation, legislation based on obsolete technology, and perceptions of consumers and companies driven by "upfront" rather than "life cycle cost" are just some of the factors that can kill a project.

Despite these commercial realities and the fact that a business primarily exists to create value and returns for its shareholders, the way business chooses to invest is changing. A new attribute of competitive advantage is emerging – that of the business approach to sustainable development.

This is where companies look beyond products and services with predictable commercial returns in established markets to invest in resources, competencies and technologies that will give them a competitive edge in new and emerging markets.

Transforming energy services in the developing world



Ghana's government has set an economic growth target of 6% per annum to achieve middle-income country status by 2020 on the basis of its Poverty Reduction Strategy. This scenario would require annual electricity generating capacity of approx. 27,000 GWh by 2020, or almost four times the electricity supply of 2006. The Strategic National Energy Plan has proposed projects that would increase electricity generation to approx. 13,000 GWh, a capacity that would fall far short of the requirement to achieve middle income status.

Most low- and zero-GHG energy technologies will not be cost competitive at scale without some combination of investment support mechanisms, technological advances or regulatory regime improvements. An abundance of potential projects, technologies or investment opportunities will not in itself necessarily translate into the mobilization of capital flows for implementation. Many energy efficiency projects and Clean Development Mechanism (CDM) proposals have faced this problem, yet they have tremendous potential for reducing emissions, managing energy demand challenges, and optimizing value in the long term. Some of the world's poorest countries may be at a further disadvantage because of limited institutional and commercial capacity, not to mention high-risk ratings that affect the ability to attract, develop and manage substantial project-based investments.

The following approaches can help overcome these barriers and tap various financing sources.

Government policies

Integrate energy, climate change and development strategies – energy and climate policies should be integrated into national development strategies. Without energy there are no means to cook food, heat and light homes, maintain schools and hospitals, drive industry and connect people and goods to markets. For the 1.6 billion people who currently lack access to electricity, energy services are critical to achieving the Millennium Development Goals (MDGs.)

Improving energy transmission - Public policies should focus on improving grid transmission and energy storage systems. This is particularly important for renewable energy because it can be less predictable than fossil fuel-based power generation. The IEA estimates that some US$ 5.2 trillion is required in generation investments, and an additional US$ 6.1 trillion for transmission and distribution networks from now until 2030.[18]

Subsidies and other incentives – Many countries subsidize their energy sectors– estimated at around US$ 162 billion per year between 1995 and 1999.[19] Governments can encourage a long-term shift to low-GHG technologies through appropriate tax incentives and/or subsidies that would be phased out over time.

Private sector participation

The role of large companies – National and multinational companies can develop and deliver large scale investments in energy technologies that reduce GHG emissions and/or improve energy efficiency. In so doing these companies can create new markets and associated revenue streams for energy-related products and services for currently underserved populations in developing countries.

The role of small and medium enterprises (SMEs) – SMEs can play a key role in providing energy services where their in-depth knowledge of local needs and spending patterns can be used to tailor energy solutions and ensure broad-based impact.

Funding models

Multilateral or mutual funds – These funds bring together private sector, financial intermediaries, countries, development banks and other entities to develop project portfolios. This model benefits from risk diversification, specialization and economies of scale by reducing the transaction costs associated with individual project investments as different investors expect different returns. Examples include World Bank Carbon Funds.

Bilateral deals - Joint ventures between companies have the advantage of flexibility and can mobilize private sector funds and technology for larger projects and areas of new market potential by spreading risks and capital among the partners. Multinational companies are increasingly willing to invest in projects, not only to receive commercial returns or manage a carbon compliance position but also to gain long-term strategic market advantage. This can come through the development and testing of new technologies or positioning a company as pursuing a sustainable business model in a rapidly emerging market.

Less developed countries will typically need a more innovative spectrum of private and public sector finance (e.g., World Bank or International Finance Corporation), concessionary finance, and a variety of guarantees and insurance mechanisms to lower the risk profile of a project within parameters acceptable to external investors.

Capacity building

Access to finance for energy projects is not in itself sufficient. Developing countries also require substantial capacity building and related funding from public and private sector investors. Capacity building needs to be tackled at two levels: for large-scale infrastructure projects as well as for small-scale solutions, driven and implemented by local entrepreneurs. For large-scale projects, it is crucial to strengthen the strategic planning capabilities and project management skills of both regulatory authorities and project developers. For small-scale solutions, knowledge of the local market is crucial and needs to be complemented with strengthening of business skills and adapting technologies to local needs.

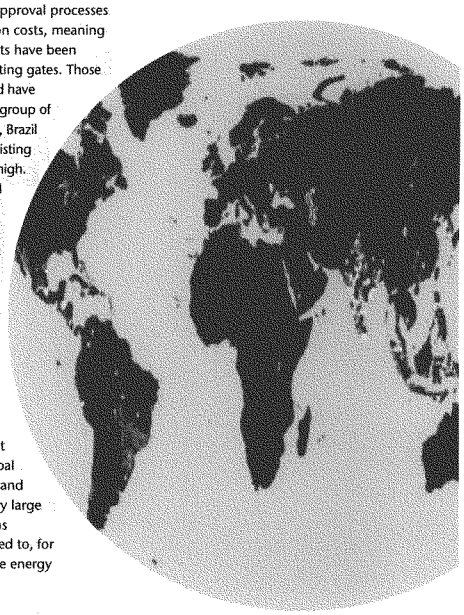
Clean Development Mechanism

The Clean Development Mechanism (CDM) is one of the Kyoto Protocol's flexible instruments and is designed to mitigate climate change by encouraging investments in low-GHG technologies in developing countries. The CDM has succeeded in bringing clean energy technology to some countries in the developing world. Yet many projects have been weighed down by lengthy approval processes and high transaction costs, meaning hundreds of projects have been stopped at the starting gates. Those that have succeeded have focused on a select group of countries like China, Brazil and India, where existing market potential is high. Only 3% of all CDM projects are located on the African continent and primarily within South Africa (see Figure 5).[20]

Around 35% of CDM credits in the pipeline come from just 15 projects for industrial gases that have very high global warming potential and thus generate a very large volume of emissions reductions compared to, for example, renewable energy projects.[21]

Pricing for certified emission reductions (CERs) created from CDM projects have generally been low, on the back of low-cost, end-of-pipe solutions that have satisfied market demand for CERs. Projects in Africa are further disadvantaged because CERs have historically been priced 20% lower than the global average.[22]

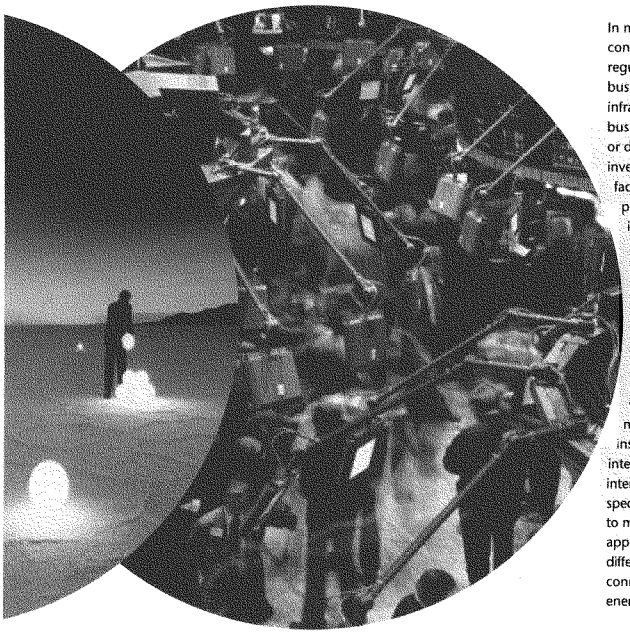
Low-cost solutions are not likely to trigger technology transfer in the early stages of technology development. Major technology investments in the near term will require substantial additional support and incentives to both scale up the investment amounts and reduce costs. Policy certainty regarding the mechanism's role and design in a post-2012 international climate framework could also provide much needed clarity for project-based investments.



- = CDM project, large scale, several locations
- = CDM project, small scale, one location
- = CDM project, small scale, several locations

Figure 5: Map of CDM project locations worldwide (Source: UNFCCC)

Harnessing capital markets



An important feature of the financial markets is their ability to set current values for future outputs. After accounting for attendant risks, a market puts a price on an asset according to expectations of the asset's ability to deliver future returns.

In markets and with investments, confidence is important. Political and regulatory risks, legal frameworks, business and investment infrastructures, and sustainable business models can either accelerate or diminish the nature and pace of investment or market liquidity. Such factors will determine the number of participants and potential scope of investment capital. Well-designed market frameworks can reduce project risks and maximize access to the greatest number of investors.

The business case for scaling up low- and zero-GHG technology projects in emerging economies, where energy needs are greatest, must draw upon mainstream institutional investors, the international development community, international money markets and speculators. Investment structures need to match the various investment appetites of potential investors, their different needs and interests, and connect or align these with clean energy projects and portfolios.

Using the markets to drive capital flows in clean technologies for developed and developing countries can only reach its full potential – in improving energy services while reducing emissions – if mainstream investors recognize the market potential of the energy underserved and the associated value in technologies, activities and infrastructure that reduces the carbon intensity of the global economy.

Key Messages

Engaging the private sector

WBCSD members recognize the societal need to significantly scale up investments in lower GHG technologies. They also see opportunities, for example:

- Establishing new markets for low GHG technologies and services
- Gaining competitive advantage through technological innovation
- Reducing costs through energy efficiency.

However, the members also recognize that a project's ability to attract investment also depends heavily on the prospect of a commercial rate of return. A lack of certainty over policies related to carbon pricing and GHG reduction targets increases the risk of achieving a commercial return for low-GHG technology projects. While this uncertainty prevails, the bulk of potential private capital available will probably flow to traditional energy sources, or remain uncommitted until definitive policies, which underpin a pragmatic approach, begin to emerge.

International policy efforts must align with the investment cycle that can last for decades, from initial R&D through to actual deployment at scale. A broad and efficient mix of policies and programs targeted at mitigation and adaptation and backed by supportive regulation and governance frameworks will reduce investment uncertainty and encourage business to invest for the long term.

Governments are engaging with business through instruments like the CDM and public-private technology partnerships. These are forming new areas of collaboration and new business opportunities.

However, in its current form the CDM will fail to achieve investment at scale and will not help solve the dire energy needs in regions such as sub-Saharan Africa.

Policies to change the world

Most stakeholders agree it will take a combination of financial mechanisms, including the carbon markets and official development assistance (ODA), to guarantee the energy demands of the future are met in a way that mitigates climate change. In order for business and private capital to play its role in delivering low- and zero-GHG technologies, key considerations in the design elements of future frameworks include the following.

Create robust and integrated policy frameworks

- Develop **policy frameworks that create predictable future demand** for new technologies and reward innovation
- Establish a **clear and strong expectation of a carbon price** in the near and long-term future to encourage investment
- Incorporate energy and climate strategies into national **development plans**
- Develop approaches that **expand or aggregate projects** through programs or portfolios to standardize and streamline the transaction process
- Establish **stable and transparent regulatory regimes** to help reduce corruption and improve country risk profiles.

Address all stages in the technology development cycle

- **Invest in public and private energy R&D** with the support of international financial institutions to help low-GHG technologies such as CCS, renewables and nuclear power through the various stages of development
- Ensure the commercial viability of technologies such as CCS and IGCC through direct **support and incentives in the demonstration phase**
- Adopt pragmatic and inclusive approaches that create **fast-track approval processes** to accelerate deployment of these new technologies
- Set an example for other sectors by acting **as an early adopter**, buying new, advanced technology products for government fleets and operations.

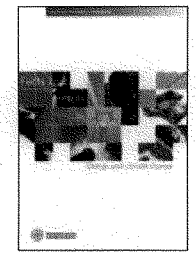
Encourage technology cooperation to developing countries

- Enhance growth and competitiveness in developing countries through technology cooperation by establishing a **competitive business-to-business framework** for transactions
- **Dismantle trade barriers** affecting the diffusion of technologies to encourage investment and business participation
- Manage the **intellectual property rights regime** to balance the need to incentivize innovation and the dissemination of technologies to support investment in new technologies.

Build capacity

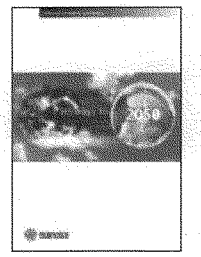
- **Build institutional capacity** to translate policies into robust and integrated development plans
- Support **investment in SMEs**, particularly in capacity building, so they can own and/or operate small-scale energy projects in order to help ensure deployment of technologies
- **Influence public behavior and acceptance** of new technologies through awareness raising and education to help ensure future demand for low-GHG energy services.

Energy and Climate Trilogy



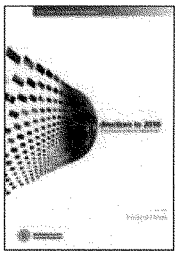
Facts and Trends to 2050

Presents key facts and trends related to energy and climate change and outlines corresponding dilemmas. Primarily designed for business, the issues are presented succinctly and illustrated by graphs and projections.



Pathways to 2050

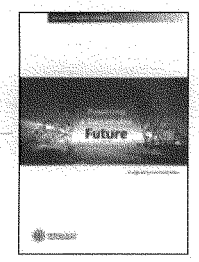
Builds on *Facts and Trends to 2050* and provides a more detailed overview of potential pathways to reducing CO_2 emissions.



Policy Directions to 2050

Explores potential policy approaches and mechanisms that might be deployed to introduce the required changes in the energy system.

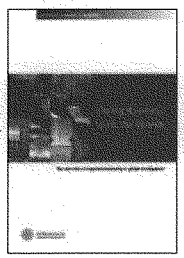
Electricity Utilities



Powering a Sustainable Future

A collaborative effort driven by the eight international companies that comprise the WBCSD's Electricity Utilities Sector Project. The report highlights the huge potential for end-use energy efficiency, which can provide more energy, more securely and sustainably, and at a lower price.

Development



"Doing Business with the World" - The new role of corporate leadership in global development

Shows how companies can contribute to global sustainable development through their core businesses. It offers a business perspective on key challenges and opportunities for the development of poor countries, as well as key messages for companies and governments on how to promote sustainable business solutions that benefit the poor and the societies and environments in which they live.

Promoting Small and Medium Enterprises for Sustainable Development

In collaboration with SNV Netherlands Development Organization, explains how governments can help alleviate poverty by focusing on small and medium enterprises (SMEs) and how larger corporations can help themselves by including SMEs in their value chains.

About
WBCSD

The World Business Council for Sustainable Development (WBCSD) brings together some 200 international companies in a shared commitment to sustainable development through economic growth, ecological balance and social progress. Our members are drawn from more than 30 countries and 20 major industrial sectors. We also benefit from a global network of about 60 national and regional business councils and partner organizations.

Our mission is to provide business leadership as a catalyst for change toward sustainable development, and to support the business license to operate, innovate and grow in a world increasingly shaped by sustainable development issues.

Our objectives include:
Business Leadership – to be a leading business advocate on sustainable development;

Policy Development - to help develop policies that create framework conditions for the business contribution to sustainable development;

The Business Case - to develop and promote the business case for sustainable development;

Best Practice - to demonstrate the business contribution to sustainable development and share best practices among members;

Global Outreach – to contribute to a sustainable future for developing nations and nations in transition.

Disclaimer
This report is released in the name of the WBCSD. Like other WBCSD reports, it is the result of a collaborative effort by members of the secretariat and executives from several member companies. A wide range of members reviewed drafts, thereby ensuring that the document broadly represents the majority view of the WBCSD membership. It does not mean, however, that every member company agrees with every word.

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Footnotes

[1] IEA. *World Energy Outlook*. 2006.

[2] World Bank. "Investment Framework for Clean Energy and Development: a platform for convergence of public and private investments".

[3] UNFCCC. "Report on the analysis of existing and potential investment and financial flows relevant to the development of an effective and appropriate international response to climate change". 2007.

[4] Ibid.

[5] *WBCSD. Energy and Climate: Facts and Trends to 2050*. 2007.

[6] See note 2.

[7] See note 2.

[8] See note 1.

[9] See note 1.

[10] See note 1.

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[13] WBCSD. *Policy Directions to 2050*. 2007.

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[15] IEA and OECD. *Energy Technology Perspectives: Scenarios and Strategies to 2050*. 2006.

[16] See note 1.

[17] Energy Commission of Ghana.

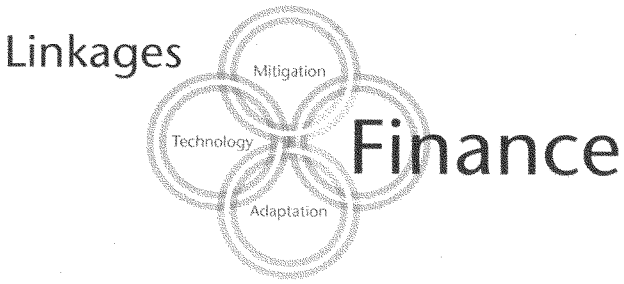
[18] See note 1.

[19] See note 14.

[20] Source: www.unfccc.org (accessed November 2007).

[21] See note 14.

[22] Reuters. "World Bank urges CO_2 markets to invest in Africa." 16 November 2006.



"Governments are asking us two key questions on climate change. How far can business go on its own, based on normal operations and investments? How can governments facilitate and enhance further action and investment by business? As the leading business voice on sustainable development we at the WBCSD recognize we owe governments answers to these questions."

WBCSD President Björn Stigson

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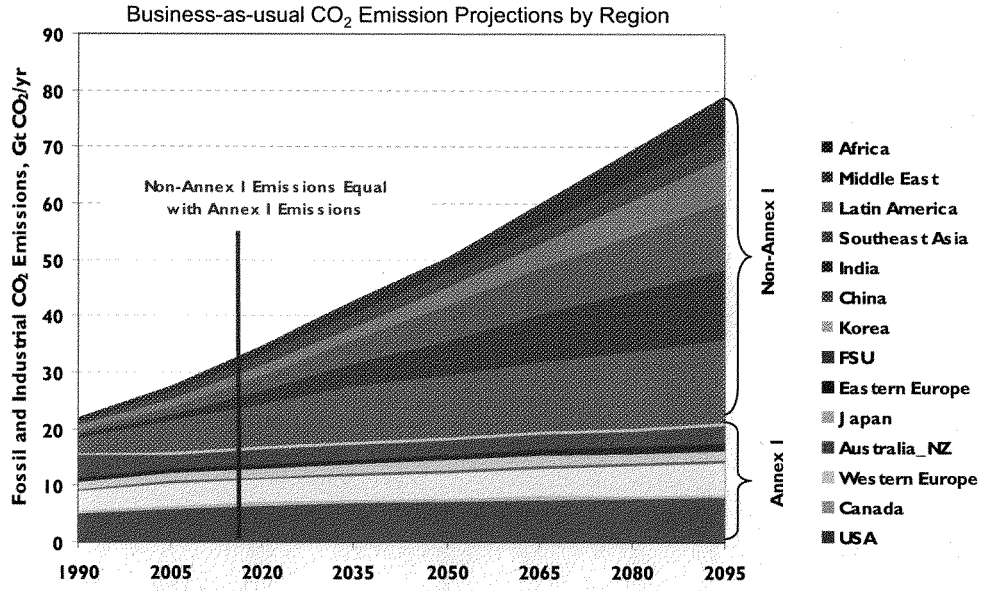
Important Transitions in Emitting Countries Over the Coming Century



Data derived from *Global Energy Technology Strategy, Addressing Climate Change: Phase 2 Findings from an International Public-Private Sponsored Research Program*, Battelle Memorial Institute, 2007.