U.S. SECURITY IMPLICATIONS OF INTERNATIONAL ENERGY AND CLIMATE POLICIES AND ISSUES

Tuesday, July 22, 2014

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WITNESSES

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U.S. SENATE
SUBCOMMITTEE ON INTERNATIONAL DEVELOPMENT AND FOREIGN ASSISTANCE, ECONOMIC AFFAIRS, INTERNATIONAL ENVIRONMENTAL PROTECTION, AND PEACE CORPS
COMMITTEE ON FOREIGN RELATIONS
WASHINGTON, D.C.

The subcommittee met, pursuant to notice, at 3:11 p.m. in Room SD-419, Dirksen Senate Office Building, Hon. Edward J. Markey, chairman of the subcommittee, presiding.

COMMITTEE MEMBERS PRESENT: Senators Markey [presiding], Murphy, and Barrasso.

OPENING STATEMENT OF HON. EDWARD J. MARKEY, U.S. SENATOR FROM MASSACHUSETTS

SENATOR MARKEY: Welcome to this very important hearing and we thank all of you for being here. Right now dozens of wars and conflicts dot our world map, from the Sudanese desert to America's longest war in Afghanistan. The root causes of war are diverse and rarely simple, from religious divisions to democratic yearnings. But two major factors have emerged in the modern era that act to strain the strands of stability until they snap — climate change and energy security.

In two regions of our world, climate and energy have recently played major roles in exacerbating what were already tense times. In December 2010, a Tunisian street food vendor lit himself on fire in protest of government corruption and extreme poverty. That spark spread in Tunisia and ignited the Arab Spring.

Yet, feeding this anger over years of corruption and autocratic rule was a more immediate hunger. In 2010, terrible droughts in Russia, in natural gas, and floods in Pakistan decimated wheat harvests and created a global shortage. The price of wheat increased dramatically. The Middle East, home to the world's top nine oil importers, felt it acutely, especially since the region's farmers struggled with their own parched fields. Much of Syria was gripped with the worst drought it had ever experienced. The price of bread skyrocketed across the region and demands for regime change were not far behind.

About 600 miles north of the Syrian border, the ashes of Malaysia Airline Flight 17 blanket a wheat field in pro-Russia separatist-controlled eastern Ukraine. A surface-to-air missile apparently split the plane and snatched nearly 300 lives. But another weapon has already been deployed in the Russian-Ukraine conflict and in wars across the globe — energy. Russia has already shut off the natural gas spigots to Ukraine. That's more than half of Ukraine's gas supply gone. When winter arrives and natural gas demand spikes, this could become another political and humanitarian crisis, bringing suffering to Ukrainian families and challenges to the new government. Because of Europe's reliance on Russian gas, Putin's energy weapon gives him unparalleled leverage to continue his bullying tactics.

Energy profits can also inflict damage. ISIS, the rebel group destabilizing Iraq, was funded initially by Sunni oil sheiks. ISIS is no longer an upstart insurgency. They're a legitimate threat, consolidating their power around energy holdings as much as sectarian alliances. They have captured Iraqi oil fields. They control much of Syrian oil production, and now they are selling this oil on the black market. Revenues from these operations buy them credibility, weapons, and loyalty — valuable commodities for building a so-called "caliphate" in this volatile region.

Since the Industrial Revolution, our world has burned fossil fuels, increasing temperatures and destabilizing our climate. Since that time, we have become more

dependent on these same fuels that have destabilized countries and drawn America into international conflicts.

Tunisia is not the first time famine has played a role in a regional conflict. In a 2007 Congressional hearing of mine, one general told the story of Somalia, how drought had caused famine, famine had encouraged conflict, how U.S. military forces were sent to ensure food reached those people who needed it and was not used by warlords to gain further power, and how 18 U.S. soldiers lost their lives in what we now call Blackhawk Down. The general believed all went back to the drought that led to the famine.

Russia is not the first country to use energy as a weapon in geopolitics. Much has changed in the U.S. energy sector since OPEC's devastating embargo four decades ago. The shale revolution has boosted U.S. oil production to record levels. Yet much remains the same. Oil still commands a monopoly over our transportation sector. We remain dependent on foreign suppliers to meet nearly one-third of our needs, roughly the same share as 1975, when we banned the export of American oil.

Today we have two panels of experts to help us examine how the twin challenges of climate change and energy security are driving conflicts now and what new conflagrations could be on the horizon. We must do everything in our power today to mitigate the threats that will require military intervention tomorrow. If we fail in our responsibility, it is our men and our women in uniform that will get called upon to try to clean up the mess.

Now I turn to recognize the ranking member of the subcommittee, the Senator from Wyoming, Senator Barrasso.

SENATOR BARRASSO. Thank you very much, Mr. Chairman. Mr. Chairman, the United States is facing serious national security threats across the globe. Americans understand the real direct threats to our national security — aggressive regimes in

Syria, Russia, and North Korea, Iran's nuclear weapons program, expanding terrorist threats from al Qaeda, ISIS, and Hamas, and the unfolding emergency at our borders.

Despite the fact that the administration's foreign policies have led to a more unstable and more dangerous world, the White House last week said that the administration has, quote, "substantially improved the tranquility of the global community," end quote. In the face of a growing number of global disasters, Secretary of State Kerry believes that climate change is one of the greatest threats facing our Nation. Secretary Kerry has called climate change the world's most fearsome weapon of mass destruction.

While the rest of the world is looking to the United States to focus and lead on multiple threats to our security, to their security and to ours, as terrorists wage war, as a resurgent Russia invades its neighbors, as commercial airlines are shot down in cold blood, the administration is focused on climate change. Why? Because, according to the White House, the world is tranquil.

The world is far from safe, far from save to preserve our national security. To preserve our national security, we need to spend taxpayer dollars where they are needed the most. Unfortunately, the Obama Administration spent $7.5 million — billion in scarce U.S. taxpayer funds, funds that could have been used to fight terrorism and aggression in the Middle East or in Eastern Europe, to support international climate change programs between fiscal year 2010 and 2012. Folks in my home State of Wyoming would call this spending wasteful and irresponsible at best, especially as our friends and allies struggle with violent, deadly crises that have real implications for our security.

I believe taxpayer money would be better spent improving the security of U.S. embassies, protecting our service members who are serving this Nation in often dangerous locations across the globe, and fighting terrorism and bad actors that wish to do us harm.

The U.S. share of the world's carbon emission has been declining for nearly a decade before President Obama took office. Meanwhile, China's emissions grew by 173 percent from 1998 to 2011 and shows no end in sight.

The drastic steps President Obama wants to take and the damage it will do to our economy would have no impact on global temperatures. That is, unless the President can convince other countries that their economies should stop growing, too. Given the President's current foreign policy record, the chances of that happening are slim.

Countries are starting to realize these policies are hurting their economies and their competitiveness, while yielding few environmental benefits. European Union countries like Germany are abandoning restrictive energy policies in favor of reliable fossil fuels like coal. Just last week, Australia repealed their carbon tax and plans for an emissions trading scheme. Prime Minister Abbott called the carbon tax "a $9 billion hand brake on our economy." He also called it "a useless, destructive tax" which damaged jobs, which hurt families' cost of living, and didn't actually help the environment.

If President Obama cannot succeed in Paris, all he will have accomplished with his climate change policies will be to have pulled the hand brake on the American economy. He will have no environmental or security benefit to show for it.

This hearing is entitled the "U.S. Security Implications of International Energy and Climate Policies and Issues." I am here to tell you there are serious implications of this administration's energy and climate policies. They have an implication on our economy wellbeing and most especially on our national security. These policies, already adopted in Europe, have led to crime and to poverty. They have weakened our allies and they will weaken us.

What is needed is an "all of the above" energy strategy that creates American jobs, grows our economy, and strengthens our national security. Energy security, not

restrictions, will provide the peace and tranquility the global community wants and our Nation deserves.

Thank you, Mr. Chairman. I look forward to the testimony.

SENATOR MARKEY: I thank the gentleman, and we will turn to our panel. We will hear first from Dr. Daniel Chiu, Deputy Assistant Secretary of Defense for Strategy and Force Development, from the U.S. Department of Defense. We welcome you, doctor. Whenever you are ready, please begin.

STATEMENT OF DANIEL Y. CHIU, PH.D., DEPUTY ASSISTANT SECRETARY OF DEFENSE FOR STRATEGY AND FORCE DEVELOPMENT

DR. CHIU: Thank you, Chairman Markey and Ranking Member Barrasso. Thank you for this opportunity to testify before you today on how DOD is considering the implications of climate change on national security in our war to protect the Nation both in the near and the longer terms.

As you know, the Department of Defense's primary responsibility is to protect our national security interests around the world. To do this, we need to consider all aspects of the global security environment and plan appropriately for the range of potential challenges and prepare for the possibility of unexpected developments, both in the near and long terms.

It is in this context that the Department of Defense must consider a wide range of global trends, to include the effects of climate change, such as sea level rise, shifting climate zones, and more severe weather events, and how these effects could impact our national security. Some of these effects are already being seen today on military bases, installations, and other DOD infrastructure, such as increased flooding from sea level rise and storm surge. We are also seeing the potential for decreased capacity of DOD properties to support training, as well as implications for our supply chains, for the requirements in terms of equipments, vehicles, weapons systems, and other assets that the Department buys.

As a result, we have already found the need to adapt much of our infrastructure, including for example building more wind-resistant structures, protecting water supplies, and improving fire breaks at DOD installations. DOD is currently conducting a baseline study, to be completed later this year, to identify what infrastructure is vulnerable to extreme weather events and sea level rise, so that we can ensure that these challenges are addressed appropriately.

In the longer term, the impacts of climate change may have an effect on and alter the environments in which our military will be operating. For example, sea level rise may lead us to rethink where and when executing amphibious operations may be appropriate, while changing temperatures and changes in seasonal patterns could impact our assumptions about when and where military operations, certain types of military operations, can take place.

The effects of climate change may also compound instability in other countries and regions by affecting things like the availability of food, water, by instigating human migration and competition for natural resources. This could create significant instabilities and potentially provide an avenue for extremist ideologies and conditions that could foster terrorism or other challenges to U.S. national security.

Therefore, as a Department we are working to better understand how these impacts of climate change can affect our planning and operations in the U.S. and abroad. We are currently working to take into consideration the impacts of climate change in, for example, our longer term planning scenarios. We are thinking about how the effects of climate change may affect the frequency or severity of events that might lead to the need for humanitarian assistance and disaster relief activities over time. We are looking at our efforts to plan and enhance the capacity of partner militaries to respond to natural disasters, to enable them to effect these operations.

We are also working to address the implications for potentially higher demands for defense support to U.S. civil authorities due to extreme weather events in the United

States. The effects of climate change are particularly clear in the Arctic region, where diminishing sea ice will make the Arctic Oceans increasingly accessible. This is a decades-long dynamic, but we must monitor and account for it today. This is why Secretary Hagel released the Department of Defense's Arctic Strategy in November of 2013, which, in support of the National Arctic Strategy released earlier in 2013, seeks through U.S. leadership and collaboration to preserve an Arctic region that remains free of military conflict, in which nations act responsibly and cooperatively, and where economic and energy resources are developed in a safe and sustainable manner.

In order to do so, DOD will focus on ensuring security, support, and safety, promoting defense cooperation, and preparing for a wide range of challenges and contingencies that includes consideration of Arctic contingencies. We do this in the meantime by maintaining domain awareness to ensure that we are prepared for any changes in either Arctic conditions or activities in the Arctic.

The Department currently assesses that the Arctic is a relatively low military threat environment and that existing and planned DOD infrastructure and capabilities in the region are adequate to meet U.S. defense needs in the near and mid-term futures. We will of course continue to reevaluate capabilities and requirements as conditions and regional activities change and will be prepared to address any changes or gaps that could emerge.

Given the nature of climate change, in particular in the Arctic, the United States's response to these challenges requires a whole-of-government approach, as well as international collaboration, both of which are the bedrock of our efforts in these areas. By taking a proactive approach to assessment, analysis, and adaptation, DOD believes it can manage the risks posed by the impacts of climate change and minimize the effects to the Department's missions, while continuing to protect national security interests around the world through strong leadership.

Thank you again for this opportunity to speak and I look forward to answering your questions.

[The prepared statement of Dr. Chiu follows:]

[SUBCOMMITTEE INSERT]

SENATOR MARKEY: Thank you.

Our next witness is Mr. Amos Hochstein, Deputy Assistant Secretary of State for Energy Diplomacy at the Department of State. Welcome.

STATEMENT OF AMOS J. HOCHSTEIN, DEPUTY ASSISTANT SECRETARY OF STATE FOR ENERGY DIPLOMACY, U.S. DEPARTMENT OF STATE

MR. HOCHSTEIN: Thank you, Mr. Chairman, Senator Murphy, for inviting me here to talk. I will summarize my testimony and, with your permission, have it submitted for the record in the longer version.

Mr. Chairman, as you said, recent developments that have been splashed across the front pages of newspapers across the globe serve as the latest reminders of the interplay between energy security, foreign policy, and our own national security. The critical nature of the geopolitics of energy is easily on display when you look at the global oil supply disruptions today, which are at historic levels of over 3 million barrels per day. Due to reduced output in Libya, Sudan, and South Sudan caused by political instability, politically induced declines in Nigeria and Venezuela, and reductions in Iran's exports by over 50 percent due to effective U.S. sanctions, it is now more important than ever that the United States and the State Department's Bureau of Energy Resources work diligently to ensure that energy resources are used to drive economic growth, prosperity, stability, and cooperation, rather than conflict.

Today's hearing is timely. Competition for access to and control of energy sources and supply routes can indeed be a source of conflict and revenues from energy sales can fuel and provide funds that prolong conflict. Poor governance of natural resources can also contribute to conflict. As you mentioned, Mr. Chairman, in your

opening remarks about corruption, Senator Lugar, former chairman of this committee, said in sponsoring his legislation, quote, "The resource curse affects the United States as well as producing countries. It exacerbates global poverty, which can be a seedbed for terrorism. It empowers autocrats and dictators, and it can crimp world petroleum supplies by breeding instability."

It is important to look at the global context. We are in the middle of a global energy transformation. On the demand side, we are seeing a historic shift where already non-OECD economies are surpassing and overtaking the OECD in total demand today and into the foreseeable future. On the supply side, production and delivery of energy is also changing dramatically. Energy supply is no longer concentrated in a small number of OPEC countries. New producers are joining their ranks.

As you said, nowhere is this transformation more evident than here in the United States. The dramatic shift in the United States' energy balance has significantly impacted our national energy markets, as vast quantities of improved energy — sorry, imported energy — once destined for the United States have become available to other economies in Europe and in Asia.

Ukraine and Europe's dependence on Russian gas is a clear example of the risk of relying on any one dominant suppliers. The situation is urgent for Ukraine. While Ukrainian production is sufficient to cover summer demand, without Russian gas Ukraine will not be able to meet its consumption needs when the winter heating season resumes if those supplies from Russia are not continued. The short-term impact of this cutoff has been relatively small in Europe because it is not in the gas-intensive heating season and because last winter was mild, leaving stocks unseasonably high.

Our European energy security efforts intensified after Russia cut off gas supplies to Ukraine and European customers in 2009, advocating energy diversification across the European continent. We work hand in hand with the EU Commission as well as

with energy envoys in Eastern and Central European countries, meeting often with the, quote, "V-4 Plus" states. Second is diversity of import routes. Europe must build interconnected pipeline systems that allow gas to flow freely throughout the continent, unlike today. Finally, European countries must pursue diversification of sources, away from a dependence on any single supplier.

We are supporting Europe with actions as well as words. It is unlikely the Southern Corridor would have become a reality without State Department engagement. We strongly support the creation of the Greece-Bulgaria Interconnector, which will allow gas from the Southern Corridor from Azerbaijan to supply Southeast Europe, rather than just enter Central and Western Europe via Italy.

We support the EU's regulatory efforts in what is referred to as the Third Energy Package, which promotes market-based rules and fair competition, reducing Russia's ability to use its monopoly status as a weapon against its neighbors.

The value of energy diversification does not stop in Eastern Europe. Most of the Caribbean island states are significantly reliant on a single source for energy and European finance and similarly suffer from corruption and an inadequate investment climate. I recently joined Vice President Biden in Columbia and the Dominican Republic as he announced a new Caribbean Energy Security Initiative.

Existing offshore hydrocarbon discoveries in Israel and Cyprus, as well as potential offshore discoveries in Lebanon and Egypt, are transforming countries. I spend a lot of my time in the region helping to facilitate discussions between Israel, Cyprus, Lebanon, Jordan, and Egypt as these discoveries continue to play a role in redefining previous geopolitical relationships. Energy cooperation has significantly warmed relations between Israel and Cyprus, a point that was underscored by President Anastasiades when I was in Nicosia with Vice President Biden in May.

In Egypt, over the past two years I have made — in Egypt, similarly we expect to see deals potentially announced with Israel in the coming months. Over the past two

years, I have made 16 trips to Jordan to help facilitate solutions to Jordan's energy crisis, which was a result of terrorist bombings of the natural gas pipelines through Israel and Jordan. These efforts recently culminated in an historic deal for regionally competitive prices signed between Houston-based Noble Energy, operating offshore Israel, and the Jordanian industrial complex, saving Jordan billions and helping to stabilize its future economy.

Competing exclusive economic zone claims by Israel and Lebanon present a potential flashpoint for conflict as Lebanon continues to move forward with its first offshore exploration bid.

Closer to home, the State Department has brought negotiation to a successful completion and saw the U.S.-Mexico Transboundary Hydrocarbons Agreement enter into force with the support of the U.S. Senate.

Mr. Chairman, in conclusion, the energy diplomacy I have discussed today does not include all of our engagements around the world. The role of the State Department and the Energy Bureau in engaging these key energy security issues is now an integral part of our overall foreign policy and diplomacy. With wise stewardship of resources and by fostering private innovation and investment to expand energy access, we can ensure that the world's energy resources develop into a sustained driver of growth and stability, as opposed to conflict.

Thank you and I look forward to your questions.

[The prepared statement of Mr. Hochstein follows:]

[SUBCOMMITTEE INSERT]

SENATOR MARKEY: We thank you, Mr. Hochstein.

Finally, we are going to hear from Mr. Eric Postel, who is the Assistant Administrator for the Bureau of Economic Growth, Education and Environment for USAID. Welcome, Mr. Postel.

STATEMENT OF ERIC G. POSTEL, ASSISTANT ADMINISTRATOR FOR THE BUREAU OF ECONOMIC GROWTH, EDUCATION AND ENVIRONMENT, U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

MR. POSTEL: Thank you. On behalf of USAID, I would like to thank you, Chairman Markey, Ranking Member Barrasso, and Senator Murphy, for holding today's hearing and giving me the opportunity to testify. I request that my full statement be submitted for the record.

SENATOR MARKEY: Without objection.

MR. POSTEL: Today I will highlight how a lack of clean energy access and-or an inability to address climate change risk can have a destabilizing effect on a country's economy, security, and the wellbeing of its citizens. Stability and wellbeing overseas often directly helps ensure U.S. national security. Today about 1.6 billion people, most of them living in developing countries, lack access to a reliable source of electricity. As a result, President Obama launched the Power Africa Initiative to promote a private sector solution to this shortage.

Expanding reliable energy access requires getting regulatory structures right while protecting vulnerable populations. Distortionary policies like fossil fuel subsidies can reduce incentives for energy efficiency, hamper low or no-carbon energy production, raise dependence on energy imports, and create unsustainable fiscal liabilities. One striking example is a country that several have already mentioned today, which is the Ukraine, where the U.S. Government is now working with Ukrainians to bring electric rates to a level that covers costs, to protect the most vulnerable from the impact of gas and heating rate increases, to strengthen payment discipline, to improve energy efficiency in the heating sector, and to increase transparency.

For many countries, renewable energy such as solar or wind has begun to play an important role in meeting their energy needs. As the cost of renewable energy declines, many countries are scaling up renewables for a variety of reasons, including

cost, domestic energy security, and addressing climate change. As a result, USAID is working to expand the use of renewables in countries such as India, Philippines, South Africa, and Ethiopia. In Ethiopia, Power Africa, for example, is helping develop Corbetti, a 1,000-megawatt geothermal plant that will be the largest geothermal plant in East Africa and the country's first privately owned energy project.

Improving a country's resilience to adverse climate change impacts is essential to economic growth, stability, and security. It also protects our development assistance investments. Floods, droughts, cyclones, and extreme temperature constitute 75 percent of natural disasters globally and affect more than 200 million people annually.

Focusing on building resilience also saves money. Disaster planning efforts are cheaper than relief efforts and reconstruction. The World Bank estimates that every dollar used for disaster risk reduction has a seven dollar savings in disaster recovery costs. So, for example, USAID and NASA are helping Bangladesh adopt a new flood forecasting system to reduce the losses associated with the large-scale flooding that occurs in that country most years.

In many of the world's poorest countries, agriculture plays a substantial role in their economies, but adverse climate impacts can reduce agricultural productivity and output and in extreme cases cause widespread food insecurity.

USAID has begun working to make our agriculture investments more resilient to weather variability. In Ethiopia we are working to increase agricultural incomes and enhance resilience to climate change for up to 15 million people. In Senegal and the Dominican Republic, we are working with the local insurance companies to help them build the expertise to design and market affordable weather-based insurance that can reach small rural households whose livelihoods depend on that weather.

Improving and sustaining access to water in the face of more frequent and severe droughts is another element of our approach. Our programs in the Sahel work to increase access to water by repairing and improving water access points, building

appropriate irrigation infrastructure, and introducing practices to improve water conservation and filtration.

USAID is also working to reduce greenhouse gas emissions by addressing deforestation and land use change. For example, we are working with the Tropical Forest Alliance 2020, a public-private partnership of more than 400 companies, to reduce deforestation associated with key global commodities.

In conclusion, we see a clear set of linkages between our efforts to improve energy access and address the impacts of climate change with our national security. Thank you for the opportunity to testify this afternoon and I look forward to your questions.

[The prepared statement of Mr. Postel follows:]

[SUBCOMMITTEE INSERT]

SENATOR MARKEY: Thank you, Mr. Postel.

The chair will recognize himself. Let me ask you this, Dr. Chiu. Does the Defense Department take a wait and see attitude on climate change and the risks that it poses, or does it integrate climate change into its future planning in terms of our ability to be able to properly anticipate the challenges to our country?

DR. CHIU: I believe the answer is the latter. We are integrating it into our future planning. Let me give you an example of how we are thinking about that. We have a lot of experience doing humanitarian assistance and disaster relief operations. Commander PACCOM, for example, speaks a lot about the demands that he has for providing that kind of assistance to our allies and partners in the Asia Pacific region. Currently our ability to plan for these has been — or in the past our ability to plan for these has largely been an extrapolation of past efforts, and we have literally looked backwards, for example, at the last ten years and kind of projected the same incidents and severity going forward to plan for our activities.

We have increasingly found that that is not an appropriate methodology for looking at future challenges. We are now taking into account the variability provided to us by the data that NOAA, the Navy's Oceanographer's Office and other scientific sources provide us for then looking at the potential for increased incidents of extreme weather and what that will do for the demand signal. So that is one example of how we are beginning to integrate into our future planning.

SENATOR MARKEY: Thank you.

Mr. Postel, a lot of people say that energy is just another commodity and we should just treat it that way; it is no different than anything else; it is like a watch or a computer chip. But when I look at USAID I see a lot of focus on food, on agriculture, on energy. Can you talk a little bit about how important it is for a country to have their own energy capacity so that they are not dependent upon other countries?

MR. POSTEL: Thank you for your question, Senator, and thank you for your support of a number of USAID's activities.

The thing is about energy is that it is used across all sectors. So even if we are talking about a health clinic in Haiti where the lights go out because there is insufficient energy supply, putting the doctors in a real difficult situation in terms of patients who may be on the operating table, to agriculture, where you need energy in a variety of aspects of that, across all sectors of economies and human endeavor, you need energy. How do we study in classrooms if we do not have energy in a lot of aspects of that?

So we feel that the energy requirement is needed as it affects all aspects of development. Then you start to get into the issue of energy diversification and not necessarily relying on just one source, as one of the witnesses talked about, and lastly in terms of affordability, that when countries are able to diversify away from strictly imported sources of energy we see a lot of advantages of that economically for the country.

SENATOR MARKEY: Thank you.

Mr. Hochstein, do you agree with that? Do you agree that energy plays such a significant role that it has to be treated differently than any other commodity in the world?

MR. HOCHSTEIN: I think I would. Energy is — I think there are a lot of commodities — there are a number of commodities that probably would fit into categories where we would want to take particular care, but energy clearly has an impact across the broader economy, as Eric Postel just said. Without reliable, affordable access to electricity and energy resources, it is difficult to see economies grow and develop and lower businesses develop into mid-sized businesses and so on, without that kind of access to affordable and reliable energy.

SENATOR MARKEY: The bottom line is that we fight trade wars over automobiles or over computer chips. We fight real wars over food and energy. That is just the bottom line and what differentiates those commodities. We just have to keep that always in the front of our mind.

Mr. Hochstein, do you agree that there is a real problem that is taking place with ISIS in terms of the supply of oil to the global market potentially in Iraq and across that region?

MR. HOCHSTEIN: I think — let me limit my comments to what we can say in this forum, sir. Clearly, we are very troubled by everything about ISIS, including the fact that they have been able to secure energy resources and energy fields, refineries, on both sides of the Syria-Iraq border. I think it is very troubling.

SENATOR MARKEY: Well, there have been news reports that ISIS is raising about $1 million per day selling Iraqi and Syrian oil on the black market. Can you confirm those figures?

MR. HOCHSTEIN: I have seen those stories and probably in this hearing, in this session, I probably cannot go into greater detail. But I think there is no doubt that they are in control of some of the energy resources in Iraq.

SENATOR MARKEY: Iraqi oil production recently rose to 3 million barrels per day, a level higher actually than the pre-U.S. invasion levels, making it the eighth largest oil producer in the world. Most of the oil is exported. For the moment, ISIS has not pushed into southern Iraq, where the majority of the country's oil is produced. If they did, even if they threatened to, there could be a major impact in production from southern Iraq, some have estimated potentially a loss of upwards of 1.5 million barrels per day. That could raise prices dramatically all across the planet. Can you talk a little bit about that?

MR. HOCHSTEIN: Yes. As you said, Mr. Chairman, Iraq's oil production is largely in two places. One is in the south in the Basra region, which is the southern tip of Iraq on the Persian or the Arabian Gulf. Its production has risen consistently over the last few years, to some degree against the odds, and its exports stand today at about 2.6, 2.7 million barrels a day. So they are a tremendous contributor to global oil supplies and to stability in the oil markets.

Especially, the rise, the substantial rise in oil supplies out of Iraq came at the same time that we were restricting a lot of oil supplies out of Iran. So it very much supplied that kind of balance.

The other area where it is an emerging area for oil production is in the north, in the Kurdistan region, the KRG. Both of those areas are still under the control of the Iraqi government and the government of the KRG.

SENATOR MARKEY: Thank you.

Senator Barrasso.

SENATOR BARRASSO. Thank you, Mr. Chairman.

Secretary Chiu, today's hearing focuses on U.S. security implications of energy and climate policy. And I agree, there are serious implications for our national security, and you see them by the climate policies being implemented in places like Europe. Global international crime syndicates are manipulating these policies for profit. These

groups use funds from manipulating these green policies to aid and support terrorist organizations and drug cartels that wish to do us and our allies harm.

Europol, the European Union's law enforcement agency that handles criminal intelligence, issued a threat assessment in June of 2013. Now, I have asked that this threat assessment be entered into the record, Mr. Chairman.

SENATOR MARKEY: Without objection.

[The information referred to follows:]

[SUBCOMMITTEE INSERT]

SENATOR BARRASSO. The threat assessment states that, quote, "There are increasing reports of Italian organized crime groups engaging in a so-called alternative or green energy market." The threat assessment highlights a mafia in Italy which it calls one of the most threatening organized crime groups at the global level. They state in the report — they cite a study that says the crime group earns 44 billion euros a year in income from its illicit activities. The group has forged close alliances with Mexican and Colombian drug cartels, has gained a foothold in the U.S. and Canada, recently been implicated in money laundering, a well-known terrorist organization. The Europol threat assessment clearly states this group is, quote, "involved in environmental crime."

I have similar assessments from Canada, from the Canadian government, on money-laundering and terrorist activity financing watch; also from Interpol; and I would like those also entered into the record, Mr. Chairman.

SENATOR MARKEY: Without objection.

[The information referred to follows:]

[SUBCOMMITTEE INSERT]

SENATOR BARRASSO. So I ask you, Mr. Secretary: Are there serious unintended consequences to our national security if we go down this path, as Europe has done, in

adopting such policies that can be so easily exploited to fund non-state criminal or terrorist elements, folks that wish to do us harm?

DR. CHIU: Senator, my interpretation of the facts that you've presented is that transnational crime, as we have seen in many different sectors, is attracted to where the money is, and we see that across many different types of sectors. Transnational crime as an element of concern for our national security, you are absolutely correct, is something that we have to pay attention to. But I believe it is the economic incentives for this, rather than climate change or the effects of climate change, which the Department is focused on, that are the causes of this.

SENATOR BARRASSO. So the solution offered of a similar scheme like that can run itself into significant problems from the standpoint of organized crime, with the solution that those countries have come up with.

Next, in October of 2003 Peter Schwartz and Doug Randall released a report, "An Abrupt Climate Change Scenario and Its Implications for the United States National Security." This is a number of years ago, which was commissioned by Andrew Marshall, Director of the United States Department of Defense Office of Net Assessment. I ask, Mr. Chairman, this be put in the record as well.

SENATOR MARKEY: Without objection.

[The information referred to follows:]

[SUBCOMMITTEE INSERT]

SENATOR BARRASSO. It states that "Even the most sophisticated models cannot predict the details of how the climate change will unfold, which regions will be impacted in which ways, and how governments and societies might respond."

So I say, why should we then spend billions of taxpayer dollars, defense dollars specifically, on climate change predictions about future conflicts due to drought and famine that the Department's own studies say cannot — that we cannot predict? Is this

not just wasteful spending based on faulty predictions, given all of our other defense needs to fight terrorism abroad?

DR. CHIU: In totality, that particular report, which was done to look at a very long-term time frame, decades-out time frame, says it is difficult to predict, but we must consider the range of possibilities, which is exactly what we do in the Department of Defense. I am not aware of any billions of dollars of U.S. Department of Defense money that are being spent on predictions. In fact, what I am talking about here is mostly taking into consideration, like many other trends that we take into consideration, to ensure that we are prepared should these events occur.

In some of these cases, we are recommending, frankly, monitoring to additionally consider those trends. In some of these cases, there will be specific activities, particularly in the near term the installation pieces that I have already mentioned that we do have to manage and adapt to today.

SENATOR BARRASSO. But it is interesting, because the DOD-commissioned report, as you say, it is very difficult to make these clear predictions, and what do you protect and prevent against. It says in 2007 a particular severe storm could cause the ocean to break through levies in The Netherlands, making a few key coastal cities such as The Hague unlivable. The report also predicts that between 2010-2020 Europe, quote, "struggles to stem emigration out of Scandinavian and Northern European nations in search of warmth."

So it would be interesting — there is a prediction that by 2018 Russia will join the European Union. So if we had spent our defense dollars based on these types of predictions — and you talked about using defense dollars to protect ourselves as we look at all of these potential predictions — we would have wasted billions of scarce defense dollars.

My point is, are we not just betting our scarce national security dollars on a risky bet by making predictions about weather, climate, years into the future a major national security priority?

DR. CHIU: As I have said, Senator, we have not done that. We have not either made those predictions or invested in those scenarios. Moreover, sir, as you said yourself, the report points out that one cannot predict those events. I believe they represented they were trying to represent kind of the range of possible severe events, which is what they did, but that is all that they did. It painted a range of possibilities that we needed to take into consideration. I think we have effectively, and I think you have seen our investments with regard to those.

SENATOR BARRASSO. In March of this year, Jeff Kueter, President of the George Marshall Institute, released a study called "The Climate of Insecurity." Mr. Chairman, I ask that this be entered into the record.

SENATOR MARKEY: Without objection.

[The information referred to follows:]

[SUBCOMMITTEE INSERT]

SENATOR BARRASSO. Thank you, Mr. Chairman.

The report says: "Efforts to link climate change to the deterioration of U.S. national security rely on improbable scenarios, imprecise and speculative methods, and scant empirical support." The report goes on to say — and this is just March of this year. It says: "Accepting the connection can lead to the dangerous expansion of U.S. security concerns, inappropriately applied resources, and diversion of attention from more effective responses to known environmental problems."

It also provides information to show that factors other than the environment were much more significant in explaining the onset of conflict. A recent survey cited in

the report found that primary causes of inter-state conflict and civil war are political, not environmental.

So do you disagree that the primary cause of conflict and war is political, not environmental?

DR. CHIU: No, sir, I do not disagree with that. But I do believe that a lot of the politics can be driven by the effects of climate change, including, as we have mentioned today, things like water shortages, food shortages, extreme weather, mass migration as a result of these.

I would point out, I am not familiar with that very specific report, but the work that I am describing here is not so much thinking of climate change as in and of itself deteriorating U.S. national security, but really that the effects of climate change need to be taken into consideration as we seek to protect U.S. national security interests, along with the many other trends and drivers of these types of phenomena that you have suggested.

SENATOR BARRASSO. Because it is interesting, when you take a look at what the Secretary of State has talked about as kind of the greatest, the most — "the world's most fearsome weapon of mass destruction" is what Secretary of State Kerry has called climate change. But you are agreeing that the primary cause of conflict and war is political, not environmental.

Thank you, Mr. Chairman.

SENATOR MARKEY: The Senator from Connecticut.

SENATOR MURPHY. Thank you very much, Mr. Chairman.

Thank you to the witnesses for being here today. Just a quick comment on the beginning of the line of questioning from Senator Barrasso. I think we all appreciate the caution about the ability of criminals to infiltrate renewable energy markets. As a representative of a State that has lost hundreds of millions of dollars in bad investments with Enron, one particular conventional energy company, we know that fraud is not

limited to the renewable energy markets and in fact criminals have found their way into virtually every industry in which you could make some money and across the globe. That is an invitation to go after the criminals and the syndicates rather than to divest our interest and money from those particular industries.

Let me start with you, Mr. Hochstein, and talk a little bit about Ukraine and Russia again. We have had a heck of a time getting an energy efficiency bill, a fairly modest piece of legislation, through the United States Senate. It strikes me as an imperative for this country to get serious about using less energy, which is a win-win. We make ourselves less dependent on foreign sources and we save the government and private industry some money along the way.

But this is a big part of the story about why Ukraine has gotten in as much trouble as they have gotten into. Their dependency on Russia is due to the fact that they do not have domestic resources or alternative sources, but also because they waste an enormous amount of energy. If you sort of talk about what really is compromising Ukrainian national sovereignty today, you would put energy efficiency at the top of the list — These old Soviet distribution systems by which one giant boiler, set of boilers, is responsible for heating and transmitting heat to an entire neighborhood, in which the majority of that heat is lost along the way.

When you talk about national security for Ukraine right now, well, they want to look for shale oil and they want to be able to bring in new energy resources. When you talk to the Ukrainian leadership themselves, at the top of their list is energy efficiency, is that not right?

MR. HOCHSTEIN: Yes, sir. I think, Senator, you articulated it quite right. I think that — there is a number of issues that we need to work with Ukraine and that we would like to help them with. But you are correct that before you can get to the point of looking at some of the financial issues there is two base points that have to be addressed. The first is protecting this industry and this sector from corruption, as has

been the case for the last several decades, which has contributed to where they are today.

The inefficiency of the system, as you have just described, is right on the mark. The easiest dollar to save is the one that you do not spend. If you can get the systems to be far more efficient and to address the subsidies that, in a gradual way, that encourage inefficiency in the system, and if we can address all these fundamental issues in the sector, plus have the advantage of increasing production from unconventional sources, conventional sources, and looking at some of the other work, that would go a long way to solving their dependence on the single source on Russia.

To that end, we are working. Already we have identified areas that we will be giving some technical expertise. We are working as a whole-of-government approach on this. We work closely with our colleagues from USAID in some of the efforts on efficiency, on introduction of other sources of energy, like renewables, into the system. I am looking, working with the Department of Energy on the areas of technical advice to increase the amount of conventional gas that they can produce in the short term, short to medium term, and in the longer term looking at what we can do on the unconventional side.

SENATOR MURPHY. As we look to the ways in which countries would comply with a new global agreement on carbon emissions, efficiency is the quickest and easiest way to get there. So if we are looking at ways to try to provide some incentives for countries that are far behind the curve in terms of energy efficiency, which compromises their security, as is the case with Ukraine, a global carbon reduction agreement is going to be one of the fastest ways to try to prompt countries to get serious about energy efficiency.

MR. HOCHSTEIN: I would presume that is correct. I would note that we have a special envoy on climate change and he works on a lot of those areas and I do not. But the baseline where we work together and we all come together is on the areas of

efficiency. It clearly is something that we need to encourage more of because it will get us towards those goals that you described just now.

SENATOR MURPHY. I pose this question to Mr. Postel, but either of the other panel members can comment on this. Let us try to look ahead to what some of the next global scarcity crises are. You talked a little bit in your presentation about water scarcity. I think about India and Bangladesh, where you do a lot of work at the top of the list. These are countries, India in particular, which rely on the Tibetan Plateau in order to receive the majority of the natural water resources that they use. Reports are that in the northern portion of India the glaciers have retreated over the last three to five decades by 25 to 35 percent, that they may be gone by 2050.

This is a crisis waiting to happen, a country with simmering instability to begin with, a bursting population. I'm talking about India is on the verge of potentially losing the major source of natural water, the Tibetan Plateau glaciers.

I know you are doing a lot of work on this issue, USAID is, something I am sure the Department of State worries about. Talk about the potential for water instability in a country like India should we not reverse the damage done to the biggest source of their water?

MR. POSTEL: Thank you for your question, Senator, and thank you for your support of USAID's development work. As you just described, in that situation and some other situations if you have these big changes that affect water, which could occur for any number of reasons, but if you lose those glaciers, you could have a whole series of things initially. As all that snow starts and ice starts converting into water, you could actually have an abundance of water, and there are issues that have happened. Then afterwards, of course, once it is gone it is gone, and then we have to look at things like water conservation and what are the other possibilities, because you could have many, many people without water.

So I do not want to speculate about — I am not familiar with specific modeling, but we see this in several different places around the world where there are these possibilities and we are trying to think through how can we respond in those circumstances, how can we be more efficient with water and so forth.

SENATOR MURPHY. One of the ways, as you know because again USAID has done an enormous amount of work on this — and if you allow me, Mr. Chairman, I will just make this one final comment — is around the issue of clean cook stoves. There are three billion people worldwide who do their cooking on rudimentary stoves using wood or some other form of biomass. That is a particular issue in India and much of that black carbon, which is a super pollutant, is essentially landing in the region that is heating up those glaciers.

Senator Collins and I have a piece of legislation that we have just introduced which would help to supplement the work that USAID and State and others have done on this initiative. But I applaud all of your work. This is a crisis happening and waiting to happen at an even greater level and this is a quick way to try to address it.

Thank you, Mr. Chairman.

SENATOR MARKEY: Thank you. I thank the Senators. I thank the panel. This is actually a panel we could not have had five years ago. The State Department did not have an Energy Bureau and the Department of Defense and USAID did not nearly as fully integrate climate into any of their strategizing five years ago. But the world has changed and we are just trying to be realistic about what is happening out there.

Again, I think that Blackhawk Down in Somalia, with 11 and 12 three and four-star admirals and generals saying that was the cause, is enough for us to pay close attention to the threats that could emerge in the future. I congratulate President Obama for his focus on this, and we thank this panel for their great work.

I tell you what. I will ask each of you to give us the 30 seconds you want us to remember from your testimony, and that would be I think very helpful to us. So, Mr. Hochstein.

MR. HOCHSTEIN: I think, just as you said, that the integral interplay of geopolitics and energy security are going to continue to be interwoven and will have effects one on the other. We need to have a clearer and better and deeper understanding of the role that energy is playing in decision-making around the world and how that affects our own national security and global national security.

SENATOR MARKEY: Mr. Postel.

MR. POSTEL: For USAID, climate variability has the potential to affect our entire portfolio of work on development, affecting billions of people. So we are working hard to try to factor this in and make sure that we are good stewards of taxpayer money with all our investments across the board.

SENATOR MARKEY: Dr. Chiu.

DR. CHIU: For DOD, the emphasis I would highlight is on planning for the effects of climate change, not to make predictions, but to be prepared so that we are not caught off guard.

SENATOR MARKEY: Thank you. Thank you all for your service to our country, and we will take a minute here and just change the name plates and ask for the second panel to move up to the table.

[Pause.]

SENATOR MARKEY: We welcome the second panel and we have just as distinguished a group on the second panel as was on the first, and the subject deserves it. We are going to begin by recognizing Rear Admiral David Titley, Retired, who is a Board Member of CNA Military Advisory Board. We welcome you, Admiral. Whenever you are ready, please begin.

STATEMENT OF REAR ADMIRAL DAVID W. TITLEY, USN [RETIRED], BOARD MEMBER, CNA MILITARY ADVISORY BOARD, AND DIRECTOR, CENTER FOR SOLUTIONS TO WEATHER AND CLIMATE RISK, THE PENNSYLVANIA STATE UNIVERSITY

ADMIRAL TITLEY: Thank you very much, Mr. Chairman. Chairman Markey, Ranking Member Barrasso, and distinguished members of the committee: Thanks for the opportunity to discuss the implications of climate change on geopolitical security. It is a privilege to come before you today and discuss this very important topic.

Before I begin with my oral statement, I would request, sir, that we can submit the MAB report for the record.

SENATOR MARKEY: Without objection.

[The information referred to follows:]

[SUBCOMMITTEE INSERT]

ADMIRAL TITLEY: I am David Titley. I currently serve as a member of CNA's Military Advisory Board, or MAB for short. In this capacity I am here today not only representing my views on security implications of climate change, but on the collective wisdom of 16 admirals and generals who also serve on CNA's MAB. I am also the Director for the Center for Solutions to Weather and Climate Risk at the Pennsylvania State University.

I had the honor of serving in the United States Navy for 32 years, where my capstone assignment was Oceanographer and Navigator of the Navy, and under Admiral Gary Roughead's direction I assumed leadership of the U.S. Navy's Task Force on Climate Change.

Sir, our collective bottom line judgment is that climate change is an accelerating risk to our Nation's future. Although we have seen some movement in climate mitigation and adaptation, the MAB felt compelled to issue our latest report because of the lack of sufficient comprehensive action by both the United States and the international community. Strengthening resilience to climate impacts is critical, but to ultimately reduce the long-term risk we must take action to stabilize the climate.

Climate does not change in a vacuum. It impacts and in turn is affected by our food, energy, and most of all water demands. The world has added over half a billion people since our first climate report in 2007 and increasingly people are moving to coastal urban areas, where the impacts of a changing climate and sea level rise will be the greatest. We will deal with all of this in a very fiscally constrained environment. Failure to think about how climate change might impact our globally interconnected systems and all elements of U.S. power and security is, frankly, a failure of imagination.

If there is a canary in the climate coal mine, if I can mix my metaphors, it is the Arctic. Arguably, there has been no region on Earth where the climate has changed faster in recent decades than the Arctic. Those changes are making the region more accessible to a wide variety of human activities, including shipping, resource extraction, fishing, and tourism.

While the MAB is encouraged to see U.S. policymakers planning for the Arctic and for climate change in general — the 2014 Department of Defense Quadrennial Defense Review, U.S. Navy's recently updated Arctic Road Map, and the Senate's Fiscal Year 2015 Defense Appropriations Act report are all good examples of that — the MAB does believe that the United States and the international community could accelerate continued development of Arctic capacity and capability to match the speed of observed changes in that critical region.

Climate change will affect our military in very real ways, by creating new mission sets, just as I discussed with the Arctic, by placing our bases under stress from sea level rise, droughts, floods, wildfires, and heat stress, and by stretching overall capacity by adding additional domestic disaster relief missions to our guard forces at a time when we are downsizing our ground forces.

Mr. Chairman, we know you understand these changes and their risks. As you already mentioned in your opening statement, seven years ago when you were a member of the House General Sullivan, then Chair of the MAB, testified before your

committee about the impact of climate and drought in Somalia and the cascading effect of poor governance, famine, forced migration, and the consequences that we only, frankly, understood in hindsight.

I wish I could tell you today that such weather and climate-related impacts were an aberration. Unfortunately, my professional assessment, along with that of my MAB colleagues, is that these increasingly serious impacts to our security will only continue to increase in both frequency and consequence barring meaningful action to both adapt to the changes in climate and ultimately to stabilize a system on which mankind has literally built civilization.

Admiral Skip Bowman, fellow MAB member and former Director of Naval Reactors, shared with us his key tenets. They are: face the facts; respect even small amounts of risk, especially when that risk has large consequence; seek total responsibility; and require continually rising performance. I believe Admiral Bowman's tenets are an excellent framework to think through not only the planning, but the required actions needed to adapt to and stabilize the climate.

In closing, Senator, the potential security ramifications of global climate change should serve as catalysts for cooperation and change. Instead, climate change impacts are already accelerating instability in vulnerable areas of the world and are serving as catalysts for conflict. We believe, though, that continued leadership and tangible pragmatic actions of the United States are critical to minimizing the worst outcomes and maximizing our opportunities for a better world.

I will be happy to take your questions, sir.

[The prepared statement of Admiral Titley follows:]

[SUBCOMMITTEE INSERT]

SENATOR MARKEY: Thank you, Admiral, very much.

Our next witness, Mr. David Goldwyn, is a Nonresident Senior Fellow at the Energy Security Initiative at the Brookings Institution. Welcome, sir.

STATEMENT OF DAVID L. GOLDWYN, NONRESIDENT SENIOR FELLOW, ENERGY SECURITY INITIATIVE AT THE BROOKINGS INSTITUTION

MR. GOLDWYN: Thank you, Mr. Chairman, Mr. Ranking Member. I will summarize my statement. I would be grateful if the full statement was entered into the record.

It is really an honor for me to talk to you today about the foreign policy challenges facing the U.S. and how we can respond to protect both energy security and climate change. We really face even historically an unprecedented amount of uncertainty in energy markets. We are looking at supply disruptions in Iraq, possibly Russia, Nigeria, Sudan, and Venezuela. We have policy risks. Things could go either way with negotiations with Iran and with Russia, which could lead to significant displacement of supply or increased supply. And as many of my fellow panelists have talked about, the growing risk of conflict driven by climate change.

We have a lot of tools at our disposal to address these risks. One of them is helping ourselves through our own production. As Amos Hochstein said, our ability to grow our production has helped mitigate that nearly three million barrels a day in displaced oil that conflict has presented the global economy. The fact that we have increased gas production has allowed LNG supplies to flow to other countries, which has decreased the cost for them and decreased Russia's revenues.

The question is whether we are doing all that we can, with all the tools that we have, to mitigate the risks that we are facing today. The four key tools that we have are: first, energy diplomacy, and that really means policy reform, talking to other countries about how to get prices right so energy efficiency and other technologies can be deployed.

The second is technical assistance, helping countries grow their own supplies, whether it is oil, gas, or renewables, or how to introduce tariffs that will allow renewable energy into their electricity systems.

The third is the promotion of deep and liquid energy markets. Part of that is the fourth tool, which is exports, which is how do we connect our providence to the global economy in a way that can reduce prices and increase availability overall. I think that we can deploy all these tools in a way that both reduces greenhouse gas emissions and increases energy security by giving other countries access to lower carbon resources, whether those are natural gas or renewables or some combination of the two, or coal with carbon sequestration.

So to give an example, in Ukraine the number one job we have, as Senator Murphy said earlier, is getting prices right. No one wants to buy energy efficiency equipment unless you are saving money. You cannot save money if the price is below the cost of the electricity itself. So getting prices right is job one. Growing their own supply is probably job two. Diversifying their supply and having more energy storage is job three. So there is a lot that we can do with Ukraine to help them get access to more diverse supplies.

Europe overall, we need the entire suite. Europe needs an integrated gas market so you can move LNG from Spain all the way to Ukraine. They do not have that right now. They need to reduce monopolies and enforce antitrust laws so that Gazprom does not own all the infrastructure inside of Europe. They need to provide more LNG access so they can access more gas. They need better interconnections, they need indigenous gas, they need to rethink nuclear European as well.

Even in the Caribbean and Central America — I made reference in my testimony to a report I put out with the Atlantic Council last week which talks about the ways that the Caribbean and Central America can get off of fuel oil and diesel, reduce their

electricity costs, reduce their carbon footprint, by accessing natural gas, because they will get to renewables, but they have serious policy obstacles.

So we could make the cheapest natural gas available, which comes from the U.S. Gulf Coast, enable them to cut their costs in half, be more competitive, and address our own security challenges as well.

So in nearly every case we can add to our own security by signaling that we will be helpful with supply as well. We can do policy reform, we can do technical assistance, but the reality is is that we have natural gas in abundance and we have certain grades of crude oil in abundance as well, light oil that we need less and condensates that we need less than we need heavy oil. And simply by signaling that we will make those supplies available to the global market, we can help impact price formation, and by impacting price formation we can make the cost of that lower carbon energy more accessible, whether that is cheaper European for Ukraine, whether that is cheaper natural gas for the Caribbean, or whether that is even easier gas access for parts of Africa that are now using diesel or fuel oil or even biomass.

So I think there are things that we can do. I do not profess that it is a simple question, but I think there are a lot of studies going on. Right now there have been many on LNG, some going on crude oil which show that we can do this without impacting domestic prices and we can manage the climate impacts as well.

So all I would say now is that we should take energy security and climate security with equal seriousness, that we need to look at the options about how we can advance both of these agendas. I think there are options that involve diplomacy, that involve technical assistance, and that involve more competitive markets, and I would just urge the committee to give all of them a fair hearing.

Thank you.

[The prepared statement of Mr. Goldwyn follows:]

[SUBCOMMITTEE INSERT]

SENATOR MARKEY: Thank you, Mr. Goldwyn.

Next we are going to hear from Mr. Michael Breen, who is the Executive Director of the Truman National Security Project. Welcome, sir.

STATEMENT OF MICHAEL BREEN, EXECUTIVE DIRECTOR, TRUMAN NATIONAL SECURITY PROJECT

MR. BREEN: Thank you, Mr. Chairman, Chairman Markey, Ranking Member Barrasso. Thank you for the opportunity to testify today.

Although we find ourselves in a considerably better position with regard to energy than that of several years ago, the lack of diversified energy sources around the world continues to create vulnerabilities for the United States and our allies and opportunities for many of our rivals and adversaries.

Unfolding events in Iraq exemplify the ways in which energy and security are intertwined. Iraq is where I personally first came to understand energy security as a young Army officer fighting to defend fuel convoys against insurgent attack. A decade later, those same desert roads are once again a combat zone, with fuel supplies once again at the center of the fight. As is the case in other conflicts, non-state actors in Iraq seek to capture and exploit energy resources as a source of funding.

One of ISIL's primary objectives during its recent offensive was the refinery at Baiji, which is the largest in Iraq. Reporting indicates that ISIL is raising as much as a million dollars a day from selling crude oil from fields it controls which is smuggled through Turkey and Iran. Revenues are then directed to purchase weapons, pay insurgent fighters, and help buy the loyalties of local tribal leaders and government officials.

Meanwhile, continued conflict in Iraq has a destabilizing effect on the global market. Dramatic increases in Iraq's oil production are an essential element in most

projections of global supply growth. In IEA's World Energy Outlook, for example, the most likely scenario projects that Iraq will double its oil production by 2035. But that projected progress is currently at risk.

In the short term, some estimate that the loss of just a third of Iraqi oil production would cause a $37 a barrel rise in the price of oil. Longer term, though, investments in the Middle East may fall short of projections if regional conflict persists, which could lead to a potential supply shortfall into the 2020s.

Conflict in Ukraine also illustrates the increasingly dangerous use of energy as a geopolitical weapon, in this case with respect to natural gas. Russia has repeatedly used Ukraine's energy dependence and lack of diversification as leverage, cutting off natural gas exports. Meanwhile, about 16 percent of Europe's total natural gas consumption comes from Russia through Ukraine. Russia's manipulations of Ukraine's energy markets have created concerns about natural gas shortages in the European Union. Up to this point, EU sanctions against Russia and other responses to aggression in Crimea have fallen well short of U.S. action.

Despite dramatic advances in extractive technology, the geopolitical dynamics of energy are unlikely to move in America's favor beyond the short term, especially with regard to oil. Fundamentally, this is because demand in the developing world is projected to increase dramatically, offsetting increases in U.S. production. Oil demand is projected to grow to about 109 million barrels a day by 2035, with China becoming the world's largest consumer by about 2030.

Meanwhile, IEA projects that U.S. tight oil production will plateau in the 2020s before dropping to 9.2 million barrels a day by 2035, leaving us in roughly the same geopolitical position we were in before the shale revolution.

In addition, climate change makes our current energy system unsustainable, creating cascading risks and impacts around the globe.

Given these dynamics, a singular focus on fossil fuels production and export simply plays into the strengths of our competitors, while leaving the U.S. and our allies with continued long-term vulnerabilities. Ukraine again provides an excellent example. Many advocate U.S. LNG exports as a path to reducing Russian leverage. Such a policy has limited but clear benefits. However, LNG exports probably will not begin in substantial volume until 2017 at the earliest and reaching Ukraine will be difficult.

Meanwhile, Ukraine is so reliant on Russian natural gas in large part because it is the second least efficient nation in Europe. If Ukraine were simply as energy efficiency as the average Russian country, it would reduce its natural gas consumption by more than 50 percent. That is why, as proposed by Chairman Markey earlier this year, the U.S. Government should leverage its full resources in assisting Ukraine to improve its energy efficiency, increase its domestic production, and reform its energy markets.

This approach applies more broadly as well. The U.S. should place greater emphasis on encouraging efficiency along with the development of renewable sources and more resilient distributed energy systems. The Department of Defense has been a clear leader in this respect, prioritizing critical investments in more diverse, resilient and reliable energy sources in order to maximize freedom of action and minimize risk. The rest of government, along with the Nation as a whole, would do well to follow a similar approach.

Thank you.

[The prepared statement of Mr. Breen follows:]

[SUBCOMMITTEE INSERT]

SENATOR MARKEY: Thank you, Mr. Breen.

Our final witness, Ms. Mary Hutzler, is Distinguished Senior Fellow for the Institute of Energy Research. We welcome you.

STATEMENT OF MARY HUTZLER, DISTINGUISHED SENIOR FELLOW, INSTITUTE FOR ENERGY RESEARCH

MS. HUTZLER: Chairman Markey, Dr. Barrasso, and members of the committee: Thank you for the invitation to testify today concerning the prospect of greater energy security and particularly how the contours of various climate policies are shaping our own domestic energy future and that of our allies.

I want to begin by congratulating you, Chairman Markey, for your successful bid to fill the seat vacated by Secretary of State John Kerry. I have had many opportunities through the years to testify before you during your nearly four decades of service in the House of Representatives and I welcome the opportunity to continue that dialogue.

For more than seven years I have served IER and before that I held several management positions at the Energy Information Administration, including as Acting Administrator. In all that time, neither energy analysts at EIA nor policymakers in the U.S. Congress were able to predict the transformation of America's domestic energy frontier that occurred over the last few years. For decades, U.S. energy policy had been guided by the ever-elusive quest for diminishing energy resources. Our allies around the world also felt the squeeze of perceived energy scarcity. Meanwhile, climate alarm intensified a political push for renewable energy.

Data now exists to examine the effects of these policies, both on the climate and on the economies of the nations who adopted aggressive agendas for decarbonization. Over the course of the last decade, countries across the European Union have pursued the specter of a green energy future with unparalleled enthusiasm. Through various tax measures, taxpayer-funded subsidies, mandates, surcharges, and feed-in tariffs, our allies across the Atlantic have provided us an instructive lesson.

Today industrial electricity prices in the EU are two to five times higher than in the United States. According to the European Commission, electricity prices in Europe have risen 37 percent more than those in the United States when indexed against 2005

prices. By 2020, as many as 1.4 million additional European households are expected to be in what some analysts refer to as "energy poverty."

The EU system of cap and trade, a variation of which narrowly passed the U.S. House of Representatives in June 2009 but never became law, has proven fertile terrain for fraudsters, tax cheats, market manipulators, and various cyber criminals who exploit the inherent weaknesses of carbon trading schemes. According to the market analysts at Bloomberg, as much as 7 percent of the total carbon market is based on fraudulent trading in a given year.

Additionally, some of our European allies are now facing the steep decline of their economies and a dramatic rise in their unemployment rolls as they struggle under a heavy green energy burden. In Spain, for each megawatt of wind energy installed more than four jobs were lost. For each megawatt of solar, nearly 13 jobs were lost. And in the past seven years, Spain's unemployment rate has jumped from 9 percent to more than 25 percent. Fortunately, Spain's policymakers are trying to stop the hemorrhage that their quest for green energy has exasperated.

Wind and solar cannot sustain a growing, vibrant economy. These technologies do not create long-term jobs and they cannot supply reliable electricity when consumers need it most. In Germany, where utilities have been ordered to generate 50 percent of their electricity from renewable sources by 2030, the EU's largest economy is now risking what their own energy minister called "de-industrialization." Germany's green energy agenda, phase-out of its nuclear units, and restrictions on development of its domestic resources have resulted in high electricity prices, dependence on Russia for natural gas supplies, and increased greenhouse gas emissions.

In the U.K., nearly one-fifth of the nation's population is now in energy poverty, up from 6 percent just a decade ago. In Australia, where a short-lived carbon tax threatened to set the world's twelfth largest economy back decades, the government has

repealed it to mitigate the harm caused by a tax that neither helped the environment nor the economy.

The policies of these countries have followed a similar pattern. The government passes ambitious green energy laws, electricity rates rise as subsidies increase out of control, job losses pile up, and the government is forced to consider amending or repealing its misguided policies.

Europe's green energy policies have contributed to its economic slowdown, where Europe is now unable to meet its minimal NATO commitments to fund defense. And because Russia is an important energy supplier, Europe is increasingly reluctant to act against aggression.

The United States must not follow a similar course. The bright horizon of America's domestic energy future is not guaranteed and policymakers should temper their enthusiasm for renewables with the real world facts, now observed with undeniable effects for those who have pursued the green energy dream.

Thank you for the opportunity to testify. I am happy to answer any questions.

[The prepared statement of Ms. Hutzler follows:]

[SUBCOMMITTEE INSERT]

SENATOR MARKEY: Thank you, Ms. Hutzler. Good to see you again.

She did not say that she agreed with me on everything, but we are old pals from these debates in the past.

Let me just begin by saying I think Senator Murphy and I agree that if there is any crook in any part of the energy sector anywhere in the world, that they should be cuffed, tried, and jailed. So we can agree with that, and it does not make any difference if we are talking about Gazprom or we are talking about Enron or we are talking about anything else that has fraudsters in it. The surest and certain way of policing that is to just make sure that the cops come in and arrest them in front of everybody else, and

then the mothers of everyone else are just so ashamed they call their son or daughter and just say: I hope you are not doing the same thing in the energy market. So let us just hope we have cops on the beat.

In addition, I think what I would just like to say is we do have a cap and trade system in the United States. We call it the Regional Greenhouse Gas Initiative. It is all of New England plus New York and Maryland and Delaware. There there have not been any accusations of rampant corruption. Moreover, we have actually seen a 40 percent reduction in greenhouse gases in that sector over the last eight years. And, very interestingly, electricity prices have gone down over that same period of time. So I would just like to stipulate that.

Let me begin with you, Admiral Titley. Could you talk a little bit about your own views on climate change and its interrelationship with defense policy? What has happened over the years, in your own thinking?

ADMIRAL TITLEY: Thanks very much, Senator, for that question. It is I think a matter of public record, it is on a TED Talk and a number of other places, I actually started out as a pretty big skeptic of this. I was trained as a meteorologist. I sometimes tell people I am a recovering forecaster. And I lived and died by the computer models. Back when I was going to college, they frankly were not too much good more than about two, maybe three days out, probably two days out.

When you were running naval oceanography, it was really all weather and it was the tactical side of the ocean. So that is pretty much what I did for quite a long time. The climate continued to change and by the 2000s as I was becoming a senior officer, you start looking — we call it looking a little bit beyond the horizon — and you start seeing these issues. Admiral Gary Roughead, then Chief of Naval Operations, asked me to come up to Washington from my current job and start running this task force on climate change.

The first thing I did is I kind of fell back on my training as a navigator. I probably have to remind half the people in here, there was a time that we did not have global positioning system, so I actually had to use a sextant, and you had to use all the data. So that is what I did, is I wanted to look at all the data, not trusting any one piece of data entirely.

So I looked at how much radiation are we getting from the sun, how much heat and energy are we getting from the sun? What else could be causing this? Scientists sort of wanted to try to disprove the theory. And you would look at these number of independent lines of evidence, very similar to how you would navigate a ship: air temperatures, sea temperatures, ocean ice melting, land ice melting, ecosystems moving either pole-ward or north-ward.

All of this either came to support what I call cutting edge nineteenth century science, a bunch of old dead white guys. Fourier, Tindall, Arnhus basically had kind of figured out the theory back between 1842 and 1895. We are simply refining that, but that is what it is. And I kind of came to my independent conclusion that that is what we are doing.

So I am sort of like the reformed smoker. I am probably the worst type of climate person here because I started out really not seeing that. If somebody else wants to ask, I can tell people why climate models are good for 30 or 50 years, but weather models still have trouble after a few days.

Thank you, sir.

SENATOR MARKEY: But do you have to be a weatherman to predict that the defense of our Nation is going to be affected by the changes in the climate?

Admiral Titley: No, sir, and that was the beauty of the Military Advisory Board, 16 admirals and generals, all except for myself and Royal Navy Admiral Neil Morisetti three and four-stars, none of which are either weather or oceanography. They are war-fighting admirals and generals. So they deal with the specialty branches, be it logistics,

intelligence, weather, every day in their professional lives. They are paid to make assessments.

What they see is they see this is a change in our physical battle space. And just like the Department of Defense looks at and war-fighting commanders look at changes in demographics, economics, political environments, we would frankly be negligent if we did not plan for the chance and for the risk of this changing. Large consequence, not exactly known probability, but we would be negligent if we said, well, it is not going to happen.

SENATOR MARKEY: Mr. Breen, a lot of people again say that oil and gas are just the same as any other commodity; it is no different from a computer chip or a watch. And I suppose the Swiss Army might go to war over watches, but I am not sure many other countries would. Can you talk a little bit about that and the special role that oil and gas do play and how we should be viewing that from the perspective of the United States?

MR. BREEN: Sure, Mr. Chairman. Thanks for the question. I think the difference between oil and gas and other commodities is these energy commodities are strategic commodities. They are things that every advanced economy in the world is dependent on in order to function and survive, that every advanced military needs in order to fight.

For example, oil is a great example of this. The U.S. transportation sector, over 93 percent of our transportation sector is dependent on oil to move. This is, as we all know, it is a globally traded, fungible commodity. There is a highly integrated global market for it, which means that events that happen anywhere in the world affect our supply, which affects in turn, because we are not diversified, I would argue, because we are single source dependent on this one commodity, we are stuck. Whatever happens to the price around the world, whatever happens to supply, we need to respond to that.

That is, frankly, the nightmare that Ukraine finds itself in now. They are dependent on a single massive supplier of resources. As the gentleman from the State

Department testified earlier, sir, they are asking themselves if they are going to make it through the winter because they are so dependent on a single strategic commodity for the welfare of their people. That is a geopolitical, strategic, and ultimately military problem, not an economic one.

SENATOR MARKEY: Thank you.

Senator Barrasso.

SENATOR BARRASSO. Thank you, Mr. Chairman. Mr. Chairman, Senator Inhofe had a statement that he would like to have included in the record and I ask unanimous consent that I could submit that on his behalf.

SENATOR MARKEY: Without objection.

[The prepared statement of Senator Inhofe follows:]

[SUBCOMMITTEE INSERT]

SENATOR BARRASSO. Thank you, Mr. Chairman.

Ms. Hutzler, you cited a number of examples of failed climate policies in Europe, including Germany, Spain, the United Kingdom, Italy. Would you like to elaborate further on these examples? Are there other examples not included in your testimony that you could highlight for us?

MS. HUTZLER: Certainly. As I mentioned, in each of these cases the government enacted green energy laws, and in order to get the mandates that they wanted they had to subsidize these technologies to a great extent. That increased electricity prices, it hurt their economies, and they lost jobs. So they ended up amending or repealing some of these laws.

The specifics of the different policies are different across the countries, but essentially, like Germany had their residential customers pay more for the subsidies than their industrial customers. They were protecting some of them. In Spain, the government actually took up some of the difference in the subsidies because they did

not get enough money from the consumers. In fact, since 2000 Spain paid $41 billion more for the power that they received than their consumers actually paid for. So that puts them pretty much into national debt.

But in each of these cases what we see happening is that they are slashing these subsidies. In Germany's case they are trying to spread the subsidies over more of the businesses rather than just the residential customers.

SENATOR BARRASSO. Can you tell me how successful the Kyoto Protocol was in making countries that signed the treaty more energy independent and secure from countries or foreign entities that did not share their strategic interests?

MS. HUTZLER: Well, I do not think that they are more energy independent and secure. It is just the opposite. If you take a look at their energy prices, their electricity price, for instance, as I mentioned, it is 37 percent higher than the U.S. price indexed to 2005 levels. So their policies in fact have hurt them.

In one case that I mentioned, they are actually spending less on defense now than they did prior to the Kyoto Protocol. They are spending only 1.6 percent of their GDP. NATO guidance says that they should be spending 2 percent. And we are spending as much as 2.5 percent. In fact, Secretary of Defense Hagel has called on the EU to spend more because of the crisis in the Ukraine.

SENATOR BARRASSO. Well, that is what I heard when I was in Latvia and Lithuania, that the concerns are that they were supposed to get to 2 percent, but they are unable to, and a lot of it has to do with the expenses that you have outlined. You mentioned them specifically in your report when you talk about the impact on the economies, that they are having to not have the available funds to spend on defense, which is putting a specific additional stress on NATO.

If the United States had adopted a cap and trade system, do you think it would have helped or hurt our strategic interests?

MS. HUTZLER: I personally think that it would hurt them because of the same thing that happened in the European Union. In fact, you can take a look at Australia, who just repealed its carbon tax because it was not globally competitive. Electricity prices increased 15 percent, unemployment went down 10 percent, and it just made them not globally competitive, which is an important part of being energy secure.

SENATOR BARRASSO. I think it was an interesting discussion and then decision in Australia to repeal because of the specific impacts of it on the economy. Anything else that you kind of gained from that Australian decision?

MS. HUTZLER: I find it very interesting that it was just in place for two years and they recognized this. Their citizens were very unhappy about the fact that they could not compete globally.

SENATOR BARRASSO. Thank you

Mr. Goldwyn, thanks so much for your report on uncertain energy. In your testimony you state that the United States and other stable democratic countries, such as Canada and Australia, are well poised to meet a considerable share of the world's growing oil and gas demand and attain the associated export revenues. From a geopolitical perspective, you say, increased LNG exports from the United States and its allies would shift rents away from traditional autocratic suppliers, including Russia, that have used the proceeds to finance policies at odds with U.S. national security interests.

You went on to say a clear signal from the U.S. that LNG exports will be available to European allies for future purchase would put immediate pressure on Russia's market share and export revenues.

Do you believe U.S. liquified natural gas exports can serve as this important diplomatic tool for the U.S. to strengthen our national security and to assist the security of our allies and helping to alleviate manipulations and threats from Russia, and could you expand on that a little bit?

MR. GOLDWYN: Yes, sir, I do. I think that our ability to export LNG is an important foreign policy tool. First, we increase the global supply of LNG. We bring down the price. We make it more accessible. When the price goes down, our competitors will lose revenue, and right now Russia is a major, major exporter of gas. We saw the historical example of this when over the last few years, when the displacement of LNG meant for the U.S. forced Gazprom to renegotiate most of its contracts with Europe and forced them to power prices.

It is also forcing the delinkage between the pricing of gas correlating to the price of oil and having gas correlate to its more natural competitor, which is coal. So I think there is a price benefit and there is also a supply benefit. Both countries in Europe and Asia want secure suppliers. Often they will pay a premium for knowing that they have a secure source of supply. So our willingness to export to them, as seen by the initial contracts even for the projects right now, show that countries in Europe and Asia are interested in that.

Third, to the extent that they buy from us and they do not buy from somebody else, those rents go here, they do not go elsewhere. Numerous studies, the study on net benefits for the Department of Energy, the Brookings study on LNG exports, the DeLoitte study which is cited in I think the testimony I had before the Energy and Natural Resources, show that just the swap on LNG is almost a $4 billion shift away from Russia to European consumers by bringing down those prices.

So there is a lot of benefits, and it is a little bit of practicing what we preach, too. For years we have been building a system based on global trade. We have relied on that to get resources when we need them. It is just a little bit of practice what you preach.

SENATOR BARRASSO. Thank you.

Thank you very much, Mr. Chairman. My time has expired.

SENATOR MARKEY: Thank you.

Well, we will go to a second round. We just have an incredible panel here. I think it is important — thank you, Mr. Breen, for raising the question of what happens with oil production in the United States, because even though we still import 30 percent of the oil that we consume in the United States, there are advocates for us to start exporting, even though we still import 30 percent and even though, as you are saying, the Energy Information Agency is saying we are going to plateau relatively soon in terms of our total oil production.

So that goes to a national security issue, too: How wise are we to be exporting our own oil and natural gas when we do not have a surplus today and production is going to slow down and plateau in the relatively near future? Can you talk about that?

MR. BREEN: Sure, chairman, and thank you. I think the question really to me is how do you make use of opportunity. If you end up in a situation where you have, as Ms. Hutzler said, an unexpected increase in supply, which is likely to be — increase in production, which is unlikely to last all that long into the future, how do you make use of that? I would argue that there are a number of things we could do domestically with natural gas supplies that might be extremely beneficial.

For example, transitioning municipal truck fleets, garbage trucks, buses, things like that to natural gas might help alleviate our single-source dependence on oil to fuel our transportation sector, which I would argue is a strategic risk, being so dependent on oil for that purpose.

SENATOR MARKEY: I think that there is another canard out there that renewable electricity is not working on the planet, whereas the reality is that last year 50 percent — listen to this: 50 percent of all new electrical generating capacity for the world was renewable, 50 percent of all new capacity installed last year. So we can pick out individual places if we want, but that is a pretty big trend across the planet, even in the United States.

We can go back — you can talk about Spain, but let us talk about the United States. When President Bush left office the Dow was at 7,000, unemployment was at 10,000 — I mean, was at 10 percent. Since President Obama's been in office, we have installed 70,000 megawatts of wind and solar in our country and by the end of next year we could be — maybe the end of 2016, we will have 100,000 megawatts of wind and solar in the United States, which is equal to the nuclear power industry after 60 years. And over that same period of time, during the Obama Administration, the Dow went from 7,000 to 17,000, the unemployment rate has gone from 10 percent down to 6 percent.

So I do not think we should be looking at Spain. We should be looking at ourselves. The same thing is true with the Regional Greenhouse Gas Initiative, the cap and trade system we have for the utility sector across the Northeast. Greenhouse gases went down by 40 percent, electricity rates went down, and we saw a massive installation actually of renewable energy plus conservation, energy efficiency.

So can you talk about that global perspective, Admiral Titley, and how you view this revolution and what we should be doing as a Nation to kind of encourage that indigenous installation of renewables, energy efficiency, self-sufficiency in other words, in other countries of the world?

ADMIRAL TITLEY: Thanks, Senator. Really, the way I take a look at this is this is a risk-based issue, so how do we mitigate the risks of the climate change? We talk about in our MAB report stabilizing the climate. Clearly one way to help stabilize the climate is to reduce the amount of carbon that you are putting into the air. It is kind of like for 150 years we have just been sort of dumping the trash out in the road and nobody has picked it up, so we do not either stop dumping trash and we do not even put it back in the ground.

So the more we can do on these types of renewables, I think we are in good shape. I am often asked, do I believe in climate change? And I tell people, no, I do not

believe in climate change. I am convinced by the evidence that it is happening. What I do believe in is in American ingenuity. I think that — and I end just about every talk I give with, actually it is a slide out of the Tom Hanks Apollo 13 movie, where we get the guys back against all odds — this country, when focused, can do incredible things.

So if we can, through the help of the Congress, sir, set the right incentives, set the right stability, the ingenuity in the academic and the private and in the government sectors will come together and we will fix this problem. We really can fix this problem. The examples you gave, sir, are just the leading edge of how we can do this. We will get there. It is how much pain are we going to suffer.

MS. HUTZLER: Senator Markey —

SENATOR MARKEY: Excuse me just a minute. The reality is that Tom Hanks was right in the Apollo movie. Failure is not an option. They had to innovate. They had to be imaginative. They had to figure out a way of improvising in order to get that capsule back to Earth.

The same thing is true for us right now, except it is the entire planet, and failure is not an option because we know that the worst, most catastrophic impacts are coming and it is going to have a devastating impact upon our national security and the globe's.

I do believe they are weapons of mass destruction, these storms. I mean, when the United States Congress is talking about appropriately $60 billion in the aftermath of Hurricane Sandy, that is quite a catastrophe that we had to appropriate money in order to deal with. It would have been in a lot of ways smarter to spend the money up front in avoiding the worst consequences, because we would have jobs, we would have industries, and we would have things that we could export around the world as well.

So from my perspective — and I will just give you one final shot at this, Admiral. Can you just talk a little bit about how concerned should the Nation be about this issue? Can you just go to that? How do these 16 admirals and generals that you represent here today view this as a threat to us?

ADMIRAL TITLEY: Yes, sir, thank you. We see this, frankly, as an accelerating risk for national security. It is like, well, what does that mean? Really, what we see is this change on what we have literally built human civilization on. If you take a look at how the climate has varied, and it varies a tremendous amount — people say, well, jeez, it changed before, it will change again. Absolutely. But about 8 to 10,000 years ago, after we came out of the Ice Age, it stabilized. When did we get agriculture? When did we get the first literally civilization, and the next thing you know we are all carrying around iPhones and looking at them? That all happened on the basis of we did not have to spend brain power and effort to move about.

So now — and we have done tremendous things with fossil fuels. Look at the kind of life it has given us. The unintended byproduct was it has in fact jeopardized that very foundational basis of what we have built civilization on. So we have got to figure out how to at least keep or improve our life. And we can do that. We can have a better life even than what we have right now, but at the same time stop this harmful effect.

And if we do not do that, that is where we see these risks. Some people talk about humanitarian assistance, disaster relief, and that is all well and good. I am more concerned about these varsity-level impacts, what we start seeing now in North Africa, ISIS — we have already talked about this. These really unintended scary consequences come out that can be traced back to a thread, not the cause but a thread, going back to climate, sir.

SENATOR MARKEY: Thank you very much.

Senator Barrasso.

SENATOR BARRASSO. Ms. Hutzler, I think there were some things you might have wanted to add in on that?

MS. HUTZLER: Yes. I wanted to address some of the remarks that Senator Markey made. He talked about a certain measure in electricity generation and that is capacity.

He did not talk about generation. And he compared 100 gigawatts of renewables to 100 gigawatts of nuclear. Well, if you take nuclear, it has a capacity factor of 90 percent. Renewables have a capacity factor, such as wind, around 30 percent.

So in that 100 gigawatts capacity, you are going to be generating three times as much more electricity from nuclear than you are from renewables. They are just not comparable.

I also wanted to address his comments regarding the Regional Greenhouse Gas Initiative, lowering greenhouse gas emissions and lowering electricity prices. Well, first of all, greenhouse gas emissions were lowered after 2008 because of the global recession. That was one of the biggest impacts of lowering carbon dioxide emissions.

Another is the whole shale revolution, where we used hydraulic fracturing and horizontal drilling to get natural gas. That dropped natural gas prices down to about a fourth and that really reduced the cost of generating electricity. So actually natural gas combined cycle units are the cheapest form of technology that you can use to generate electricity and actually get electricity from it.

But I also wanted to mention the issue in Senator Markey's home State of Cape Wind, offshore wind. Cape Wind has been trying to get both the financing and the customers to build the wind farm offshore for now over a decade. They think they finally have it together. But that wind is going to cost the people in Massachusetts 18 cents per kilowatt hour just to start. Then under the 15-year contract it goes up by 3.5 percent a year, so it is going to end up 25 cents a kilowatt hour. That is two and a half times what we pay for the average cost of electricity in this country.

So you have to be very cautious about which renewable technologies you pick, both in terms of the amount of generation you can get from them and from their cost.

SENATOR BARRASSO. I wanted to ask one other thing. You heard my questioning of the first panel about this increasing manipulation of the European carbon reduction policies and the funding of international crime groups. Do you view this as a serious

flaw in carbon trading schemes and other climate-inspired policies, and do you see some serious unintended consequences to our own national security if the U.S. adopts such policies as those that were taken in Europe?

MS. HUTZLER: Well, carbon trading policies are very complex. They are complex because of the number of participants and they are complex because they have components that are very difficult to implement right. As a result, you can get a lot of unintended consequences, as I mentioned in my testimony. Certainly one of the criminal activities — and yes, there are criminal activities everywhere, but I think you see a lot more in a carbon trading scheme than you do in a carbon tax, as in Australia's situation. The complexity is very different.

Another place where we have seen abuse in the United States is with renewable identification numbers. Refiners have to use so much biofuels when they produce gasoline, and so on and so forth, their products, and there has been abuse there where there have been fake RIN's that these people have purchased and we have actually gotten these people — we have found most of this fraud. So it is happening in this country, too, when you have a policy like that.

SENATOR BARRASSO. Thank you.

Mr. Goldwyn, if I could just get back to our Latin American energy needs. In your report, Latin America and the Caribbean region have incredibly high energy costs and insufficient rates of investment. Many of the countries rely upon energy sources such as Venezuela oil which may not be sustainable in the long run. So we see greater energy diversification for these countries as something that would be important for them.

U.S. natural gas exports as part of that broader energy strategy I believe can help nations in the Western Hemisphere as well, to help them lower energy costs to consumers, to businesses, to enhance competitiveness, promote economic growth, provide jobs here at home as well. In your testimony you noted that, quote, "Promoting

the adoption of gas in the Caribbean and Central American energy mix would bring about several benefits for U.S. interests." Could you just expand a little bit about what are the benefits to the United States and what impacts U.S. exports of liquified natural gas would have on the region and its energy needs?

MR. GOLDWYN: Sure. Thank you, Senator, and I want to give credit to the Inter-American Development Bank. They actually did a pre-feasibility study on the availability of gas for the region and they are the ones that came up with these calculations that the average price of electricity in the top 12 economies is over 30 cents per kilowatt, the average in the U.S. is about a dime, and seeing the climate and economic benefits of substituting gas for fuel oil and diesel.

So the benefits are several. The region is important to us. Economically, it is closely tied to South Florida's tourism industry. For migration purposes, stable populations are important. Certainly if there was instability in that region, Jamaica, Dominican Republic, they would be much more vulnerable to transnational crime. And for moral reasons, these are our neighbors.

So for them to have competitive economies they have to have affordable electricity. For them to deal with climate change, they need to have a smaller carbon footprint than they have right now. And for them to have political autonomy, they need to have liberation from dependence on Venezuela for the credit with which they buy all of their oil and their product. So all of those are tremendous benefits to the United States if we are able to help them and we can do it at a relatively low cost.

The long-term solution for these countries — and they have great potential for renewable energy, some geothermal, some wind, some solar. But the intermittency problem is significant for them. They have to have baseload electricity. This is the problem worldwide, is where do you get baseload electricity? You have got coal, oil, nuclear, and gas. And for significant near-term greenhouse gas reduction, gas is actually the most cost-effective scaleable alternative.

If I could, Senator, there has been a lot of talk about whether oil is a strategic commodity and what we should do about it. I would just like to address that. There is no question that oil and good are both strategic commodities. We would never think of banning the export of food, particularly to other countries, because we needed to, it was a strategic commodity and we needed to keep it at home. I think the same is true of oil and of gas. If we — the fact that we import some and we do not — and we import basically heavy oil, which matches our refineries, but we no longer import light oil because we produce so much we have it in surplus, does not mean that we should not export it.

It is the basic principle of comparative advantage. If we can sell something and make more money and put that into the economy, then why not? And if the day comes, frankly, when we do not have it in surplus, the economics will not justify exporting it and we will go back to doing what we have done for decades, which is asking other countries to produce as much as they can and not to restrict the export, to allow the global market to move it to its most efficient source.

So we will need that insurance. The question is now today, when we have a surplus, why should we not do what we have asked every other country in the world to do and when we can do it in an efficient way and benefit ourselves? I think that is an element of contradiction, is a nice word. But we are in the middle of negotiating two major trade agreements. I think it is really important that we practice what we preach.

SENATOR BARRASSO. Thank you.

Thank you, Mr. Chairman.

SENATOR MARKEY: The chair would recognize himself again, just to say this: that if we had a 30 percent shortage of wheat in the United States, 30 percent short, and people said, well, we should export part of that 70 percent that we still have, I do not think America would be happy with that. I do not think they would say, let us export wheat even though we are importing 30 percent of the wheat that we use in our country right

now, and there might be a little part of the country that has a little surplus, let us send it out of the country. I think that we would not export it, Mr. Goldwyn. That is what I think.

I agree with you that food and oil are in the same category, but the fact that we have a surplus of food puts us in a different category than we have with our energy resources, where we do not have a surplus. We are still importing. So it is just a different situation.

If you remember, Russia stopped exporting wheat when they had a problem, when they had a drought. They just stopped exporting it, because wheat is like oil. They are not sending their extra wheat into the Ukraine. They are sending extra natural gas into the Ukraine when they had a shortage.

So from my perspective, I put those two in the same category. And I think it is a good analogy, food and oil and natural gas. In each instance, when we do not have a surplus and when it is a big deficit, which it is with oil, then I do not think that we should be exporting it.

So here is what I think we should do, give each of you one minute to summarize what it is that you want the committee to know. We will give you — we will go in reverse order from the opening statements. So we will begin with you, Ms. Hutzler. Give us your one-minute summary that you would like the committee to remember.

MS. HUTZLER: I want the committee to remember that Europe's policies in these areas have failed, that they have enacted green energy laws that needed huge subsidies and that their electricity prices increased, that they have lost jobs, and that they have had to amend these laws, and that it has cost them national debt, it has caused corruption and fraud to occur; and that Australia too had a carbon tax that they have repealed because of not being competitive in the global marketplace.

SENATOR MARKEY: Thank you, Ms. Hutzler.

Mr. Breen, you have one minute.

MR. BREEN: Thank you, Mr. Chairman. If I were to summarize, I would say simply that the subject of this hearing and the timing of it are quite appropriate. Energy and security are inextricably intertwined, and the lack of diversification of U.S. supplies and global supplies and sources continues to create opportunities for rivals and adversaries and vulnerabilities for ourselves; that in the face of that and in the face of the reality that in the long term almost all projections that I am aware of do not see increasing U.S. production keeping up with global demand to the extent that it changes the geopolitical calculus for the United States, that in that world the soundest investments are investments in efficiency and investments in more diversified sources of energy, both for ourselves and as a tool of foreign policy for our allies.

I think it is all well and good to export, if you happen to have it, an excess of natural resources. But America's truest contribution to the world, to our allies, and our best export is technical knowledge and innovation.

SENATOR MARKEY: Thank you, Mr. Breen.

Mr. Goldwyn.

MR. GOLDWYN: Thank you, Mr. Chairman. Four points. First, we have lots of tools at our disposal to address these energy and climate issues: diplomacy, technical assistance, and open trade. We are going to need to use all of them to address the security challenges we face overseas.

Third, I would say that many of the challenges that we face can be addressed in ways that will both reduce greenhouse gas emissions and increase our security.

But fourth, we need to consider open trade as part of that. Not all is the same and not all — so there are elements that we do not need, which we can export and share with others. The question is when we have something in surplus will we share it with our friends and allies. No country has ever grown its supply of anything by restricting its export. So I think it is something that requires some study, but I urge you to consider.

SENATOR MARKEY: Thank you, Mr. Goldwyn.

Admiral Titley.

ADMIRAL TITLEY: Thank you, Senator. I would say, as far as the science of climate goes, we do not know everything, but we know an awful lot. If the intelligence community could tell us as much as the climate community can about the next 30 to 50 years, we would find General Clapper and his agency heads and we would give them all Medals of Freedom today. That is how much we know about climate.

In the military, as General Sullivan famously says, we do not wait for 100 percent certainty to tackle any issue. If you wait for that on the battlefield, you will probably be dead.

With respect to climate, this is really about the food, the energy, the water, and the nexus of those three very, very critical issues. If they are mishandled in other countries and other regions, that produces stress and that almost always ends up in a poor security situation that the United States usually gets to deal with in some way, shape, or form. We can deal with this in risk management and ultimately, sir, America can lead the way. We can fix this.

Thank you.

SENATOR MARKEY: Thank you, Admiral.

Thank you each for your service here in the Congress. We very much appreciate your testimony here today.

I ask unanimous consent that the record remain open for written questions from committee members to our witnesses until Friday at noon. Without objection, that will be put in the record and any of the answers which you give us in writing to those questions will be seen in the record.

We thank you each of you for your testimony today, and we thank everybody else for participating. This hearing is adjourned.

[Whereupon, at 5:05 p.m., the hearing was adjourned.]