

CLIMATE CHANGE AND NATIONAL SECURITY

HEARING

BEFORE THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

UNITED STATES SENATE

ONE HUNDRED ELEVENTH CONGRESS

FIRST SESSION

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JULY 30, 2009
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COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

ONE HUNDRED ELEVENTH CONGRESS
FIRST SESSION

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CLIMATE CHANGE AND NATIONAL SECURITY

THURSDAY, JULY 30, 2009

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
Washington, DC.

The full committee met, pursuant to notice, at 10 a.m. in room 406, Dirksen Senate Office Building, Hon. Barbara Boxer (chairman of the full committee) presiding.

Present: Senators Boxer, Inhofe, Carper, Lautenberg, Cardin, Klobuchar, Whitehouse, Udall, Voinovich, Barrasso, Bond, and Alexander.

OPENING STATEMENT OF HON. BARBARA BOXER, U.S. SENATOR FROM THE STATE OF CALIFORNIA

Senator BOXER. The committee will come to order.

I am deeply honored at having some many great Americans before us today. We welcome the panel.

I just want to go through the way we are going to proceed.

Today, on the floor of the Senate, momentarily maybe, or maybe not for a while, is a very important measure to replenish the Highway Trust Fund which, because of a number of reasons, some good and some bad, is running out of funds. When I say some good, it is because it means people are driving more fuel-efficient vehicles, and we are starting to make progress in that regard.

So, we see that the Trust Fund is running low on funds. So, today we have a measure to replenish the Fund. Unfortunately, it is a little controversial. So, I will have to leave at some point, and Senator Cardin will then take over as the Chair. He is just a great member of the committee. He is always there for us if we need him. And I thank him very much for that.

So, I am going to give an opening statement and colleagues will as well. After that, Senator Warner has reminded me of a Senate rule that says when a former Senator appears before the committee, he or she must be sworn in.

So, we will do that just for Senator Warner. We will not do that for the other members of the panel. And then we will proceed. We will go right down the row, and we look forward to hearing all of your comments.

Today's hearing will give us an opportunity to focus on climate change and national security. Again, I want to extend a warm welcome to our panel, and if I might just say, as a point of personal privilege, to our former colleague, Senator Warner, who retired just last year and whose leadership on this issue has been invaluable.

For many years, the world's experts on security have been telling us that global warming is a threat to our Nation's security and a danger to peace and stability around the world. Their words of warning should not be ignored. In 2003, the Defense Department commissioned a study that found the U.S., and I am quoting here, "will find itself in a world where Europe will be struggling eternally with large numbers of refugees washing up on its shores and Asia in serious crisis over food and water. Destruction and conflict will be endemic features of life." That is from the Defense Department in 2003.

A 2007 report conducted by the Center for Naval Analyses found that the United States could more frequently be drawn into situations of conflict "to help provide stability before conditions worsen and are exploited by extremists."

And just last September, the NATO Secretary General said that global warming will, and I quote, "sharpen the competition over resources, notably water, it will increase the risks to coastal regions, it will provoke disputes over territory and farming land, it will spur migration, and it will make fragile states even more fragile."

In addition to the destabilizing impacts that global warming will bring, shortages of food production due to drought, shrinking supplies of clean water as glaciers recede, displacement of people from low lying areas as sea levels rise, we must also address the ways in which our dependence on oil makes us more vulnerable.

A May 2009 report by retired U.S. Generals and Admirals, including Admiral McGinn, one of our witnesses today, stated that "a business as usual approach to energy security poses an unacceptable high threat level from a series of converging risks."

I believe we must heed these warnings to protect our Nation's security, and addressing the threats posed by climate change will also bring with it tremendous opportunity. The steps we take to address global warming, including incentives for the development of clean energy such as wind, solar, geothermal and algae fuels, developing a fleet of electric and other highly efficient vehicles, will help lessen our dependence on foreign oil.

Clean energy legislation will also create millions of new clean energy jobs. It will build a foundation for long-term economic growth.

We need to accelerate the process of building a new American clean energy economy. Clean energy, I believe, is the U.S. path toward economic leadership, a robust recovery, a healthier life for our families and a more secure world.

So, I look forward to hearing the testimony of witnesses today.

Now, I have made my statement in about 3 minutes. I would ask colleagues to try to hold your opening statements to 4 minutes, just given the panel before us. Well, I will ask you to take 4 but if you do 5, we will take extra time over here.

Go right ahead.

**OPENING STATEMENT OF HON. JAMES M. INHOFE,
U.S. SENATOR FROM THE STATE OF OKLAHOMA**

Senator INHOFE. All right. Thank you, Madam Chairman.

I welcome back Senator Warner. He and I have been on both sides of this issue because we served on the Armed Services Com-

mittee for many years together as well as both of us chairing this committee in the past. And on most things I agree with him.

I want to welcome the other people who are here today. Obviously, we disagree, we differ on the credibility of the science used in the reports that we have read. But that is not the focus of today. What I would like to do in my focus today, and first of all I have to say, Madam Chairman, and you talked a little bit about the competition on the floor, I have to leave here at 11:10 a.m., so I will be doing it at that time.

For the sake of this hearing, I am going to stipulate that the central finding in any reports that global warming poses a serious national security threat, I do not think it does, in fact it does not, but I will stipulate that it does for the purpose of this meeting, and also that the science is there, which I do not agree with.

Actually, I say to my good friend Senator Warner, so much has happened since a year ago when you had your bill on the floor and since your retirement, in terms of the scientists that have come over who were on the other side of the issue, but let us assume, for the sake of this committee hearing, that all of that stuff is true.

Now, what I am going to focus on is the link between developing American resources and American's national security. And I am going to explain why passing a cap-and-trade bill will not solve any of the legitimate issues that you identify in your reports.

Let me be clear. Even if we experience catastrophic changes in climate, the Waxman-Markey bill and its soon to be Senate variant would do nothing to stop it. EPA Administration Lisa Jackson, and I am sure you all read about this, it happened 3 weeks ago in this very room, in response to my question as to, you know, well if we were to pass the Waxman-Markey bill, would it have an effect of reducing CO₂ and she said no, it would not. In other words, unilateral action is not going to do it.

Chip Kappenberger, who used to be with the University of Virginia and is now with New Hope Environmental Services, has recently confirmed Administrator Jackson's statement. In a quantitative analysis released this morning, he found that using IPCC's own science, the Waxman-Markey would reduce global temperatures by less than one-tenth of one degree Fahrenheit by 2050.

This is kind of interesting because I can remember back when Al Gore was Vice President and he hired Tom Wigley, a foremost authority, a scientist, he said if all developed nations were to sign the Kyoto Treaty and live by their mission requirements, how much would it reduce temperature. His result was seven-one-hundredths of one degree Fahrenheit in 50 years. That is almost exactly the same thing that Chip Kappenberger said.

So, if the Waxman-Markey does virtually nothing to affect climate, what would be the impact on energy security? I would say to Admiral McGinn and Captain Powers, in your testimony you discuss with compelling force that the United States needs to reduce dependence on foreign oil, particularly from hostile regimes. I could not agree more. I am with you on that. We have got to do that. There is a national security issue there.

And I have argued for years that, for national security purposes, the United States must provide access to all forms of domestic energy supplies including wind, which we have a lot of in Oklahoma,

one of the leaders in wind energy, but also solar, geothermal, nuclear, clean oil and natural gas. It is clear that we have the resources.

According to a report by the Utah Mining Association, America's recoverable—this is very significant, I say to you, all three witnesses—America's recoverable oil shale resources are nearly three times as large as those in Saudi Arabia. The study concluded that utilizing U.S. oil shale deposits could provide America with the potential to be completely energy self-sufficient with no demands on external energy sources.

So the big problem we have is the people, and many of them are right here at this table, who do not want us to go offshore, do not want us to exploit our own resources. And so we cannot do that. That makes us more dependent.

I would conclude that if we were to pass something, which we are not going to do, but if we were to pass something close to the House bill, it would have the effect of making us more, not less, dependent upon other countries to run and defend this machine called America.

Thank you, Madam Chairman.

[The prepared statement of Senator Inhofe follows:]

Opening Statement of Senator James M. Inhofe
Environment and Public Works Committee
“Hearing on Climate Change and National Security.”
July 30, 2009

[Link to Press Release](#)

Thank you, Madame Chairman, for calling this important hearing today on climate change and national security. These are two issues that I have followed closely for years, both as a senior member of the Senate Armed Services Committee, and as ranking member and former chairman of this committee. In fact, I have worked on both issues on both committees with my good friend and former colleague, Sen. Warner. It’s good to see you here and I look forward to your testimony.

Welcome to the other witnesses here today. Captain Powers and Vice Admiral McGinn, thank you for your service to this country. I read your testimony with great interest. Not surprisingly, there are a number of areas where we agree. I’d like to talk about those in a minute.

Obviously, we differ about the credibility of the science used in your reports—and we differ about some of the report’s conclusions based on that science. But that’s not what my focus is today. Instead, I’m going to stipulate that the central finding in your reports—that climate change poses serious national security threats—is true. I’m even going to stipulate that all of the science informing your reports is true.

What I am going to focus on is the link between developing American resources and America’s national security. And I’m going to explain why passing cap-and-trade won’t solve any of the legitimate issues you identify in your reports.

Let’s be clear from the outset: even if we experience catastrophic changes in climate, the Waxman-Markey cap-and-trade bill, and its soon-to-be Senate variant, will do nothing to stop them. EPA Administrator Lisa Jackson said as much before this committee a few weeks ago. She agreed that unilateral action to address global warming is futile without meaningful participation from China, India, and other developing countries.

Chip Knappenberger, an environmental scientist with New Hope Environmental Services, has recently confirmed Administrator Jackson’s statement. In a quantitative analysis released this morning, he found that, using the IPCC’s own science, Waxman-Markey would reduce global temperatures by less than one-tenth of a degree Fahrenheit by 2050. In other words, the bill is all pain for no climate gain.

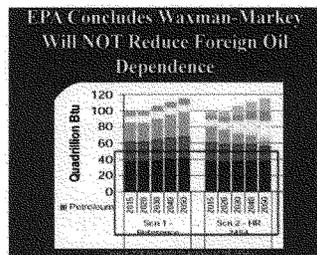
So if Waxman-Markey does virtually nothing to affect climate, what will be its impact on energy security? Vice Admiral McGinn, Captain Powers, in your testimony, you discuss with compelling

force that the U.S. needs to reduce dependence on foreign oil, particularly from hostile regimes. I couldn't agree more. I have argued for years that, for national security purposes, the United States must provide access to all forms of domestic energy supplies, including wind—which I have in good measure in Oklahoma—solar, geothermal, nuclear, clean coal, oil, and natural gas.

And it's clear we have the resources. According to a report by the Utah Mining Association, America's recoverable oil shale resources are nearly three times as large as those in Saudi Arabia. The study concluded that utilizing U.S. oil shale deposits could provide America with the "potential to be completely energy self-sufficient, with no demands on external energy sources."

That's the economic way to increase our energy security. Waxman-Markey is just the opposite: it would close access to American resources, destroy jobs, send manufacturing overseas, and therefore make us more dependent on energy from abroad.

What's more, Waxman-Markey won't achieve the main goal its supporters routinely trumpet. In its analysis of Waxman-Markey, EPA found that cap-and-trade would not "substantially change consumer behavior in their vehicle miles traveled or vehicle purchases at the prices at which low GHG emitting automotive technologies can be produced." It further stated that Waxman-Markey "creates little incentive for the introduction of low-GHG automotive technology."



It's notable, too, Vice Admiral, that in your 2007 and 2009 reports, cap-and-trade is never mentioned—and there is no recommendation to enact cap-and-trade. Instead, in your 2007 report, you call for, among other things, U.S. engagement with the "international community" to forge a meaningful climate change agreement. This implies that U.S. action alone won't solve the problem. I couldn't agree more.

If we decide as a nation to regulate greenhouse gas emissions—and I hope we won't—then the result will be carbon leakage. That's a fancy term that means manufacturing jobs and emissions will move overseas to countries that don't regulate emissions. By sending our jobs and basic industries to China and India, America will be weaker, and our strategic competitors will be stronger.

How can the United States continue to be the world's economic leader if we effectively de-industrialize the United States economy? I have in my hand a new report from the Government Accountability Office (GAO), which was requested by Sen. Baucus, a member of this committee. The report examines the impacts that climate change measures could have on U.S. manufacturers. I

recommend reading it to everyone here today.



According to GAO, "if domestic greenhouse gas emissions pricing were to make emissions more expensive in the United States than in other countries, production costs for domestic industries would likely increase relative to their international competitors, potentially disadvantaging industries in the United States. As a result, some domestic production could shift abroad, through changes in consumption or investment patterns, to countries where greenhouse gas emissions are less stringently regulated."

This needs no comment. It speaks for itself. It's clear, then, that passing cap-and-trade will do great harm to our economic security, to our energy security, and therefore to America's national security. We cannot on the one hand de-industrialize America and on the other hope that America will remain a great power. The sensible solution here is to free ourselves from Middle East oil by producing more of our resources—all of our resources—right here at home, and to pursue policies to encourage manufacturing here in the United States.

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Senator BOXER. Thank you, Senator, very much.
Senator Cardin.

**OPENING STATEMENT OF HON. BENJAMIN L. CARDIN,
U.S. SENATOR FROM THE STATE OF MARYLAND**

Senator CARDIN. Madam Chair, thank you very much, and I will ask for unanimous consent to put my entire statement in the record.

Senator BOXER. Without objection.

Senator CARDIN. I want to welcome our panel. Just for a moment, I want to single out Senator Warner. We have a very distinguished panel, but it is really a pleasure to have Senator Warner back before our committee.

Senator Warner has devoted his life to this topic. His entire life has been devoted to helping our national security and dealing with the environmental risks. He served with great distinction in the U.S. Senate and was our expert leader on national security issues.

And Senator Warner, you understood the relationship between dealing with our environment and dealing with our national security. It is a pleasure to welcome you back to our committee.

I agree with Senator Inhofe that we do have a security issue because of dependency on foreign oil. There is no question about that. We use 25 percent of the world's fossil fuels and we have 3 percent of the world's reserves of oil. And, quite frankly, we have given the oil industry plenty of acreage in order to explore the oil that we have. The problem is we do not have enough oil. We need to develop alternative and renewable energy sources, and that needs to be a part of our national security strategy.

But it is also true that the global climate change has a direct impact on the security of America. We know that just a slight change in climate has a dramatic impact on the stability of many regions in the world. If sea level rise is increasing, we know people that live on the coastal areas are going to migrate, and that migration will cause instability among other counties.

We also know that because of the change in the weather conditions, it will bring about droughts, it will bring about real concerns about feeding people in different regions in the world. That has a security concern about those regions. So we know about those concerns.

And then perhaps the one area that I hope we all could agree on is the availability of drinking water, and so many areas—they are being affected because of the melts of the glaciers and the impact that is going to have on regional security. All of this affects the United States' interests.

We are interested in stability in these regions for obvious reasons, but it also can put a stress on our own military and the demands of our own military as far as dealing with the potential instability in different regions in the world.

So, we have a direct interest in dealing with global climate change from a national security perspective as it relates to the security of our resources, but also as it relates to the stability internationally and U.S. interests and what we may be called upon as far as our military is concerned.

For all those reasons, Madam Chair, I am pleased that we are holding this hearing. I think you have a very distinguished panel that can help answer the questions as to why we need to deal with global climate change as a national security priority.

[The prepared statement of Senator Cardin follows:]

STATEMENT OF HON. BENJAMIN L. CARDIN,
U.S. SENATOR FROM THE STATE OF MARYLAND

Chairman Boxer, thank you for holding this hearing.

Research has shown an interesting correlation between traumatic climate events and political strife around the world. A study published in the November 2008 edition of the journal *Science* found geological evidence in Chinese caves that show extended droughts occurring right around the time when the Tang, Yuan and Ming dynasties were in decline.¹ Even today, drought and famine are at the heart of much of the civil and political strife in several sub-Saharan African nations. Similarly, last year's cyclone in Myanmar killed tens of thousands of people and increased tensions between the ruling military junta and the citizenry.

Climate scientists have predicted that global climate change could increase the frequency and intensity of extreme weather events like tropical storms, floods and droughts. Events like this can cause serious food shortages, foster the spread of diseases and lead to civil unrest.

Food and water shortages in Afghanistan, Somalia, Sudan and Pakistan are a contributing factor to the civil unrest these countries are experiencing. The combination of humanitarian crises and Islamic extremists creates a growing threat situation for our national security including our troops deployed overseas. The impacts of climate change will only exacerbate this problem.

CLIMATE AND WATER RESOURCES

The common element in the climate crisis is water. Some regions of the world face the threat of rising sea levels, more intense storms and flood events. Myanmar is a case study of how real this threat is. A similar event in Bangladesh or Indonesia could take hundreds of thousands of lives and create millions of "climate refugees" seeking asylum in neighboring countries, where they may face persecution as ethnic minorities. The U.S. has national security interests to help impacted nations mitigate these threats.

Separate issues accompany situations where water scarcity results from climatic changes. Changes in weather patterns that decrease precipitation cause extended drought, expand arid regions, and literally dry up freshwater supplies necessary for drinking water and agriculture. Warmer and dryer climates also diminish snowpack affecting downstream river flows. Droughts in vulnerable parts of the world can have a direct impact on food supplies and public health which can add to local and international tensions and increase demands for emergency assistance.

DOMESTIC ENERGY SECURITY

Our reliance on dirty fossil fuels gives OPEC nations indirect control of our economy. Last summer, the average price for gasoline topped out at more than \$4 a gallon, and this was caused by growing global demand for oil from countries like China and India and because OPEC nations control the supply. We need to regain control of not only our energy sources but also our fuel usage.

The United States consumes nearly 25 percent of the world's fossil fuels yet even the most liberal estimates say that we control or possess only about a 3 percent of the world's petroleum resources. This is not a problem we can drill our way out of. Diversification of our energy sources is critical to American energy and economic security, and the way to get there is to harness the Nation's abundant renewable energy and invest in abundant domestic alternative energy sources.

However, we are naive to think that industry will move toward cleaner, diversified and domestic energy sources without regulation and incentives to do so. But domestic political leadership will lead to domestic corporate leadership.

U.S. LEADERSHIP—CONCLUSION

The United States is a global leader in providing humanitarian aid to nations in need. Our generosity helps build trust and strength among our allies, and by help-

¹ Pingzhong Zhang, Hai Cheng, et al. "A Test of Climate, Sun, and Culture Relationships from an 1810-Year Chinese Cave Record," *Science* 322 (November 7, 2008).

ing maintain peace and stability in countries wrought by disaster also improves our national security.

We should anticipate more international and domestic disaster situations arising from the impacts of climate change. That is why I support both international and domestic climate adaptation programs funded through a portion of the allowance auction proceeds.

Reducing our carbon emissions, becoming the world's leader in renewable technology production and providing international climate adaptation funding to help countries plan and protect at risk communities facing the impacts of a changing climate are all policy solutions that demonstrate our commitment to lead the world in facing the climate crisis.

Senator BOXER. Senator, thank you very much.

Senator BOND.

Senator BOND. Thank you very much, Madam Chair. But Senator Voinovich, were you here ahead of me?

Senator VOINOVICH. I think I was.

Senator BOND. I apologize.

Senator BOXER. I am so sorry.

Senator BOND. As much as I want to talk, I believe he was here first.

Senator BOXER. I am so sorry. I had misinformation. We will switch you two around and put back the 5 minutes. Thank you.

Senator Voinovich.

**OPENING STATEMENT OF HON. GEORGE V. VOINOVICH,
U.S. SENATOR FROM THE STATE OF OHIO**

Senator VOINOVICH. Thank you very much.

First of all, I would like to welcome my good friend, John Warner, back here to the Senate. John, you and I have to sit down and talk about how it is on the outside once you leave this place because I am contemplating on doing that next year.

Madam Chairman, I am certainly glad that the committee has decided to delay marking up this climate change legislation. The hearings that our committee has held on the issue have reinforced my concerns with the size and scope of the legislative options that Congress is considering.

Any legislation that passes through the committee should both reduce our Nation's greenhouse gas emissions and make our Nation more energy secure. It should include provisions that allow us to fully utilize the domestic resources and responsibly increase our domestic production of oil and natural gas to relieve energy costs and strengthen our energy security.

I have long tried to encourage the harmonization of our energy, environment, economy and national security. This is my eleventh year on this committee. Unfortunately, national security concerns have never been prominently considered during my 11 years on this committee. I consider what we have been doing a tail wagging the dog agenda, driven by the environmental part of this four-part harmonization—energy, environment, economy and national security.

For years the gap in the United States between demand and domestic supply of oil has been widening. U.S. oil production has steadily declined since 1970 when it was nearly 10 million barrels per day to 4.9 million barrels today. But the U.S. consumed an average of 19.4 million barrels per day in 2008.

With many of our domestic resources now off limits, we have been forced to seek energy abroad. In 1973, the U.S. imported 6 million barrels per day of crude oil, or 34 percent. By 2008, these numbers had risen dramatically. Net oil imports were 9.7 or 61 percent of our total liquid fuel use.

In 2006, Hillard Huntington, Executive Director of Stanford University's Energy Modeling Forum, testified before the Foreign Relations Committee, of which I was a member at that time, and said "The odds of a foreign oil disruption over the next 10 years are slightly higher than 80 percent." He went on to testify that if global production were reduced by merely 2.1 percent, it would have a more serious effect on the economy than Hurricanes Katrina and Rita.

These concerns led me to introduce the National Energy Security Act, along with Senator Dorgan. This bill expands development of domestic oil and natural gas and moves us toward sustainable clean energy production and use by streamlining the permitting of the most promising areas of the outer Continental Shelf, providing \$50 billion in Federal loan guaranty authority for low carbon electricity including nuclear and advanced coal, and promoting the electrification of our transportation fleets so that by 2050, 80 percent of it would be electrified, and supporting something very important, a robust, reliable national grid.

This legislation is based on a report created by the Energy Security Leadership Counsel, a group of business and military leaders, and I am sure some of the military people know who are on this committee, who have committed to developing long-term policies that will reduce U.S. oil dependence and improve energy security.

The preamble of their report reads: Hostile state actors, insurgents and terrorists have made it their intention to use oil as a strategic weapon against the United States. Steadily rising global oil prices add to the danger by exacerbating tensions among consuming nations. Oil dependence, with its incumbent exporting of American wealth, exacts a tremendous financial toll on our country. Excessive reliance on oil constrains U.S. foreign policy and burdens a U.S. military, the protector of last resort for the global economy.

I would be interested to know if the witnesses here today share some of these concerns that were in the preamble of this report that this distinguished group of people put together.

Our problem today is, instead of considering this big picture, we are considering an overly complicated and partisan approach that would simply exacerbate the situation. Indeed, the financial burden that the Waxman bill places on the domestic oil industry will force the off shoring of U.S. refining capacity and jobs, leaving us at the mercy of foreign nations for refined gasoline supplies.

I have talked to individual after individual. First of all, we have not been building any refineries. Now, we are finally doing it. With this legislation, forget any new refineries in the United States. They are going to move overseas. Right now, in India, they are building the biggest refinery in the world with the idea that we will pass this legislation, our guys will be forced overseas and we will start getting more oil, more refined oil, from India.

We should be very, very concerned about this as a Nation. Our security is in deep jeopardy today, and we had better wake up.

Thank you, Madam Chairman.

[The prepared statement of Senator Voinovich follows:]

STATEMENT OF HON. GEORGE V. VOINOVICH,
U.S. SENATOR FROM THE STATE OF OHIO

Madam Chairman, I am certainly glad that the committee has decided to delay marking up climate change legislation. The hearings that our committee has held on the issue have reinforced my concerns with the size and scope of the legislative options that Congress is considering.

Any legislation that passes through the committee should both reduce our Nation's greenhouse gas emissions and make our Nation more energy secure. It should include provisions that allow us to fully utilize the domestic resources and responsibly increase our domestic production of oil and natural gas to relieve energy costs and strengthen our energy security.

I have long tried to encourage the harmonization of our energy, environment, economy and national security. Unfortunately, national and security concerns have never been prominently considered in this committee: here we have a "tail wagging the dog" agenda driven by environmental extremists. As such, our Nation's reliance on foreign sources of energy has steadily increased.

For years the gap in the United States between demand and domestic supply has been widening. U.S. oil production has steadily declined since 1970, when it was nearly 10 million barrels per day (BPD), to 4.9 million BPD in 2008. The U.S. consumed an average of 19.4 million BPD in 2008.

With many of our domestic resources now off limits, we have been forced to seek energy abroad. In 1973, the U.S. imported 6 million BPD of crude oil, or 34.8 percent of our total supply. By 2008, these numbers had risen dramatically: net oil imports were 9.7 million BPD, or 61 percent of our total liquid fuel use.

In 2006, Hillard Huntington, Executive Director of Stanford University's Energy Modeling Forum, testified before the Senate Foreign Relations Committee that "the odds of a foreign oil disruption happening over the next 10 years are slightly higher [than] 80 percent." He went on to testify that if global production were reduced by merely 2.1 percent, that it would have a more serious effect on the economy than hurricanes Katrina and Rita.

These concerns lead me to introduce the National Energy Security Act along with Senator Dorgan. This bill expands development of domestic oil and natural gas and moves us toward sustainable clean energy production and use by streamlining the permitting of the most promising areas of the Outer Continental Shelf; providing \$50 billion in Federal loan guarantee authority for low carbon electricity, including from nuclear and advanced coal; promoting the electrification of the transportation fleet; and supporting a robust, reliable national grid.

The legislation is based on a report created by the Energy Security Leadership Council, a group of business and military leaders committed to developing long-term policies that will U.S. oil dependence and improve energy security. The preamble of their report reads:

"Hostile state actors, insurgents, and terrorists have made their intention to use oil as a strategic weapon against the United States. Steadily rising global oil prices add to the danger by exacerbating tensions among consuming nations ... [O]il dependence, with its incumbent exporting of American wealth, exacts a tremendous financial toll on our country ... [E]xcessive reliance on oil constrains ... U.S. foreign policy and burdens a U.S. military ... the protector of last resort for ... the global economy."

I would be interested to know if any of the witnesses here today share these concerns. I think the threat posed to our national security is real and that the comprehensive bipartisan approach provided by Senator Dorgan and myself is the solution that Congress should be using.

Instead, we are considering an overly complicated and partisan approach that would simply exacerbate the situation. Indeed, the financial burden the Waxman bill places on the domestic oil industry will force the off-shoring of U.S. refining capacity and jobs, leaving us at the mercy of foreign nations for refined gasoline supplies. This undercuts our national security interests and our economy.

During a time when the national unemployment rate is at 9.5 percent and the national debt is over \$11.5 trillion, we should first do no harm to the economy when enacting climate change policy. A 1,400-page job killing "Ruth Goldberg" climate proposal is no path to recovery.

That this bill will do little to address this global environmental issue and much to erode our competitive position in the world marketplace, our economy, and our national security interests is without dispute. This was confirmed by Administrator Jackson's recent statement before this committee that unilateral U.S. action "will not impact world CO₂ levels;" in a recent GAO report, which concludes that the bill could "cause output, profits, or employment to decline;" and a preliminary report by EIA that shows by 2030 annual losses in GDP could be as high as \$465 billion, with corresponding annual decreases in manufacturing output by as much as \$642 billion, and a \$272 billion hit to the pocketbooks of working families.

Madam Chairwoman, I hope that we can work together in examining the true costs of any climate change legislation that might come before the Senate Environmental and Public Works Committee before we hamper the U.S. economy with altruistic goals through complicated unachievable mandates.

Senator BOXER. Thank you so much.
Senator Lautenberg.

**OPENING STATEMENT OF HON. FRANK R. LAUTENBERG,
U.S. SENATOR FROM THE STATE OF NEW JERSEY**

Senator LAUTENBERG. Thank you very much, Madam Chairman.
If I can personalize for a moment. John, I have not seen you around. Where have you been?

[Laughter.]

Senator LAUTENBERG. You are one of the few members who are left of the venerated generation, and we miss you. We are pleased to see you here among the other distinguished colleagues, particularly you.

Madam Chairman, as we research the consequence of just saying no and staying the course that we are on, we hear the alarm ringing loudly across our country. As we research the consequences of doing that, we see greenhouse emissions continue to rise at their current rates, global temperatures could increase by more than 11 degrees by the end of this century, sea level rise threatening families and communities who call the coastal areas of their homes; inhabitants of low lying areas in the Pacific are already seeking new homes on higher ground because their old homes are threatened and will soon be underwater.

As people are displaced, they will compete for resources, for land, fresh water and food, and because of global warming, there will be fewer resources to fight over. For example, Himalayan glaciers that provide water to billions of people in China, India and Pakistan will recede. And with temperatures rising and water declining, crops throughout that volatile region and many others will wither and die. People around the world could face a terrible choice: fight their neighbors for the means to stay alive, or flee their homes and become climate refugees.

According to the CIA's National Intelligence Counsel, as many as 800 million people or more will face water or crop scarcity in the next 15 years—15 years, setting the stage for conflict and breeding the conditions for terrorism.

This is the future if we continue down the path of relying on dirty fuels like coal and oil and ignoring the dangerous consequences. And if we fail to change course, it is our children and our grandchildren who are going to suffer most from our negligence.

Last month, the House of Representatives passed a landmark bill that could change these grim forecasts. It would reduce greenhouse

gas emissions at a low cost and in a way that creates thousands of new clean energy jobs. The world's eyes are now on the Senate, and specifically on this committee, to pass a bill that moves our country away from the dirty, unstable sources of energy and toward clean, sustainable and efficient ones, and to stave off that life-altering 11 degree rise in temperature.

Clean energy can create jobs, as it has in my home State of New Jersey. More than 2,000 clean energy companies now call New Jersey home, employing more than 25,000 people. Clean energy can reduce air pollution that causes asthma and cancer, reducing healthcare costs for all of us.

And clean energy can strengthen our national security. As retired General Anthony Zinni has said, we will pay now to reduce greenhouse gas emissions today or we will pay the price later in military terms and that will involve human lives.

We cannot afford to wait any longer. We have got to get to work, get past the no zone, and pass our clean energy bill.

I thank you all for being here.

Senator BOXER. Thank you very much, Senator Lautenberg.

And now, it is Senator Bond.

**OPENING STATEMENT OF HON. CHRISTOPHER S. BOND,
U.S. SENATOR FROM THE STATE OF MISSOURI**

Senator BOND. Thank you, Madam Chair, for holding this hearing.

I join in welcoming our former colleague, my long-time hero and leader, Squire Warner. He does not have to be sworn in for me to know that he is telling the truth. Unfortunately, today we see the truth in little different forms. But I believe that what he says is what he believes to be the truth. It is great to see him back.

With respect to Waxman-Markey, unfortunately it will do little to stop foreign wars overseas. It will do little to help our climate. It will do everything to start U.S. trade wars that hurt U.S. workers at home and abroad.

As our Ranking Member pointed out, the EPA Administrator confirmed recently that the Waxman-Markey bill will have no appreciable effect on world temperatures because EPA analysis shows that passing a U.S. cap-and-trade bill alone, without China and India taking similar action to reduce their own carbon emissions, will not halt the worldwide rise in carbon concentrations, and if you believe that they create temperature increases, temperatures will go up.

With no halt to rising world temperatures, Waxman-Markey will do nothing, nothing, to address the threat to America's national security that military advisors might see from climate change. Waxman-Markey will do nothing to address climate as a threat multiplier for instability in some of the world's most volatile regions. Waxman-Markey will do nothing to avoid tensions to stable regions, nothing to prevent terrorism from worsening, and nothing to avoid dragging the United States into conflicts over water and other critical resource shortages.

I would like to know whether any of the panelists specifically support Waxman-Markey that the House passed. We had a group of Governors testify last week, and when pressed, they refused to

support the specifics of Waxman-Markey. I surmise we may have an Admiral join them this week.

It is easy to see why. Waxman-Markey will kill 2.5 million U.S. jobs, even after including new green jobs. An Admiral knows that cutting off the arm of a sailor does not make the sailor stronger or fight better. Cutting off 2.5 million jobs from American's workers will not make America stronger. It will make us weaker and less secure.

Waxman-Markey not only threatens our economic security at home with massive job losses, but also threatens our economic security by starting a new international carbon trade war.

I met with a Chinese delegation, a high level delegation that came in town this week. I had conversations directly with the Vice Ministers for Commerce and Environment. They are very much concerned with carbon tariffs in the Waxman-Markey bill. They have no intention of enforcing radical limits on their carbon emission. They want to work with us, as they are, in finding cleaner ways to use energy. But they will not limit their ability to use fossil fuels to increase the well being of their citizens.

And I am sure that China will not hesitate to retaliate with their own trade tariffs and sanctions in response to any U.S. climate sanctions. They already showed that when we put Buy America provisions in the misnamed stimulus bill. They had a Buy China response to it.

A carbon trade war will hurt Missouri farmers who could no longer export crops overseas and manufacturing workers who could no longer export their products. All told, Missouri has nearly \$13 billion in total exports at risk in a carbon trade war, and over \$700 million in agricultural exports that could go unsold. Workers at 4,000 Missouri businesses that export overseas could face job losses, 3,600 of these in small or medium-sized businesses with under 500 employees.

There are better paths to stabilize at-risk nations and reduce significantly our dependence on foreign oil. I am a co-sponsor, with Senator Durbin, of the Water for the World Act to increase USAID and state capability to improve clean water. I believe this is the kind of smart power the United States can employ, putting sandals and sneakers on the ground to make life better for millions, avoiding the later need for boots and battleships.

We support dramatic action to expand clean energy, nuclear, clean coal when ready, electric, plug-in and hybrid vehicles, biofuels, new cellulosic and algae-based ethanol fuels; even wind and solar where they make sense. And we need to expand our use of American resources here at home. Clean energy, American energy, not energy taxes, not lost jobs.

Thank you, Madam Chair. I ask that my full statement be included in the record.

[The prepared statement of Senator Bond follows:]



Thursday, July 30, 2009

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**STATEMENT OF U.S. SENATOR KIT BOND
 SENATE ENVIRONMENT AND PUBLIC WORKS COMMITTEE HEARING
 ON NATIONAL SECURITY AND CLIMATE CHANGE**

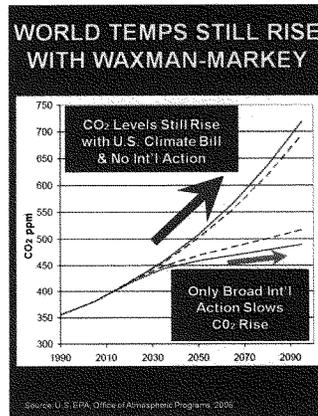
Madame Chairman, thank you for holding this hearing today on national security issues and climate change. Unfortunately, the Waxman-Markey cap and trade bill will do little to stop foreign wars overseas, and do everything to start U.S. trade wars that hurt U.S. workers at home and abroad.

Testimony this month by U.S. EPA Administrator Jackson confirmed that the Waxman-Markey bill will have no effect on world temperatures. This is because [EPA analysis shows](#) that passing a U.S. cap and trade bill alone without China and India taking similar action to reduce their own carbon emissions will not halt the world-wide rise in carbon concentrations. That means temperatures will still go up.

With no halt to rising world temperatures, Waxman-Markey will do nothing to address the threat to America's national security that military advisors see from climate change. Waxman-Markey will do nothing to address climate as a threat multiplier for instability in some of the world's most volatile regions. Waxman-Markey will do nothing to avoid adding tension to stable regions, nothing to prevent terrorism from worsening, and nothing to avoid dragging the United States into conflicts over water and other critical resource shortages.

I would like to know whether any of the panelists specifically support Waxman-Markey as passed by the House last month. We had a group of Governors testify last week and when pressed, they refused to support the specifics of Waxman-Markey. I surmise we may have an admiral join them this week.

It is easy to see why. Waxman-Markey will kill 2.5 million U.S. jobs, even after including any new green jobs. An admiral knows that cutting off the arm of a sailor doesn't make that sailor stronger or fight better. Cutting off 2.5 million jobs from America's workers will not make America stronger, it will make us weaker and less secure.



Waxman-Markey not only threatens our economic security at home with massive U.S. job loss, but also threatens our economic security abroad by starting a new international carbon trade war. I met with the Chinese delegation in town this week, including the Vice Ministers for Commerce and the Environment. They are very concerned with the carbon tariffs in the Waxman-Markey bill. I am sure that China will not hesitate to retaliate with their own trade tariffs and sanctions in response to any U.S. climate sanctions.

A carbon trade war will hurt Missouri farmers who could no longer export their crops overseas. A carbon trade war will hurt Missouri manufacturing workers who could no longer export their products overseas.

All told, Missouri has nearly \$13 billion in total exports at risk in a carbon trade war and over \$700 million in agricultural exports that could go unsold. Workers at over 4,000 Missouri businesses that export overseas could face job loss, with 3,600 of these small- or medium-sized businesses under 500 employees.

MISSOURI THREATENED BY CARBON TRADE WAR	
Total Exports	\$12.8B
Agricultural Exports	\$700M
Exporting Companies	4,000
Exporting Small & Med. Bus.	3,400

Instead of putting Missouri jobs at risk and closing overseas markets to Missouri exports, there are better paths to stabilize at risk nations and reduce significantly our dependence on foreign oil.

I am a cosponsor with Senator Durbin of the Water for the World Act to increase USAID and State capacity to improve clean water and sanitation in the Third World. That bill has as its goal providing 100 million additional people with sustainable access to safe drinking water and sanitation by 2015. That is the kind of smart power the U.S. can deploy with sandals and sneakers, making life better for millions and avoiding the later need for U.S. boots and battleships.

Republicans also support dramatic action to expand clean energy sources - those include nuclear, clean coal when ready, electric hybrid and plug-in vehicles, biofuels, new cellulosic and algae-based fuels, and even wind and solar where it makes economic sense. Republicans support dramatic action to expand American energy sources - those include environmentally friendly sources of oil off our own U.S. shores, American clean coal and natural gas under our own lands.

Republicans support dramatic action to expand affordable energy - that means increasing supplies of clean energy to keep prices down and not using carbon taxes and lost jobs to punish people already struggling through the worst recession in generations. Clean energy, American energy, affordable energy - not energy taxes, not lost jobs. That is the agenda I urge this committee, this Congress, and this Nation to embrace.

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Links:
 U.S. Environmental Protection Agency, http://www.epa.gov/climatechange/downloads/s2191_EPA_Analysis.pdf
 Missouri Department of Economic Development, http://www.missourieconomy.org/pdfs/global_market_0313.pdf
 Missouri Economic Research & Information Center, http://www.missourieconomy.org/pdfs/2008_non-manufactured.pdf

Senator BOXER. Without objection. So ordered.
Our next would be Senator Carper.

**OPENING STATEMENT OF HON. THOMAS R. CARPER,
U.S. SENATOR FROM THE STATE OF DELAWARE**

Senator CARPER. Thanks, Madam Chair.

To my leader, for the folks on the panel, I used to be a naval flight officer back during the Vietnam war, and our Secretary of the Navy at the time was John Warner. I have always referred to him as my leader. It is great to see you again. When I first came to the Senate, I referred to him as Mr. Secretary, and he referred to me as Lieutenant Carper. I have always been deferential to him and value him very much. He has been a great friend and mentor, and I am just delighted to see you back.

To a real Admiral, not a Rear Admiral, but a real Admiral, Vice Admiral Dennis McGinn, it is very nice to see you. And Mr. Powers and Mr. Rivkin, thank you for joining us, too.

I listened to my friend, also a recovering Governor, Senator Bond, talk about all the things that we need to do. He said we need more nuclear. I think we need more nuclear. He said we need more clean coal. We need more clean coal. He said, I think he said, we need more solar, we need more wind, we need to create more biofuels and maybe turn CO₂ emissions into wastes that go to feed biofuels, feed algae, stuff like that. We need all of those things.

The remarkable thing to me is that if we are smart about putting together a piece of legislation that not only addresses security concerns that flow out of climate change, not only address the threats to our environment and so forth, but are really smart about it, we will actually create incentives to do all of those things that Senator Bond just talked about.

Some of my friends like to talk about putting a tax on carbon. I do not think there are a lot of people who are going to vote for that. Most of the people I hear talk about it would not vote for it. But what we do need to do is put a price on carbon.

I like to quote, and I have repeatedly, John Doerr, who sat right where Senator Warner is sitting today. John Doerr is a very successful entrepreneur from California who started a lot of companies, hundreds of companies, made a lot of money, created a lot of jobs. His advice to us as we focus on this issue of climate change is to No. 1, put a price on carbon, No. 2, put a price on carbon, and No. 3, put a price on carbon.

If we are smart, we will put a price on carbon. And we will put together legislation around it and a regulatory structure around it that will not create this tale of horrors that we keep hearing about, but will provide the ways to address, appropriately, our security needs, our environmental challenges, and most important, help us create a whole bunch of new jobs, to put people to work, to give us technologies that we can sell around the world.

Thank you, Madam Chair.

Senator BOXER. Thank you very much.
Senator Barrasso.

**OPENING STATEMENT OF HON. JOHN BARRASSO,
U.S. SENATOR FROM THE STATE OF WYOMING**

Senator BARRASSO. Thank you very much, Madam Chairman.

I would like to welcome all of those who are coming to share their thoughts with us, but a special welcome to my good friend, Senator John Warner. Senator, it is great to see you again. Thank you for being here.

Madam Chairman, I agree that climate change is a national security issue, and the evidence that this is the case really is overwhelming. In a recent Reuters article dated May 30, 2009, entitled Carbon Credit Schemes Will Draw Organized Crime According to Interpol, Peter Younger, an environmental crimes specialist at Interpol, was quoted as saying, in the future, if you are running a factory and you desperately need credits to offset your emissions, there will be someone who can make that happen for you. Absolutely, organized crime will be involved.

Interpol has partnered with the U.S. Environmental Protection Agency to address this threat. They have created something called the Climate Change Crime and Corruption Working Group. The group's stated goal is to explore legislative restraints and potential loopholes that may potentially lead to the development of new crime areas with result to the issue of climate change.

They have a Web site for people to go to and get more information and all that. I will put that into the record, Madam Chairman.

Senator BOXER. Without objection. We will do it.

Senator BARRASSO. Thank you. As well as the article, if I may, Madam Chairman, from Reuters.

Senator BOXER. Yes.

[The referenced information was not received at time of print.]

Senator BARRASSO. Thank you.

As of now, two investigators with the EPA participated in this working group at Interpol. Interpol is the world's largest international police organization with 187 member countries. It facilitates cross-border police cooperation and supports and assists all organizations, authorities and services whose mission is to prevent or combat international crime.

Interpol and the EPA are aware of the potential threat that cap-and-trade schemes can pose if taken advantage of by these elements. They recognize the dangers that carbon markets can lead to funding streams to international organized crime elements.

These criminal elements are a threat to all nations. They traffic in weapons, explosives, fake IDs, passports, drugs, money laundering and human trafficking. Some are designated as terrorist organizations, including organizations in Colombia, the Russian mafia and the Mexican drug cartels that threaten our border. Carbon markets created by Waxman-Markey could become a boon to these and to fund these organizations.

We should all be concerned because these groups are a threat to U.S. national security. Some even operate within our own borders. If we are to endeavor to create a carbon trading scheme here in the United States, we have to know the national security implications of such an approach.

We need to know if Interpol's assessment is shared by other members of the intelligence community. How prepared are they to

deal with this potential new funding stream for international crime organizations in the carbon markets?

And it is for that reason, Madam Chairman, as Ranking Member of the Subcommittee of Oversight of this committee, I sent letters yesterday to the Director of National Intelligence as well as to the agency heads of the Central Intelligence Agency, the National Security Agency, the Securities Exchange Commission, the Environmental Protection Agency, the Department of Homeland Security and the Federal Bureau of Investigation.

In those letters I ask, given that Congress is considering cap-and-trade legislation that would create carbon credit markets in the United States, whether those agencies agree with Interpol's assessment about the threats posed by international criminal organizations.

I also ask what threats to U.S. national security would result if criminal or terrorist elements raised funds through carbon markets as Interpol has suggested. In the case of the EPA, I asked what are the current findings of Interpol's Climate Change Crime and Corruption Working Group since the organization is being headed by EPA investigators?

To my knowledge, Madam Chairman, our committee has not been briefed on the activities of this working group. I believe that such a briefing should occur as soon as possible. I believe the committee needs to get the full picture from our intelligence and environmental agencies as to the potential threats posed by the manipulation of carbon markets.

I have asked that the responses to my letters be provided in the next 2 weeks and I will share those responses with the members of this committee so that we may get a full picture of this national security issue before we vote on legislation to create carbon markets.

Thank you, Madam Chairman.

Senator BOXER. Thanks very much, Senator.

And now we will go to Senator Klobuchar.

**OPENING STATEMENT OF HON. AMY KLOBUCHAR,
U.S. SENATOR FROM THE STATE OF MINNESOTA**

Senator KLOBUCHAR. Thank you very much, Madam Chair.

I listened to my colleague's remarks with interest because my focus, I guess, is a little more basic, and that is first of all, the effects that climate change could have on our national security climate change itself. I was honored to speak with you, Vice Admiral McGinn, a bit about this in the last few days and was just struck by what I am sure we will hear today.

Just when you look at—if you believe the scientists, and I do, the effect of the melting of the Himalayan glaciers could have on countries like Afghanistan and Pakistan, already incredibly volatile situations, the effect it will have if China starts running out of water.

Those are real national security threats that we have to look at. I am no expert on that. So, in terms of the effect that climate change has on national security, I am very much looking forward to your testimony and hearing what you have to say about that because I think it is a whole different angle on this.

Sometimes people can say, well, I do not really care what happens in these other developing nations. They are not mine. When I was in Vietnam with Senator McCain and Senator Graham, the No. 1 thing the Prime Minister there raised was climate change because they are on the ocean.

But even if you say you do not care about what happens to those countries, we should care from a national security standpoint if what happens in those countries is going to affect the national security of the United States of America. So, I care very much about hearing about that today.

The second thing that I care about is the effect that this reliance on foreign energy has on our own country. Last year, the National Intelligence Counsel completed a classified assessment titled The National Security Implications of Global Climate Change Through 2030. These were consensus findings of key, 16 U.S. intelligence agencies. Again, this was during last year, and the last time I checked, that was during the Bush administration.

The assessment explores how climate change could threaten U.S. security in the next 20 years. They talk about the political instability, the mass movements of refugees, terrorism, conflicts over water, as you mentioned, Vice Admiral McGinn, with China. The assessment also indicates that additional stress on resources and infrastructure will exacerbate internal state pressures and generate interstate friction through competition for resources or disagreement over responses and responsibility.

If there is one thing that all Americans, whether they are Republicans or Democrats or Independents, can agree on, is that our Nation relies too much on foreign energy and that this reliance puts our Nation at a security risk.

The 1970s demonstrates our Nation's vulnerability. I was 10 years old in 1970, but I remember that decade and the lines of people when OPEC decided to reduce the global oil supplies. Americans were forced to line up their cars at gas stations across the country.

Over 30 years later, Americans import more oil than ever. We import nearly 5 billion barrels into this country and send hundreds of billions of dollars a year to foreign countries. Now, we know that it is OK to have those kinds of relationships with Canada. We know it is OK to have them with our allies. We are not going to say no to importing all foreign oil.

But when we look at some of the countries where we rely on our energy, countries that we would rather not be dealing with, that put us at risk if they cut off our supply, we know that we have to be producing our own homegrown energy.

And we know that it is going to have to be a comprehensive strategy. It is going to have to include things like biofuels, which have been cutting edge in our State, and we are looking forward to developing the next stage of biofuels, which is cellulosic. It is going to be nuclear, it is going to be everything from geothermal to hydro to the cutting edge work that is being done with wind and with solar. We know it should be comprehensive, and I think there is bipartisan agreement on that, including some increased drilling in our own country.

But that being said, if we just turn our heads and say, oh, this hearing should be about the national security implications of cap-and-trade, I would like to be a little more basic here and focus on what are the national security implications if we start losing glaciers so that these developing countries that we are already trying to keep very instable governments in place become ever more instable.

What are the effects in the Mideast? What are the effects if we become more and more dependent on foreign oil? That is what I hope this hearing will be about.

Thank you very much.

Madam Chair, I yield the floor.

Senator BOXER. Thank you very much, Senator.

Senator Alexander.

**OPENING STATEMENT OF HON. LAMAR ALEXANDER,
U.S. SENATOR FROM THE STATE OF TENNESSEE**

Senator ALEXANDER. Thanks, Madam Chairman.

Let me welcome Senator Warner, especially, and the entire group of witnesses. I look forward to that.

We have a broad spectrum of opinion here about climate change, as Senator Warner will remember. Some do not believe it is much of a threat; some are ready to jump off the cliff. My view of it is that I am convinced enough that I think we ought to buy some insurance, and we ought to do something about it.

So, I do not want to argue about climate change today. I want to concede the point. The questions that I will have, when my turn comes, will be more about if climate change is the inconvenient problem, then I want to be talking about what appears to be the inconvenient solution—nuclear power.

Some on the other side have said, well, the Republicans do not have any ideas. Well, all 40 Republican Senators have endorsed No. 1, building 100 nuclear plants in the next 20 years. Nuclear is 70 percent of our carbon-free, pollution-free energy, and that is the number that we built between 1970 and 1990, and we can do it again.

Two, we endorse the idea of doing all we can to electrify half of our cars and trucks, thinking that is our fastest and best way to reduce our consumption of foreign oil by about one-third. Three, we support offshore natural gas exploration. It is low carbon. And oil, we ought to use less of it, but use more of our own.

And finally, we support doubling energy research and development on a series of mini-Manhattan Projects to try to look at these alternatives in renewable energies and see if we can make them cost competitive and reliable while we are doing the other things that we already know how to do, such things as making solar costs competitive. In the TVA region today, it costs four or five times what other things do. And making electric batteries better, and green buildings, and finding ways to re-use nuclear fuel in the safest and best way, even fusion on down the road.

So, my questions are going to be, we have a distinguished group of military people here, a former Secretary of the Navy. What if you were assigned, in a strategic session, we have got a problem

here and we need to build 20 percent of our electricity from pollution-free, carbon-free energy.

Someone might come up with a plan and say, well, let us use biomass, sort of a controlled bonfire. Since the wind does not blow in Tennessee and Virginia, that is what they tell us we can use. You might say, well, you would have to forest an area the size of the Great Smoky Mountain National Park in order to get the equivalent of one nuclear power plant.

They say, well, let us use solar. And you might say, well, that is very promising, and we hope to use it one day; it has strategic advantages, but it is four to five times the cost of other electricity in the TVA region, and you know, to equal a 1,000-megawatt nuclear power plant you would have to cover, oh, 30 square miles.

Then someone will surely say, let us build wind turbines. We, in effect, we do not have a clean energy policy in the United States or ever a renewable energy policy. We have a national windmill policy. We have the President saying we need increased—20 percent of our electricity needs to come from wind turbines. We are spending—the Congress has appropriated nearly \$30 billion in subsidies over the next 10 years for wind developers. It is considerably higher than the subsidies for all other renewable energy.

The Secretary of the Interior met this week with the wind turbine makers, and they said, let us make it 20 percent of our electricity. Well, if you are thinking about that in a strategic way, A, it is more expensive. That is 130,000 to 180,000 wind turbines and all the transmission lines that go with them, which would cover an area the size of West Virginia and only be available one-third of the time. So, would that meet our strategic objectives?

Then you can say, well, our other option is take the technology we invented and that France is using, 80 percent of its electricity is nuclear power, and this is attracting jobs from Spain, which has more expensive electricity, it has more expensive electricity, it has among the lower carbon emissions in the European Union. Or look at China, building more nuclear plants than all the rest of the world put together with our help, India building them with our help, Japan building one every year. We have not built one in 30 years.

So, would you not make a military judgment that, while we figure out all of the renewable and alternative energies, which are promising and intriguing, why are we not giving the same kind of attention to building 100 nuclear power plants in the next 20 years? We invented the technology, we know how to do it, and would it not be the fastest way to deal with, and maybe the only way to seriously deal with, global warming in this generation?

Thank you, Madam Senator.

Senator BOXER. Thank you very much, Senator.

We will hear from Senator Udall, then Senator Whitehouse unless we have an intervening, and then we will move on.

Senator Udall.

**OPENING STATEMENT OF HON. TOM UDALL,
U.S. SENATOR FROM THE STATE OF NEW MEXICO**

Senator UDALL. Thank you, Madam Chair. I would like to put my opening statement in the record and just be very brief.

Senator BOXER. Without objection.

Senator UDALL. Senator Warner, it has not changed much, has it, in terms of the speeches and you not getting to talk here quickly? I wonder what it feels like on the other side there.

So, I am going to be very, very brief. I just want to say to you, and I am hoping that you being able to speak and me giving up my time to you, that you may be able to persuade some of your former colleagues on the other side of the importance of doing climate change legislation.

I know that you were very bold and very courageous when you stepped out and you did, with Senator Lieberman, a piece of legislation. And I know from traveling on a river with you and Senator Worth in the West that you were interested in climate change a long time ago.

We were with one of the top climatologists, a fellow by the name of John Fierer, and we went down a river and he explained to us what was going to happen in terms of the Western landscape and how it was twice as hot and we would see those pine trees disappear and things like that.

So, I am going to yield back the rest of my time. I may only be able to be here until a little bit before 11 a.m., so hopefully you can speak and persuade some of the folks on the other side of the aisle that this is important and it is on our national security interest. And then, we get it done.

So, thank you very much, and I yield back.

[The prepared statement of Senator Udall follows:]

STATEMENT OF HON. TOM UDALL,
U.S. SENATOR FROM THE STATE OF NEW MEXICO

It is well known and often repeated that the U.S. imports nearly 70 percent of its oil, consumes 25 percent of global supply, and has only 3 percent of its reserves.

As a result, our oil dependence is fully recognized as a national security problem. However, we are only beginning to realize that we face a fate worse than oil dependence—global oil scarcity.

Today, global reserves are about 1.2 trillion barrels, and the world uses about 85 million barrels every day. If consumption and supply stay constant, the world has less than 40 years left of supply. With supply peaking and demand accelerating, it could be much less than 40 years. Major oil fields are declining, and the International Energy Agency estimates we need to replace more than 50 percent of global production—45 million barrels per day, equal to 4 new Saudi Arabias—just to tread water.

Claims of vast oil shale deposits in the U.S. and worldwide do not recognize that these are not counted as reserves because the vast amounts of them have proven to be unrecoverable economically. In fact, it appears likely that more energy would be required to recover the oil shale than contained in the oil shale. It is also a problem that 3 barrels of water are required to recover 1 barrel of oil shale.

And of course, every new gasoline powered vehicle on the road in China or India makes treading water on global oil supplies that much harder.

Many oil industry experts believe balancing future supply and demand is impossible given the geologically finite supply of oil and the dysfunctional politics and economics of oil-rich nations. More than 75 percent of the 1.2 trillion barrels of global reserves are controlled by foreign national oil companies that do not operate under market principles.

In 2008, the U.S. spent \$475 billion on foreign oil imports. That works out to around \$4,000 per American family in 1 year. Most experts expect prices to rise over the coming years, increasing this foreign oil tax on U.S. consumers. For comparison, that cost is over 20 times more than the estimated cost of the House American Clean Energy Security Act.

Given these figures, and our testimony today, it is clear that legislation to provide clean energy incentives to reduce foreign oil dependence does not cost the U.S.—it saves both money and lives. The Senate must urgently consider legislation to

achieve leadership in the next generation of clean energy technology, reduce our dependence on foreign oil, and prevent the catastrophic impacts of global warming.

Senator BOXER. Thank you very much.
Senator Whitehouse.

**OPENING STATEMENT OF HON. SHELDON WHITEHOUSE,
U.S. SENATOR FROM THE STATE OF RHODE ISLAND**

Senator WHITEHOUSE. I am going to follow the good example of my colleague, Senator Udall, and simply welcome my friend Senator Warner here. We miss you, John.

Senator Warner and I served together on the Intelligence Committee during the time that we overlapped. He was a very distinguished and senior member of that committee. It was during that time that the national intelligence estimates by the then Bush administration national security officials chronicling the hazards and risks that we face from climate change came out. I know he was instrumental in getting that report done.

I just want to welcome him back and let him know what a good thing it is to see him back in the institution to which he brought such luster.

Thank you, Madam Chairman.

Senator BOXER. Thank you very much.

We are getting to our witnesses. I want to put two, unless there is objection, two documents in the record because Senator Bond mentioned the study, I think it is the Heritage Foundation, he did not mention that, that says there will be a loss of 2.5 million jobs. If it is another one, then it is another study. Do you know the name of the study?

Senator BOND. [Remarks off microphone.]

Senator BOXER. The National Black Chamber of Commerce study of 2.5 million jobs lost. And I am putting in the record the Pew Charitable Trust Study which shows that the clean energy jobs have been the one bright spot in this economic recession, both in California and in all 50 States.

[The referenced Pew study follows:]



The Clean Energy Economy California

California has the largest clean energy economy of the 50 states. Jobs in this sector grew at a faster rate than total jobs in the Golden State between 1998 and 2007. California's clean energy economy has been driven by significant investment, attracting more than \$6.5 billion in venture capital in the past three years. It also has been driven by public policies, from financial incentives for clean energy development and energy efficiency to renewable portfolio and energy efficiency standards. California's Green Building Action Plan—a goal for public buildings to be 20 percent more energy efficient by 2015—could save the state \$100 million annually.¹

BY THE NUMBERS, THE CLEAN ENERGY ECONOMY:

- Jobs (2007): **125,390**
- Businesses (2007): **10,209**
- Venture Capital Funds (2006-2008)*: **\$6,580,426,908**
- Patents (1999-2008): **1,401**

EXAMPLES OF COMPANIES:**

Bridgelux, Sunnyvale (Energy Efficiency): designs and manufactures LED lighting

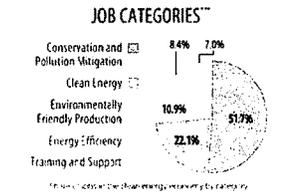
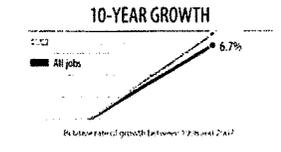
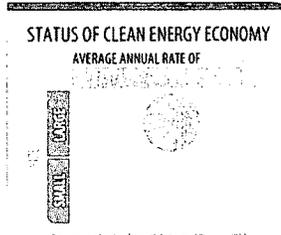
Zpower, Camarillo (Clean Energy): designs and manufactures silver zinc batteries for next generation cell phones and computers (formerly known as Zinc Matrix Power)

■ MORE ABOUT THE SECTOR

Download the full report by visiting www.pewtrusts.org/cleanenergyeconomy

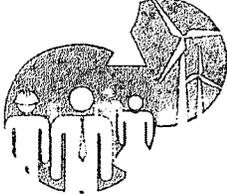
NOTES: **Values reported in 2008 dollars. **Information current as of May 8, 2009. This report is intended for educational and informational purposes. References to specific products, services, companies and policy makers have been included solely to advance these purposes and do not constitute an endorsement, sponsorship or recommendation by The Pew Charitable Trusts. ***These numbers may not add up to 100 percent due to rounding. ****Financial incentives include residential, commercial and industrial loan financing, rebate programs and tax incentives.

SOURCES: Jobs and establishment data from The Pew Charitable Trusts, 2009; based on the National Establishment Time Series Database; analysis by Pew Center on the States and Collaborative Economics. (1) State of California: Office of the Governor press release, "Executive Order S-20-04," December 14, 2004, <http://gov.ca.gov/executive-order/3360/> (accessed May 13, 2009).



- ### CLEAN ENERGY POLICIES
- Financial Incentives****
 - Renewable Portfolio Standards
 - Energy Efficiency Resource Standards
 - Regional Cap and Trade Program

the CleanEnergy Economy



Repowering Jobs, Businesses and
Investments Across America



Executive Summary

America's clean energy economy is flourishing as a critical component of the nation's future.

Research by The Pew Charitable Trusts shows that despite a lack of sustained policy attention and investment, the emerging clean energy economy has grown considerably—extending to all 50 states, engaging a wide variety of workers and generating new industries. Between 1998 and 2007, its jobs grew at a faster rate than overall jobs. Like all other sectors, the clean energy economy has been hit by the recession, but investments in clean technology have fared far better in the past year than venture capital overall. Looking forward, the clean energy economy has tremendous potential for growth, as investments continue to flow from both the government and private sector and federal and state policy makers increasingly push for reforms that will both spur economic renewal and sustain the environment.

By 2007, more than 68,200 businesses across all 50 states and the District of Columbia accounted for about 770,000 jobs that achieve the double bottom line of economic growth and environmental sustainability (Exhibit 1).

In today's tough financial climate, when millions of jobs have been lost, those numbers may sound modest. Three quarters of a million jobs represent half a percent of all jobs in the United States today. But Pew's research shows that between 1998 and 2007, clean energy economy jobs—a mix of white- and blue-collar positions, from scientists

and engineers to electricians, machinists and teachers—grew by 9.1 percent, while total jobs grew by only 3.7 percent. And although we expect job growth in the clean energy economy to have declined in 2008, experts predict the drop in this sector will be less severe than the drop in U.S. jobs overall.

Pew's research indicates a strong start for a new economy still very much in its infancy. To put our clean energy economy numbers in perspective, consider the following. Biotechnology, which has developed applications for agriculture, consumer products, the environment and health care and has been the focus of significant public policy and government and private investment, employed fewer than 200,000 workers, or about a tenth of a percent of total U.S. jobs in 2007, according to a 2008 Ernst & Young report. And the well-established traditional energy sector—including utilities, coal mining and oil and gas extraction, industries that have received significant government investment—comprised about 1.27 million workers in 2007, or about 1 percent of total employment.

Growing attention and financial support from both the private and public sectors indicate that the clean energy economy is poised to expand significantly. Signaling interest in new market opportunities, venture capital investment in clean technology crossed the \$1 billion threshold in 2005 and continued to grow substantially, totaling about \$12.6 billion during the past three years. Although they have dropped significantly in recent months because of the recession, investments in clean

technology are actually faring better than other industries: They were down 48 percent in the first three months of 2009 compared with a year earlier, while total venture capital across all sectors was down 61 percent for the same period. "It's important not to miss the forest for the trees," Nicholas Parker, executive chairman of the Cleantech Group, said in January 2009. "In 2008, there was a quantum leap in talent, resources and institutional appetite for clean technologies. Now, more than ever, clean technologies represent the biggest opportunities for job and wealth creation."

Between 2006 and 2008, 40 states and the District of Columbia attracted venture capital investments in technologies and industries aimed at economic growth and environmental sustainability. And all states will receive a major infusion of federal funds through the recently enacted American Recovery and Reinvestment Act (ARRA), which allocates nearly \$85 billion in direct spending and tax incentives for energy- and transportation-related programs.

Every State Has a Piece of the Clean Energy Economy

With traditional manufacturing jobs declining during the past decade, states have been working aggressively to develop new industries and create jobs that will endure—and remain within U.S. borders. They also have been working to address the public's concerns about high energy prices, national security and our dependence on foreign oil, and global warming—all with an understanding that America is on its way to being a carbon-constrained country. "While our economic engine has for years been powered by relatively inexpensive energy,

there is evidence that this era is coming to a close," a National Governors Association report noted in 2007. "Meanwhile, we are increasingly aware of the serious impacts of global climate change—and how America's consumption of fossil fuels is contributing to a warming Earth."

Pew's analysis shows that every state has a piece of America's clean energy economy. Texas, for instance, generates more electricity from wind than any other state, had more than 55,000 clean energy economy jobs in 2007, and attracted more than \$716 million in venture capital funds for clean technology between 2006 and 2008. Tennessee has succeeded in cultivating jobs in recycling, waste treatment and water management, among other conservation industries; jobs in Tennessee's clean energy economy grew by more than 18 percent between 1998 and 2007, compared with 2.5 percent growth in all jobs in the state. Colorado has raised the amount of power electricity providers must supply from renewable energy sources to stimulate job growth in solar and wind power and other forms of clean energy generation. Ohio ranked among the top five states with the most jobs in clean energy, energy efficiency and environmentally friendly production in 2007. Idaho, Kansas, Mississippi and South Dakota are among more than a dozen states where the number of jobs in the clean energy economy in 2007 was modest, but the average annual growth rate of those jobs was among the highest in the country. All told, in 38 states and the District of Columbia, job growth in the clean energy economy outperformed total jobs growth between 1998 and 2007. In a number of states, job gains in the clean energy economy have helped lessen total job losses.

Defining the Clean Energy Economy

Pew partnered with Collaborative Economics, Inc., a public policy research firm based in California, on the research. While organizations on both sides of the political spectrum have weighed in with forecasts and economic modeling to estimate the size of the clean energy economy, Pew's analysis is the first of its kind to count actual jobs, businesses and investments for each of the 50 states and the District of Columbia. Our numbers are conservative and may be lower than some other reports for three reasons: First, we developed a stringent definition of the clean energy economy; second, we used a new, labor-intensive methodology that counted only companies that we could verify online as being actively engaged in the clean energy economy; and third, we counted businesses and jobs supplying products and services generated by the clean energy economy, not the companies using these products and services to make themselves "greener" (i.e., we counted only companies and jobs on the supply side, not the demand side, of the clean energy economy).

Policy makers, business leaders and the public need credible, reliable data to ground their policy deliberations and choices, and to understand where emerging economic opportunities lie. They also need a clear, concrete and common definition of what constitutes the clean energy economy so they can track jobs and businesses and gauge the effectiveness of public policy choices and investments.

Based on significant research and input from experts in the field, including the advisory panel that helped guide this study, Pew developed the following definition:

A clean energy economy generates jobs, businesses and investments while expanding clean energy production, increasing energy efficiency, reducing greenhouse gas emissions, waste and pollution, and conserving water and other natural resources.

The clean energy economy cuts across five categories: (1) Clean Energy; (2) Energy Efficiency; (3) Environmentally Friendly Production; (4) Conservation and Pollution Mitigation; and (5) Training and Support.

While specific jobs and businesses will change in the coming decades, the five categories of the clean energy economy will not—providing a clear, practical and consistent framework for federal, state and local policy makers and the private sector to track investments, job and business creation, and growth over time.

Jobs of Today, and Jobs of Tomorrow

Pew's framework takes into account that technology, scientific research, market forces and public policy will continue to drive innovation and competition, so the largest segments of today's clean energy economy may not be its driving forces tomorrow.

Our data show that 65 percent of today's clean energy economy jobs are in the category of Conservation and Pollution Mitigation—a sector that reflects the growing recognition among the public, policy makers and business leaders of the need to recycle waste, conserve water and mitigate emissions of greenhouse gases and other pollutants. But three other categories—Clean Energy, Energy Efficiency and Environmentally Friendly Production—are growing at a far faster clip. And about 80 percent of venture capital investments in 2008 were in the sectors of Clean Energy and Energy Efficiency: businesses and jobs working to develop clean, renewable energy

sources such as wind and solar and products and services that reduce our overall energy consumption—all of which will help meet the demands of a carbon-constrained economy.

The flow of venture capital indicates which sectors are most attractive to investors and have the greatest growth potential. The number of jobs and businesses in Clean Energy and Energy Efficiency will grow over time—and as the country increases the amount of power it draws from renewable sources, we will generate less waste, reduce our reliance on foreign oil and produce fewer carbon emissions that cause global warming. That does not mean that jobs in the Conservation and Pollution Mitigation category will disappear. As other countries seek to follow America's lead, they increasingly will need help managing their finite natural resources and addressing the adverse effects of their use of fossil-fuel energy sources—creating a new market for our products, technology and know-how.

Public Policy's Role in Driving the Clean Energy Economy

Public policy is another important indicator of the future of the clean energy economy.

Policies intended to advance the clean energy economy—from comprehensive energy plans, renewable energy standards and energy efficiency measures to the development of alternative fuels, job retraining and waste reduction efforts—have been adopted or are being actively considered by both the federal government and states. It is too early to tell to what degree these efforts will succeed in stimulating U.S. job growth, strengthening America's competitiveness, curbing pollution and conserving resources. But Pew's analysis indicates such policies have great potential

because they create significant incentives for both the private and public sectors to develop new technologies, infrastructure and processes for clean energy, efficiency and conservation. Now that we have baseline data in hand, Pew will conduct follow-up research to assess which approaches are particularly effective in generating jobs, businesses and investments in the clean energy economy.

State policies. Governors and legislators across the country are seeking to get to the double bottom line of economic growth and environmental sustainability by adopting policies to advance the clean energy economy.

Financial incentives. Forty-six states offer some form of tax incentive to encourage corporations and residents to use renewable energy or adopt energy efficiency systems and equipment. Thirty-three states provide residential, commercial and industrial loan financing for the purchase of renewable energy or energy efficiency systems or equipment. And 22 states and the District of Columbia offer rebate programs to promote the installation of solar water heating or solar panels for electricity generation.

Renewable portfolio standards. Twenty-nine states and the District of Columbia have adopted renewable portfolio standards, which require electricity providers to supply a minimum amount of power from renewable energy sources.

Energy efficiency standards. Nineteen states have established energy efficiency standards for energy generation, transmission and use.

Regional clean energy initiatives.

Twenty-three states are participating in three major regional initiatives seeking to increase renewable energy generation and reduce carbon pollution from power plants that causes global warming.

Vehicle emissions standards. Fourteen states and the District of Columbia have adopted (and three more states are poised to adopt) California's vehicle emissions standards, which allow states the right to require automakers to reduce carbon emissions from new cars and light trucks more aggressively than federal standards mandate. On May 19, 2009, President Barack Obama established national limits on vehicle emissions by adopting fuel efficiency standards that match California's.

Federal policies. The federal government also has played a critical role, adopting policies and making investments that have spurred economic growth and environmental protection from coast to coast. Laws enacted in the 1960s and 1970s helped develop the recycling, waste reduction and waste management industries. The EPA's Energy Star and Water Sense certification and labeling initiatives long have helped consumers choose and use products that conserve energy and water. And for almost two decades, the U.S. Department of Commerce has helped manufacturers improve efficiency, reduce waste and develop clean technologies and products.

In the last three years, federal policy makers have taken major steps to drive the clean energy economy forward. President Obama's recent efforts to enact stronger fuel efficiency

standards built on earlier legislation. In 2007, President George W. Bush signed into law the first congressionally mandated increase in fuel efficiency standards for cars and light trucks in more than 30 years. The Energy Independence and Security Act of 2007 is projected to save consumers \$25 billion at the gas pump, save 1.1 million barrels of oil a day and reduce greenhouse gas emissions.

Enacted in February 2009, ARRA—the federal stimulus bill—includes an array of provisions to spur clean energy generation and energy efficiency businesses, jobs and investments. Among the almost \$85 billion the package allocates to energy- and transportation-related spending, about \$21 billion is dedicated to extending tax incentives for wind, solar and other renewable energy manufacturers. ARRA also provides more than \$30 billion for direct spending on clean energy programs, including \$11 billion to modernize the nation's electricity grid; \$2 billion for advanced battery technology; more than \$6 billion for state and local efforts to achieve energy efficiency; \$5 billion for weatherization of low-income homes; \$500 million for job training to help workers participate in the clean energy economy; and \$300 million to purchase thousands of new, fuel-efficient vehicles for the federal fleet from American auto companies.

Moving forward. Given America's need to create enduring jobs and industries while conserving natural resources and reducing carbon emissions, federal leaders are deliberating additional measures to spur the clean energy economy.

President Obama has signaled his support for a federal clean energy plan to reduce greenhouse gas emissions by at least 80 percent by 2050, and a national renewable

portfolio standard that would require that 25 percent of the nation's energy supply be derived from renewable sources by 2025. At this writing, the U.S. House of Representatives is considering the American Clean Energy and Security Act, a market-based proposal that would limit overall greenhouse gas emissions and distribute tradable federal allowances for each ton of pollution emitted. The program

would apply to electric utilities, oil companies and other entities that produce more than 25,000 tons of carbon dioxide each year. The bill would increase significantly the amount of energy derived from low- or zero-carbon sources, including renewables—meaning that businesses and jobs would be generated to develop clean energy sources to meet the demand.

EXHIBIT 1 THE U.S. CLEAN ENERGY ECONOMY BY THE NUMBERS

By 2007, 68,203 businesses in the United States had generated more than 770,000 jobs in the clean energy economy. And between 2006 and 2008, about \$12.6 billion of venture capital investments was directed toward clean technology businesses in 40 states and the District of Columbia. The U.S. clean energy economy is an emerging source of jobs that achieve the double bottom line of economic growth and environmental sustainability. Every state has a piece of America's clean energy economy.

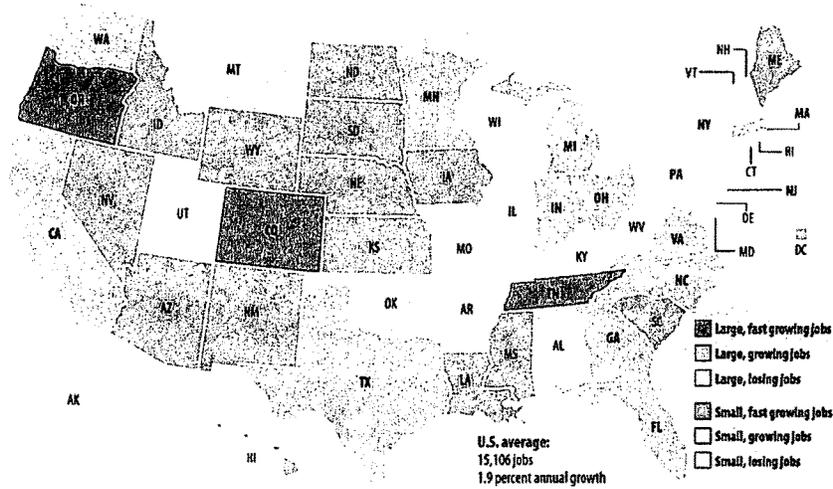
	CLEAN BUSINESSES 2007	CLEAN JOBS 2007	CLEAN JOB GROWTH 1998-2007	OVERALL JOB GROWTH 1998-2007	VENTURE CAPITAL 2006-2008 (thousands)		CLEAN BUSINESSES 2007	CLEAN JOBS 2007	CLEAN JOB GROWTH 1998-2007	OVERALL JOB GROWTH 1998-2007	VENTURE CAPITAL 2006-2008 (thousands)
Alabama	799	7,849	2.2%	1.6%	\$0	Montana	408	2,155	0.2%	12.7%	\$0
Alaska	350	2,140	9.4	15.7	0	Nebraska	368	5,292	108.6	-4.9	0
Arizona	1,123	11,578	21.3	16.2	31,106	Nevada	511	3,641	28.8	26.5	19,804
Arkansas	448	4,597	7.8	3.5	22,845	New Hampshire	465	4,029	2.0	6.8	66,917
California	10,209	125,390	7.7	6.7	6,580,427	New Jersey	2,031	25,397	-9.6	-2.7	282,568
Colorado	1,778	17,008	18.2	8.2	622,401	New Mexico	577	4,815	50.1	1.9	147,913
Connecticut	857	10,147	7.0	-2.7	30,050	New York	3,323	34,363	-1.9	-2.6	209,590
Delaware	211	2,368	-2.3	-8.9	3,342	North Carolina	1,783	16,997	15.3	6.4	82,571
District of Columbia	280	5,325	18.8	-7.1	89,877	North Dakota	137	2,112	30.9	9.4	0
Florida	3,831	31,122	7.9	22.4	116,980	Ohio	2,513	35,267	7.3	-2.2	74,224
Georgia	1,827	16,222	10.8	15.7	179,686	Oklahoma	693	5,465	6.8	2.4	5,192
Hawaii	356	2,732	43.6	7.3	12,304	Oregon	1,613	19,340	50.7	7.5	70,002
Idaho	428	4,517	126.1	13.8	27,890	Pennsylvania	2,934	38,763	-6.2	-3.1	232,897
Illinois	2,176	28,395	-2.5	-2.5	108,519	Rhode Island	237	2,328	0.7	0.6	22,845
Indiana	1,268	17,298	17.9	-1.0	26,000	South Carolina	884	11,255	36.2	2.2	0
Iowa	729	7,702	26.1	3.6	149,237	South Dakota	169	1,636	93.4	4.9	0
Kansas	591	8,017	51.0	-0.3	13,275	Tennessee	1,090	15,507	18.2	2.5	16,329
Kentucky	778	9,308	10.0	3.6	0	Texas	4,802	55,646	15.5	6.7	716,894
Louisiana	995	10,641	19.5	3.0	0	Utah	579	5,199	-12.4	10.8	26,957
Maine	725	6,000	22.7	3.3	0	Vermont	311	2,161	15.3	7.4	53,747
Maryland	1,145	12,908	-2.4	1.3	323,996	Virginia	1,446	16,907	6.0	6.6	70,828
Massachusetts	1,912	26,678	4.3	-4.4	1,278,462	Washington	2,008	17,013	0.5	1.3	635,109
Michigan	1,932	22,674	10.7	-3.6	55,099	West Virginia	332	3,065	-4.1	0.7	5,741
Minnesota	1,206	19,994	11.9	1.9	49,938	Wisconsin	1,294	15,089	-5.2	3.4	46,743
Mississippi	454	3,200	24.8	3.6	30,384	Wyoming	225	1,419	56.4	14.0	6,942
Missouri	1,062	11,714	5.4	2.1	24,480	U.S. Total	68,203	770,385	9.1	3.7	12,570,110

NOTE: Venture capital values are adjusted for inflation and reported in 2008 dollars. See appendices for the complete data sets.

SOURCE: Pew Charitable Trusts, 2009, based on the National Establishment Time Series Database and data from the Cleantech Group™ LLC; analysis by the Pew Center on the States and Collaborative Economics

EXHIBIT 10
WHERE ARE THE JOBS IN THE CLEAN ENERGY ECONOMY?

Looking simultaneously at the total number of jobs (large or small) and their average annual growth rate (fast growing, growing or losing), states' clean energy economies fall into six groups: large and fast-growing jobs, growing jobs or losing jobs; and small and fast-growing jobs, growing jobs or losing jobs. Large states had more jobs in their clean energy economies in 2007 than the national average of 15,106 jobs. Small states had fewer than the national average of clean energy economy jobs. States with fast-growing clean energy economies experienced average annual growth between 1998 and 2007 that exceeded the national average of 1.9 percent. Growing states had a positive average annual rate of growth less than 1.9 percent and losing states have experienced negative growth.



STATE	TOTAL CLEAN JOBS 2007	AVG. ANNUAL GROWTH 1998-2007	STATE	TOTAL CLEAN JOBS 2007	AVG. ANNUAL GROWTH 1998-2007	STATE	TOTAL CLEAN JOBS 2007	AVG. ANNUAL GROWTH 1998-2007
Alabama	7,849	0.31%	Kentucky	9,308	1.09%	North Dakota	2,112	3.17%
Alaska	2,140	1.14	Louisiana	10,641	2.06	Ohio	35,267	0.85
Arizona	11,578	2.19	Maine	6,000	2.34	Oklahoma	5,465	0.89
Arkansas	4,597	0.99	Maryland	12,908	-0.11	Oregon	19,340	4.77
California	125,390	0.88	Massachusetts	26,678	0.52	Pennsylvania	38,763	-0.48
Colorado	17,008	1.98	Michigan	22,674	1.20	Rhode Island	2,328	0.37
Connecticut	10,147	1.11	Minnesota	19,994	1.38	South Carolina	11,255	3.56
Delaware	2,368	0.23	Mississippi	3,200	2.57	South Dakota	1,636	7.89
District of Columbia	5,325	2.13	Missouri	11,714	0.71	Tennessee	15,507	2.14
Florida	31,122	0.90	Montana	2,155	0.15	Texas	55,646	1.70
Georgia	16,222	1.18	Nebraska	5,292	10.00	Utah	5,199	-1.31
Hawaii	2,732	4.29	Nevada	3,641	3.15	Vermont	2,161	1.69
Idaho	4,517	10.11	New Hampshire	4,029	0.44	Virginia	16,907	0.66
Illinois	28,395	-0.25	New Jersey	25,397	-1.08	Washington	17,013	0.23
Indiana	17,298	1.88	New Mexico	4,815	4.73	West Virginia	3,065	-0.36
Iowa	7,702	2.66	New York	34,363	-0.14	Wisconsin	15,089	-0.55
Kansas	8,017	4.74	North Carolina	16,997	1.62	Wyoming	1,419	5.16

SOURCE: Pew Charitable Trusts, 2009, based on the National Establishment Time Series Database; analysis by Pew Center on the States and Collaborative Economics.

EXHIBIT 11
STATE LEADERS IN JOBS ACROSS
THE CLEAN ENERGY ECONOMY BY CATEGORY

Although California leads in overall employment in each category, a closer look reveals other notable trends. Arizona makes the top 10 in Clean Energy but in no other category. Massachusetts, New York and Ohio are among the top 10 in all but one category.

While Arizona, Arkansas, Iowa, Maine, Nebraska, Wisconsin and the District of Columbia each have fewer than 15,106 jobs in the clean energy economy—the national average—they rank among the top 10 states in one of the five categories. In all, nearly half the states rank among at least the top 10 states in at least one category of the clean energy economy.

Clean Energy	JOBS 2007	Energy Efficiency	JOBS 2007	Environmentally Friendly Production	JOBS 2007	Conservation and Pollution Mitigation	JOBS 2007	Training and Support	JOBS 2007
California	27,672	California	10,510	California	13,666	California	64,799	California	8,743
Pennsylvania	10,099	Texas	6,353	Minnesota	3,815	Texas	40,617	New York	3,499
Minnesota	4,030	Ohio	5,367	Oregon	3,304	Pennsylvania	24,703	Illinois	3,216
Ohio	3,653	Oregon	4,893	Ohio	2,800	Florida	24,686	Massachusetts	3,155
Texas	3,479	New York	3,311	Iowa	2,237	New York	23,082	District of Columbia	3,130
New York	3,421	Wisconsin	2,801	Texas	2,223	Ohio	22,296	Texas	2,974
Michigan	2,941	Maine	2,560	Nebraska	2,162	New Jersey	20,060	Florida	2,249
Massachusetts	2,890	Massachusetts	2,553	Illinois	1,921	Illinois	19,631	Virginia	1,755
District of Columbia	2,728	Virginia	2,135	Colorado	1,361	Massachusetts	17,374	Pennsylvania	1,742
Colorado	2,639	Florida	2,071	Arkansas	1,303	Michigan	15,852	North Carolina	1,659

SOURCE: Pew Charitable Trusts, 2009, based on the National Establishment Time Series Database; analysis by Pew Center on the States and Collaborative Economics.

economy as of that year, it was a close second with 0.85 of its overall jobs dedicated to the clean energy economy. At the other end of the spectrum, 0.24 percent of Mississippi's total jobs were part of the clean energy economy in 2007, although the state's number of jobs in this area was growing.

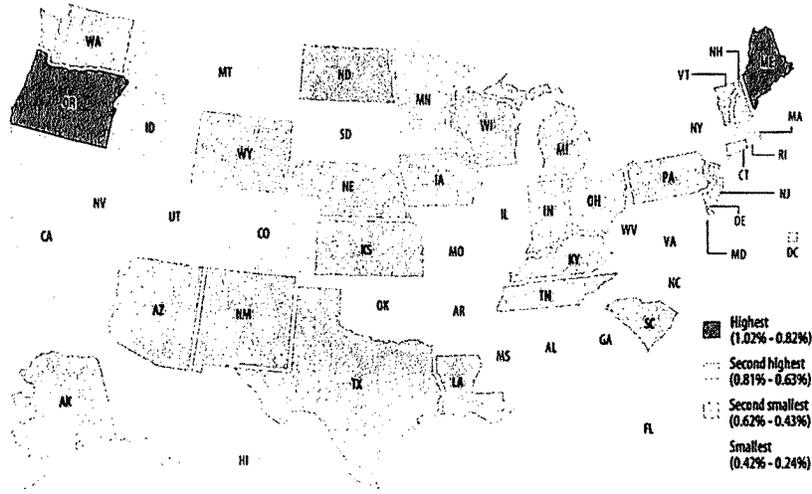
Analysis Three: Growth of Jobs in the Clean Energy Economy Compared with Overall Jobs Growth

Nationally, jobs in the clean energy economy grew by an average of 1 percent annually during the past 10 years, while total employment grew by an average of 0.4 percent annually. In 38 states and the District of Columbia, job growth in the clean energy economy outperformed total job growth between 1998 and 2007. In a number of states, job gains in the clean energy economy have helped lessen total job losses.

Job growth in the clean energy economy eclipsed growth for all jobs by more than 2 percent in 11 states: Hawaii, Idaho, Iowa, Kansas, Mississippi, New Mexico, North Dakota, Oregon, South Carolina, South Dakota and Wyoming. Oregon's large and fast-growing clean energy economy, for example, has dwarfed the growth of overall jobs in the state, expanding by an average of 4.8 percent compared with an average of less than 1 percent annually. This growth is not limited to one industry or job type: Oregon's jobs in the clean energy economy have experienced marked growth during the past 10 years in all five of Pew's categories. And although North and South Dakota have very small clean energy economies, the growth of these jobs in both states has outpaced their growth of total jobs. In North Dakota, overall jobs grew by 1.0 percent, but jobs in the clean energy economy grew by an average of 3.2 percent. In South Dakota, overall jobs grew by

EXHIBIT 12
**CLEAN ENERGY ECONOMIES AS A
 SHARE OF STATES' OVERALL ECONOMIES**

It is important for states to know just how many of their total jobs fall within the clean energy economy. Nationally, jobs in the clean energy economy accounted for 0.49 percent of all jobs in 2007; 22 states exceeded that national average.



	TOTAL JOBS	PERCENT CLEAN		TOTAL JOBS	PERCENT CLEAN		TOTAL JOBS	PERCENT CLEAN
Alabama	2,193,589	0.36%	Kentucky	2,069,602	0.45%	North Dakota	422,054	0.50%
Alaska	388,361	0.55	Louisiana	2,326,888	0.46	Ohio	6,304,302	0.56
Arizona	2,661,437	0.44	Maine	707,195	0.85	Oklahoma	1,784,492	0.31
Arkansas	1,366,809	0.34	Maryland	3,108,256	0.42	Oregon	1,902,294	1.02
California	17,556,872	0.71	Massachusetts	3,870,356	0.69	Pennsylvania	6,542,137	0.39
Colorado	2,668,069	0.64	Michigan	5,279,234	0.43	Rhode Island	549,754	0.42
Connecticut	2,150,723	0.47	Minnesota	3,143,012	0.64	South Carolina	2,059,151	0.55
Delaware	502,773	0.47	Mississippi	1,356,603	0.24	South Dakota	444,659	0.37
District of Columbia	1,021,958	0.52	Missouri	3,178,657	0.37	Tennessee	3,144,614	0.49
Florida	9,903,922	0.31	Montana	512,093	0.42	Texas	11,726,811	0.47
Georgia	4,955,677	0.33	Nebraska	1,038,673	0.51	Utah	1,291,211	0.40
Hawaii	651,894	0.42	Nevada	1,280,532	0.28	Vermont	365,646	0.59
Idaho	718,373	0.63	New Hampshire	735,051	0.55	Virginia	4,238,337	0.40
Illinois	6,792,326	0.42	New Jersey	4,957,892	0.51	Washington	3,098,042	0.55
Indiana	3,348,351	0.52	New Mexico	970,632	0.50	West Virginia	792,474	0.39
Iowa	1,800,264	0.43	New York	9,964,700	0.34	Wisconsin	3,150,600	0.48
Kansas	1,531,164	0.52	North Carolina	4,629,118	0.37	Wyoming	302,245	0.47

SOURCE: Pew Charitable Trusts, 2009, based on the National Establishment Time Series Database; analysis by Pew Center on the States and Collaborative Economics.

of Columbia have had at least one registered clean technology patent in the past 10 years. Exhibit 15 shows the 10 states with the highest number of patent registrations from 1999 to 2008. See Appendix E for the 50-state table.

EXHIBIT 14 VENTURE CAPITAL INVESTMENTS

Top 10 states attracting venture capital investments in companies in the clean energy economy, 2006-2008. In millions.

California	\$6,580
Massachusetts	1,278
Texas	717
Washington	635
Colorado	622
Maryland	324
New Jersey	283
Pennsylvania	233
New York	210
Georgia	180

NOTE: Investment values are adjusted for inflation, reported in 2008 dollars and rounded to the nearest \$1,000,000.

SOURCE: Pew Charitable Trusts, 2009, based on data from The Cleantech Group™ LLC; analysis by Pew Center on the States and Collaborative Economics.

EXHIBIT 15 CLEAN TECHNOLOGY PATENTS

Top 10 states in clean technology patent registrations 1999-2008

California	1,401
New York	909
Michigan	749
Texas	414
Connecticut	404
Massachusetts	384
Ohio	309
Illinois	297
Georgia	256
New Jersey	248

SOURCE: Pew Charitable Trusts, 2009, based on data from I790 Analytics; analysis by Pew Center on the States and Collaborative Economics.

Senator BOXER. Then, I wanted to also say to put in the record this page 10. This is to Senator Voinovich who said we never talked about national security. The very first thing when I was so honored to take the gavel of this committee is put together this book called Voices of the Senate on Global Warming. In the introduction, on page 10, we talk about the U.S. Department of Defense-sponsored report and the implications on National Security. So, I am going to put that page into the record.

[The referenced information follows:]

Voices of the Senate
on
Global Warming



ENVIRONMENT AND PUBLIC WORKS COMMITTEE
JANUARY 30, 2007
BARBARA BOXER, CHAIRMAN

**U.S. Defense Department Sponsored
Report, Climate Change and Its
Implications for National Security**

The report commissioned by the Department of Defense suggests that with the potentially dire consequences of abrupt climate change the United States “will find itself in a world where Europe will be struggling internally, with large numbers of refugees washing up on its shores and Asia in serious crisis over food and water. Disruption and conflict will be endemic features of life.”

Report Commissioned by the U.S. Department of
Defense (2003)

Senator BOXER. And with that, Senator Warner, let me tell you that we have checked with Senate counsel, sir, and, even though you have been insisting that you be sworn in, we do not want to swear you in, they said it is absolutely unnecessary.

Senator INHOFE. Madam Chairman——

Senator BOXER. So, I want you to please feel comfortable with that.

Senator INHOFE. Let me add this into the record——

Senator BOXER. Can I just do this? But we will put that in.

Senator WARNER. I will abide by the wishes of the Chair and the distinguished Ranking Member. The rules require it, but if the counsel wants to waive it, that is fine by me and let us get one with our——

Senator BOXER. Yes, we want you to feel totally comfortable in that. Please sir, go right ahead.

STATEMENT OF HON. JOHN WARNER, FORMER U.S. SENATOR

Senator WARNER. Well, I would like to observe, and thank you for the heartfelt comments by so many of you here as I return to this room which I think is, Senator Inhofe, I think I was here 22 years and you 20 years in this room, and all of the magnificent leaders that we had in the course of those years, our beloved friend, Mr. Whitehouse, John Chafee, and I could go on and on. You bring, the current leadership, you carry on the traditions that our forebears, like Pat Moynihan and others had, in the good work of this committee.

I frankly am very impressed with the opening statements that have been made. There is a perception that the Senate is not doing much on climate change. This hearing dispels that by the opening statements.

Each of you, while you have your strong differences and differences of opinion, you have recognized the magnitude of the problem facing the Congress of the United States, and now in the lap of the U.S. Senate, of trying to come to grips with fashioning a piece of legislation, if that is achievable, to help alleviate the problems that I think we all agree on. And there are some problems out there.

I will tell you what is the driving motivation for me. I think you said it, Senator Lautenberg. You referred to the fact that when I left, there were only five of us that had served in World War II. You and I served as enlisted men. Here, a half-century later, those young men and women in uniform that respond to the orders of the Commander in Chief, the President of the United States, to go beyond our shores in the great traditions of this country, 200-plus years of tradition in this country, to help those people less fortunate than ourselves who become victims of situations that imperil their lives and their freedom.

This country is going to go on doing that. And I think there is a building base of evidence that global warming is contributing to much of the instability in the world today, particularly the very fragile sovereign nations, which as a consequence of global climatic changes, do not have either the water or the energy or the food to meet the basic needs of their people. And that sovereignty falls,

and into that vacuum so often come individuals and groups who have views totally antithetical to the free world.

So I come back, and I am here to speak on behalf of those young people and say they are standing at the ready, the same as you and I and other generations have throughout the history of this country, to respond to the orders of the Commander in Chief.

Our mission is to determine, through the legislative process and other processes, what we can do to try and lessen the degree to which global climatic changes cause situations which require the United States and other nations to respond to help others.

You will find no greater supporter of nuclear energy than this humble soul. If I look back on the fortune I have had in my career, I was Secretary of the Navy and Undersecretary for over 5 years. At that time, we had close to 100 nuclear plants, largely operating at sea, but nevertheless some shore installations where we did our training and experimentation.

We are fortunate, and I say this simply because of the safety rules that we had, of the technology that we have had, that we did not have incidents of any really life threatening nature throughout that period or throughout the period of the history of the Navy.

One submarine is lost. It is still a mystery. We do not know whether or not that was occasioned by any malfunctioning as occasioned by a nuclear plant. But certainly, on the shore installations and into the ports all across America which welcomed our submarines and ships; we had no problems.

I think that is a solid precedent for arguing today to return, as you have said Senator Alexander, to a greater reliance on nuclear energy to resolve the climate change dilemmas.

I thank you for—I do have to mention that I am here under title 18 section 207 which expressly allows the committee to have before it a retired Senator. I want to comply with the rules because the alternative to the rules is not very pleasant. So I wish to do it.

[Laughter.]

Senator WARNER. I came to this effort to try and work on climate change through the combined work in this committee and in our committee, Senator Inhofe, of the Armed Services Committee.

I do not know if you remember, Senator Inhofe, but in 2008, I was Chairman and Senator Clinton—I remember it was right in this room—Senator Clinton and I were talking one day, and we decided that we would put something in the Armed Services Committee bill to begin to energize the Department of Defense toward looking at the problem occasioned by global climatic changes.

And so in the 2008 bill, and I would like to submit that statute for the record for ease of reference.

Senator BOXER. Without objection.

Senator WARNER. I should have appended it to this statement.

[The referenced information was not received at time of print.]

Senator WARNER. We put in the legislation saying to the Department, begin to look at this situation, begin to do the planning, and see how that might affect the future roles and missions of the men and women of the Armed Forces.

In 2008, Secretary Gates came out with this statement: We also know that over the next 20 years and more certain pressures, population, resource, energy, climate, economic and environmental,

could combine with rapid cultural, social and technological change to produce new sources of deprivation, rage and instability.

He marched off. And what I have put in there in the first few pages of my statement, and Madam Chairman, Ranking Member and members of this committee, this has given me the best opportunity I have had thus far to alert you to all of the wonderful things going on in the Department of Defense toward addressing these issues.

I set it forth in here, by virtue of statements by people from the Department that I personally called, spoke with them, and solicited those statements for the benefit of this committee. I worked with many of them [unintelligible] elsewhere as we discussed, together with an enormous number of very competent non-profit organizations who are addressing specifically this issue, the correlation between our national security, our forthcoming new energy programs, and the complexities of climate change.

So, I just want to be brief. I put it all in here for easy reference for you to look at. And there it is. I do hope that, I think the wisdom of the Senator leadership, largely Senator Reid, to bring together the confluence, the recommendations of six committees, I fervently urge that the Chair and perhaps you, Senator Inhofe, could look into whether or not our committee, the old Armed Services Committee on which I served 30 years and as its Chairman on several occasions, if that committee could not join with the six and put forth the perspective.

Because it is that young person in uniform that goes out to help solve the problem by orders of the Commander in Chief. So I do believe the Department should put on the record the many things that it is doing now, give it an opportunity to meet this issue, and try to work with the Congress of the United States to prepare these things.

So I will close my statement by saying that I do hope that, in the course of questions, I can amplify just a little bit on the need to being in the Armed Services Committee to be the seventh member of this panel.

I yield the floor, and I thank you for the courtesy of the committee.

[The prepared statement of Senator Warner follows:]

Testimony by Senator John Warner (Retired)
Senate Committee on Environment and Public Works
July 30, 2009

Chairman Boxer, Ranking Member Senator Inhofe, Members of the Committee, thank you for the invitation to a former long-serving member of this committee to provide my thoughts on the interrelationship between America's energy future, the challenge of global climate change, and the potential consequences on America's national security, and the sovereign security of many nations worldwide.

As I appear today by invitation to the Committee. I am complying with the provisions of law in Title 18 U.S.C. § 207 and the Senate Rules on Ethics giving testimony before a formal Congressional public hearing, under oath, and expressing my own personal opinions, and not those of my law firm or clients.

My work in this field today is with the Federal Executive Branch, state and local governments, veteran and military-oriented organizations, non-profit organizations, and experts on climate. The goal is to listen to the public concerns in their hometowns across America.

How did I come to join in the efforts of so many who have concerns on the impacts of climate change on our nation's energy security, economic security, and overall national security?

During my fifth and last Senate term, I was privileged to Chair the Armed Services Committee and serve on this Committee. Many retired military officers, and concerned citizens visited with me to discuss the concepts of how America's military policy, energy policy, and climate policy were interrelated.

Unquestionably, they are!

Today, I confine my views and opinions to this subject and make a specific recommendation.

Let's start with a statement from the Secretary of Defense

Robert Gates:

“We also know that over the next 20 years and more certain pressures – population, resource, energy, climate, economic, and environmental – could combine with rapid cultural, social, and technological change to produce new sources of deprivation, rage, and instability.”

Remarks to the U.S. Global Leadership Campaign (July 15, 2008).

Secretary Gate's warning was observed by the Chairman and Ranking Members of the Senate Foreign Relations Committee in their opening statements at the Committee's hearing last Thursday, July 21, 2009.

Senator John F. Kerry said:

“Climate change injects a major new source of chaos, tension, and human insecurity into an already volatile world. It threatens to bring more famine and drought, worse pandemics, more natural disasters, more resource scarcity, and human displacement on a staggering scale. Places only too familiar with the instability, conflict, and resource competition that often create refugees and IDPs, will now confront these same challenges with an ever growing population of EDPs—environmentally displaced people. We risk fanning the flames of failed-statism, and offering glaring opportunities to the worst actors in our international system. In an interconnected world, that endangers all of us.”

Senator Dick Lugar said:

“The American military is at the forefront of those working to develop energy resources that do not depend on the good will of unpredictable and sometimes hostile regimes. America is rich in coal, as are large developing nations like China, India, and Ukraine. Coal remains a big part of the energy plans of many countries. The United States and the world are unlikely to be able to deal with climate change without progress on clean coal technologies. The Pentagon is experimenting with coal-to-gas and coal-to-liquid technologies to fuel America’s military. As the Pentagon moves to expand the use

of coal fuels, it should simultaneously work to develop cost-effective carbon sequestration methods and cooperate with other agencies and entities engaged in this endeavor.”

There are many non-profit organizations who have made significant contributions towards creating greater understanding of the need for the national climate debate to embrace our national defense considerations.

Organizations I have been privileged to work with are the Center for Strategic and International Studies, Center for Naval Analysis, World Resources Institute, and Council on Foreign Relations.

The Center for a New American Security recently conducted a forum with a very distinguished panel of government and non-government defense officials. The discussion was lead by Sharon Burke, Vice President for Natural Security. She stated:

“As disaster rates rise, the U.S. military and civilian assistance agencies are likely to be called upon increasingly to conduct and support humanitarian and disaster relief operations, similar to Operation UNIFIED ASSISTANCE, which responded to the Indian Ocean Tsunami. These disasters will vary in scale and location and the United States and other developed nations will be unable to bring relief in all cases. Social unrest and state instability may result, which will likely increase and contribute to supply disruptions and influence U.S. strategic priorities.”

Another organization, “The American Security Project,” represented by its President Vice Admiral Lee F. Gunn was a panel member with Admiral McGinn and me before the Foreign Relations Committee. He said:

“Climate change will force change in how we operate our forces around the world; changes will effect ground operations and logistics as well as operations at sea and in the air. Sea level rise threatens large investments in U.S. facilities around the world. Desertification and shifts in the availability of water can change logistic patterns drastically for all our forces.

“The British Indian Ocean Territory, the island of Diego Garcia is a critical staging facility for U.S. and British naval and air forces operating in the Middle East and Central Asia. It sits just a few feet above

sea-level at its highest point. Rising sea levels may swamp Diego Garcia and deny the United States this critical operating hub for its armed forces. There are myriad other examples of contingencies for which our national security team must prepare.

“The Arctic is a prime example of how alliances will be forced to adapt to the realities of climate change. Just a few years ago, the scientific community was predicting that the Arctic wouldn’t be ice-free until the middle of this century. Now the predictions put that date at 2013; just four years from now.

“In the Arctic, the loss of sea-ice has caused concern in the U.S. Navy for nearly a decade. What naval planners know is that loss of sea-ice at the North Pole has the potential to increase commercial and military activity by other powers. As if we needed any evidence of this, look no further than the 2007 expedition by Russia to plant its flag in the sea-bed at the North Pole. Not surprisingly, Canada, Norway, Denmark, and the United States—all nations bordering on the arctic—responded critically to Russia’s actions.”

In preparing for this hearing I consulted with the Department of the Navy and asked to include as a part of my testimony today a statement by the Oceanographer of the Navy, Read Admiral Titley:

“The Navy recognizes the challenges poised by the ongoing changes in the global climate system. One area of immediate interest is the decrease in Arctic sea ice extent together with scientific predictions that ice coverage will continue to decrease. As noted in the 2007 Cooperative Strategy for 21st Century Seapower, “climate change is gradually opening up the waters of the Arctic, not only to new resource development, but also to new shipping routes that may reshape the global transportation system. While these opportunities offer potential for growth, they are potential sources of competition for access and natural resources.” Outside of the Arctic, global climate change may, as noted in a recent Center for Naval Analysis study, act as a threat multiplier for instability in some of the most volatile regions of the world and add to tensions even in stable regions with good governance.

“In May 2009, the Chief of Naval Operations (CNO) convened an Executive Board specifically to examine the state of the Navy’s current knowledge and capabilities to respond to these climate change challenges. This led to the formation of the Navy’s Task Force Climate Change (TFCC) as a cross-OPNAV team to examine the issues and use a science-based approach to assess timelines for action and potential risks. TFCC is also looking for partnership opportunities as multiple agencies and allies begin to consider climate change effects. TFCC working groups are currently developing the initial Navy Roadmap for the Arctic that will be delivered to the CNO later this summer. The various working groups are examining a number of focus areas

including strategy, policy, infrastructure, military systems, and arctic environmental assessment and prediction capabilities in order to guide future Navy strategy, policy, and investment decisions. The Roadmap will lay out a series of milestones for Navy actions, studies, investments, and partnerships. This will provide a means to make future decisions of not only “what” should be done but also “when” based on the best available scientific assessments.”

I made a further request of the Deputy Undersecretary of Defense for Strategy, Plans, and Forces, to provide me with a statement describing on-going work in the Department of Defense. Secretary Kathleen Hicks forwarded this very interesting report:

“Energy and climate change are two of the key strategic trends affecting national security. The impacts of climate change will disproportionately affect regions with limited adaptive capacity. It will contribute to food and water shortages, increase the spread of disease, and may lead to mass migration. It is going to accelerate state failure in some cases, and may also lead to the spread of insurgency as weak governments fail to cope with its effects. The 2008 National Defense Authorization Act requires DoD to consider the impacts of climate change on roles, missions and installations in the QDR. This effort is ongoing, but clearly will not end with the

delivery of the QDR report to Congress. We expect our support to civil authorities for disaster relief missions to grow due to projected increases in extreme weather events such as severe storms, floods and droughts. We must also be prepared to respond to conflicts over natural resources, including food, water or land. As climate science advances, and new observations give us fresh insights, we will periodically re-evaluate DoD climate change risks and vulnerabilities in order to develop policies and plans to manage the effects of climate change on DoD operations and missions.”

Chairman Boxer, Members of the Committee, I have now had the opportunity to testify before the House of Representatives Committee, chaired by Messrs. Waxman and Markey, the Senate Foreign Relations Committee, and now this Committee whose work will be vital to the Senate’s legislative responsibilities on the relationship between energy, climate change and national security.

I have had many years of experience working “in” the Defense Department and, here in the Senate, working “with” the Defense Department.

The Defense Department is the largest user of energy of any single entity in the United State, or, likely the world.

As the testimony of this panel today will confirm, it is the men and women in uniform who will likely be called upon by the President to address adverse situations brought on by erratic climate changes.

America’s citizens can take great pride in the work being done now, and the planning for the future, by the Department of Defense under the leadership of Secretary Gates and the officers and men of all the Services.

Their story must be told in greater detail to the American public.

All polls and studies confirm the great respect the American public has for those – in uniform and civilians – working for our nation’s security.

They have great credibility.

The DoD has vast experience and resources for research.

By this hearing, this Committee, like the Foreign Relations Committee, is giving them a voice.

Six Committees of the Senate, so far as I know, are going to make specific recommendations to Senate Leadership on pending legislation.

I most respectfully suggest the Armed Services Committee, which can compile a more detailed record, also make a submission to the Senate Leadership.

The Armed Services Committee has a reputation for achieving consensus on vital issues with a high degree of bipartisanship. History records this record over a half century, for that level of bipartisanship is a duty owed on matters relating to our nation's security, and, especially to the uniformed personnel and their families.

Bipartisanship is key to today's public acceptance and endurance and implementation in the future of proposed legislation.

The challenges and problems must be addressed by all nations – it's a global problem with consequences and burdens to be shared by all people

At this time strong leadership internationally is needed.

The United States must lead, and now. Our nation is among the major emitters of pollution. Only if we lead, stepping forward with a long stride, can we expect the other significant emitters to follow.

Thank you.

Senator John W. Warner
(Ret).
Alexandria, Virginia
August 20, 2009

The Honorable Barbara Boxer
Chairman
Committee on Environment and Public Works
SD-456 Dirksen Senate Office Building
Washington, DC 20510

The Honorable James M. Inhofe
Ranking Member
Committee on Environment and Public Works
SD-456 Dirksen Senate Office Building
Washington, DC 20510

Re: Follow-up on Testimony to Senate Committee on the Environment and Public Works (July 30, 2009)

Dear Madam Chairman:

Once again, I would like to thank the Committee for the opportunity to share my thoughts on the harmful impact that unchecked climate change will have on the national security of the United States. I was very encouraged by the interest of the Committee members in this pressing issue, and I look forward to being of service as this legislation moves forward this autumn. Below are my responses to the questions received from Senators Cardin and Inhofe on August 12th, as well as a response to a question Senator Barrasso posed during my testimony. I respectfully ask that this letter be included in the Record

Question from Senator Cardin:

1. We know that terrorist organizations like Al Qaeda and fringe political organizations like the Taliban find safe harbor and prosper in countries in disarray. There are growing concerns about the proliferation of Islamic Extremism in Indonesia for example, which also happens to be a nation at risk from the impacts of Climate Change.

- Can you explain how terrorist organizations have exploited natural disasters that cause civil unrest?

Terrorism and civil unrest have a long history of association with natural disasters. Widespread misery stemming from natural disasters produce conditions ripe for manipulation by the fringe forces found in any society, making famine one of the most common precursors of civil conflict throughout history. For example, the French Revolution was precipitated by famine and malnutrition, as hunger led to bread riots, the storming of the Bastille and a horrific

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spiral of violence. Interestingly enough, modern researchers believe this famine may have been the direct result of an unusual destabilization of weather patterns in Western Europe.^{1/}

The connection between climate and national security was evident in our struggle with Communism. In January 1947, an unusual weather front in the Arctic Circle led to a bout of catastrophic snowfall and cold in Western Europe. This harsh and unpredicted weather severely compounded the misery and economic privation already present in post-war Western Europe. Communist organizations throughout the continent attempted to use this misery to their advantage in their subversive efforts to deal a decisive blow to capitalism. As General Lucius Clay, then Military Governor of the U.S. Zone in Germany, explained "There is no choice between becoming a Communist on 1,500 calories [a day] and a believer in democracy on 1,000."^{2/} The Marshall Plan was the US response to these specific conditions. This program cost the U.S. government over \$100 billion in today's dollars, but is widely credited with preserving democracy in France, Western Germany, Italy, Britain and many other European nations.

Drought conditions are a strong contributor to the current conflict in Darfur and lead to the food shortages which were then manipulated by warlords to stoke violence in Somalia. These conditions are expected to significantly increase if climate change continues to go unchecked. Indeed, the number of people facing significant water shortages in Africa may triple to as many as 600 million people by 2050, according to the United Nations Intergovernmental Panel on Climate Change (the "IPCC") and the Fourth Assessment Report it published in 2007 (the "IPCC Report," discussed further below). This stress may well manifest itself in civil unrest, inter-state conflict over dwindling water supplies and, unfortunately, terrorism.

- Are you of the opinion that climate change increases the risks of more terrorist hotspots developing around the world?

Since the end of the Cold War, the threats and challenges facing the security of the United States and the international community have increasingly come from the equatorial regions of the world. Islamic terrorism, genocide in Darfur and Rwanda, ethnic conflict in Somalia and numerous other conflict zones lie within areas that science tells us will be most impacted by global warming. Unpredictable and extreme weather events, leading to drought, infestation and malnutrition pose a significant risk of further destabilizing these areas. It will be like taking the hornet's nests that exist already in the world, and shaking them up simultaneously.

Therefore it is almost certain that this destabilization will fuel terrorist recruiting. We have long seen how terrorist organizations have recruited suicide bombers and foot soldiers from the extreme misery present in refugee camps in Palestine, Lebanon and Pakistan. A recent report by a Naval Reserve Captain points out the security impacts of exponentially growing numbers of "environmental refugees," 50 million of which are estimated to exist in 2010 and with as many

¹ Richard H. Grove, "Global Impact of the 1789-93 El Niño," *Nature* 393 (1998), 318-319.

² Quoted in Greg Behrman, *The Most Noble Adventure: The Marshall Plan and the Time When America Helped Save Europe* (Free Press, 2007), pg. 29.

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as 200 million people being displaced from their homelands due to environmental changes by 2050.^{3/} It is believed that Al Qaeda has never been larger than several thousand members, but if 1/100th of one percent those 200 million refugees find their way into terrorist recruiting centers, enemies of the United States will have 20,000 new recruits to use as cannon fodder.

Therefore, I agree with many outstanding military leaders and experts that unmitigated climate change will serve to radicalize people in many of the world's current and potential hotspots, thereby increasing the terrorist threat to the United States.

Question from Senator Inhofe:

1. What impact do you think your cap-and-trade bill would have had on global warming?

Had the Lieberman-Warner Climate Security Act been enacted, it would have set the United States, the historic greatest emitter of greenhouse gases and current per capita largest emitter, on a path to reduce its emissions at a rate the science has determined is necessary to avert catastrophic global climate change by mid-century.

In addition, the Lieberman-Warner bill would have incented and, in part, funded, the research, development and deployment of innovative technologies and alternative energy sources. It would have reduced the U.S. reliance on foreign sources of oil, which would have in kind reduced the potential burden on U.S. armed forces.

2. Why would our trading partners not respond in kind if carbon tariff provisions are passed as part of cap-and-trade legislation?

I believe the greater risk is that if the United States does not enact policies to reduce its greenhouse gas emissions, other nations that are taking such steps would impose carbon tariffs on U.S. manufactured goods.

3. Do you agree that we need an all-of-the-above energy strategy that includes incentives to build more nuclear power plants, more clean coal plants, more natural gas drilling in the OCS?

I have been a long time proponent of nuclear power, clean coal and natural gas drilling. With that said, I do not think that the U.S. makes the greenhouse gas reductions necessary to avert catastrophic global climate change without a specific carbon emissions reduction program in place. Nuclear power, clean coal and domestic natural gas are part of the solution, but they do not represent an "all of the above" strategy, which clearly must include a cap on emissions.

Question from Senator Barrasso:

During the hearing on July 30th, one of the subjects of the panel's discussion was the National Intelligence Assessment on the National Security Implications of Global Climate

³ Rymn J. Parsons, CAPT, USNR, "Taking Up the Security Challenge of Climate Change," (Strategic Studies Institute, August 2009), pg. 3.

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Change (the "NIA"), issued last year by the National Intelligence Council (the "NIC"). Senator John Barrasso raised the question about the origin of the science used by the intelligence community in the analysis reflected in the NIA. I offered to provide a more detailed response to the question, and this letter is my response to Senator Barrasso's question.

I would first like to draw your attention to the Statement for the Record of Dr. Thomas Fingar, then currently the Deputy Director of National Intelligence for Analysis and the Chairman of the National Intelligence Council, to the House Permanent Select Committee on Intelligence and the House Select Committee on Energy Independence and Global Warming, given on June 25, 2008. I have worked with Dr. Fingar for many years and know him to be insightful, unbiased and a dedicated public servant. In his testimony, which I append to this letter, Dr. Fingar explains that the research for the NIA began with several governmental entities, the U.S. Climate Change Science Program, the National Oceanic and Atmospheric Agency as well as climate experts at the Department of Energy's national laboratories. Important analytical support also came from Columbia University's Center for International Earth Science Information Network, the Naval Postgraduate School and the Joint Global Change Research Institute, which is a joint research program between the University of Maryland and the Pacific Northwest National Laboratory. The insights of these entities were augmented by other allied partners, external experts and existing published research. In creating the NIA itself, this information was reviewed and analyzed by the National Intelligence Officers for Science and Technology, for Economics and the Council's Long Range Analysis Unit. The work of these officers was supported by the Defense Intelligence Agency's Armed Forces Medical Intelligence Center, the Office of Naval Intelligence, the Department of State Bureau of Intelligence and Research, the Office of Transnational Issues from the Central Intelligence Agency, and the National Geospatial-Intelligence Agency.

As Dr. Fingar stated in his testimony, however, the pure climate science used and accepted by this broad group of intelligence professionals stemmed from the authoritative IPCC Report (discussed previously). As a reminder to the Committee, the IPCC was founded in 1988 by a resolution of the United Nations General Assembly and charged with comprehensively reviewing both the science and impacts of climate change, a subject of growing concern even at that time. This concern, of course, has continued to escalate over the intervening 21 years and the IPCC Report is the most recent comprehensive findings published by the body. It was in recognition of the scholarship of the IPCC Report that the Nobel Peace Prize in 2007 was awarded to the IPCC, a prize that was shared with our former colleague, Vice President Albert Gore, Jr.

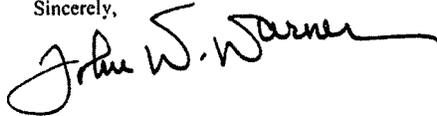
The NIC's confidence in the IPCC Report is due not only to the international respect that the scientific community accords to the report, but also due to the role the U.S. government played in coordinating and reviewing the report. Indeed, 231 of the 620 scientists who authored the IPCC Report were Americans. In addition to having such a large contingent of the scientific expertise involved in authoring the study, the IPCC report and its findings were peer-reviewed by an additional body of over 650 scientists, 194 of whom were American. Moreover, I believe that is a very safe assumption that a much broader group of these scientists gained a significant portion of their expertise through study at one of more of the fine universities and colleges located here in the United States.

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Therefore, I do not hesitate to conclude that the physical and meteorological science incorporated into the intelligence community's analysis of this issue is the finest that the United States and the world has to offer. Furthermore, I am proud that the U.S. government and scientific community have played such an important role in the vigorous research conducted in this area over the last three decades. The authority of this research - and the thorough analysis of its implications offered by the NIA - leave me with little doubt that the issue of global climate change must be addressed by the Congress as soon as possible.

The probability and likely scale of catastrophes originating in global climate change are alarming, and I thank the members of the Committee for sharing in my concern that this will pose a serious threat to our national security.

Sincerely,

A handwritten signature in black ink that reads "John W. Warner". The signature is written in a cursive, flowing style with a long horizontal stroke at the end.

John W. Warner

cc:
The Honorable John Barrasso
SD-307 Dirksen Senate Office Building
Washington, DC 20510

Enclosure: Statement for the Record of Dr. Thomas Fingar, dated June 25, 2008

**House Permanent Select Committee on Intelligence
House Select Committee on Energy Independence and
Global Warming**

25 June 2008

**National Intelligence Assessment on the National
Security Implications of Global Climate Change to 2030**



Statement for the Record

of

Dr. Thomas Fingar

**Deputy Director of National Intelligence for Analysis
and Chairman of the National Intelligence Council**

STATEMENT FOR THE RECORD OF
DR. THOMAS FINGAR
DEPUTY DIRECTOR OF NATIONAL INTELLIGENCE FOR
ANALYSIS AND CHAIRMAN OF THE NATIONAL INTELLIGENCE
COUNCIL

BEFORE THE
PERMANENT SELECT COMMITTEE ON INTELLIGENCE AND THE
SELECT COMMITTEE ON ENERGY INDEPENDENCE AND GLOBAL
WARMING
HOUSE OF REPRESENTATIVES

25 JUNE 2008

Chairman Markey, Chairwoman Eshoo, Ranking Member
Sensenbrenner, Ranking Member Issa, and Members of the Committees
thank you for the opportunity to brief both committees on the "National
Security Implications of Global Climate Change to 2030." I am Tom Fingar,
the Deputy Director of National Intelligence for Analysis; I am joined today
by Rolf Mowatt-Larsen – Director, Office of Intelligence and
Counterintelligence at the Department of Energy, Dr. Mathew Burrows –
the NIC's Counselor, and Ms. Karen Monaghan – the National Intelligence
Officer for Economics. I would like to divide my remarks into four sections
this afternoon. I will first provide an overview of the history and the process
the Intelligence Community (IC) used to explore this topic, followed by a
summary of our key observations; and then I will provide a brief description
of some of the collection and analysis challenges, and lastly our future plans.

History and Process

We began our effort following a National Intelligence Priorities
Framework review in 2006, believing the time was right to develop a

community level product on the national security significance of future climate change. It had obviously become an important global issue. Following draft Congressional language in the Spring of 2007, we elevated the level of our effort to a National Intelligence Assessment (NIA), developed terms of reference, and initiated the study.

This study used a fundamentally different kind of analytical methodology from what is typical for an intelligence product such as a National Intelligence Estimate (NIE). We depended upon open sources and greatly leveraged outside expertise. Since the Intelligence Community does not conduct climate research, we began our effort by looking for other US government entities that were experts in this area. We worked with the US Climate Change Science Program and visited with climate modelers and experts from the Department of Energy national laboratories and the National Oceanic and Atmospheric Agency (NOAA). We also relied upon support from the Joint Global Change Research Institute—a joint research program between the University of Maryland and the Pacific Northwest National Laboratory—Columbia University's Center for International Earth Science Information Network, and the Naval Postgraduate School in Monterey California.

Our primary source for climate science was the United Nations Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report, which we augmented with other peer-reviewed analyses and contracted research. We used the UN Panel report as our baseline because this document was reviewed and coordinated on by the US government and internationally respected by the scientific community. For this analysis, we

relied predominately upon a mid-range projection from among a range of authoritative scenario trajectories provided by the IPCC.

Our overall strategy consisted of developing a good understanding of climate science, and supplementing this with state specific information on water scarcity, overall vulnerability to climate change, and populations at risk of sea level rise. In consultation with the Naval Postgraduate School, we analyzed this material to assess the capability of specific nation-states to cope with the effects of climate change. We did not evaluate the science of climate change per se; nor did we independently analyze what the underlying drivers of climate change are or to what degree climate change will occur.

Throughout our effort, we remained mindful of what the effects of future climate change would mean for US national security. We used a broad definition for national security. We first considered if the effects would directly impact the US homeland, a US economic partner, or a US ally. We also focused on the potential for humanitarian disaster, such that the response would consume US resources. We then considered if the result would degrade or enhance one of the elements of national power (Geopolitical, Military, Economic, or Social Cohesion), and if the degradation or enhancement, even if temporary, would be significant. In the end, we reported on key effects that we judged would meet this threshold.

The NIA focuses on the implications of global climate change for US national security interests by 2030. In the study, we assume that the climate will change as forecast by the IPCC. The year 2030 is far enough out to have witnessed climate-induced changes to the physical and biological worlds, yet close enough to allow judgments about the likely impact of such

changes. We offer a glimpse of climate change impact beyond 2030 because expectations about the relative severity of climate changes projected later in the century will color the perceptions of policymakers between now and 2030.

On the National Intelligence Council this effort was conducted by the National Intelligence Officers for Science and Technology, and for Economics, and the NIC's Long Range Analysis Unit. Within the Intelligence Community, we were supported by the Defense Intelligence Agency's Armed Forces Medical Intelligence Center, the Office of Naval Intelligence, the Department of State Bureau of Intelligence and Research, the Office of Transnational Issues from the Central Intelligence Agency, and the National Geospatial-Intelligence Agency. We received inputs to the document and critiques from outside experts and allied partners. We used contract studies, previous research, and consultations with many others.

Summary of Key Observations

Allow me to provide a summary of our key observations. We judge global climate change will have wide-ranging implications for US national security interests over the next 20 years. Although the United States will be less affected and is better equipped than most nations to deal with climate change, and may even see a benefit owing to increases in agriculture productivity, infrastructure repair and replacement will be costly. We judge that the most significant impact for the United States will be indirect and result from climate-driven effects on many other countries and their potential to seriously affect US national security interests. We assess that climate change alone is unlikely to trigger state failure in any state out to 2030, but the impacts will worsen existing problems—such as poverty,

social tensions, environmental degradation, ineffectual leadership, and weak political institutions. Climate change could threaten domestic stability in some states, potentially contributing to intra- or, less likely, interstate conflict, particularly over access to increasingly scarce water resources. We judge that economic migrants will perceive additional reasons to migrate because of harsh climates, both within nations and from disadvantaged to richer countries.

Climate Change...

Looking more specifically at the future global climate, current scientific observations indicate the Earth's climate is changing. Changes cited by the IPCC include rising global temperatures, increasing heavy precipitation events, and rising sea levels. The global mean annual average temperature has risen 0.13 degrees Celsius (C) per decade during the period 1955-2005—double the rate observed in 1906-2005. However, temperature changes vary across the planet, and impacts vary as a function of local circumstances. Some areas are experiencing less warming or even cooling. Precipitation has generally increased over land north of 30 degrees latitude over the period 1900 to 2005, but the tropics have experienced less precipitation since the 1970s. IPCC says that intense tropical cyclone activity is likely to increase. Global sea level rose 1.7 mm per year during most of the 20th century, but has risen approximately 3 mm per year since 1993.

Many physical and biological systems are changing in ways consistent with the present warming trend. Among the most significant changes

highlighted by scientists are the thawing of the northern latitude permafrost¹ which is forcing repair or replacement of buildings and pipeline infrastructure, and the increase of heat waves and droughts (both in frequency and intensity), although attribution of increased droughts to greenhouse gas (GHG) emissions remains controversial.

In some cases, changes in ecosystems and natural resources are occurring faster and with larger magnitude than scientists anticipated as recently as ten years ago. Temperatures in the Arctic are rising almost twice as fast as the global rate, and temperatures are rising faster over land masses than over open oceans.

Looking out to 2030, certain broad-brush projections of climate change can be made. Global temperature change is expected to increase approximately one half degree C over the next two decades and sea level rise is expected to be no greater than 75mm (.075m).² The IPCC and others project that water will become increasingly scarce across several regions, including parts of Asia and parts of Africa and the southwestern United States. Water scarcity can be caused by many factors—absence of precipitation, increased evaporation, demographics, land use, or reductions in river flows.

...And National Security

From a national security perspective, climate change has the potential to affect lives (for example, through food and water shortages, increased health problems including the spread of disease, and increased potential for conflict), property (for example through ground subsidence, flooding,

¹ Permafrost is soil, rock, sediment or other material with a temperature that has remained below zero degrees centigrade for two or more consecutive years.

² The change is reference to the average global temperature for the period 1980 to 1999.

coastal erosion, and extreme weather events), and other security interests. The United States depends on a smooth-functioning international system ensuring the flow of trade and market access to critical raw materials such as oil and gas, and security for its allies and partners. Climate change and climate change policies could affect all of these—domestic stability in a number of key states, the opening of new sea lanes and access to raw materials, and the global economy more broadly—with significant geopolitical consequences.

In addition, anticipated impacts to the Homeland—including possible increases in the severity of storms in the Gulf, increased demand for energy resources, disruptions in US and Arctic infrastructure, and increases in immigration from resource-scarce regions of the world—are expected to be costly. Government, business, and public efforts to develop mitigation and adaptation strategies to deal with climate change—from policies to reduce greenhouse gasses to plans to reduce exposure to climate change or capitalize on potential impacts—may affect US national security interests even more than the physical impacts of climate change itself.

Regional Climate Trends to 2030³

I will now summarize some regional climate change trends.

Africa⁴

Climate-induced tensions are a main contributor to instability in

³ While the NIA is based predominately upon a midrange scenario, some of the analysis cited in this section refers to IPCC reports with multiple scenarios. However, scientists indicate that even if humans stopped releasing CO2 tomorrow, climate changes projected for 2030 would still occur. Scenario trajectories—including those emphasizing concerted emissions reductions—do not vary significantly over the next 20-25 years. Not all IPCC or peer-reviewed research is targeted to the 2030 time frame of this assessment. Therefore when the targeted research reflects a different period of time we specifically mention the targeted time period.

⁴ Regions are listed in alphabetical order.

several areas of Africa. We judge that sub-Saharan Africa will continue to be the most vulnerable region to climate change because of multiple environmental, economic, political, and social stresses. Observed temperatures have become warmer since the 1960s. This has been true across the varied climates of Africa. In addition, from 1961-2000 the number of warm spells increased over southern and western Africa. Rainfall varies a good deal over most of Africa, but increased seasonal variability has been observed since 1970, with higher rainfall anomalies and more intense and widespread droughts.

Scientific studies indicate that climate change is likely to cause agricultural losses, possibly severe in the Sahel, West Africa, and southern Africa. Agricultural yields from some rainfall dependant crops could be reduced by up to 50 percent by 2020.

Many African countries already challenged by persistent poverty, frequent natural disasters, weak governance, and high dependence on agriculture probably will face a significantly higher exposure to water stress owing to climate change.

Asia

In Asia, despite future climate change that is expected to produce increased precipitation, current research indicates that South, Southeast, and East Asia will face risks of reduced agricultural productivity as large parts of the region face increased risk of floods and droughts. By 2025, cereal crop yields will decrease 2.5-10 percent, according to some calculations.⁵

⁵ This assumes no CO₂ fertilization. Most plants growing in normal atmospheric CO₂ exhibit higher rates of photosynthesis and elevated CO₂ alone tends to increase growth and yield of most agriculture plants. Most of the studies have been conducted either under controlled environmental conditions (chambers), or under optimal field conditions. Potential CO₂ effects on plant biomass depend on the nutrient and water

Observed increases in surface air temperature in recent decades range from less than 1 to 3 degrees C per decade, with the most pronounced warming in north Asia. Annual average rainfall has decreased in Russia, northeast and north China, coastal belts and arid plains of Pakistan, parts of northeast India, Indonesia, Philippines, and some areas of Japan; it has increased in western and southeastern coastal China, Bangladesh, and the western coasts of the Philippines. In parts of Asia extreme weather events⁶ are more frequent and severe and intense rains and floods come more often. Droughts have intensified and/or affected more areas in Central, South and Southeast Asia. Tropical storms are more frequent in the South China Sea, and the Bay of Bengal is experiencing fewer but more intense storms.

Some projections indicate as many as 50 million additional people could be at risk of hunger by 2020, although climate change may moderate water stress in some regions of Asia. By the 2020s increases in precipitation and glacier run-off will relieve some of the water stress in Asia, but increasing consumption patterns and growing populations indicate that 120 million to 1.2 billion people will continue to experience some water stress.

Australia and New Zealand

Australia and New Zealand will likely see increased temperature by 2030 and continued changes in precipitation patterns. Since 1950 there has been a 0.3 to 0.7 degrees C warming in the region, with more heat waves, fewer frosts, and an increase in the intensity of Australian droughts. Recent reports indicate more rain in northwestern Australia and southwestern New

levels. With CO₂ fertilization, the Asian cereal crop yields will vary from +2.5 to -10 percent, with China and Mongolia showing the slight rise in one of three data runs.

⁶ The IPCC defines an extreme weather event as an event that is rare within its statistical reference distribution at a particular place. Definitions of "rare" vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile.

Zealand, and less rain in southern and eastern Australia and northeastern New Zealand.

According to scientific research, floods, landslides, droughts and storm surges are likely to become more frequent and intense, and snow and frost are likely to become less frequent. Infrastructure design criteria⁷ for extreme events, here as elsewhere, are likely to be exceeded more frequently.

Europe

In the coming years, Europe will likely become hotter—with more frequent and severe heat waves—and there will be greater differences in regional precipitation. Europe warmed 0.90 degrees C between 1901 and 2005. However, the rate of warming has accelerated since 1979. During this latter period, the rate was higher in central and northeastern Europe and in mountainous regions but lower in the Mediterranean regions.

Precipitation change varies in different areas of Europe. Average winter precipitation is increasing in most of Atlantic and northern Europe, while yearly precipitation trends are decreasing in eastern Mediterranean regions. Most parts of the continent are receiving more precipitation per wet day, even in some areas that are becoming drier.

By the 2020s, increases in winter floods are likely in maritime regions and more flash floods are likely throughout Europe.

Latin America and the Caribbean

By 2020, temperature increases in Latin America will vary across the region, with the highest temperatures projected to occur over tropical South America. Temperature increases are likely to increase from 0.4 to 1.8

⁷ Infrastructure design criteria include such things as maximum and minimum temperature, rates of precipitation, snow and ice accumulation, and wind intensity and direction.

degrees C over the 1980-1999 period. Highly unusual extreme weather events have occurred in some areas of South America including intense rainfall, flooding, drought, hailstorms, and the unprecedented Hurricane Catarina in the South Atlantic. In addition, the Caribbean Basin experienced a record hurricane season in 2005. Increases in rainfall in selected regions of South America have affected land use and crop yields, and increased flood frequency and intensity. Precipitation has decreased in other regions including western Central America.

Latin America may experience increased precipitation by the 2020s; by some estimates tens of millions of people could be removed from water stress in considering only the effects of climate change. However, despite the greater water availability from climate change, an estimated 7-77 million people are likely to remain stressed due to growing populations and increasing water consumption.

Middle East ⁸

Prospects for the Middle East are harder to anticipate because of limited climate research. By 2020 the region is expected to see an increased temperature of slightly over one degree C. Precipitation is expected to decrease between 3 and 8 percent in winter and spring, and increase 5 to 18 percent in summer and fall.⁹ From 1951 to 2003, several stations in different climatological zones of Iran reported significant decreases in frost days due to a rise in surface temperatures.

Surface water availability from major rivers like the Euphrates and Tigris may be affected by future alterations in river flows. River flows are

⁸ The Middle East is not an IPCC region, but is generally reflected in research and reporting as the West Asia sub-region.

⁹ Changes expressed are relative to 1980-1999 values.

likely to increase in winter and decrease in spring, which could negatively affect existing uses of river water.

North America

Most of North America in the mid-latitudes will likely be less affected by climate change in the next few decades than either the tropics or the polar regions. Net cereal crop yields likely will increase by 5-20 percent,¹⁰ for example, and most studies suggest the United States as a whole will enjoy modest economic benefits over the next few decades largely due to the increased crop yields. Costs begin to mount thereafter, however, and some parts of the United States—particularly built-up coastal areas—will be at greater risk of extreme weather events and potentially high costs related to losses in complex infrastructure. From 1955 to 2005, annual mean air temperature increased to the greatest extent in Alaska and northwestern Canada, followed by the continental interior. The growing season has lengthened an average of two days per decade since 1950 in Canada and the contiguous United States.

For most of North America, annual precipitation has increased, with the most marked increase in northern Canada. However, precipitation has decreased in the southwest United States, the Canadian prairies, and the eastern Arctic.

Polar Regions

Scientists state that the polar regions, which are already affected by climate change, will see further change by 2030 to include loss of land- and sea-based ice and greater exposure of bare ground. For several decades,

¹⁰ The increase assumes CO₂ fertilization. Without CO₂ fertilization, the range is -2.5 to + 10 percent change in cereal yields, with the poorer yields in Mexico and to a lesser extent, the United States (two of three data runs).

surface temperatures in the Arctic have warmed about twice as fast as the global rate, with associated reductions of sea ice and glaciers. In addition, the duration of river and lake ice has decreased in northern latitudes, and (since 1980) permafrost has warmed in nearly all areas for which measurements are available. Evidence reported in the IPCC Fourth Assessment Report indicates that the Greenland ice sheet's interior is thickening at a decreasing rate while its edges are thinning. The Antarctic shows more variability; meteorological stations show strong and significant warming over the past 50 years, but other long-term records are mixed.

Economic Impacts Projected to Rise Over Time

We assess that no country will be immune to the effects of climate change, but some will be able to cope more effectively than others. Most of the struggling and poor states that will suffer adverse impacts to their potential and economic security are in Sub-Saharan Africa, the Middle East, and Central and Southeast Asia. However, the spillover—from potentially increased migration and water-related disputes—could have a harmful global impact. The global impact on economic growth out to 2030 or so is likely to be minimal, but the effect in particular countries or regions could be substantial.

Most estimates—including the UK commissioned Stern Review—show limited aggregate damage to the world economy by the 2030s. One model, for example shows a decline of 0.3 percent annually of global GDP by 2030. A couple of economic models yield net benefits for OECD and other countries with small increases in global mean temperature—the most likely scenario in the next decade or two. However, the impact on global economic growth begins to mount over time and even conservative estimates

put the costs at up to 3 percent of global GDP annually if the Earth's temperature were to rise 2-3 degrees C, which many scientists believe could begin to happen as early as mid-century.

Agricultural Production Most at Risk

Global cereal yields likely will increase out to 2030, but regional differences in production are likely to grow stronger over time with declines proportionately concentrated in developing countries, particularly in Sub-Saharan Africa. Although the precise impact of climate change on agriculture production will differ by region and crop, damages broadly speaking will be greater in countries located closer to the equator and where temperatures are higher today. For many developing countries, reduced agriculture output can be devastating as agriculture represents a large share of their economy, a majority of their populations rely on subsistence farming, and their governments and people have less adaptive capacity.

International Migration

We judge that economic refugees will perceive additional reasons to flee their homes because of harsher climates. Besides movement within countries, especially to urban areas, many displaced persons will move into neighboring developing countries, sometimes as a staging ground for subsequent movement onward to more developed and richer countries with greater economic opportunities. Many likely receiving nations will have neither the resources nor interest to host these climate migrants. Receiving nations probably will have increased concern about migrants who may be exposed to or are carrying infectious diseases that may put host nation populations at higher risk.

Winners and Losers from Climate Change

Most developed nations and countries with rapidly emerging economies are likely to fare better than those in the poorer, developing world, largely because of a greater coping capacity. Nevertheless, many regional states important to the United States will be negatively impacted. Rapidly developing states could experience economic setbacks and uneven growth leading to political change or disruption. And most US allies will experience negative impacts but also have the means to cope.

Implications for the United States

On the homefront, responding to thawing in and around Alaska, water shortages in the Southwest, and storm surges on the East and Gulf Coasts will involve costly repairs, upgrades, and modifications. A warming climate also will encourage wildfires throughout the longer summers. The IPCC estimates annual costs from severe weather in damage to property and loss of economic productivity for the United States to be in the tens of billions of dollars. Nonetheless, most models predict that the United States on balance will benefit slightly from climate change over the next few decades, largely due to increased agricultural yields. Current infrastructure design criteria and construction codes may be inadequate for climate change and exacerbate vulnerability to increasing storm intensity and flooding. A number of active coastal military installations in the continental United States are at a significant and increasing risk of damage, as a function of flooding from worsened storm surges in the near-term. In addition, two dozen nuclear facilities and numerous refineries along US coastlines are at risk and may be severely impacted by storms.

The United States' new military area of responsibility—Africa Command—is likely to face extensive and novel operational requirements. Sub-Saharan African countries—if they are hard hit by climate impacts—will be more susceptible to worsening disease exposure. Food insecurity, for reasons both of shortages and affordability, will be a growing concern in Africa as well as other parts of the world. Without food aid, the region will likely face higher levels of instability—particularly violent ethnic clashes over land ownership.

Closer to home, the United States will need to anticipate and plan for growing immigration pressures. Although sea level rise is probably a slow and long-term development, extreme weather events and growing evidence of inundation will motivate many to move sooner rather than later. Almost one-fourth of the countries with the greatest percentage of population in low-elevation coastal zones are in the Caribbean, so assisting these populations will be an imminent task. Broad Western hemispheric cooperation will be necessary to mitigate the impact on harder-hit countries.

As climate changes spur more humanitarian emergencies, the international community's capacity to respond will be increasingly strained. The United States, in particular will be called upon to respond. The demands of these potential humanitarian responses may significantly tax US military transportation and support force structures, resulting in a strained readiness posture and decreased strategic depth for combat operations.

To insert a sense of urgency into the debate and pressure international institutions and countries to adopt adaptation and mitigation strategies, environmental and human rights NGOs may press to broaden the definition of "refugee" to include environment or climate migrants. Such a change

would have implications for the United States, other donors, and organizations like UNHCR to provide assistance to displaced populations similar to recent efforts to provide aid to internally displaced peoples. Elsewhere, developing countries—particularly major greenhouse gas emitters—may demand that the WTO Agreement on Trade-related Aspects of Intellectual Property Rights (TRIPS) be amended to allow for the production and development of generic copies of green technologies, citing the precedent of HIV AIDS drugs. Indeed, last year the European Parliament asked for an examination of whether TRIPS presented a significant barrier to technology transfer.

In multinational forums, we assess that the climate change issue will become more prominent on the agenda, and the US's leadership overall in the global arena will be judged by the extent to which it is perceived as forging a viable and effective global consensus for tackling climate change. Expectations are that US leadership will be pivotal in helping the international community set meaningful long-term goals for greenhouse gas emissions reductions and mitigating and adapting to climate change through technological progress and transfers, financial assistance, and support for climate migrants.

Collection and Analysis Challenges

Let me now discuss collection and analytic challenges we faced in the development of this assessment. As I indicated in my opening remarks, we used a fundamentally different type of collection and analytic methodology and were fortunate to have assistance from talented expertise inside and outside of the Intelligence Community.

To answer the question of national security impacts from Global Climate Change, we needed first and foremost to understand what the future climate might look like and what the physical and ecosystem impacts of change might be. For this, we were critically dependant upon open source science and, as I indicated, elected to use the IPCC reports and other peer-reviewed scientific material. From an intelligence perspective, the present level of scientific understanding of future climate change lacks the resolution and specificity we would like for detailed analysis at the state level. Most of the IPCC material is based upon an understanding of how the climate may change at the global level. We require improved and better validated regional and local models (accounting for regional and local processes) of strategic climate change, particularly models that provide details on hydrological consequences and changes in the frequency and intensity of extreme events.

Finally, there is a need for better information on physical, agricultural, economic, social, and political impacts from climate change at state and regional levels. This research does not necessarily require classified sources or methods and may be performed in an open and unclassified environment. From an IC perspective we do not seek to duplicate capability that exists in the open scientific community, but we will benefit from continued support for research to resolve the above issues.

From an analytical perspective, the IC examines state stability as a critical part of determining potential threats to US interests. When evaluating state stability, water shortages, disease, and the environment are considered along with other factors. The IC also considers the effects that climate change negotiations and mitigation efforts will have on the US

economy, its trade goals, and its diplomatic relationships with the international community.

Near term, additional analysis is required to determine the world-wide potential vulnerability to storm tracks and severe weather. This analysis should consider changes in anticipated storm tracks and severe weather patterns, populations and infrastructure at risk, and local physical factors. In addition, detailed agriculture vulnerability should be studied; this would include anticipated changes in temperature, precipitation levels and patterns. Much, if not all, of this analysis can be performed with open source data, and much of the basic analytical work can be performed outside of the Intelligence Community by academia or non-IC components of the US Government.

Our analysis could be greatly improved if we had a much better understanding and explanation of past and current human behavior. Continued research to model social human dynamics at the individual and society level would support this improved understanding. This would necessitate the ability to integrate social, economic (infrastructure, agriculture, and manufacturing), military, and political models. Continued research in these efforts—while a significant challenge—could have high analytical payoff. In the interim, assessing the future of a society's evolution will by necessity be a scenario-driven exercise and an imprecise science. The continued use of outside experts is critical to our success.

Future Research Plans

I would like to conclude with a summary of our tentative plans for future work. The National Intelligence Council plans on three follow-on

efforts. As I alluded to earlier, we were challenged in the present effort to get detail information on specific states. However, the science of modeling is continuously improving and we believe that more focused and targeted studies can be of value today. For one effort, we would like to explore in depth the potential effects of climate change on a set of countries and regions of the world and the resulting impact to US security interests.

For the second effort, we would like to conduct a scenario exercise and report on the potential national security impacts from possible climate change remediation strategies. We call this type of work "alternative analysis." We recognize that global remediation efforts will most likely come from a wide variety of sources and that the final determination of what strategies a state chooses will be dependant upon many factors aside from national security. Our objective with this effort is to better inform the policy community as to the national security ramifications from each of these strategies. At present the four remediation strategies we are considering include a predominant dependence upon either carbon capture and sequestration, biofuels, a family of renewables, or nuclear power.

Our third effort will be to explore the geopolitics of climate change and how that may shift the relationships between major powers. Some of this will also be explored in the NIC's Global Trends out to 2025, which is expected to be published in December 2008.

Senator BOXER. Well, we are so grateful to you for being here with us today, Senator. Everyone sitting up here has such great affection and admiration for you, regardless of where we stand on this issue. And I thank you so much.

I had the honor of hearing Admiral McGinn yesterday speak to some of us about this issue. At this point, I have been called to the Senate floor for the debate on the Highway Trust Fund. So, I am going to hand over the gavel and everything that goes with it to Senator Cardin, who will be in charge.

Thank you to the rest of the panel, and I will see everybody on the floor later.

Senator CARDIN [presiding]. Well, thank you, Madam Chair.

We will now hear from Vice Admiral Dennis McGinn, USN, Retired, Member, Military Advisory Board, Center for Naval Analyses.

Senator INHOFE. Mr. Chairman, before you do that, I would like to submit for the record from the Fertilizer Institute. I meant to do that before.

Senator CARDIN. Without objection. It will be included in the record.

[The referenced information follows:]



The Fertilizer Institute

Nourish, Replenish, Grow

Written Statement of The Fertilizer Institute
to the
U.S. Senate Committee on Environment and Public Works
July 30, 2009

The Fertilizer Institute (TFI) respectfully submits the following statement regarding our industry's perspective on climate change policy and national security. All farmers rely on our products to produce food, feed, and now fuel, with corn being the nation's largest fertilizer consuming crop. We would like to draw the committee's attention to climate policy and the potentially devastating impact it could have on our nation's food security.

The fertilizer industry makes an essential contribution to our food supply and thus to our nation's security. TFI member companies supply nitrogen, phosphate, potash and other plant nutrients to farmers who grow food for America's dinner tables. Fertilizers replenish our soils harvest after harvest to promote healthy and abundant crops for food production. Those nutrients are removed with the harvested crop and help provide nutritional value to the foods we eat. These nutrients must be replaced to ensure each year's crop grows a nutritious supply of food.

Since the introduction of the American Clean Energy and Security Act of 2009 (H.R. 2454) in the House, we have been expressing serious concerns with the impact of this legislation on the fertilizer industry, its farmer customers and the U.S. food supply. During the past decade, high natural gas prices had a devastating impact on the U.S. nitrogen fertilizer industry. We are particularly concerned that a consequence of this legislation will be higher energy prices which will drive the remaining U.S. nitrogen production offshore. In this event, U.S. food production would rely solely upon our ability to secure fertilizers from the countries of the Arab world, Venezuela, China and Russia.

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“Civilization as it is known today could not have evolved, nor can it survive, without an adequate food supply. Yet food is something that is taken for granted by most world leaders despite the fact that more than half of the population of the world is hungry.” Those words were spoken by Nobel Laureate Norman Borlaug whose work to bring modern agriculture to the developing world is credited with saving millions of lives.

During last year’s food crisis, Borlaug’s words rang true as the world was reminded that hunger and political instability go hand in hand. Food riots in Asia and grain hoarding elsewhere in the world defined the food crisis of 2008. While food news no longer dominates news reports, the global food supply remains precariously low. During seven of the past nine years, global cereal consumption has surpassed demand, eroding stocks to their lowest levels in 30-40 years.

Nitrogen is the primary building block for all organisms. It is essential to making proteins, helps keep plants green, and is an essential component of soil structure. Phosphorus helps plants use water efficiently and potassium helps with photosynthesis and helps to protect plants from extreme temperatures, weeds and insects. Used together, these fertilizer nutrients help feed the world by increasing farmer’s yields by as much as 60 percent.

In addition to food security, nitrogen products such as ammonia and urea play a critical role in pollution abatement; serving as the critical chemicals for selective catalytic reduction. This role is expanding as clean diesel regulations come into play for both light and heavy duty transportation vehicles.

Providing nutrients in a form growing plants can easily use requires significant amounts of energy. As an energy intensive industry, nitrogen fertilizer production will be significantly impacted by a cap and trade system because it is uniquely sensitive to the price of natural gas which is required in the production process. We use natural gas as a feedstock in a fixed chemical process that combines nitrogen from the air and hydrogen from the gas to produce nitrogen fertilizer, in a form that the plant can take up. Unless the laws of chemistry change, there is nothing we can do to alter this process and, consequently, as much as 90 percent of the cost of producing a ton of ammonia, the building block for all other nitrogen fertilizers, can be

tied directly to the price of natural gas. In 2008, the nitrogen fertilizer industry spent \$3 billion on natural gas. Each \$3 MMBtu increase in the cost of natural gas raises nitrogen fertilizer production costs by \$1 billion.

Historically, the cost of natural gas has exacted a heavy toll on America's nitrogen fertilizer producers and the farmer customers they supply. Specifically, since 2000, the U.S. nitrogen industry has closed 26 nitrogen fertilizer (anhydrous ammonia) production facilities, due primarily to the high cost of natural gas. Currently, only 29 nitrogen plants are still operating in the United States and today over 55 percent of the U.S. farmer's nitrogen fertilizer is imported. Of this imported fertilizer, 82.7 percent comes from countries without climate change policies in place to regulate carbon and a majority of these countries are those from whom we are striving for energy independence.

Moreover, reduced domestic production of fertilizer will only increase costs to American farmers since they will be more exposed to price volatility and product availability resulting from importing such a great deal of our plant nutrient needs.

Last year China placed export tariffs in excess of 180 percent on key fertilizers – just to ensure that its food production system remained robust during the heart of the food crisis. Ironically, just last month, when the countries comprising the G-8 met in Italy to discuss critical issues, fertilizer was at the forefront of an aid package for developing nations supported by G-8 members including the Obama Administration.

We urge the Senate to ensure that any future climate change policy does not harm America's remaining nitrogen fertilizer production. Specifically, we ask that the Senate ensure that we do not outsource our nitrogen fertilizer industry and in doing so, risk our nation's food security.

Senator CARDIN. Admiral McGinn.

STATEMENT OF DENNIS McGINN, VICE ADMIRAL, U.S. NAVY (RETIRED); MEMBER, MILITARY ADVISORY BOARD, CENTER FOR NAVAL ANALYSES

Mr. MCGINN. Thank you.

Mr. Chairman, Ranking Member Inhofe, ladies and gentlemen, distinguished members of the committee, it is an honor to appear before you today to discuss this critically important topic of climate change and national security.

Since early last year, I have had the privilege of serving with some of our Nation's most distinguished and senior retired military leaders on a CNA Military Advisory Board which produced two reports focused on the very topic of this hearing. The first examined the national security threats of climate change, and the most recent analyzed the national security threats of America's current energy posture.

To begin, I want to recognize what currently, I believe, weighs most heavily on American's minds. We are in the midst of the most serious financial crisis of our lifetimes. After a year of examining our Nation's energy use, it is clear to all members of our Military Advisory Board that our economic, energy, climate change and national security challenges are inextricably linked.

Our past pattern of energy use is responsible in no small measure for our economic situation today. If we do not adequately address our Nation's growing energy demand and climate change now, future financial crises will most certainly make this one look like the good old days.

Our weakened national and global economy has temporarily reduced the demand and cost of oil. However, this recession will end, and the volatile cycle of ever higher fuel prices will most surely return.

Global population growth and projected per capita increase in energy consumption over the next 20 years will make fossil fuel supply and demand curves divergent. Oil is already becoming more difficult and expensive to produce. And as a Nation that uses 25 percent of the world's oil every year while owning less than 3 percent of known reserves, we cannot drill our way to sustained economic security and independence.

Without bold action now to significantly reduce our dependence on fossil fuels, our national security will be at greater risk in the future. Fierce global competition and conflict over dwindling supplies of fossil fuels will be a major part of the future strategic landscape. Moving toward clean, independent domestic energy choices lessens that danger and significantly helps us to confront the serious challenges of global climate change at the same time. Because these issues are so closely linked, solutions to one affect the others.

In 2007, the Military Advisory Board produced a report entitled "National Security and the Threat of Climate Change." Its principle conclusion was that climate change poses a serious threat to America's national security by acting as a threat multiplier for instability in some of the most volatile regions of the world, likely dragging, as Senator Warner so ably pointed out, the United States and

our young men and women into conflicts over water and other critical resource shortages.

Climate change is different from traditional military threats because it is not defined by a specific enemy or hot spot to which we are trying to respond. It is going to affect every country and every person in the world in different ways, but all at the same time in the future.

There is a lot of discussion, and we heard some of it here today, about whether or not climate change is real, and if it is, can we really do anything about it as the United States?

As military professionals, we were trained and, I must say, learned by hard experience, to make decisions when faced with threatening situations even when they were defined by ambiguous information. We based our decisions on trends, indicators, and warnings because waiting for 100 percent certainty during a crisis can produce disastrous results. And in carefully considering the threat of climate change to our national security, the trends and warnings are clear.

So what should we do as a Nation? First, we need to recognize, as I said before, that economics, energy security, climate change and our national security are all inextricably linked. Next, we need to carefully avoid the temptation to ignore these connections and then only take small steps to address narrow issues. That is because large, interconnected security challenges require bold, comprehensive solutions.

And here I would say that the United States has both the ability and the responsibility to lead. If we do not make changes, other nations will not. And they will use our own inaction as an excuse for them to continue on a business as usual path.

The Military Advisory Board at CNA recently examined our national energy posture and released a report this May entitled "Powering America's Defense: Energy and the Risks to National Security." This report clearly found that America's energy posture constitutes a serious and urgent threat to national security, militarily, diplomatically and economically.

Our report finds that not just foreign oil but all oil, and not just oil but all fossil fuels, pose significant security threats to the military mission and to the Nation. And most importantly, are exploitable by those who wish to do us harm.

Our growing fossil fuel reliance jeopardizes our military and exacts a huge price tag in dollars and lives, cripples our foreign policy, weakens U.S. international leverage and entangles the United States with hostile regimes. It also undermines, as I mentioned before, our economic stability.

The U.S. pattern of energy usage in a business as usual manner creates an unacceptably high threat level from a series of converging risks: markets for oil shaped by finite supplies, increasing demand and rapidly rising costs, growing competition and conflict over diminishing fuel resources, and destabilization driven by climate change in virtually every region of critical importance to the United States.

Unless we take steps now, not later, to prevent, mitigate and adapt to these challenges, rising energy demand and accelerating climate change will lead to an increase in conflicts and an increase

in conflict intensity. And most important, will place an avoidable and unacceptable burden on our young men and women in uniform, now and in generations to come.

Some may be surprised to hear former Generals and Admirals talk about climate change and green, clean energy. But they should not be. In the military, we learned early that reducing threats and vulnerabilities is essential well before you get into harm's way. That is what this discussion is all about.

Our Nation requires diversification of energy sources and a serious commitment to energy efficiency and renewable energy of all forms. Not simply for environmental reasons, but for national security reasons.

We call on the President and Congress for visionary leadership and a long-term commitment to achieve energy security in a carbon constrained world. Without swift and serious action, the United States will continue barreling headlong toward a future of conflict, less security, and a greatly diminished quality of life.

The challenges inherent in this suite of issues may be daunting, particularly at a time of economic crisis, but our experience informs us there is good reason for viewing this moment in history as an opportunity for the United States. We need not exchange benefits in one dimension for harm in another. In fact, in our analysis, we have found in considering these interlinked challenges that the best approaches to energy, climate change and national security may be, in many cases, one and the same.

Mr. Chairman, Senator Inhofe and members of the committee, if we act with boldness and vision now, future generations of Americans will look back on this as a time when we came together as a Nation and transformed a daunting challenge and worry into an opportunity for a better quality of life and a much more secure future for our world.

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

I request that my full statement be submitted for the record.

Senator CARDIN. Without objection, your full statement will be included in the record.

[The prepared statement of Mr. McGinn follows:]

Statement of Vice Admiral Dennis McGinn, USN, Retired
Member, Military Advisory Board, CNA
before the
Senate Environment and Public Works Committee
Hearing on "Climate Change and National Security"
Washington, DC, July 30, 2009
10:00 a.m. - 406 Dirksen Senate Office Building

Chairman Boxer, Ranking Member Inhofe, distinguished members of the Committee, ladies and gentlemen; it is an honor to appear before you today to discuss the critically important topics of climate change and national security. Thank you for the opportunity to share my views which are based on over thirty-five years of service to our nation in the United States Navy and as a senior executive involved on a daily basis with the science and technology of energy, transportation and the environment.

Since early last year I have had the privilege of serving with some of our nation's most distinguished and senior retired military leaders on the CNA Military Advisory Board.

This Board has produced two reports, the first in April, 2007 and the latest in May of this year, focused on the very topic of this hearing. The first examined the national security threats of climate change, and the most recent analyzed the national security threats of America's current and future energy posture.

Before I get to the details of these reports, I have to acknowledge the elephant in the room. We are in the midst of the most serious global financial crisis of our lifetimes. After a year of examining our nation's energy use, it is clear to all members of our military board that our economic, energy, climate change and national security challenges are intertwined and co-dependent. Our past pattern of energy use is responsible, in no small measure, for our economic situation today. If we do not adequately address our nation's growing energy demand and climate change now, in wise and visionary ways, future financial crises will most certainly dwarf this one.

To illustrate this point, consider that our weakened national and global economy have temporarily reduced demand and the cost of oil in international markets. However, this recession will end and the volatile cycle of high fuel prices will most surely return. Simply consider global population growth and the projected per capita increase in oil consumption over the next twenty years. The fossil fuel supply and demand curves are divergent. Oil is already becoming more difficult and expensive to produce. And as a nation that uses twenty-five percent of the world's oil every year, while owning less than three per cent of the known reserves, we cannot drill our way to sustained economic security and independence.

Without bold action now to significantly reduce our dependence on fossil fuels, our national security will be at greater risk. Fierce global competition and conflict over

dwindling supplies of fossil fuel will be a major part of the future strategic landscape. Moving toward clean, independent, domestic energy choices lessens that danger and significantly helps us confront the serious challenge of global climate change. Because these issues are so closely linked, solutions to one affect the other. Technologies and practices that improve energy sources and efficiency also reduce carbon intensity and carbon emissions, and, most critically, increase our national security.

With the foregoing in mind, I will now describe the ways in which our national security is dramatically impacted by both our energy use and climate change.

First – the national security impacts of climate change.

In 2007, after a year-long study, the CNA Military Advisory Board produced a report called “*National Security and the Threat of Climate Change*” which concluded that climate change poses a “serious threat to America's national security”, acting as a “threat multiplier for instability” in some of the world's most volatile regions, adding tension to stable regions, worsening terrorism and likely dragging the United States into conflicts over water and other critical resource shortages. On the most basic level, climate change has the potential to create sustained natural and humanitarian disasters on a scale and at a frequency far beyond those we see today. The consequences of these disasters will likely foster political instability where societal demands for the essentials of life exceed the capacity of governments to cope.¹

Climate change is different from traditional military threats, according to CNA Military Advisory Board member Vice Admiral Richard Truly because it is not like “some hot spot we’re trying to handle.” “It’s going to happen to every country and every person in the whole world at the same time.”ⁱⁱ

Not only will global warming disrupt the environment, but its effects will shift the world's balance of power and money.ⁱⁱⁱ

Drought and scant water have already fueled civil conflicts in global hot spots like Afghanistan, Nepal and Sudan, according to several new studies. The evidence is fairly clear that sharp downward deviations from normal rainfall in fragile societies elevate the risk of major conflict.^{iv}

And as you know, The Intergovernmental Panel on Climate Change -- the world’s leading scientific panel on climate change -- including more than 200 distinguished scientists and officials from more than 120 countries and the U.S. -- predicts widening droughts in southern Europe and the Middle East, sub-Saharan Africa, the American Southwest and Mexico, and flooding that could imperil low-lying islands and the crowded river deltas of southern Asia.^v

Since the April, 2007 CNA Military Advisory Board report was published, a National Intelligence Assessment on global climate change confirmed our findings. And the scientific community has begun issuing reports showing that climate change is occurring

at a much faster pace than originally believed. The Arctic is a case in point. Two years ago, scientists were reporting that the Arctic could be ice-free by 2040. Now, a growing number of climatologists are telling us it could happen within just a few years.

Some may look at this changing analysis as a reason, or an excuse, for delay. We believe that would be the wrong path. As military professionals, we were trained to make decisions in situations defined by ambiguous information and little concrete knowledge of the enemy intent. We based our decisions on trends, experience, and judgment, because waiting for 100% certainty during a crisis can be disastrous, especially one with the huge national security consequences of climate change. And in this case, the trends are clear. Climate trends and scientific metrics continue to suggest, in an increasingly compelling way, that the global environment is changing.

In thinking about the best ways to deal with this growing threat, we need to keep clearly in mind the close relationship between the major challenges we're facing. Energy, security, economics, and climate change – these are all connected. It is a system of systems. It is very complex. And we need to think of it in that way and not simply address small, narrow issues, expecting to create the kind of change needed to fundamentally improve our future national security. Interconnected challenges require comprehensive solutions.

It will take the industrialized nations of the world to band together to demonstrate leadership and a willingness to change – not only to solve our current economic problems, but to address the daunting issues related to global climate change. And here, I'd say the U.S. has a responsibility to lead. If we don't make changes, then others won't. We need to look for solutions to one problem that can be helpful in solving other problems. That's one of the things we uncovered in our work – there are steps that can help us economically, militarily, diplomatically. And those steps fit with the direction the world is heading in considering climate solutions. Those are good and much needed connections.

As retired Marine Corps General Anthony Zinni, former commander of U.S. Central Command said “The intensity of global temperature change can be mitigated somewhat if the U.S. begins leading the way in reducing global carbon emissions.” He concluded, “We will pay now to reduce greenhouse gas emissions today...or we will pay the price later in military terms and that will involve human lives.”^{vi}

Building on a key finding in the 2007 report, that climate change, national security and energy dependence are inextricably intertwined, the CNA Military Advisory Board most recently devoted over one year to examining our national energy posture and this past May released a report entitled: “*Powering America's Defense: Energy and the Risks to National Security.*”

This report found that America's energy posture constitutes a serious and urgent threat to national security -- militarily, diplomatically and economically.

Moving beyond recent studies on the dangers of imported oil, our new report finds that not just foreign oil -- but all oil -- and not just oil but all fossil fuels, pose significant security threats to military mission and the country, and are "exploitable by those who wish to do us harm."

We found that our over reliance on fossil fuels does the following:

- Jeopardizes our military and exacts huge price tag in dollars and lives. Our inefficient use of oil adds to the already great risks assumed by our troops. It reduces combat effectiveness. It puts our troops -- more directly and more often -- in harm's way. Ensuring the flow of oil around the world stretches our military thin -- and these are the same men and women already fighting wars on two fronts.
- Cripples our foreign policy & weakens U.S. international leverage. Our dependence on oil -- not just foreign oil -- reduces our leverage internationally and sometimes limits our options. I say all oil, because we simply do not have enough resources in this country to free us from the stranglehold of those who do. We find ourselves entangled with unfriendly rulers and undemocratic nations simply because we need their oil. And we cannot produce enough oil to change this dynamic -- we have to wean ourselves from it.
- Entangles the United States with hostile regimes. In 2008, we sent \$386 billion overseas to pay for oil -- much of it going to nations that wish us harm. This is an unprecedented and unsustainable transfer of wealth to other nations. It puts us in the untenable position of funding both sides of the conflict and directly undermines our fight against terror.
- Undermines our economic stability. We are in the midst of a financial crisis, and our approach to energy is a key part of the problem. We are heavily dependent on a global petroleum market that is highly volatile. In the last year alone, the per-barrel price of oil climbed as high as \$140, and dropped as low as \$40. And this price volatility is not limited to oil -- natural gas and coal prices also had huge spikes in the last year. While these resources may be plentiful, they are increasingly difficult to access, and have associated local environmental impacts, such as slurry spills and smog. The economic and environmental costs are steep. There are many who say we cannot afford to deal with our energy issues right now. But if we don't begin to address our long-term energy profile in significant ways now -- future economic crises will dwarf this one.

We also found that continuing the United States' energy usage in a business-as-usual manner creates an unacceptably high threat level from a series of converging risks, which include:

- A market for fossil fuels shaped by finite supplies, increasing demand and rising costs
- Growing competition and conflict over fuel resources
- Destabilization driven by ongoing climate change

As our first report showed, unless we take dramatic steps to prevent, mitigate and adapt, climate change will lead to an increase in conflicts, and an increase in conflict intensity, all across the globe. It's in this context – a world shaped by climate change and competition for fossil fuels – that we must make new energy choices.

Our second report concludes that we cannot pursue energy independence by taking steps that would contradict our emerging climate policy. Energy security and a sound response to climate change cannot be achieved by pursuing more fossil fuels. Our nation requires diversification of energy sources and a serious commitment to renewable energy. Not simply for environmental reasons – for national security reasons.

We call on the President and Congress to make achieving energy security in a carbon-constrained world a top priority. It requires concerted, visionary leadership and continuous, long term commitment. It requires moving away from fossil fuels, and diversifying our energy portfolio with low carbon alternatives. It requires a price on carbon. And perhaps most importantly, it requires action now.

By clearly and fully integrating energy security and climate change goals into our national security and military planning processes, we can benefit the safety of our nation for years to come. In this regard, confronting this energy challenge is paramount for the military – and we call on the Department of Defense to take a leadership role in transforming the way we get, and use, energy for military operations, training and support. By addressing its own energy security needs, DoD can help to stimulate the market for new energy technologies and vehicle efficiencies.

But achieving the end state that America needs, requires a national approach and strong leadership at the highest levels of our government.

Some may be surprised to hear former generals and admirals talk about climate change and clean energy, but they shouldn't be. In the military, you learn that force protection isn't just about protecting weak spots; it's about reducing vulnerabilities well before you get into harm's way. That's what this work is about.

As a member of our Board, General Robert Magnus, former Assistant Commandant for the Marine Corp said "Our only choice is whether we're going to make the decisions forcefully and in a timely manner. We could lag and then we'll find ourselves in a much more serious situation, when all of these other costs come on us."

Climate change, national security, and energy dependence are an interrelated set of global challenges. Without swift and serious legislative action and investment, the U.S. will continue barreling headlong toward the catastrophic national security, economic and human suffering effects of climate change.

I conclude by quoting from the foreword to our May, 2009 CNA Military Advisory Board report.

“The challenges inherent in this suite of issues may be daunting, particularly at a time of economic crisis. Still, our experience informs us there is good reason for viewing this moment in history as an opportunity. We can say, with certainty, that we need not exchange benefits in one dimension for harm in another; in fact, we have found that the best approaches to energy, climate change, and national security may be one in the same.”

Madame Chairman and Members of Committee, if we act with boldness and vision now, future generations of Americans will look back on this as a time when we came together as a Nation and transformed daunting challenge and worry into opportunity, a better quality of life and a more secure future for our world.

ⁱ CNA Report on “National Security and the Threat of Climate Change”
<http://securityandclimate.cna.org/report/National%20Security%20and%20the%20Threat%20of%20Climate%20Change.pdf> (April 16, 2007).

ⁱⁱ “Military on Climate Change” *Washington Post* (April 15, 2007).

ⁱⁱⁱ Informed Reader column “How Global Warming Will Play With Investors” *Wall Street Journal* (March 9, 2007).

^{iv} Revkin, Andrew “Global Warming Called Security Threat.” *New York Times* (April 15, 2007) <http://www.ciesin.columbia.edu/pdf/waterconflict.pdf>.

^v <http://www.ipcc.ch/SPM6avr07.pdf> KANTER, James and ANDREW C. REVKIN. “Scientists Detail Climate Changes, Poles to Tropics.” *New York Times* (April 7, 2007).

Jolis, Anne and Alex MacDonald. “U.N. Panel Reaches Agreement On Climate-Change Report.” *Wall Street Journal* (Apr. 6, 2007).

^{vi} *Washington Post* “Military on Climate Change” (April 15, 2007).

The Honorable Barbara Boxer
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The Honorable James M. Inhofe
 Ranking Member
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The Honorable Benjamin Cardin
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August 20, 2009

Dear Chairman Boxer, Ranking Member Inhofe and Senator Cardin:

Thank you for your letter on August 12, 2009, in regards to the hearing before the Senate Environment and Public Works Committee entitled, *Climate Change and National Security*. I appreciate your interest in this important topic and welcome your subsequent questions. I will certainly attempt to answer your questions to the best of my ability using information from the two CNA reports from the Military Advisory Board entitled, *Climate Change and the Threat to National Security* and *Powering America's Defense: Energy and the Risks to National Security*.

Senator Benjamin L. Cardin:

- **Would you say that a military/humanitarian response to a climate driven crisis is inevitable – especially if we fail to take action to reduce the causes of Climate Change?**

In the Military Advisory Board's report from 2007, we stated that climate change could result in the military being called upon to perform an increasing number of missions related to humanitarian assistance and disaster relief. We felt this was particularly the case in the most volatile regions of the world (such as in parts of Africa, Asia, and the Middle East) where climate change may serve to multiply the threats already posed by political instability, weak governments, and other social pressures. We felt that the U.S. military is likely to be called upon to perform more of these missions because they have the competence, manpower, equipment, and flexibility necessary to handle these situations better than any other organization on the planet.

- **What would further delay of action mean for our military's ability to respond to a climate driven crisis?**

Climate change threatens to make humanitarian crises both more severe and frequent (either through occurring more often in the same region, more frequently across a combination of regions, or both). As such, the stress placed on the military's ability to respond could be multiplied.

The best way to respond to a humanitarian crisis is to prevent it from happening in the first place. As such, the U.S. should act to mitigate the impacts of climate change to the extent possible. However, because a certain level of climate change and warming is already in the pipeline, the U.S. should also act to adapt to the impacts that cannot be avoided. Some of these actions should include working with the nations that are most likely to be impacted by climate change-related effects as well as those that have the least ability to absorb these impacts. By doing so, the demand on the U.S. military to perform such missions can be alleviated. It is imperative to begin taking these actions promptly so as to avoid any unnecessary impacts.

- **Do you think it is wise for the United States Army to be so reliant on fossil fuels?**

In *Powering America's Defense: Energy and the Risks to National Security*, the CNA Military Advisory Board argued for the importance of the U.S. military Services and Department of Defense (DoD) to be at the forefront of adopting low carbon and energy efficient technologies. The military's heavy dependence on liquid fuels, in all Services, for powering our in-theater operations poses a significant risk to our military forces. Not only does our over-reliance impose a significant financial burden on the Department, but the delivery of these fuels through long convoys puts our men and women directly in harm's way and causes combat assets (including attack helicopters and fixed-wing aircraft) to be diverted from their primary missions.

- **What can the military do to reduce its reliance on fossil fuels?**

The Military Advisory Board believes that the Department of Defense should focus on cutting its use of fossil fuels in order to improve its operational effectiveness, protect American troops, save money, and help the nation as a whole transition to a more energy-secure future.

In *Powering America's Defense: Energy and the Risks to National Security*, we have laid out a "Roadmap for the Energy Security" that the Department of Defense and U.S. military can follow to reduce the risks posed by their current energy posture (of which dependence on fossil fuels is an important component). Briefly, we have laid out six priorities for the Department in order to solve the energy problems that pose the greatest threat to the Department's mission and that can help the nation as a whole:

Priority 1: Energy security and climate change goals should be clearly integrated into national security and military planning processes.

Priority 2: DoD should design and deploy systems to reduce the burden that inefficient energy use places on our troops as they engage overseas.

Priority 3: DoD should understand its use of energy at all levels of operations. DoD should know its *carbon footprint*.

Priority 4: DoD should transform its use of energy at installations through aggressive pursuit of energy efficiency, smart grid technologies, and electrification of its vehicle fleet.

Priority 5: DoD should expand the adoption of distributed and renewable energy generation at its installations.

Priority 6: DoD should transform its long-term operational energy posture through investments in low-carbon liquid fuels that satisfy military performance requirements.

A finer level of detail on each of these priorities can be found in the text of our report.

Senator James L. Inhofe:

- **Can the United States put together an effective, workable climate policy without China, India, and the developing world?**

Neither of our reports specifically addressed this topic. However, the second recommendation of our report, *Climate Change and the Threat to National Security*, stated that, “The U.S. should commit to a stronger national and international role to help stabilize climate change at levels that will avoid significant disruption to global security and stability.” As we have done so many times in the past, the United States needs to play a global leadership role and work with all nations to address the challenges of climate change, energy and security. Our U.S. leadership role has to be one that has the essential element of moral authority derived from leadership by example.

- **Do you believe China would follow our lead if we adopted cap-and-trade?**

Although the Military Advisory Board did not specifically examine a “cap-and-trade” system, we believe it is critically important for the United States to take a leadership role; fully recognize the scientific and economic trends, indicators and warnings related to climate change and energy security; and to take appropriate action. Such action would take into consideration the need to fully account for all costs and the enormous risks related to our growing dependence on fossil fuels. Working with nations like China and India to change the trajectory of their greenhouse gas emissions will be of critical importance if we are to avoid the worst impacts of climate change.

- **Do you agree with the GAO that passing a unilateral cap and trade bill could put U.S. industries, including chemicals, primary metals, paper, nonmetallic mineral manufacturers at a disadvantage to other countries, such as China and India, that most likely require mandatory emissions reductions?**

I am unfamiliar with this GAO study and neither of CNA's reports addressed this specific topic. However, in our study, *Powering America's Defense: Energy and the Risks to National Security*, the second finding stated that "A business-as-usual approach to energy security poses an unacceptably high threat level from a series of converging risks."

- **How strong of a role should nuclear power play in lessening energy dependence?**

The CNA Military Advisory Board believes that there are many solutions that can address the interrelated issues of energy security, climate change, and national security. While our studies did not specifically examine nuclear power, we recognize that the United States should take a portfolio approach to developing future energy choices. Appropriate policies, priorities and resources should be applied to each of those choices based on the most accurate and objective analysis of their costs, benefits, and risks. In this regard, I highly recommend a recently released report, *America's Energy Future: Technology and Transformation* by the Committee on America's Energy Future; National Academy of Sciences.

As has been said many times, there is no "silver bullet" solution to our energy security and climate change challenges, however, the role of greatly increased energy efficiency, in every sector of our economy, will be a major positive factor going forward.

- **Do you believe a Waxman-Markey style bill will adequately address those problems and threats?**

Neither of our studies examined specific legislative proposals. However, we believe it is important for the Congress, and the country, to fully recognize the size and urgency of the challenges before us and to, take significant action to address the root causes of energy insecurity and climate change and the threats they pose to our national security.

Chairman Boxer, Ranking Member Inhofe, Senator Cardin, I appreciate your work on this important topic and hope I adequately addressed your questions and concerns. Please feel free to contact me with any further inquiries or for additional discussion.

Sincerely,

Vice Admiral Dennis McGinn (Ret.)
Member of the CNA Military Advisory Board

Senator CARDIN. Admiral McGinn, we thank you very much for your service and your testimony here today.

Our next witness is Jonathan Powers, Retired U.S. Army Captain and Chief Operating Officer, Truman National Security Project.

Mr. Powers.

STATEMENT OF JONATHAN POWERS, CAPTAIN, U.S. ARMY (RETIRED); CHIEF OPERATING OFFICER, TRUMAN NATIONAL SECURITY PROJECT

Mr. POWERS. Thank you.

Chairman, Ranking Member Inhofe, members of the committee, ladies and gentlemen, I am honored to appear today with this distinguished panel.

I am Jon Powers, and I am the Chief Operating Officer of the Truman National Security Project. The Truman Project is working to raise awareness between the connections of climate change and national security.

As a former U.S. Army Captain and Iraq veteran, I understand firsthand the challenges our national security apparatus will face when dealing with this growing threat. It is important that Americans understand the threat and ensure our leaders address the challenge while setting the standards for others to follow.

Over the course of my time in the military, I learned incredibly valuable lessons. On my first day with my unit, my Platoon Sergeant grabbed me by my lapels, dragged me around to the side of the motor pool, and he said, sir, there are two types of leaders in the military, those who lead by rank and those who lead by example. The soldiers will follow those who outrank them. But they want to follow those that set the standard, set the example.

For too long, our Nation has been leading on climate change by rank, and it is time we begin to lead by example. America is at a critical point, and our security relies heavily on how we address this growing threat.

The Center for New American Security points out that climate change may not be a threat that soldiers can attack and defeat, but it is likely to affect the safety and prosperity of every American.

The threat to global stability is both serious and urgent. Climate change will increase the frequency and intensity of storms and droughts and decrease the availability of drinking waters. When Indonesia was hit by a massive tsunami in 2004, our military responded with aid, ships, planes, helicopters, costing \$5 million per day, and only the U.S. military had the capacity to respond.

If the occurrence of such storms increases, the demand on the U.S. to respond will also increase. This matters because Indonesia is the world's most populous Muslim country, and U.S. efforts dramatically improved the U.S. image among Indonesians. This is a major accomplishment in America's fight against Islamic extremism.

Then there are the dangers of increased drought and decreased drinking water. Lake Chad, formerly one of Africa's largest fresh water sources, is shrinking to 5 percent of its original volume. The fight over scarce resources such as water is already happening in

destabilizing states like Sudan and Somalia where extremist groups target failing governments.

Climate change will also hit us here at home. The IPCC estimates that Latin America will see 50 percent of agricultural lands undergo desertification and salinization in less than 50 years. You can imagine what this will do to immigration challenges in North America.

If we wish to fight climate change, we must attack the problem at its source: fossil fuels. America's reliance on oil is an Achilles heel that the enemies use against us.

Al Qaeda has called on its supporters to attack oil facilities and infrastructures throughout the Middle East. According to the Oil and Gas Terrorism Monitor, the number of attacks increased from less than 50 a year before September 11, 2001, to 344 by 2006. It is imperative that we develop energy alternatives that will protect us against these threats.

We are also propping up the economies of some unsavory regimes. Based on Truman Security Fellow's analysis of 2008 production estimates, for every \$5 rise in the price of a barrel of oil, Putin's Russia receives more than \$18 billion annually, Ahmadinejad's Iran an additional \$7.9 billion annually, and Chavez's Venezuela an additional \$4.7 billion annually.

And we are depleting our own financial resources. DOD is the largest energy consumer in the Nation. According to CNA's most recent report, a \$10 rise in the price per barrel will cost DOD more than the entire annual procurement budget for the Marines.

When the price of oil doubled from \$30 in December to \$65 today, this had a tremendous impact on both our military's bottom line and our Nation's economic security. Goldman Sachs predicts that by 2010, crude oil will hit \$100 per barrel. Many economic experts suggest the continued rise in oil prices may cause a double dip recession.

OPEC's leadership has the ability to help relieve this economic stress. But do we want to leave our national security in their hands?

I believe the American people want us to take our security in our own hands. We must establish policies that will seriously and urgently reduce the threat of climate change, reduce our dependency on oil, and provide clean energy incentives. This will allow a recovering economy to focus its investments in clean, domestic and safe energy.

This committee will play a critical role in establishing an America that leads by example in developing domestic legislation that will protect our environment and ensure our national security.

Thank you.

[The prepared statement of Mr. Powers follows:]

**WRITTEN STATEMENT OF
JONATHAN POWERS, RETIRED US ARMY CAPTAIN
CHIEF OPERATING OFFICER, TRUMAN NATIONAL SECURITY
PROJECT**

**SENATE COMMITTEE ON ENVIRONMENT
AND PUBLIC WORKS
ON
CLIMATE CHANGE AND NATIONAL SECURITY**

JULY 30, 2009

Chairman Boxer, Ranking Member Inhofe, Members of the Committee, Ladies and Gentlemen, I am honored to appear here today with this distinguished panel to discuss the incredibly important issue of climate change and national security. I am the Chief Operating Officer of the Truman National Security Project whose mission is to recruit, train, and position a new generation of progressives to lead on national security. The Truman Project is currently working to raise awareness of the connections between climate change and national security. As a former US Army Captain and Iraq veteran, I understand first hand the challenges our national security apparatus will face when dealing with this growing threat. It is important that the American public understands the threat and ensures our leaders both address the challenge and use our international leadership to set the standards for others to follow.

Over the course of my time in the military I learned incredibly valuable lessons in situations that ranged from running training exercises in garrison to patrolling the streets of Baghdad. I believe the most important piece of advice I received was when I first met my soldiers as I arrived to my unit fresh out of Officer Basic. My well seasoned and experienced platoon sergeant grabbed me by my lapels and dragged me around to the side of the motor pool to provide me words of wisdom I will never forget.

He said, "Sir, there are two types of leaders in the military, those who lead by rank and those who lead by example. The soldiers will follow those who outrank them, but a true leader sets the example and sets the standards for all to follow."

When it comes to climate change, we as a nation have been trying to lead by rank for too long. It is time we begin to lead by example. America is at a critical point, and our security relies heavily on how we address this growing threat.

A recent report from the Center for New American Security¹ rightly points out that "Climate change... may not be a threat that soldiers can attack and defeat, but it is likely to affect the safety and prosperity of every American, both through its effects on global stability and on our local environments."

The threat to global stability is both serious and urgent. Changes to our air and sea temperatures are expected to result in increases in frequency and intensity of both storms and droughts, and decrease the availability of drinking water around the globe.

So how does this changing physical environment affect our national security?

I believe it is important to note that the threats to national security created by climate change are not abstracts – we have actually seen them firsthand. For example, when Indonesia was hit by a massive tsunami in December 2004, the U.S. military responded with logistics aid, ships, planes, and helicopters to establish a rapid supply chain to stricken regions. At a price tag of \$5 million per dayⁱⁱ, only the U.S. military had the capacity to respond so quickly to a disaster of such magnitude. If the intensity and occurrence of such storms increase, the demand for the United States to respond to such events will increase in turn. With America's military overstretched in Iraq and Afghanistan, this will seriously tax U.S. resources.

Many Americans might ask how these actions affect our national security. Indonesia is the world's most populous Muslim country, and U.S. efforts after the tsunami dramatically improved the image of the U.S. in the eyes of Indonesians. This is a major accomplishment in America's fight against Islamic extremism.

Then there are the dangers of increased drought and decreased drinking water. In Sub-Saharan Africa, Lake Chad, formerly one of Africa's largest freshwater sources, is shrinking to 5% of its original volume.ⁱⁱⁱ The fight over the scarcity of resources such as water is happening in already destabilized or fragile states, such as the Sudan or Somalia. As a result, these nations become targeted by extremist groups looking to take advantage of failing governments.

It should be no surprise then that a recent National Intelligence Assessment judged that "sub-Saharan Africa will continue to be the most vulnerable region to climate change because of multiple environmental, economic, political, and social stresses."^{iv}

Climate change will also hit us here at home. The Intergovernmental Panel on Climate Change estimates that Latin America will see 50% of agricultural lands undergo desertification and salinization in less than 50 years.^v You can imagine what this will do to immigration challenges here in North America.

Whatever damage is done, is already done. But if we wish to fight climate change, and prevent any further damage to our security then we must attack the problem at its source - fossil fuels. There is little doubt that America's reliance on oil is an Achilles heel that our enemies deliberately use against us. It is imperative that we develop energy alternatives that will protect us against this threat.

Al Qaeda has called on its supporters to attack oil facilities and infrastructure throughout the Middle East. As a result, the number of attacks increased from less than 50 a year, before September 11th, 2001, to 344 by 2006.^{vi}

The economic and security costs of our oil addiction are overwhelming and we must reduce our dependence.

First, we are propping up the economies of some rather unsavory regimes. A Truman Project Security Fellow conducted an analysis on the impact that increases to crude oil prices have on the gross revenue streams of certain nations based on BP's 2008 production estimates. The Truman Fellow found that for every \$5 rise in the price of a barrel of crude oil Putin's Russia receives more than \$18 billion annually, Ahmadinejad's Iran an additional \$7.9 billion annually, and Chavez's Venezuela an additional \$4.7 billion annually.

Are these countries where we want to be sending our nation's treasure?

Second, we are depleting our own financial resources. Our Department of Defense (DoD) is the largest energy consumer in the nation, and our nation is the largest energy consumer in the world. According to the CNA's most recent report,^{vii} a \$10 per barrel rise in the price of oil will cost DoD over \$1.3 Billion dollars annually. That is more than the entire procurement budget for our Marines.

With the price of oil doubling from nearly \$30 in December to approximately \$65 today, you can see this has a tremendous impact. It impacts both our military's bottom line and our nation's economic security.

Goldman Sachs' predicts that by 2010 crude oil will hit \$100 per barrel, and McKinsey is estimating that we will have a sharp increase between 2010 and 2013.^{viii} Those prices will be troubling to our economy as we struggle to recover from what many have referred to as some of the most challenging economic times since the Great Depression.

Many economic experts and political leaders worldwide are beginning to suggest that the continued rise in oil prices may cause a "double dip" recession. JP Morgan recently warned in a memo that "we can argue whether it is \$75 or \$100 a barrel that will start to impact economic growth, but it will happen,"^{ix}

Some of our closest allies are concerned about this "double dipping." For example, British Chancellor of the Exchequer Alistair Darling warned in June that oil prices have "the potential to be a huge problem as far as the recovery is concerned."^x

OPEC's leadership has the ability to help relieve this economic stress, but do we want to leave our national security in their hands?

I believe the American people want Washington to take our security in our own hands and reestablish policies that will seriously and urgently reduce the threat of climate change.

The economic challenges that we currently face as a nation provide the incentive to halt the funneling of billions of dollars overseas. We have the opportunity to reduce our dependence on oil by providing clean energy incentives. This will allow our recovering economy to focus its investments in clean, domestic, cheap, and safe energy.

This committee will play a critical roll in once again establishing America as a nation that leads by example. It is vitally important that you develop domestic legislation that will protect our environment and ensure our national security. We can only accomplish this by reducing greenhouse gases, providing clean energy incentives, freeing us from foreign dependence, and growing our economy.

We obviously have a major task ahead of us. But then again, so did the generation that lived up to President John F. Kennedy's call to put a man on the moon and answer the security threat of its era. And as we celebrate the recent anniversary of the lunar landing, I believe President Kennedy's word still ring true for today's security challenge.

We choose to address these challenges "not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win."

ⁱ CNAS working paper on "Natural Security" (June 2009) <http://www.cnas.org/naturalsecurity>

ⁱⁱ US State Department report on "Going the Distance: The U.S. Tsunami Relief Effort 2005" <http://www.ciaonet.org/wps/dod147/dod147.pdf>

ⁱⁱⁱ Nature Reports Climate Change "Is this what the world's coming to?" (October 2007) <http://www.nature.com/climate/2007/0710/full/climate.2007.56.html>

^{iv} House Permanent Select Committee on Intelligence House Select Committee on Energy Independence and Global Warming Testimony by Dr Thomas Fingar on "National Intelligence Assessment on the National Security Implications of Global Climate Change to 2030" (June 2008)

^v IPCC report on Climate Change 2007: Climate Change Impacts, Adaption and Vulnerability, IPCC 2007 http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_wg2_report_impacts_adaptation_and_vulnerability.htm

^{vi} Oil and Gas Terrorism Monitor report http://www.ogi-tm.com/ogi_threats_st.php

^{vii} CNA Report on "Powering America's Defense: Energy and the Risks to National Security" (May 2009) <http://www.cna.org/documents/PoweringAmericasDefense.pdf>

^{viii} Plumer, Bradford "Peril at the Pump," *Foreign Policy* (June 2009) <http://www.cnas.org/naturalsecurity>

^{ix} Swartz, Spencer, "Rising Oil Prices Risks Snuffing Out Recovery," *The Wall Street Journal* (June 2009) <http://blogs.wsj.com/environmentalcapital/2009/06/12/rising-oil-price-risks-snuffing-out-recovery/>

^x Swartz, Spencer, "Rising Oil Prices Risks Snuffing Out Recovery," *The Wall Street Journal* (June 2009) <http://blogs.wsj.com/environmentalcapital/2009/06/12/rising-oil-price-risks-snuffing-out-recovery/>

Jonathan P. Powers
Washington, DC
August 20, 2009

The Honorable Barbara Boxer
Chairman
Committee on Environment and Public Works
SD 456 Dirksen Senate Office Building
Washington, DC 20510

The Honorable James M. Inhofe
Ranking Member
Committee on Environment and Public Works
SD 456 Dirksen Senate Office Building
Washington, DC 20510

Re: Follow-up on Testimony to Senate Committee on the Environment and Public
Works (July 30, 2009)

Dear Madam Chairman:

I would like to thank the Committee for the opportunity to testify on the incredible threat that climate change poses to the national security of the United States. I was honored to be a part of the distinguished panel and appreciated the tremendous interest in this issue shown by the Senators. Below are my responses to the questions received from Senators Cardin and Inhofe on August 12th. I respectfully ask that this letter be included in the Record.

Question from Senator Cardin:

1. I think the American military's role in delivering humanitarian relief around the world is incredibly important. While we debate spending on multi-billion dollar war planes and the wars we are fighting in the Middle East, the job American soldiers do to bring food, medicine, water and supplies to struggling populations around the world highlights the peaceful objectives of our military and our government.

-Knowing that climate change is likely to increase the number of humanitarian crisis around the world, where do you see future military humanitarian deployments taking place?

The growing threat of climate change will require a broad scope of humanitarian deployments that could range from small scale prolonged assistance in resource management, such as water, to massive storm response deployments that provide necessary assistance and security. The region I believe will be most immediately affected by this is Sub-Saharan Africa. According to the a recent National Intelligence Assessment, "sub-Saharan Africa will continue to be the most vulnerable region to climate change because of multiple environmental, economic, political, and social stresses."¹

¹ House Permanent Select Committee on Intelligence House Select Committee on Energy Independence and Global Warming Testimony by Dr Thomas Fingar on "National Intelligence Assessment on the National Security Implications of Global Climate Change to 2030" (June 2008)

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As I stated in my testimony, this area contains numerous fragile or failing states that already are challenged by scarcity of resources, migration, and other elements that are enhanced by climate change. Future military humanitarian deployments will be needed to provide critical support missions to ensure extremist groups are not able to target these nations.

-What is the connection between United States humanitarian efforts and preserving our national security?

In the summer of 2003, I served as a Platoon Leader in a north-eastern sector of Baghdad, Iraq. Each day that we drove through our urban neighborhoods we witnessed the level of sewage rising like the tides, until in one area it was nearly the entire depth of our vehicle tires. One of the most critically important guard sites consisted of the water treatment facility in our area because we understood the importance of protecting this necessary resource. Our soldiers saw first hand the level of security in our sector quickly decline when we lacked the capabilities of providing simple services like water, electricity, or sewage. Initial failures in Iraq serve as an example of the critical connection between US humanitarian efforts and preserving security.

During my testimony I discussed the December 2004 Tsunami because this provides a non-battlefield example of a major accomplishment in our fight against Islamic extremism. The U.S. military responded with logistics aid, ships, planes, and helicopters to establish a rapid supply chain to stricken regions. Indonesia is the world's most populous Muslim country, and U.S. efforts after the tsunami dramatically improved the image of our nation in the eyes of Indonesians. This investment will pay tremendous dividends when extremist groups move to engage the local populous with their rhetoric of hatred, only to find that support for America is strong.

It is also important to recognize the development work that USAID and their partnerships with Non-Governmental Organizations play in our national security. Agricultural programs such as the Initiative to End Hunger in Africa can provide the stable environment for the development of local governance and security elements. These smart power efforts are critical to our national security because they not only protect locals, but deprive extremists of potential footholds.

Senator James M. Inhofe

I. I see in your testimony and reports that you recommend concerted, immediate action to reduce greenhouse gases. What should we do? What steps should we take over the next decade to address this issue?

There is no question that climate change is a threat multiplier, and that the national security interest is a compelling reason for the U.S. to slow the process of climate change. America's national security apparatus is working to develop responses to this growing threat because it realizes that the likely effects of global climate change are too grave to ignore. I believe any the legislation on the issue must reduce greenhouse gases, provide clean energy incentives, free us from foreign dependence, and grow our economy. The American Clean Energy and Security Act was a step in the right direction, but we look for the leadership of the Senate to continue to build on the foundation to secure our nation with renewable energy.

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2. Do you believe imposing severe restrictions on the U.S. refining industry, which will drive refiners overseas, will be helpful in the near term to reduce our dependency on foreign oil or any oil?

No, I believe legislation like the American Clean Energy Act will lower our reliance on oil, both foreign and domestic, and help us better secure our energy future. An EPA analysis estimates that the American Clean Energy and Security Act will reduce our oil consumption by 150 million barrels annually by 2020. This will save us twice the oil that we could get a peak production from drilling the Outer Continental Shelf and save us over \$24 billion annually at the pump.

Our current policies produce wild and unpredictable swings in the price of fuel, make planning and budgeting impossible for ordinary families and for huge consumers like the military (which spends about \$20 billion a year on fuel and must develop its budget years ahead). This inefficiency reduces our independence, limits our foreign policy options, and puts us under the whim of foreign regimes, some with either unstable governments or, even worse yet, philosophies hostile to U.S. interests. There are twenty-three countries in the world whose oil and gas products constitute more than 60% of their total exports. None of these are democracies. These are not the regimes that we want controlling our national security policies.

Improving our efficiency, which is what the climate legislation now being considered by the Congress does, will reduce this burden, both on our military and on our civilian life. A cap on carbon will drive us to a smarter, more efficient use of energy. It will stimulate exactly the kind of technological innovation that will free us from dependence on foreign oil and from volatile prices. It will help us anticipate future challenges including the collision of finite supplies and increasing world demand. It will protect our armed services and our civilian populations. It is one of the best tools America has to get out in front of a problem that will soon entangle the entire world.

Climate change is recognized by military leaders as an increasing threat to national security, but the solutions are not military but political. This will require both national legislation and U.S. participation in international agreements and actions. For these reasons, I believe energy security is the 21st Century definition of patriotism.

3. If you were a top official in the Chinese government, negotiating in Copenhagen in December, how would you view unilateral U.S. action on climate change? Do you think it would strengthen or weaken your negotiating position?

All current evidence points to the conclusion that China is poised to beat the United States in the development and deployment of energy efficiency technologies. This is no longer a matter of international negotiations; it is a matter of competitiveness in the world economy.

There is an obvious disconnect between what China says at the negotiating table and what it is actually doing. China, in its 11th 5-year plan², set targets to reduce national energy intensity—the measure of energy used per unit of GDP—by 20% in the five years between 2006 and the end of 2010, an average reduction of 4% per year. These efforts, along with targets and measurement systems established by other countries, can help to build trust in international climate relations, helping countries to assess progress and share best practices.

² Yuxia, Jiang, "China approves five-year plan for environment protection," *China View* (September 2007) http://news.xinhuanet.com/english/2007-09/26/content_6797209.htm

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Setting targets is one thing, but achieving them is quite another, and one of the fundamental challenges is measuring and tracking progress. Developed countries—including the U.S.—have been measuring greenhouse gas emissions for quite some time using tested economy-wide accounting practices. As a result, the U.S. has a good idea of which sectors are contributing to national greenhouse gas emissions, which in turn helps to inform important policy choices. But this has not generally been the case in developing countries, which often do not have the experience, history, or institutional capacity to measure greenhouse gas emissions with the precision necessary to support a target expressed in those terms.

Ultimately, countries will need to do more than reduce their energy intensity if the climate problem is to be solved. But China's recent progress on measurement of energy intensity suggests a useful path forward in the near term for developing countries, with developed country support. Actions based on metrics that can be reliably measured and managed within such countries are more likely to deliver tangible results. Achieving these kinds of results, in turn, could lead to success at the UN-led international climate negotiations in Copenhagen in December.

Thomas Friedman of the New York Times has brought to public attention something China watchers have noted over the recent years, that China is

“innovating more and more energy efficiency and clean power systems. And when China starts to do that in a big way — when it starts to develop solar, wind, batteries, nuclear and energy efficiency technologies on its low-cost platform — watch out. You won't just be buying your toys from China. You'll be buying your energy future from China.”

Our concern at this stage should not be whether China will come to the table to sign an international agreement, but whether China is positioning itself to be the world leader in clean and efficient energy technology. America will strengthen our negotiating position by passing legislation that reduces greenhouse gases, provides clean energy incentives, and frees us from foreign dependence.

As I stated in my initial testimony, this committee will play a critical roll in once again establishing America as a nation that leads by example. It is vitally important that you develop domestic legislation that will protect our environment and ensure our national security. We can only accomplish this by implementing serious and urgent legislation that results in reducing greenhouse gases, providing clean energy incentives, freeing us from foreign dependence, and growing our economy.

Sincerely,

Jonathan Powers
Truman National Security Project

Senator CARDIN. Captain, thank you very much for your testimony.

We will now hear from David Rivkin. Mr. Rivkin is a partner at Baker & Hostetler and is Co-Chairman of the Center for Law and Counterterrorism at the Foundation for Defense of Democracies, and a Contributing Editor of National Review Magazine.

Mr. Rivkin.

STATEMENT OF DAVID B. RIVKIN, JR., PARTNER, BAKER & HOSTETLER LLP; CO-CHAIRMAN, CENTER FOR LAW AND COUNTERTERRORISM AT THE FOUNDATION FOR DEFENSE OF DEMOCRACIES

Mr. RIVKIN. Chairman Cardin, Ranking Member Inhofe, members of the committee, thank you for the opportunity to testify on this important subject and particularly to do so on this great panel of many distinguished witnesses, including Senator Warner, a true American hero.

We heard a number of times today that there is general consensus that unilateral U.S. cap-and-trade would not have any discernible positive impact on global climate. To me, the question then, therefore, is whether or not Waxman-Markey, which features the unilateral approach to cap-and-trade in dealing with carbon reductions, would induce other major emitters, especially India and China, to follow suit.

We heard a number of times during the last Presidential campaign and even a little bit today about how the U.S. can lead by example by adopting tough carbon-related mandates that other emitting nations would follow. This leadership by example argument is buttressed by the claim that it should be possible to use carbon tariffs to compel countries that refuse to adopt carbon-related mandates of their own.

These claims have been swiftly disproved. The results of the recent international climate talks in Bonn and the G8 Summit in Italy were not promising. Bilateral exchanges have not budged China and India from their adamant refusal to cap emissions. If anything, their objections have become more vociferous as the U.S. commitment to impose unilateral emissions caps has become more palpable.

To understand why unilateral cap-and-trade will not induce emission reductions by other countries, we must call upon our experience in a more traditional diplomatic context. In this regard, experience teaches us that unilateral concessions are never a good idea.

For example, the arms control agreements of the interwar and cold war period all rested on the principle of reciprocity. This included carefully negotiated undertakings in which parties exchanged measured concessions backed up by careful compromises and verification and compliance mechanisms. This general lesson is reflected with particular clarity in the area of nuclear arms control.

The reason I think it is an apropos analogy is that first, arms control was a centerpiece of our foreign policy for decades, and second, because many people came to believe that, the logic of nuclear deterrence and stability aside, nuclear arms control was a moral

obligation. This is very much the case with climate change today. And yet, even there unilateral concessions never worked.

Understanding linkage is also important here. Even if we assume that our Chinese, Brazilian and Indian interlocutors are as passionately concerned about ameliorating climate change as we are, they would be practicing deficient statecraft if they did not seek to pursue their goal in a manner that benefits their other economic, political and military interests.

In this regard, changing the world's security and economic architecture, which they presently see as unduly tilted in favor of the West in general and the United States in particular, is their major strategic priority. An asymmetrical carbon reduction regime under which the United States make the greatest sacrifices, the Europeans do a little bit, and the developing countries do hardly anything at all would advance this goal. Therefore, the passage of Waxman-Markey will make emitter states in the developing world even less willing to reduce emissions.

Attempting to reduce greenhouse gas emissions through trade penalties would also be highly problematic for a number of reasons. First, carbon tariffs are likely to be illegal under WTO rules. Numerous countries, as well as senior U.N. officials, have already denounced them as a violation of WTO principles. Moreover, legal or not, carbon tariffs would certainly be challenged repeatedly and acrimoniously before the WTO dispute resolution mechanism.

Some argue that the mere threat of carbon tariffs will sufficiently intimidate other countries into doing our bidding on carbon, and therefore they really would function as a deterrence or compellance mechanism. I do not believe this is credible. Either we have the leverage to lead the rest of the world now into a comprehensive binding global climate change accord where all countries adopt real reduction commitments, or we do not.

It makes no sense to suggest that we do not have the sufficient leverage now, when we are prepared for the first time in years to put our own carbon emissions into play but would somehow acquire this leverage years from now solely through the threat of difficult to implement tariff provisions.

Unfortunately, this kind of unrealistic thinking about leading by example permeates the Waxman-Markey bill. It should not drive the Senate's decisionmaking on what is one of the most important foreign policy issues of our time.

I look forward to your questions. I also request that my written statement be put into the record.

Thank you.

Senator CARDIN. Without objection, your entire statement will put in the record.

[The prepared statement of Mr. Rivkin follows:]

Statement by

David B. Rivkin, Jr.

Partner, Baker & Hostetler LLP

Co-Chairman of the Center for Law and Counterterrorism at the

Foundation for Defense of Democracies

Contributing Editor, National Review Magazine

Before the

Senate Committee on the Environment and Public Works

Hearings On Climate Change and National Security

July 30, 2009

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Chairman Boxer, Ranking Member Inhofe, members of the Committee: I want to thank you for the opportunity to testify today on the important subject of climate change and national security. I hope that my testimony will contribute to the Committee's work in this area. My testimony will focus solely on the question of how the U.S. can best exercise its leadership in a way that would produce a meaningful joint action to reduce carbon emissions by all of the world's major economies.

I. Introduction

Thus far, the Administration's legislative efforts to achieve large-scale reductions in global emissions of greenhouse gases ("GHGs") and to persuade other major GHG-emitting economies to participate equitably in the overarching effort to reduce global emissions have been reflected in the proposed American Clean Energy and Security ("ACES") Act of 2009 (also known as the "Waxman-Markey" or "cap-and-trade" bill). The Waxman-Markey bill (H.R. 2454) was passed by the House of Representatives on June 26, 2009 and is now under consideration by the Senate. The proponents of this legislation are prepared to commit the United States to a program of large-scale unilateral reductions in GHG emissions, notwithstanding the clear reluctance of other major economies to make corresponding reductions.

II. Discussion

A. The Waxman-Markey Cap-and-Trade Bill Is The Vehicle By Which The President's Unilateral GHG Reductions Agenda Would Be Implemented.

Waxman-Markey would impose a cap-and-trade system for GHG emissions on the U.S. domestic economy, with the goal of reducing allowable emissions of CO₂ to 83 percent of the 2005 level by 2050. The federal government would limit the total volume of CO₂ that U.S. companies could emit each year and issue tradable and limited emissions permits whose exchange would raise the costs, and lower the emissions, of CO₂ and other GHGs.

Cap-and-trade would be – and is intended to be – a costly policy. The consumer prices of carbon-intensive goods and services would inevitably rise, the cost of electricity for American families and business, almost all of which is derived from fossil fuels. By making carbon-intensive goods and services more costly, the cap-and-trade model seeks to induce Americans to use less of them.

B. The Waxman-Markey Cap-and-Trade Bill Would Not Have A Beneficial Effect On The Global Climate.

Many environmentalists would argue that this carbon regulatory scheme would actually represent no more than the internalization of the true costs – “negative externalities” – of an economy based on GHG emissions, and that cap-and-trade would be a small price to pay for saving the Planet. However, it is worth emphasizing that the Administration’s highest-ranking EPA official has publicly acknowledged that a unilateral cap-and-trade program by the United States alone will have no impact on the global climate whatsoever. In this respect, testifying before this Committee on July 7, 2009 EPA Administrator Lisa Jackson conceded that unilateral U.S. action to reduce greenhouse gas emissions would have no effect on climate, specifically stating that “U.S. action alone will not impact world CO2 levels.”¹

Assuming that we do not mean to commit economic suicide for its own sake, the question becomes whether, as a foreign policy matter, Waxman-Markey will help the global climate through inducing other nations to follow suit. This is a matter of foreign policy, rather than scientific or environmental analysis. Most important here are not the service-based economies of Europe which might go along in part with a U.S. cap-and-trade system, but the

¹ See U.S. Senate Committee on Environment and Public Works, Hearing on “Moving America Toward A Clean Energy Economy And Reducing Global Warming Pollution: Legislative Tools” (July 7, 2009). Webcast available at: <http://epw.senate.gov/public/index.cfm?FuseAction=Hearings.Home>. Note, however, that Secretary of Energy Stephen Chu took a contrary view at the same hearing.

world's most populous and rapidly-industrializing societies, China and India.² Reasoned consideration of the effects of passage of Waxman-Markey suggests that they will not.

C. Unilateral Adoption Of Cap-and-Trade By The United States Will Not Induce Developing Countries To Reduce Their Emissions.

Charging ahead with a project, particularly a costly one, when the key participants in the enterprise do not follow, is not leadership. Thus, if the Administration and its Congressional allies hope that Waxman-Markey will demonstrate U.S. leadership, the question becomes whether other countries will follow suit and accept analogous limits on emissions. The events over the last six months provide a clear answer to this question.

The most relevant foreign governments have already made plain that they have no interest in limiting their GHG emissions. India and China have both refused outright to accept mandatory emissions caps.³ See "China says no to greenhouse gas cuts," *AFP* (Jun. 11, 2009) (quoting Chinese Foreign Ministry spokesman Qin Gang stating that: "China is still a developing country and the present task confronting China is to develop its economy and alleviate poverty, as well as raise the living standard of its people. Given that, it is natural for China to have some increase in its emissions, so it is not possible for China in that context to accept a binding or compulsory target");⁴ Matthias Williams, "India will reject greenhouse gas emission targets," *Reuters* (Jun. 30, 2009) (quoting a statement by Indian Environment Minister Jairam Ramesh

² Europe has long claimed to be in the forefront of efforts to reduce emissions. Whether Europe would really act in concert with U.S. reductions is another question, however. The European stance on GHG emissions is far from monolithic. See, e.g., Mia Shanley & Ilona Wissenbach, "Germany calls carbon tariffs 'eco-imperialism,'" *Reuters* (Jul. 24, 2009) (reporting that German diplomats denounced a French proposal to slap "carbon tariffs" on products from countries that are not trying to cut greenhouse gases a form of "eco-imperialism" and a direct violation of WTO rules.). Available at: <http://uk.reuters.com/article/idUKLO69334820090724>. It is no surprise that France, whose economy is heavily based on nuclear power, should be more enthusiastic about punishing carbon-intensive economic activity than other European countries.

³ India, in particular, has taken pains to make its refusal to limit emissions all-but-impossible to retract, with the Indian Environment Minister publicly excoriating Secretary Clinton on environmental issues during a joint press conference. See Mark Landler, "Meeting Shows U.S.-India Split on Emissions," *The New York Times* (July 19, 2009), available at: <http://www.nytimes.com/2009/07/20/world/asia/20diplo.html>.

that "India cannot and will not take emission reduction targets because poverty eradication and social and economic development are first and over-riding priorities".⁵ Significantly, these stances, far from being idiosyncratic, reflect a reasonable assessment of Chinese and Indian interests. China and India, as well as other developing countries, are striving to pull their people out of poverty and understandably place a higher priority on economic growth powered by traditional energy sources than the United States, which can afford to be more concerned about the environment.

That the world's major developing economies would be extremely reluctant to accept any serious constraints on their carbon emissions is not particularly surprising. Indeed, it was something that was easily predictable. However, for quite some time, the proponents of the U.S. unilateral carbon reductions were able to obscure these hard geopolitical realities by arguing that it was only the Bush Administration's alleged unwillingness to entertain mandatory limits on U.S. carbon emissions that had prevented global progress. During the last presidential campaign, we heard many statements that, once U.S. "set an example" through tough carbon-related mandates, other major emitting nations would swiftly follow. This "leadership by example" argument was backed up by the claim that it would be possible for the U.S. to compel those countries, which were insufficiently inspired to adopt carbon-related mandates of their own, through trade penalties on "carbon intensive" imports.⁶

These claims have been swiftly and decisively disproven. While the Obama Administration has made the passage of the carbon cap-and-trade legislation one of the highest legislative priorities, the results of the two recent international meetings – the March 29 – April 8,

⁴ Available at: <http://www.google.com/hostednews/afp/article/ALeqM5gcKWD6TKOaM0JoHR55GjiosHw5NQ>.

⁵ Available at: <http://www.reuters.com/article/environmentNews/idUSTRE55T65N20090630>.

⁶ See Amanda Little, "Obama on the Record: An interview with Barack Obama about his presidential platform on energy and the environment," *Grist.org* (July 30, 2007) (quoting then-Senator Obama as stating that "[w]e shouldn't look at it as a single tit-for-tat exchange. The U.S. is the world's largest economy and the largest single source of the world's greenhouse-gas emissions, so it is our responsibility to take the first step. We cannot expect China and India, with a billion people each, to take the lead on

2009 climate talks in Bonn, held under the UN auspices and the July 8 – July 10, 2009, G8 Summit in Italy at which President Obama announced the launch of a Major Economies Forum on Energy and Climate – were not auspicious. Neither were the bilateral exchanges with China and India. If anything, the more the U.S. has demonstrated that it is prepared to move forward with major mandatory carbon reductions, the more vociferous has become the opposition of the major developing economies to being included in any such efforts.

At the same time, China and India also are increasingly concerned about appearing to be responsible world citizens. They could perhaps have been persuaded to make a modest contribution to global efforts to reduce GHG emissions. Unilateral adoption of cap-and-trade by the United States will not achieve this, however.

The most basic problem is that enactment of Waxman-Markey represents unilateral emissions disarmament. In negotiations with other emitting countries, our most obvious bargaining chip is the ability to promise to reduce our emissions if they reduce theirs. A desirable emissions treaty would try to spread the pain of emissions reductions across the world's economies, so that no individual country would have to accept too great a relative disadvantage vis-à-vis its economic competitors. By committing the U.S. to reductions – and drastic reductions – *regardless* of what other countries do, Waxman-Markey makes such a grand bargain on emissions impossible. The U.S. would consign itself, by statute, to the worst of all possible bargaining positions.

Climate change has increasingly come to be seen as a national security concern. In understanding why unilateral cap-and-trade would not induce appropriate actions by other countries, we may profitably draw upon the lessons of experience in more traditional diplomatic contexts, which make clear that unilateral concessions are never a good idea. Two such traditional diplomatic contexts, involving arms control and trade, are particularly instructive.

this if we do not -- but we can expect them to join us if we demonstrate leadership.") (emphasis added). Available at: <http://www.grist.org/article/obama/>.

It is important to underscore that the arms limitations agreements of the interwar and Cold War eras were all founded on the principle of reciprocity. This is the case with both nuclear and conventional forces, and has applied across the board to every conceivable aspect of arms control, whether involving naval war ships, tanks and ground forces, nuclear missiles, whether offensive or defensive, as well as the various forms of the so-called Confidence Building Measures, which limited the permissible types of exercises and military activities, as well as constrained the locations at which different force elements could be deployed. Carefully negotiated and detailed undertakings, which committed all parties to how to proceed, were invariably the only fruitful approach; nothing else has proved to work.

These general negotiating lessons were reflected with particular clarity in the area of nuclear arms control. This point is worth belaboring for the purposes of today's discussion, both because for many decades nuclear arms control has become one of the most pivotal aspects of American foreign and defense policy and because many lay persons and experts came to believe that, the logic of nuclear deterrence and strategic ability aside, nuclear arms reductions should have been propelled by a compelling set of moral imperatives. Yet, unilateral disarmament was always understood to be a bad option because, however strongly it might have been felt that nuclear weapons were undesirable, or even intrinsically evil, giving them away first meant that the U.S. and its allies would have nothing to trade for the Soviets' concession – or to rely upon for defense if strategic rivals decided to walk away from negotiations or go back on their word. Modern history is replete with instances of governments holding onto weapon systems which they did not really want so that they could be traded away at the opportune moment.

The same principle of reciprocity animates trade agreements: no country lowers its tariff walls without a reciprocal concession from its trade partner. Indeed, the U.S. has amassed literally decades worth of negotiating experience with both the global – WTO and GATT – and regional – NAFTA – trade arrangements, which demonstrates, just as with arms control, the

importance of securing detailed and comprehensive mutual agreements and undertakings, backed up by appropriate verification and compliance mechanisms.

There is one further irony here that is worth commenting upon. The previous Administration's approach to arms control was harshly criticized as being too informal – eschewing written agreements in favor of oral understandings – and lacking in details. Surprisingly, the new Administration has indicated early on that it is returning back to the traditional arms control approach of negotiating detailed written agreements with Moscow, running into hundreds of pages worth of definitions, detailed limitations and other assorted information. And yet, strangely enough, when it comes to international agreements relating to carbon, we seem to be willing to settle for some very vague generic promises by the major developing economies. This is not a very serious way to proceed.

Unilateral carbon-related commitments by the United States, leave us powerless because they leave us with nothing to trade. This would be all the more so in the case of the Waxman-Markey bill because, as a statute, it would be much less flexible than an Executive Branch foreign policy choice. Once a statute is in place, only an act of Congress can get rid of it.

There is a further problem. Given that the effect of such a policy would be a massive subsidy to carbon intensive imports from developing countries, Waxman-Markey would actually make it harder to persuade developing nation governments to reduce emissions. They would be loath to relinquish the advantage that the U.S.' unilateral sacrifice would bestow upon them. Indeed, inasmuch as India and China may already be the "rising" powers on the world stage, the U.S.'s hamstringing itself through crushing emissions limitations might be thought only to accelerate these countries' rise to global preeminence. Chinese and Indian leaders can hardly have been blind to this possibility. This, by the way, is another entirely predictable development. Linkage, that is to say, establishing connections among disparate issues and subjects, is a way of life in international relations. Thus, even if one assumes that our Chinese,

Brazilian, or Indian interlocutors are as passionately concerned about ameliorating climate change as the most dedicated of environmentalists, they would be practicing deficient statecraft if they did not simultaneously seek to pursue this goal in such a way as to benefit their other economic, political, and military interests. Seeking to change the world's existing security and economic architecture, which they presently see as being unduly tilted in favor of the West in general and the United States in particular, is the major strategic priority for the developing countries. This goal can be best accomplished through the imposition of an asymmetrical carbon reduction regime, under which the U.S. bears the greatest burden, the European countries bear the rest of the burden, and the developing countries do not do much at all. There is thus a strong argument that Waxman-Markey would make these and other large, developing GHG emitter states even *less* willing to reduce emissions than they are at present.

D. Attempting To Enforce GHG Emissions Reductions Through Trade Penalties Would Be Highly Problematic.

Having made it all but impossible to obtain a comprehensive GHG emissions limitation treaty by trading concessions with other governments, advocates of the unilateral cap-and-trade approach must rely on either the moral example of the United States' imposing emission limits on itself, or on the threat or use of trade penalties, to induce other countries to reduce their emissions. These strategies are unlikely to work.

The "moral example" of U.S. abstention from GHG emissions will have little impact on foreign leaders who must worry about feeding their populations. The leaders of more developed societies – particularly in Europe – have long been able to call for U.S. reduction of GHG emissions secure in the knowledge that the prior Administration of President George W. Bush was unlikely to take any action in the area. It is an open question whether Europe's enthusiasm for emissions reductions will persist once, as is likely, the *moral* example of Waxman-Markey proves, in fact, to be a *cautionary* one.

Trade penalties are similarly unlikely to be a very effective tool in this context, for a number of reasons. First, carbon tariffs are very likely illegal under WTO rules. Numerous countries, as well as senior U.N. officials, have already denounced the possibility of carbon tariffs as a violation of WTO principles. See Dina Capiello, "U.N. Climate Expert Warns Against Carbon Tariffs," *The Washington Post* (July 22, 2009).⁷ They will be able to make a strong argument that a carbon tariff is "trade protectionism in the disguise of environmental protection." See Remarks by Yao Jian, Spokesman for Ministry of Commerce of People's Republic of China, reported in Alan Beatie & Kathrin Hille, "China joins carbon tax protest," *The Financial Times* (July 3, 2009).⁸ This argument draws strength from the popularity of the Waxman-Markey bill among protectionist labor groups. Whether illegal under the WTO or not, it is a certainty that carbon tariffs would be challenged – repeatedly and acrimoniously – before the WTO Dispute Resolution System.

Climate-based protectionism would carry with it all the negative consequences of other forms of protectionism. If the United States puts carbon tariffs in place, other countries will likely retaliate. Protectionism pries countries apart. It widens oceans, divides friends and pushes rivals further apart. Trade would be impaired just as the world economy is struggling to recover from the worst downturn since the Great Depression (which was itself largely caused by retaliatory tariffs).

Attempts to pressure other countries into reducing emissions through tariffs will also complicate relations with countries from whom the United States needs help on a range of issues, many of which have little to do with the environment. If, for example, the United States is shackled by a unilateral cap-and-trade scheme, its foreign policy will increasingly be dominated by a desperate need to get India, China, and others to commit to emissions reductions, lest U.S. competitiveness be entirely lost. This will put the U.S. in a far worse

⁷ Available at: <http://www.washingtonpost.com/wp-dyn/content/article/2009/07/22/AR2009072200177.html>.

position vis-à-vis such countries with regard to extracting cooperation on counterterrorism, counter-proliferation programs, human rights, and a legion of other concerns. In other words, it can be argued that Waxman-Markey drives the U.S. to adopt a demanding and confrontational strategy, *even while* greatly reducing the leverage that would be available to the U.S. in dealing with other major emitters.

I have also heard it argued that the tariff approach would work without causing any disruptive consequences, that tariffs, precisely because of their very real punitive "heft," will intimidate other countries into doing our bidding on carbon. Stated differently, and to borrow a term from defense analysts, the tariff approach would compel other countries to adopt the path of carbon reductions and deter non-compliance. I find this argument utterly wanting. We either have sufficient leverage to lead the rest of the world into agreeing to join us in a comprehensive global climate change accord, under which all countries would adopt real and binding reduction commitments or we don't. We would not know how this turns out until we try. What doesn't make sense is the notion that we do not have the leverage now, when we are prepared to put our own carbon emissions into play, but will somehow acquire this leverage years down the road, by virtue of having narrow and difficult to implement tariff provisions.

III. Conclusion

If climate change is really an issue of national security, it must be treated like one. The United States should approach issues of climate change with the same prudence and realism as any other national security issue. A unilateral cap-and-trade regime which would do nothing for the climate is a huge leap in the wrong direction.

⁸ Available at: <http://www.ft.com/cms/s/0/76f0e4b0-67fc-11de-848a-00144feabdc0.html>.

**Environment and Public Works Committee Hearing
July 30, 2009
Follow-Up Questions for Written Submission**

Questions for David B. Rivkin, Jr.

Senator James M. Inhofe

1. Mr. Rivkin, you argue that following the logic of "if we lead they will follow," passing Waxman-Markey unilaterally would in effect drive the U.S. to adopt a more demanding and confrontational strategy, even while greatly reducing the leverage that would be available to the U.S. in dealing with other major emitters. Can you explain this further?

Passing Waxman-Markey, which features a unilateral U.S. cap and trade regulatory scheme, will have a host of negative consequences. The most obvious would be a loss of U.S. leverage vis-à-vis other major emitters. In the negotiation of any global greenhouse gases-related treaty, the biggest source of leverage any one country would have would be its commitment to reduce its own greenhouse gas emissions. To the extent that we unilaterally reduce our emissions, we decouple future U.S. emission reductions from any parallel commitments by other major emitters. Stated differently, we cannot agree to do bilaterally what we are already doing unilaterally. To the extent that Waxman-Markey creates a legally binding emissions reduction regime, rather than a series of policy commitments by the Executive Branch, undoing it would be particularly difficult and the resulting loss of leverage would be particularly pronounced. The same loss of diplomatic leverage would result if EPA, pursuant to existing Clean Air Act authorities, were to embark on a path of reducing U.S. mobile and stationary source emission inventories.

Because such major developing world emitters as China, Brazil, and India have clearly and even passionately reaffirmed their unwillingness to adopt mandatory emission reduction commitments, and because, as described above, any unilateral U.S. pursuit of greenhouse gases emission reductions would further weaken our ability to induce them to do so, I am convinced that the passage of Waxman-Markey would lock global climate negotiations onto a confrontational course.

To be sure, it may take a few years to develop. In the beginning, if Waxman-Markey was enacted, other major emitters are likely to reciprocate with positive rhetoric, indicating that they would also do more things themselves. The Administration would be inclined to view such statements as amounting to at least tentative commitments and would ask the American public to be patient. However, as months and years go by and no serious mandatory reductions by the developing world's major emitters ensue, disillusionment with reality would set in and mutual recriminations

would ensue. Developing countries would argue that additional actions by the developed world are necessary, and the U.S. would argue that they have not done enough. While the U.S. could also threaten to slow down or even eviscerate entirely the ongoing implementation of Waxman-Markey, because undoing legislation which is in force and which has caused key industries and States to incur substantial costs is not an easy process, this threat would not be very credible. This dynamic is certain to create confrontational situations. Indeed, precisely because the U.S., having committed to implement unilaterally major emission reductions and having proceeded down this path a considerable distance, would not have much leverage left, it would have no choice but to adopt a more confrontational diplomacy.

2. I found very interesting your argument that attempts to pressure other countries into reducing emissions through tariffs will also complicate negotiations with these countries with regard to extracting cooperation on counterterrorism, counter-proliferation programs, human rights issues or others. Can you expand on this argument?

Historically, trade disputes have proven to be a major irritant in diplomatic negotiations. Indeed, the negative fallout has often spread to other areas of bilateral and multi-lateral dialogue involving other key foreign policy issues, including counterterrorism, nuclear non-proliferation, and human rights. This negative linkage is likely to be particularly pronounced in the case of any efforts to trigger carbon tariff provisions under Waxman-Markey.

This is the case because carbon tariffs are very likely illegal under any objective analysis of WTO rules. They have been denounced as such by numerous countries, both developed and developing, as well as by senior UN officials. Thus, any effort to trigger such provisions would be viewed as a fundamentally illegitimate protectionist measure by the United States. In fact, it is entirely likely that most of our international interlocutors would assume that, having passed a Waxman-Markey-type legislative vehicle, which features unilateral cap and trade regime, the U.S. has really abandoned any serious efforts to elicit major reduction commitments from the developing countries and that the tariff provisions were really intended to be no more than a public relations sop to domestic critics. In this context, their actual utilization would prove to be all the more traumatic.

Senator CARDIN. Let me again thank our panel for adding greatly to this debate.

As I was listening to Senator Warner and Admiral McGinn and Captain Powers make your presentations about the importance of the military to take steps to minimize risk, and then I think about the investments that the United States has made to try to eliminate safe havens for extremists and terrorists.

It is a tremendous sacrifice that has been made by our soldiers in harm's way in Afghanistan, to try to bring some semblance of order to that region so that terrorist groups do not have a safe haven. And our concerns in Pakistan today. It brings up, then Captain Powers, you mentioned the Sudan and Somalia as being risk areas for safe havens for terrorist organizations and being very vulnerable to climate change.

I would just like to get your view as to whether the risks of climate change, the instability, could present additional areas that the United States will need to be concerned about as potential for safe havens for extremists groups.

Are we running the risk that we could have regions where governments will not be effective in controlling its region because of the instability caused by climate change that may very well present additional risks for the United States and our military?

Senator WARNER. I would say to you, unequivocally, colleague, that is very clearly the case. It adds additional roles and missions to our armed forces which today are valiantly fighting in two wars and undertaking in many other posts in the world to maintain stability. And oftentimes these instances arise very quickly.

That is why the Department of Defense, pursuant to a law which, as I said, Senator Clinton and I put in in 2008, are doing the planning and looking forward to how they meet those contingencies so that it would be the decision of the Commander in Chief, the President of the United States, to implement our forces.

Senator CARDIN. Admiral McGinn.

Mr. MCGINN. I think of climate change as a threat multiplier, almost like taking a large magnifying glass and putting it on top of all of the regions of the world where there are presently issues, where there are seams, where there is conflict, where there are tensions, and that magnifying glass basically makes all of those tensions and conflicts larger because of lack of water, in some cases too much water, crop failure, and environmentally displaced people crossing borders.

And when you look at those areas of the world that are of strategic importance to the United States now, one that was mentioned earlier is that nexus around the Himalayas of China, India, Pakistan, I can imagine a scenario in which, with the diminished water availability flowing to the regions and countries that rely on that water, in particular India and Pakistan, pressure from the south-east on India due to environmentally displaced Bangladeshis because of coastal flooding and numerous typhoons, that area of the world, which already has some daunting issues, having states that are fragile become failed states, and in some cases, those failed states would have nuclear weapons.

Senator CARDIN. That is a point I wanted to get to because every member of the Senate is very concerned about the stability impact

a nuclear Iran could have in that region. That is why we have made it clear that that is an unacceptable outcome, for Iran to become a nuclear weapons power.

And of course, we know about North Korea. Well, we also know about the historical security issues between India and Pakistan. The water issues that you are referring to, we have a hard time getting Pakistan to focus on its territories because of its concern with its India border.

Are we running, I guess, additional risks that we have countries that currently have stability that have nuclear capacity that could very well be at a risk as a result of the impact of climate change?

Mr. MCGINN. Yes, sir. I think the essence of it is that nations that we now know have reasonable levels of stability, certainly not as much as we would like, Pakistan is a good example and there are others like Egypt, where you bring a whole new dimension of problems into those governments, people are not getting the essential needs of life and the governments go from fragile to failed, that vacuum is filled by extremism. And those extremist governments inherit all of the capabilities that those nations have now, including armed forces, and in the case of Pakistan, nuclear weapons.

That is a daunting scenario. I am not saying that we are definitely going to see a climate change induced nuclear war in South Asia, but we cannot ignore the possibility that there are consequences when nations fail.

In the Middle East and the Eastern Mediterranean, we have had the conflict for millennia. Could we imagine a Nile Delta flooded? Can we imagine crop failures in that nation that would cause a stable government, a pro-Western government in Egypt, to go to extremism and thereby be the catalyst for a greatly expanded war in the Middle East? This has happened so many times in the past.

Senator CARDIN. Well, I thank you for that response.

I am just going to ask the guests that are in the audience to please make sure that you do not display signs. That is against our committee rules, and we cannot permit that to be done.

Senator Voinovich.

Senator VOINOVICH. Thank you.

Mr. Rivkin, I appreciate your being here today, as well as the other witnesses. Your testimony presents a sobering outlook regarding our ability to solve the climate problem on our own. I have been all over. The German Marshall Fund, we had a climate special session there to talk about things.

The thing that puzzles me, if you listen to everyone, and you have been eloquent about the problem, but the real issue is, maybe I have been around for too long, I was a mayor for 10 years and a Governor for 8 years, the old issue is, what can we do from a practical point of view to do something about it?

My frustration is that, from everyone I have talked to, if we shut down everything we do, and China and India and Brazil and the other countries that have growing economies do not participate, the impact we are going to have is going to be very little.

I would like to get into specifically the issue of the border tariffs that we would exercise against someone that does not participate in the program. The Chinese have made it very clear, and the Indians, that they are not going to sign on any of these caps. They said,

you have been polluting the atmosphere for a long time, and it is our turn to do it. We do not want to deny our people electricity and some of the other things.

But the issue of the WTO, and my thought is that the only way you are really going to have an effective way to deal with this is to amend the WTO to take into consideration, when you are considering whether someone is practicing protectionism or unfair trade, the issue of climate change and greenhouse gas emissions. Without it, when countries do things, and we do not want them to do it, and we exercise provisions under this law, they will just take us to the WTO, and we will not be successful with it.

So, I guess the real issue is, how do we get everybody else to participate in this effort? I think one of the reasons why we voted, many years ago, against the Kyoto Agreement was that we were saying, you know, why should we do it when the rest of the folks out there are not going to participate in this? How do we get everybody into the basket and to cooperate? These are real problems. I acknowledge them. But from a practical point of view, how to you get at them?

I would like your comment on this whole issue of WTO.

Mr. RIVKIN. Sure. Thank you, Senator Voinovich. I would say that amending the WTO framework in the way you are describing would take off the table some issues about the legality of the tariff approach.

I am still quite uncomfortable with going down this path. In part, because we have done very well as a country and as a leader of the free world by pushing toward greater trade openness. It is very difficult for me to envision a situation where we are able to amend the WTO framework in a way that just deals with climate change. This will open all the other issues in there, certainly in the kind of economic climate where a lot of countries are inclined to do beggar my neighbor policy.

To me, the best way to proceed here is the same way we proceeded in every other serious national security issue. Let me also register my wholehearted concurrence with the proposition that climate change has become a serious national security issue. Well, let us treat it in the same way we treated other serious national security issues: arms control, trade, even human rights.

Let us get everybody at the table. One thing I would certainly give credit to the new Administration for is that it has been very clear that we are prepared for the first time to go with the binding carbon reductions of our own, large scale ones. That is a huge leverage. Let us see how much we are going to get from the rest of the major emitting economies. We do not have to have a treaty that includes every single country in the world. But we should certainly include the major emitting economies.

And if it takes 2 or 3 years to negotiate, let us keep our emission inventory as the club, as the leverage, just the way we have done it with arms control. And I know it is very easy, with all due respect, to talk about leading by example, especially if they are moral imperatives. But I would submit to you that experience shows that in the arms control area, for example, the unilateral measures, nuclear freezes, protestations of no first use, have never worked. So,

to the extent that we take climate change seriously, let us treat it seriously.

There is some unintended irony here that I will briefly mention. The previous Administration got some criticism for approaching arms control in Moscow in kind of a casual way. Remember no long treaties? The new team has gotten back to the original framework. So, the new arms control treaty we are working on with Russia is going to run hundreds of pages long.

And yet we seem to be willing to settle when it comes to carbon reduction for some vague generic statements from the major emitters in the developing world. That is not a serious way to proceed.

Senator VOINOVICH. Thank you.

Mr. POWERS. Sir, on the aspect of leadership by example, and obviously I do not have the expertise to talk about the tariff side, but it is also the U.S. military that will be responding to the challenges in these destabilizing states where climate change will have its most effects. It is not the Indian military. It is not the Chinese military.

So, beginning to move ahead and set the standards for others to follow, I think, is incredibly important, especially leading into negotiations coming up in December. I think it is an aspect that—from a soldier's perspective, it is incredibly important to see that Washington is addressing those pieces.

Mr. RIVKIN. Just let me take 10 seconds and say this: nobody disagrees with this. The real question is, how far ahead of a pack do we get? Indicating that are prepared to do A, B and C is fine. Even beginning to do things.

But adopting a totally unilateral long-term cap-and-trade is not leading by example. It is jumping off a cliff and providing precious little of anything. In my view, it would provide disincentives for the rest of the world to do as much because they see us as being locked in. There is no example in history that any serious negotiations have ever succeeded this way.

Mr. MCGINN. Senator, there are a lot of smart people in China and in India—scientists, economists, industrialists, policymakers and legislators. They are starting to realize that business as usual is not really appropriate for them.

If you go back 20 years ago when the wall came down and we went into the old Warsaw Pact countries in Eastern Europe, everybody wanted to have a telecommunications business, the ability to connect just like the West.

But instead of laying long lines of copper and putting telephone lines and telephone poles everywhere, they said, there is technology available to do this better. We can go to a wireless scheme, and we can achieve the same end, but by different means, which do not have the costs of recreating an infrastructure that is expensive and complex.

I believe that the United States serves as the world's example in areas such as quality of life, economic robustness, technological innovation, political freedom, and we can continue to serve as an example of a better life by taking a leadership role on this issue.

Other countries do not have to achieve a higher quality of life the way the United States did because we did it during the height of

the oil and fossil fuel age. That age we can see coming to an end. Not tomorrow, not in 10 years, perhaps not even in 20 or 30 years. But it is inevitable, and there will have to be new ways to maintain that economic growth and achieve that quality of life for us. We can be a great example of that starting with good legislation that addresses the problems of climate change, energy security, and national security.

Senator WARNER. Senator, very quickly, I conclude on the last page of my statement, with a similar comment. The Admiral and I travel together on this issue. The United States has to step out and lead. I respect Mr. Rivkin's—and it is very well written, historical analysis of how—and as you know, I had a minor role myself as a negotiator internationally, and I know how its trade for this and for that.

But this situation, if you stop for a moment and decide that the world does nothing, I mean does nothing, and we just continue to go on the path we are going, the consequences are going to be catastrophic. It is the United States that sends these young people abroad and responds. We are the only ones that have the lift capacity, the seed, air, food, and medical to help out. And we are just going to end up as a 911 authority for the world unless there is some change in our culture.

I do believe there are some positive signs with China. We were disappointed with the Secretary of State's trip to India and that rather abrupt reply. But we have to endure those steps as we go along internationally. You served on this Committee of Foreign Relations for many years. So, I am betting that if the United States leads, in a very reasonable period of time the others will begin to follow and take some positive steps on their own.

If we do nothing, you can be sure that nothing else is going to be done of any consequence.

Senator CARDIN. Thank you.

Senator Lautenberg.

Senator LAUTENBERG. Thanks, Mr. Chairman.

This has been a very interesting discussion. We are asking a lot of questions, and a lot of questions go to Senator Warner. You said, Senator, and I am always happy to see you, something Admiral McGinn just talked about, copper wiring and telephone poles, well that is what I did in the Army while the bombs were falling in Belgium. Thank goodness that is a job I am not doing anymore.

Senator Warner, you said in your statement, I am a recent convert on the need to address the urgent threat of climate change. In the last 3 years I have become—and I have shortened the language a little bit—convinced that the U.S. must take a leading role in curbing emission of greenhouse gases.

What do you say to your former Senate colleagues to convert more of them to passing a global warming bill?

Senator WARNER. Well, I have to say that this hearing this morning exceeded my expectations. No. 1, we know from experience that a hearing of this type will attract three or four Senators. I counted 12 in here at one point. That is an extraordinary turnout of this committee at one of the most intense times of the Senate's work. And the opening statements were diverse, but they were constructive and heartfelt. I did not see anyone shake a fist in criticism.

I think the Senate is going to be the institution that can bring together the disparity of thinking on this and put forward its own piece of legislation. I think in some respects it will track the Waxman-Markey bill. But we are going to solve this over here ourselves.

And it seems to me, as I leave here today, I have a sense of satisfaction. This institution is doing a lot of work and we ought to bring it to the public's attention.

Senator LAUTENBERG. Thank you.

Mr. Rivkin, I find your testimony quite startling, I must say. I know that you are a distinguished attorney and represent part of a major law firm. I want to ask you, if I might, what kind of a practice do you currently conduct? What specifically do you do in terms of representation?

Mr. RIVKIN. Litigation, Senator Lautenberg.

Senator LAUTENBERG. Do you ever find yourself defending oil companies, energy companies?

Mr. RIVKIN. Well, not oil companies. Energy companies, sometimes.

Senator LAUTENBERG. How much, what part of your practice, typically, when you do represent those companies, you are representing them, I assume, as defense counsel?

Mr. RIVKIN. That is correct. But I am testifying here in my personal capacity, not on anybody's behalf.

Senator LAUTENBERG. Well, but you do not come without some influence of your background. So, come on. The fact of the matter is, I do not know what your expertise development's been, but you cannot ignore what you have been doing for a long time—

Mr. RIVKIN. If I may, Senator, the thing that was germane, and that shaped my testimony and caused me to come here is the fact that I was a defense analyst and while not privileged to serve in the military, I spent many years doing defense analysis, and to me, this climate change has become an area where I have spent many years working there—

Senator LAUTENBERG. So, you think that the way to resolve this is for us to kind of continue along, do what we, I noticed here that you said that the United States should approach issues of climate change with the same prudence and realism as any other national security issue. Does that include armament, stepping up our military? What do we do to deal with these issues?

Mr. RIVKIN. Thank you for your question. Let me clarify that I am most emphatically not suggesting that we do nothing. What I am suggesting is that we lead the world the same way in this area that we led the world in arms control or human rights area by patiently negotiating, pushing hard, obtaining verifiable commitments from our partners.

And by the way, it does not have to be one size fits all. I take note of Admiral McGinn's point about copper versus wireless communications. What I would like to see is diverse, flexible but real commitments on the part of India, China, and Brazil. What I do not want to see is a situation where we lock ourselves in—

Senator LAUTENBERG. I saw that in your testimony, that you want them to respond in better fashion. But while we, well, I think the summary really says it all, that we approach it like any other

national security issue. So, other national security issues include intelligence, armament, and a larger presence around the world.

Admiral McGinn, do you think that we can let the situation stand without incurring substantial penalties with the delays that will follow?

Mr. MCGINN. No, sir. I think that if we continue a business as usual approach to this problem, every day and every year that goes by, the challenges get greater, and unfortunately our options get narrower.

To me, Senator Lautenberg, this discussion is about dealing with greenhouse gases. It is yet another new chapter in recognizing what the true and full costs of progress are.

When I first came into the Navy as a young midshipman and went to sea, there was a wonderful insulating material called asbestos that was on all of our ships and in many of our industries, including our smokestack industries. It really did a good job of insulating by keeping energy inside. However, we found the true and full costs of that type of progress. There are some downsides to it.

We had a wonderful product that saved thousands of lives, back in World War II and into the 1950s, a mosquito repellant called DDT. It worked great. It saved lives. We needed to do that. Upon further scientific examination, however, we found that there was a downside. The full and true health-related costs associated with DDT needed to be reckoned with.

We have got Superfund sites all around the Nation that are a testimony to the goodness that this Nation has displayed in recognizing when science finds a problem, we deal with it, and we deal with it in the proper way. And as we have found, our quality of life goes up when we tackle these problems.

Acid rain is another one. The Clean Air Act was an instance when we recognized the role of science. We take what we understand from science. It may not be 100 percent certainty, but we have the ability to act on it. I think that, in the case of greenhouse gases, that is what we are talking about. We understand there is a true and full cost to the use of fossil fuels. We need to come to grips with it, and go on a different path.

Senator CARDIN. Senator Barrasso.

Senator LAUTENBERG. Mr. Chairman, just to equalize the time, I made sure that I did not take any more time than anybody else, so just one closing thing. First, there are several questions that I would like to submit in writing and want this record to be kept open.

And second, to just say to Captain Powers, the little quip that you introduced as a commentary, you say, do not lead by rank, lead by example. I think that permeates life at its best, and I am surprised that our distinguished attorney friend thinks that we ought to wait for the other guys to set the example. That is not like America at all.

Thank you very much.

Senator CARDIN. Senator Barrasso.

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

Mr. Rivkin, based on your military background, your years as a defense analyst, I think Senator Voinovich asked a little bit about China and India and what they are doing, and it seems to me that

they are putting economic growth and economic security over environmental issues.

Do they view that, would you think, as part of their own national security, their economic issues, and then I look at that in terms of where we ought to be doing well?

Mr. RIVKIN. Absolutely different political systems to be sure, but they are both, perhaps, for different reasons. India, of course is a democracy; China is not. But both see improving the lot of the people, their people, as a must. And frankly, they also, and I do not begrudge it to them, they are interested in rebalancing the existing international system.

They think that the economic balance, the military balance, the balance of power in the major sinews and institutional sinews of our international system is unduly balanced against them. So they are looking at it, again, precisely because this is a serious issue.

You have got to look at linkage. That was the case in trade, that was the case in arms control, it is the case in foreign policy in general. I am not saying they do not care about this. They do. But they want to do it in a way that advances their other goals across the board.

Senator BARRASSO. When I look at unemployment in this country now at 9.5 percent and predicted to climb higher, many studies looking at Waxman-Markey say this is going to cost Americans jobs in energy, minerals, manufacturing, big issues for Wyoming.

How would high unemployment in those sectors impact America's security in terms of us becoming more dependent on foreign sources of energy?

Mr. RIVKIN. Ironically enough, it would do precisely what you are suggesting. So, a particularly tough long-term unilateral trading cap normally would not elicit the right response from the major developing countries. But it would harm our economy. It would put stress on our society, making the situation worse.

There is one interesting point which I do not think many people appreciate. I call it the leakage problem. It will actually make things worse because if a large portion of our manufacturing sector goes offshore to countries which have no carbon constraints, these countries would even today, and will continue to have, less energy efficient economies. So, actually the goal of emissions may well go up, which is absolutely, let us just say it gently, it is encratic response. That is not what we are seeking here.

Senator BARRASSO. We got a recent memo that was released by the non-partisan Congressional Research Service. It said the intelligence community is not engaged in evaluating scientific judgments concerning global climate change. It makes me wonder whose science and assumptions the intelligence community is relying on in making their decisions. Anybody know where that, I do not know if Senator Warner or any of you know where that, because I am trying to find out where that is coming from.

Senator WARNER. I will try to determine that and provide if for the record because I was the one that instituted the requirement for the intelligence community to come up and give the Congress and the President the report. But that is a very good question.

Mr. POWERS. Sir, according to the testimony on that assessment, it was the science of the Intergovernmental Panel on Climate Change. That is the science they used.

Senator BARRASSO. So, they are using international studies, not something done here?

Mr. POWERS. The IPCC is an international group.

Mr. RIVKIN. If I could just add one point. If we are talking about intelligence assessments, again in the past, not to always harp on arms control, but when we did arms control you always wanted to understand what the goals of the other side are before you get to the negotiating table.

It would be interesting to see if our intelligence community is analyzing what the Chinese and Brazilians and Indians really think about climate change, which may be something quite different from their public statements. That would be a worthwhile endeavor.

Senator BARRASSO. The thing that struck me in this memo released by the Congressional Research Service, it said that in assessing the implications of climate change, the intelligence community is devoting certain existing resources, both budgetary as well as personnel resources, to the effort and drawing on existing expertise of various intelligence community agencies.

The memo also stated that the budget and personnel commitments associated with this effort were classified. So, I think the Committee, Mr. Chairman, ought to be briefed on what these efforts are so we can get a full picture on all of this.

With that, thank you Mr. Chairman. No other questions.

Senator CARDIN. Thank you.

Senator Carper.

Senator CARPER. First of all, let me just ask Senator Warner: is there life after politics? And if so, how would you characterize that life?

Senator WARNER. Well, I can assure you that I miss all of you and the life. But I had a good opportunity for 30 years to experience it, and there is life hereafter. I urge you to reflect carefully on it when you get ready to leave and make some preparations. I am still getting boxes and boxes of letters that I have to turn around and answer one way or another. But that is my constituents. They still recognize that we worked together for many years.

But there is no greater honor that any person can have than to serve in this institution. I say that with the deepest humility. Enjoy it while you are here, do your best, and you will never regret it.

Senator CARPER. Well, thank you for that advice. You have given us great advice over the years, and you still do.

Vice Admiral McGinn, you have known a number of Secretaries of the Navy, I presume. Is that correct?

Mr. MCGINN. Yes, sir.

Senator CARPER. Roughly how many, would you say?

Mr. MCGINN. I would have to count it up, Senator, but I was Lieutenant McGinn when you were Lieutenant Carper back during those tough times and fighting that war. I also have always considered Senator Warner as my leader, Secretary of the Navy at that time.

Senator CARPER. Yes, a great role model.

Senator WARNER. Could I add that you were a naval aviator, and he was Top Gun material?

Senator CARPER. You are kidding. Is that true?

Senator WARNER. Talk about it a little bit here.

[Laughter.]

Mr. MCGINN. I have some regrets now, sir, that all of that time I spent lighting afterburners in Navy jets may have put some greenhouse gases into the atmosphere.

[Laughter.]

Mr. MCGINN. So maybe this is a form of penance. But seriously, I had a wonderful career. I had an opportunity to command carrier-based squadrons and F-18s and A-7s and, in fact, to command an aircraft carrier.

Senator CARPER. Which one?

Mr. MCGINN. It was the U.S.S. *Ranger* out of San Diego. I also, interestingly, was the chief test pilot in Senator Cardin's State down at Patuxent River for a couple of years.

It was a fine career, and it gave me a tremendous exposure to science, engineering, and technology. It also gave me a tremendous exposure to other cultures in my numerous trips, sometimes for deployments of months and sometimes living for years overseas.

I was telling Senator Warner not too long ago that one of the motivators for guys like retired Admirals and Generals or Captains or anybody that has served in the U.S. Armed Services is that when you have been to other countries, you get to see what it is like. And you come back to this country, and you say, God, it is great to be back because this is the best Nation on earth. It is the shining city on the hill. We can and must lead.

Senator CARPER. Good. I agree. One of my favorite sayings is, I would rather see a sermon than hear one. That says a lot about leadership, and I agree with you that we need to provide the leadership.

A lot of people are saying, well, why should we get out there and provide leadership? The Chinese are not going to do that much, the Indians are not going to do that much. As it turns out, the Chinese are doing a lot. You know, they are building a lot of coal-fired plants. They are also, I think, doing a better job in terms of their emission controls in some of those new plants than we are.

We are proud of our new CAFE standards for fuel-efficient vehicles, but the Chinese are actually well ahead of us in terms of energy efficiency for the cars they are putting out on the road. I would like to ask, and maybe I could start with Senator Warner—

Senator WARNER. Could I just say, in working with you, when we worked together on the Lieberman-Warner bill, you always had a high degree of confidence that this is achievable technologically, drawing on your own background. And just recently, China and the United States did enter into an executive agreement to begin to work on the complexity of sequestration.

So, it is not just damnation against these other countries. They have got special problems. But I do believe, in their heart of hearts, and particularly their cultures, they do not want to be viewed by

the world, nor do they want to see their citizens continue to suffer from the detrimental effects to the health, of this CO₂ problem.

Senator CARPER. Good. Let me just follow up on what Senator Warner just said. I think maybe some of our colleagues on the committee, and I think maybe I should mention Mr. Rivkin, in his remarks, express concern about China and India not joining us with any enthusiasm in reducing greenhouse gases.

I think we would all acknowledge that we need every country, especially the major emitters, to begin reducing their emissions. I am sensing that the Chinese have caught on to that, and I am encouraged that they have. And you just gave us an example.

Senator Warner, what would you suggest that we do, as members of this committee and as members of the Senate, to better ensure that China and India, and really other developing countries, join us with enthusiasm in reducing emissions?

Senator WARNER. I come back to the simple statement: we have got to lead. And I do believe they will follow. They are proud nations. They have struggled with overpopulated areas and from the lack of so much of the benefits that the Western world has enjoyed for so long. They want to join. They want, I think, to join as responsible nations and work with us. But it is that first long stride that we must take that will bring them along.

Senator CARPER. Admiral McGinn, and is it Captain Powers?

Mr. POWERS. Yes, sir.

Senator CARPER. Do you all want to add anything to that?

Mr. POWERS. Yes, sir. In that leadership, I think the biggest difference between this and some other national security issues that would have been talked about, for instance, nuclear weapons, and addressing the threat of nuclear weapons is addressing the risk that we will have an explosion because of those nuclear weapons.

We have already seen the risks, the results, of climate change. And looking at the core, the root problem of the fossil fuels, and addressing the energy security piece is going to be critical, not only for our national security, but for our economy. I think that is where we can really bring our leadership.

Mr. RIVKIN. If I could just add, I think what we are all wrestling with in good faith is a definition of leadership. Let me stipulate that leadership does not mean to do nothing. Leadership does not mean not taking the first step, or even the second step. Leadership also does not mean being inflexible and seeking to impose exactly the same measures on the Chinese or the Indians or the Brazil that we would do. That is not leadership. That is stupidity. But leadership—

Senator CARPER. Let me interrupt. My time is limited. I am going to go back to Admiral McGinn here. When I was in the Navy, someone once described leadership as staying out of step when everybody else is marching to the wrong tune. Admiral.

Mr. MCGINN. One of my favorite leadership sayings was: There they go. I must hasten after them, for I am their leader. I was talking about the great sailors, marines, airmen and soldiers that I had the privilege of serving in and, in some cases, commanding, at least in name.

I think that this idea of leadership is to create opportunities for individuals and organizations, and in some cases even nations, to

be as good as they can be. In China, in India, there is tremendously good work going on toward renewable energy. For example, you probably know that China is the world's largest producer of photovoltaic cells. Many of those cells are being used not only in China, but even more so outside of China.

So, I think the United States has an opportunity to lead in many ways. We can also lead in technical areas, or perhaps even in some of the procedural and policy areas. Our leadership will bring about a more secure world.

Senator CARPER. All right. My time has expired. It is great to see each of you, especially my leader. Thank you all for joining us today and for your good work.

Senator WARNER. I think the record should show that we recognize the leadership being given by the President of the United States now on this issue. It is key.

Senator CARDIN. Senator Klobuchar.

Senator KLOBUCHAR. Thank you very much, Mr. Chair. Thank you to all of our panelists.

Admiral McGinn, you cited a number of potentially severe consequences from global climate change, and you also said that in the military, you must base your decisions on trends and experience and judgment because waiting for 100 percent certainty, I suppose like if someone is going to attack you, it is too long a wait and a crisis can be imminent.

For at least 20 years, the level of probability for climate change has increased significantly. The science has increased significantly. At what point would you consider the science sound enough to base military planning around it? And where would you rank climate change among other global threats?

Mr. MCGINN. Senator, I would put us well past the point at which we need to take action. Every day that goes by, I think the threat grows, and we need to recognize that. We need to take prudent steps now. We certainly do not want to unravel our economy or way of life. We want to improve it.

But from a military planning perspective, Senator Warner, in his leadership of the Armed Services Committee and his key role there, put into the 2008 Defense Authorization Act the requirement for the Department of Defense to consider climate change. That work is ongoing. It has begun, and it is starting to pick up momentum, but much more needs to be done.

And I fully concur with Senator Warner's recommendation of involving the Armed Services Committee and their oversight role with the Department of Defense and agencies, to see exactly what is being done. How do they assess it, and given that level of threat assessment and risk, what are they going to do about it to prepare us?

Senator KLOBUCHAR. Very good.

Senator Warner, thank you for your early leadership on this and predicting that this would be a problem early on. Do you want to comment on that and what more needs to be done?

Senator WARNER. Senator, you are doing it. I felt, as you were out of the room a few minutes ago, that the opening statements here today reflect a lot of very objective and hard thinking that is

being done by the U.S. Senate. I hope you encourage other colleagues to do it.

The idea, as a matter of fact, I worked on the Clean Air Act when I was here. I remember how we went about that was strong leadership, again in the Senate. It was Senators Chafee and Moynihan and George Mitchell that led us through that. And everybody said, the sky is going to fall in with Clean Air. We cannot do it. We cannot do it. But America did do it, again, with strong leadership and the guidance that the Congress gave and the incentives that the Congress gave.

Cap-and-trade is a complicated system. But in contrast to just a tax which to me is not the way to go, some form of cap-and-trade because it provides an incentive for the industry to step up, and with their own initiative, find the technical ways, the financial ways, and so forth, to achieve their goals.

So, press on, I say to my colleagues. Press on. We will solve this as a country. We always have. It is an uphill climb. But I must say it is one of the most complex, if not the most complex issue, that I witnessed in my many years here.

Senator KLOBUCHAR. Well, thank you very much. I think one of our issues is trying to get information out. Having leaders like you talk about the national security angle of this is very important because I do not think people intuitively think about that, as I said in my opening statement.

I wanted to follow up a little with what Senator Carper was talking about. I thought about it, actually, this last week. I watched, on Saturday night, with my 14-year-old daughter some movie about the landing on the Moon, coinciding with the 40th anniversary, and how we were in that major space race and trying to explain it to her was kind of interesting.

Then you fast forward to today which, in a way, we are in an energy race, an energy race with the Chinese and other countries. And I know we focused on climate change and how we are going to have them work with us and what we can do jointly.

But one of the things that most concerns me is that the finish line for this race is not going to be Neal Armstrong landing on the Moon. It is going to be a new wind turbine manufacturing facility, whether it is built in Ohio or whether it is built in a province of China. Whether we are going to be developing the best new battery for new cars or whether it is going to be developed in another country.

So, I wondered if you could comment a little bit about the security risk of losing this manufacturing base and losing our edge when it comes to this technology and allowing it to be built in other countries like China, which as far as I know has pledged to invest \$462 billion in renewable energy by 2020. In each of the last 3 years, China has increased wind power by 100 percent. China's plans include a 10-fold scale-up of solar power in the next decade.

So, we are looking at a serious effort on their part, which of course has its merit. But what I am concerned about is that, if we do not do something to encourage more development of this technology, we are going to lose the edge in another way, and more jobs are going to go to China. Vice Admiral McGinn and maybe Captain Powers.

Mr. MCGINN. You are absolutely right, Senator. We have the opportunity now to enhance our jobs and economy by creating a new energy economy. Every day that goes by, just as it does with global warming, our ability to compete gets a little bit tougher as infrastructures get built in these other nations, these competing nations. So we can, in fact, seize it.

We just need to have the right set of incentives to develop a national portfolio of energy efficiency technology, as well as energy source technology, whether it is renewables, nuclear power or what have you. We need to try to level the playing field vis-à-vis fossil fuels somewhat. Until that playing field is level, it is going to be a tough uphill climb with an erratic policy environment, for example, on investment tax credit or production tax credit, or lacking a renewable energy standard, for us to really see the investments coming from the private sector that will create that energy economy in this country.

Having worked as an executive for a time in Ohio at Battelle Memorial Institute running the Energy Transportation Environment Division, I really have a good appreciation for what is being done in the laboratories and what is being done in the private sector. There is a lot of great technology that is just waiting for the investment to scale up. Those technologies will really start making a difference.

Senator KLOBUCHAR. OK. I am almost out of time.

Captain Powers.

Mr. POWERS. Madam, I come from Bethel, New York, so I know all about the jobs that have picked up and gone overseas. Like any national security issue, what we need is a multifaceted interagency approach. You know, we cannot just look at the Pentagon, we have to look at Commerce and Energy and the departments that will really be involved in this.

And I think that the American Clean Energy and Security Act is a great step forward in that, to make sure that we are building solar panels, we are building windmills, in the factories that I left at home, that are closed.

Senator KLOBUCHAR. Thank you very much.

Mr. RIVKIN. Can I just take 10 seconds and say this? The reverse problem is that if we operate in a carbon constrained environment and no other countries do, many industries will go overseas creating its own national security vulnerabilities.

Senator KLOBUCHAR. Thank you.

Senator CARDIN. Let me thank our panel. I think the science information is clear that carbon emissions, greenhouse gases, have a significant impact on global climate change and that we have the technology to do something about that, that we can reverse that. I think this hearing has been particularly helpful.

Senator Klobuchar is right. I think there is a sound way that we can do this in a manner that is going to create additional jobs for our economy, and we want to make sure that we do it that way so we not only improve our environment, we help our economy.

But I think what this panel has really contributed to the debate is that, if we do this right, it will also be good for our national security. Not just the direct security for energy that we need for our

economy, but also for the potential risks to America's international commitments.

I could not agree with the panel more. It is going to be up to the United States. The consequences of failure to deal with these issues will fall squarely on the national security costs to our country.

I think this panel has been extremely helpful in furthering this debate. I thank all four of you for your patience with our committee through our opening statements. Senator Warner pointed out, as a former colleague of ours, that our members have a passionate interest in the subject as reflected in their opening comments. I think we all want to get this right, and I think you all contributed greatly to the debate.

Thank you all very much.

[Whereupon, at 12:10 p.m., the committee was adjourned.]

