# CLIMATE FOR INNOVATION: TECHNOLOGY AND INTELLECTUAL PROPERTY IN GLOBAL CLIMATE SOLUTIONS

## HEARING

BEFORE THE

## SELECT COMMITTEE ON ENERGY INDEPENDENCE AND GLOBAL WARMING HOUSE OF REPRESENTATIVES

ONE HUNDRED ELEVENTH CONGRESS

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# CLIMATE FOR INNOVATION: TECHNOLOGY AND INTELLECTUAL PROPERTY IN GLOBAL CLIMATE SOLUTIONS

**WEDNESDAY, JULY 29, 2009**

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

The committee met, pursuant to call, at 9:38 a.m. in Room 210, Cannon House Office Building, Hon. Edward J. Markey [chairman of the committee] presiding.

Present: Representatives Markey, Inslee, Cleaver, Sensenbrenner, and Blackburn.

Staff present: Camilla Bausch.

The CHAIRMAN. Today, the Select Committee will hold a hearing to focus on an issue that underlies all of our discussions on technology but which is often overlooked: intellectual property rights and the role they play in developing clean technology solutions.

The gentlemen from Wisconsin, Mr. Sensenbrenner, is a leading congressional authority on intellectual property rights; and during our recent trip to China, he constantly reminded our Chinese host that technology must solve the problems of energy security and climate change, but, to do so effectively, we need a rigorous system to protect intellectual property. I share that view, and we are having this hearing to explore those issues.

There is a huge and growing demand for climate-related technologies. It can and should be met by inventions of American companies. America is well-equipped to lead and provide the cutting-edge technologies we so urgently need for solving the climate and energy challenges, but we need to develop the solutions for tomorrow and then deploy them worldwide.

Passage of the American Clean Energy and Security Act will push entrepreneurs and college kids, Silicon Valley stars and Stanford roommates to work hard and to try their luck at inventing new ways to produce renewable energy and reduce greenhouse gas emissions. When those entrepreneurs succeed, what will happen to their product and know-how? That is the question we will explore today.

In the upcoming Copenhagen negotiations, technology cooperation will be an important topic as countries look for ways to enhance deployment of climate technology around the world. At the international level, there is a consensus that clean technologies have to be developed and deployed and that the current efforts in

this respect have to be enhanced. There is also general agreement that the private and public sector will have to find new and better ways to bring those solutions to the villages of India and the towns in South Africa. But although countries might agree on the general direction, there are very different ways to achieve the goals. With only 130 days left until the Copenhagen negotiations, the world faces great challenges to find agreement on how to address the technology challenge.

Today is a good time to take a close look at business opportunities, at technology cooperation, at barriers to spreading solutions, and at the closely related question of the protection of intellectual property rights. Intellectual property rights enable innovators to be rewarded for their creativity and investment of time and money, but these rights must be balanced with the need for incentives and the common good in the interest of sharing ideas and technology.

This is why in the U.S. we have time limits on patents and copyrights. This is why the United States and all members of the World Trade Organization agree on the treaty which outlines how intellectual property rights should be protected on a global basis.

We have the international framework in place, although I appreciate there are disagreements as to how well that framework operates in daily practice. Nonetheless, I think it is important to see if we can develop policies within this framework that can trigger the innovation and deployment that we want. With American ingenuity, we have become the world leaders in communications and information technology. Let us again embrace our opportunities for our country and businesses so that they can lead the world to a low carbon future.

Because this is our last hearing before the recess, I would also like to take a minute to recognize the retirement of—where is Tom? Tom is not here? Oh, God—Tom Weimer, who is already in retirement.

I have worked with Tom starting back in the early 1980s when I chaired my first subcommittee, the Oversight and Investigations Subcommittee, in the old Interior Committee; and Tom worked on the staff of Manny Lujan. Tom gave many distinguished years of service to that committee and then at the Interior Department, and I was pleased to work and travel with him over the past 3 years as part of the Select Committee staff. He was a consummate professional who was always fair and committed to the work of this institution. I know that he cannot be here today, but I did want to take this opportunity to congratulate him for his long and successful career in public service.

That completes my opening statement.

I turn and recognize the ranking member, the gentleman from Wisconsin, Mr. Sensenbrenner.

[The prepared statement of Mr. Markey follows:]

THE SELECT COMMITTEE ON
ENERGY INDEPENDENCE AND GLOBAL WARMING

**Opening Statement of Chairman Edward J. Markey**

**"Climate for Innovation: Technology and Intellectual Property in Global Climate Solutions"**

**Wednesday July 29, 2009**

Today the Select Committee will hold a hearing to focus on an issue that underlies all of our discussions on technology but which is often overlooked: intellectual property rights and the role they play in developing and deploying clean technology solutions. The gentleman from Wisconsin is a leading Congressional authority on intellectual property rights, and during our recent trip to China he constantly reminded our Chinese hosts that technology must solve the problems of energy security and climate change, but to do so effectively we need a rigorous system to protect intellectual property. I share that view and we're having this hearing to explore those issues.

There is a huge and growing demand for climate related technologies. It can and should be met by inventions of American companies. America is well equipped to lead and provide the cutting edge technologies we so urgently need for solving the climate and energy challenges. We need to develop the solutions for tomorrow, and deploy them worldwide.

Passage of the Waxman-Markey American Clean Energy and Security Act will push entrepreneurs and college kids, Silicon Valley stars and Stanford roommates, to work hard and try their luck at inventing new ways to produce renewable energy and reduce greenhouse gas emissions.

When those entrepreneurs succeed, what will happen to their product and know how? That is the question we will explore today.

In the upcoming Copenhagen negotiations, technology cooperation will be an important topic as countries look for ways to enhance deployment of climate technology around the world.

At the international level, there is consensus that clean technologies have to be developed and deployed, and that the current efforts in this respect have to be enhanced. There also is general agreement that the private and public sector will have to find new and better ways to bring these solutions to the villages in India and the towns in South Africa. But though countries might agree on the general direction, there are very different views on the ways to achieve the goals. With only 130 days left until the Copenhagen negotiations, the world faces great challenges to find an agreement on how to address the technology challenge.

Today is a good time to take a close look at business opportunities, at technology cooperation, at barriers to spreading solutions and at the closely related question of the protection of intellectual property rights.

Intellectual property rights enable innovators to be rewarded for their creativity and investment of time and money. But these rights must balance the need for incentives with the common good, the interest of sharing ideas and technology. This is why in the U.S. we have time limits on patents and copyrights. This is why the United States and all members of the World Trade Organization agreed on a treaty which outlines how intellectual property rights should be protected on a global basis.

We have the international framework in place, though I appreciate that there are disagreements as to how well that framework operates in daily practice. Nonetheless, I think it is important to see if we can develop policies within this framework that can trigger the innovation and deployment we want. With American ingenuity we became world leaders in communications and information technology. Let's again embrace the opportunities for our country, and businesses to lead the world into a low carbon future.

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Mr. SENSENBRENNER. Mr. Chairman, let me say that I deeply appreciate the comments that you have made on the retirement of the Republican Staff Director of the Select Committee, Tom Weimer.

When I recruited Tom for this job, his extensive background both on the Hill and in the Interior Department on energy issues was invaluable in helping get the committee off the ground. Despite the fact that the chairman and I have some rather deep disagreements over how to go about solving the problems of climate change and energy security, Tom has worked very professionally with the Democratic staff in order to make the work of the Select Committee a success.

After hearing your good words about Tom, I am going to make an offer to you. Over here on the Republican side, anybody that uses the word "cap-and-trade" instead of "cap-and-tax" ends up having to buy a round of refreshments for everybody else; and Mr. Weimer does owe a couple of rounds for letting the wrong language slip out. And when we have payback time, Mr. Chairman, I will be sure to invite you so that you can enjoy the results of Mr. Weimer's slipping up on what the Waxman-Markey bill really is. So stay tuned.

Now as far as my opening statement——

The CHAIRMAN. Can I say we have the same thing on our side? Anyone who uses the phrase "cap-and-trade" is similarly punished. Instead, they must use the words "energy independence" and "clean energy jobs revolution." So we have a similar fund on our side that we might be able to work with you and have a really good party.

Mr. SENSENBRENNER. I thank the Chair for those very good words. And, remember, some words count; and some words don't. I am glad you agree that "cap-and-trade" is a bad word.

Having said all of that, my opening statement.

Global warming has become less about science and opportunism. Soon after scientists rang alarm bells on carbon emissions, everyone from financial institutions to developing nations realized that they could get rich off of it. So while scientists continue to debate the best course of action, those with vested interest declare that the science is settled and offer solutions that conveniently would also make them rich. But we can't allow the need for action to make us victims of self-serving proposals against American interests.

Efforts to weaken intellectual property rights at the ongoing U.N. climate change negotiations are a perfect example. Developing countries like China and India see climate change as an opportunity to gain free access to American IPR. But far from mitigating climate change, relaxation of IPR would ruin our and the world's only hope of responding in a long-term way.

China, along with other developing nations in the so-called Group of 77, wants the U.N. to establish an "executive body of technology" that would be governed by many of these same countries. The Chinese and others propose that this body would determine "technology related financial requirements" and seek to ensure that privately owned technologies are available, despite the intellectual property protections. Put simply, China and the developing nations seek to transfer the developed world's clean energy technologies to an unelected U.N. body which they would control.

The current draft U.N. negotiating text that will be considered in Bonn early next month includes proposals that would "exclude from happening in developing countries environmentally sound technologies to adapt to or mitigate climate change," require "compulsory licensing for environmentally safe and sound technologies," and to ensure "access to intellectual property protected technologies and associated know-how to developing countries on nonexclusive royalty free terms."

These governments argue that the risk of climate change justify free access to technologies to help mitigate them. The result would be a transfer of billions of dollars worth of the latest technologies. But the argument mistakes or willfully ignores the truth that technology is not a natural resource that can be pulled from the ground. New technologies will exist only if there are incentives to create them; and innovators should know that if they invest their time and money, their innovations will be protected, not given away.

Chairman Markey and I respectfully disagree on how best to respond to climate change, but I think we agree that advanced technologies will ultimately be the long-term solution. Whether we adopt new taxes or a more economic approach, which I advocate, companies won't invest in new technologies unless we have strong IPR to protect them and that IPR is enforced. As Steve Flutter, head of the Electro-Imagination Division of General Electric, has told the New York Times, "Why would anybody invest in anything that they would just have to give away?"

China and India in particular have a checkered history of protecting IPR. The U.S. Trade Representative reported to Congress in April that neither China nor India provide an adequate level of IPR protection or enforcement or market action access for people relying on intellectual property protections and placed both on its priority watch list of the worst offenders.

The Trade Representative's report said overall piracy and counterfeiting levels in China remained unacceptably high in 2008 and that its IPR enforcement regime remains largely ineffective and non-deterred, while privacy and counterfeiting, including pharmaceuticals, remain a serious problem in India and its IPR enforcement regime remains weak.

Rather than demanding free access to new technologies, if developing countries want to mitigate climate change, they should pledge to protect them so that the investments will be made to develop those new technologies.

As the world works toward a new international agreement on climate change, I urge the Obama administration to end hopes that IPR will be freely granted by proposing new language for a climate change treaty that strengthens intellectual property and promises to protect and encourage technological innovation.

I thank the Chair.

The CHAIRMAN. The gentleman's time has expired.

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

Mr. INSLEE. Thank you.

I want to welcome my constituent neighbor. Robert Nelsen is here today with ARCH Venture Partners. He embodies the spirit of innovation, and I look forward to his testimony.

I also have a little token of our appreciation, Mr. Chairman, for your leadership. This is a little bit of Sapphire Energy's algae-based biofuels, and this will get you the last half mile to drive to the White House for the signing ceremony for the ACES bill. We just want to make sure that you get to the South Lawn. We have a little work between now and then, but that will get you there.

The CHAIRMAN. Thank you so much.

Mr. INSLEE. I want to make one serious comment.

The CHAIRMAN. This is serious. There is nothing more serious than algae.

Mr. INSLEE. The issue of intellectual property, to me, if we were going to be assisting the developing world—and it is a serious issue, but it ought not to be at the expense of innovators, and it ought not to be in a way that depresses and suppresses innovation. If we are going to be providing assistance to make new technologies available to the developing world, it ought to be based in a way that the community as a whole finances it, rather than just the innovation community. To do otherwise really suppresses and prevents the innovation from coming into existence that we might be able to share and/or sell to the developing world.

So I just want to make the point, and I know that we will talk about this today, that the worst way to share is to do something that would prevent that which you seek to share from ever coming into being; and when in fact you deprive folks of intellectual property, in fact that is what has happened. So there are better ways to do that, and I look forward to this discussion. Thank you.

The CHAIRMAN. The Chair recognizes the gentlelady from Tennessee, Mrs. Blackburn.

Mrs. BLACKBURN. Mr. Chairman, I am delighted we are having this hearing today. I do think it is an imperative that the Federal Government protect the intellectual property rights of our innovators.

One of the things that I realized as we were working on preparation for this hearing is that, over the past 7 years, all of the clean energy technology patents that have been put in place, 50 percent of those are U.S. innovators. So we are deeply invested in making certain that we protect that 50 percent of all of the patents that are held by U.S. citizens.

It is of concern to me that there are new developments in international law and international agreements that may threaten these rights and lead to some outright piracy and theft of some of these patent-protected technologies. I am concerned, too, about the climate fund accounts as a price for participation in any treaty or agreement with carbon emissions. I am concerned about compulsory licensing and preferential pricing of low-carbon technologies that are coming into the marketplace.

So those are all things that I am going to want to take a look at as we have this hearing, because I think we have to be careful that we don't barter or give away any of the work that has been done by our innovative community, our creative community.

I thank you for the hearing and look forward to what the witnesses have to say.

[The prepared statement of Ms. Blackburn follows:]

Statement of Congresswoman Blackburn

Select Committee on Energy Independence and Global Warming

"Climate for Innovation: Technology and Intellectual Property in Global Climate Solutions"

August 29, 2009

Mr. Chairman,

One of the responsibilities of the federal government is to ensure American innovators' intellectual property rights are protected and that they are appropriately compensated for use of their patents.

Over the past seven years, Americans innovators invested time, passion, and their own economic capital in developing new technology to power the world in the 21st century.

Their efforts produced significant results, which culminated in them receiving 50% of patents in clean energy technology during this time.

Yet new developments in international law and international agreements may threaten these rights and could lead to outright theft of patent-protected technologies.

Some countries do not even protect the patents of their own citizens, much less those of Americans and American businesses.

It is not surprising, then, to see these countries demand the transfer of patented technologies through "climate fund accounts" as a price for participation in any treaty or agreement to reduce carbon emissions. They have even called for compulsory licensing and preferential pricing of low-carbon technologies.

Mr. Chairman,

Strong intellectual property rights are the underlying force driving innovation and economic growth in America.

We need to safeguard and strengthen the patent system.

It is a system that encourages research and development into technological solutions to energy and environmental challenges. It simply cannot be bartered or given away.

Congress took a good first step toward protecting these rights when adopting my bipartisan amendment to the foreign relations reauthorization act this past June. While the amendment would block any patent transfer to a new multilateral Fund spearheaded by the United Nations that could otherwise transfer American intellectual property to extreme carbon emitters such as China and India, more must be done to protect our creators' rights.

I hope today's hearing provides a forum to further develop the record on this issue and lay a foundation for tough federal standards that protect American innovation in a green economy.

I yield the balance of my time.

The CHAIRMAN. I thank the gentlelady.

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

Mr. CLEAVER. Thank you, Mr. Chairman.

My son is an actor in California. Of course, at this point I am paying for his acting, and I think I am the only one who has rented the movie that is at Blockbuster, but I never thought about intellectual property rights until he brought it to my attention. Nobody is going to steal a line from the movie he is in, but I am aware of it, and I have been thrown into a controversy here—and I know Mr. Sensenbrenner is on the Judiciary Committee—with the royalties related to many of the iconic performers of the '60s and '70s who are not getting money when their music is being played on the radio.

So all of a sudden I have given a lot of thought to this whole issue of intellectual property; and the value of the new and, in some cases, yet-to-be-invented energy technologies to both developed and developing nations is immense. Most of the technologies that we are going to depend on have yet to be invented. So I look forward to this hearing.

There are some issues raised by Midwest Research Institute in the Fifth Congressional District which you may or may not be familiar with which I would like to lift up as we continue this hearing today.

Thank you, Mr. Chairman and the ranking member, for this hearing.

The CHAIRMAN. I thank the gentleman.

[The prepared statement of Mr. Salazar follows:]

Opening Statement
Congressman John T. Salazar
Select Committee on Energy Independence and Global Warming
'Climate for Innovation: Technology and Intellectual Property in Global Climate Solutions'
July 29, 2009

**Thank you Mr. Chairman.**

**Good morning, I want to thank the witnesses for taking the time to come here and share their information with us today.**

**As we heard at the Select Committee Hearing yesterday there are a number of technologies currently available and on the horizon that will help us reduce the amount of carbon released into the atmosphere.**

**I was interested to read Mr. Rao's testimony where he describes how energy efficiency and the built environment are keys to reducing our carbon foot print globally.**

**Yesterday we heard testimony on technology that utilizes carbon in the manufacturing of cement. We should be able to marry the two concepts, at least in the new buildings we erect.**

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**One of the things we must address is how to reduce carbon emissions globally while maintaining a healthy economy here and abroad.**

**We must also continue to encourage the innovation and creativity we heard about yesterday.**

**The trick seems to be in how to continue to encourage that innovation while sharing the technology that will allow us all to move forward in a synergistic fashion.**

**The Bali Action Plan identified 'enhanced action on technology development and transfer to support action on mitigation and adaption' as one of its four pillars.**

**The negotiations that have transpired to date on intellectual property and technology transfer have been controversial.**

**I'm very interested in hearing solutions you have to provide the environment to both innovate and share technology.**

**Thank you for your testimony and time today.**

The CHAIRMAN. We will now turn to our panel.

**STATEMENTS OF GOVI RAO, CHAIRMAN, LIGHTING SCIENCE GROUP CORPORATION; ROBERT T. NELSEN, CO-FOUNDER AND MANAGING DIRECTOR, ARCH VENTURE PARTNERS; JENNIFER HAVERKAMP, MANAGING DIRECTOR FOR INTERNATIONAL POLICY AND NEGOTIATIONS, ENVIRONMENTAL DEFENSE FUND; AND MARK ESPER, EXECUTIVE VICE PRESIDENT, GLOBAL INTELLECTUAL PROPERTY CENTER, U.S. CHAMBER OF COMMERCE**

The CHAIRMAN. Our first witness today is Mr. Govi Rao, who is the chairman of Lighting Science Group Corporation, a leading digital lighting solutions company. He is also partner of Pegasus Capital Advisors, a private equity fund manager that is also pursuing opportunities for sustainable business solutions.

He came back from his business trip to Bahrain yesterday night in order to testify in front of us today.

We thank you so much, sir, for being here. Please begin when you are ready.

**STATEMENT OF GOVI RAO**

Mr. RAO. Good morning, Mr. Chairman, Ranking Member Sensenbrenner, and members of the committee. Thank you for the opportunity to testify before you today. This is my first such event.

Mr. Chairman, as you mentioned, I am chairman of Lighting Science Group Corporation. We design and develop cutting-edge lighting products. And when I see lighting products like here in this room, what tickles me is that we still use mercury to do that, and there is a way to do that without mercury. Actually, that is what we do, is manufacture LED light bulbs which are innovative. We have manufacturing operations in New Jersey, Florida, and California. We would love to have operations in the rest of the country as well.

This hearing to me actually has a couple of connotations. At the end of the day, if it is IP or innovation, without the opportunity to commercialize any of this, it really doesn't matter. So I am going to be talking about the commercialization aspect of it.

Yes, I did come back from Bahrain last night, so I am not sure what my body clock says, but I will try to survive the next couple of hours here.

I am also a partner at Pegasus Sustainable Century Merchant Bank that we launched this year. The interesting story of Lighting Sciences, we brought together—"we" as in Pegasus Capital—brought together four small, innovative companies in the U.S.—actually three small, innovative companies in the U.S. and one in Europe. Small, not large enough to have global access, but very innovative and very entrepreneurial: one in California, one in Florida, and one in New Jersey. We have given them the ability to actually be able to provide their technology to the rest of the world by building scale in both manufacturing and R&D.

The three questions that were posed to me for today's testimony had to do with the climate-related technologies in developing countries and what opportunities do I see. I have some exciting opportunities that were just uncovered for us in the last few days in Bah-

rain. And then IPR, is it a barrier or a boost? And I have my personal opinion about that. And also to see, in the context of the upcoming negotiations, what my hopes and worries are. So I am going to address the three of them today.

My experience in the last few years in Lighting Science—and 2 years especially in building this company—has been extremely powerful in two ways. One is seeking opportunities. We look at this from a protectionist approach when it comes to intellectual property. However, we also forget that countries mentioned—Ranking Member Sensenbrenner mentioned China and India specifically, but if you take a look at Brazil, Russia, China, India, the Middle East, they are recognizing that their gap between their energy requirements today and energy production today is significant and is growing. So they are actually being very aggressive in coming up with new ways of meeting that demand, both on the energy generation side, but, more importantly, they have also started very aggressively putting a cap on how to use the energy on the demand side. That is a powerful thing. I will spend some time on that today.

While we have new technologies that are coming on stream for generation, I believe there is a tremendous amount of technologies here in this country already existing to mitigate the demand. We are not doing much about them, and I would like to spend some time on that.

This is a big paradigm for us, bigger than anything we have seen before. So whether it is our road to electricity or landing on the moon or we are talking about the Internet, any of these things, all of these things, pale in comparison to what we have in terms of climate change. We look at this from a geographical perspective in intellectual property, but I believe we have to change our paradigm and look at this as a global activity.

Let me give you an example of my 3 days in Bahrain in the Middle East over the last few days.

The opportunities there on the demand side of energy are absolutely fantastic. They are requesting us to help them curtail how they use energy, whether it is through controls or whether it is through LED lighting or whether it is digital motor control. There is demand. They know they will have to get there one way or the other.

I made a proposal here in the executive summary which is very, very simple. There is an urgent need to first act as a global community; and we have to start breaking down the barriers, the geographic barriers that we have built. The opportunities in the Middle East and Asia and China and especially in India are humongous and phenomenal. The technologies we have already. If we do not get there and actually make these technologies have the day-to-day commercialization, then we will fall behind in leadership in the commercial world, let alone the technologies base.

The markets are created locally. We just heard China is urging buy China, buy local. So make local, buy local. We have to be there with our technology. So I am not saying give away the technology. I think there is a way of establishing leadership, and I have made a proposal and would love to answer questions about that in terms

of creating an exchange for IP where innovators get rewarded and not just taken for granted.

Thank you, Mr. Chairman.

[The statement of Mr. Rao follows:]

# Testimony of Govi Rao

**Chairman, Lighting Science Group**
**Partner, Pegasus Sustainable Century Merchant Bank**

**before the**

**U.S. House of Representatives**

**Select Committee on Energy Independence and Global Warming**

## Climate for Innovation: Technology and Intellectual Property in Global Climate Solutions

**July 29th, 2009**

Mr. Chairman, Ranking Member Sensenbrenner and Members of the Committee: I thank you for the opportunity to testify before you today. My name is Govi Rao and I am Chairman of Lighting Science Group Corporation, a U.S based manufacturer of energy efficient and environmentally friendly LED (Light Emitting Diode) Lighting products. We design, develop and manufacture LED products for outdoor area and street lighting, commercial & industrial, retail and architectural applications. Among several award winning innovations, we also designed and built the famous New Years Eve, Times Square Ball and we are also building the next generation streetlight for NYC. We have manufacturing operations in New Jersey, Florida and California.

Also, I am a partner at Pegasus Sustainable Century, a merchant bank established this year by Pegasus Capital Advisors LP (Pegasus), as the market leader in providing capital as well as strategic advice to commercially attractive sustainable businesses primarily in the United States. We do this by providing growth capital and assistance from our experienced team of experts for companies that can secure competitive advantages through resource efficiency. One specific area we focus on is Conservation and Energy Efficiency, investing in innovative U.S. companies with technology and know-how that will help us improve our energy utilization by increasing efficiencies. Our portfolio companies positively contribute to lowering our carbon footprint, with products ranging from highly efficient LED light bulbs to lightweight plastic pallets to re-refined motor oil and converting former coal-fired power plants renewable bio mass. Pegasus is one of the most successful private equity firms in the United States, with a 14 year track record. Pegasus has offices in NY, CT and CA.

My testimony addresses the three questions posed by the Committee:

1. Climate related technologies in developing countries: what business opportunities do you see?
2. Do you see IPR protection as a barrier or a boost to development, deployment and diffusion of climate related technologies at the global level?
3. With a view to international climate negotiations, what are your hopes and fears with regard to spreading clean technologies and also IPR protection?

My experience over the last two years in building Lighting Science as a rapid innovator of LED solutions has been a tremendous learning, especially as it relates to seeking growth opportunities within the U.S and outside as well as in dealing with Intellectual property issues. There are numerous opportunities emerging in the developing countries and I am amazed at the speed of their adoption. I returned last night from Bahrain, and in three days, I was given 13 distinct projects - all relating to technologies affecting climate change positively. Several of these are being driven by the government.

**Urgent Need to act on Climate Change**

All our past paradigm shifts thus far, from electricity to flight and from man's landing on the moon to the internet, truly pale in comparison to the one we have at hand - global warming and climate change! This seems like the mother of all challenges we have faced thus far as a human race and I strongly believe that we need to act with an increased sense of urgency. Most of the observed increase in average temperatures since the mid 20$^{th}$ century is very likely due to the observed increase in greenhouse gas concentrations resulting from human activity. I personally believe that our current policies and practices will only result in an increase in greenhouse gas emissions over the next few decades, most likely causing further global warming, larger than what we have observed during the 20$^{th}$ century.

I would like to focus this discussion on the opportunities to manage our demand for energy – a direct impact of our legacy infrastructure. Building related emissions of CO2 account for around 40% of a country's total emissions. Existing buildings – which will comprise the majority of building stock in 2050 and beyond – offer significant opportunities for reducing energy use and hence reducing green house gas emissions. In new buildings the scope is even larger as we start with sustainable design and set targets for zero carbon footprints and include elements like the use of on-site renewable energy.

Global energy demand is increasing at an alarming pace. The International Energy Agency (IAE) predicts that by 2030 the world will need almost 60% more energy than today. Two-thirds of this increase will happen in China, India and other rapidly developing economies. The IEA also estimates this sharp increase in demand would require us to build about 4,800 GW of new

capacity between now and 2030. In addition to this, the industrialized countries face a different but parallel situation. While demand in increasing, the older power plants are reaching the end of their working lives. The IEA predicts that we have to build about 2,000 GW of power generation capacity in the OECD countries over the next 25 years including the replacement of retiring plants.

Recognizing that we can no longer rely predominantly on fossil fuels, policy targets for renewable-based energy have been established in most countries. For example: China (10% by 2010 / 15% by 2020); India (10% by 2012); Brazil (15% by 2020); Mexico (8% by 2012); Philippines (50% by 2020). Renewable energy is becoming an increasingly attractive option for power utilities and energy users. Renewable energy is a massive indigenous source available everywhere, with no geopolitical risk and with no dependence on imported fuels.

While governments around the world are treating renewable sources as part of their mainstream strategy, enabling the competitiveness of these emerging technologies like wind, bio-energy, hydro power, geothermal and solar photo-voltaics, we can surely and swiftly start reducing our energy usage now by leveraging technologies that are available today. Demand side management efforts in existing buildings can easily yield reductions of 30 to 45% in energy usage.

**A Clean Energy Blueprint study conducted by the Union of concerned scientists (UCS) found that energy efficiency could reduce our electricity usage in 2020 by about 1,700 KWh, just by improving the energy efficiency in commercial and industrial environments.**

**The cleanest, safest, most secure, reliable and cost effective kilowatt hour is the one that isn't used!**

Several technologies exist today to help us fight global warming. Not surprisingly, a big source of these innovations happens to be the SMEs (small & medium enterprise) – not just in the U.S but worldwide. A great deal of discrete innovation is happening in our country – among entrepreneurs and innovators – in small workshops, in school labs and in garages, literally.

Most of these ideas take a long time to reach commercialization, if the inventor persists through the maze of the process and costs. I see the need for us to act NOW, to work on all fronts of this NEW ENERGY FRONTIER – from renewables to storage, and intelligent controls to energy

efficient devices, appliances and buildings. While the energy crisis is going through an identity crisis of its own, our fundamental processes and policies involving technology and IPR are still mired in the old paradigm. We still work on these things with little to no sense of urgency.

In addition, markets for these energy related products and solutions are opening up world-wide at a reasonably fast pace, driving the decision makers to what is available locally. The green revolution is beginning to take shape slowly and even for those who see the picture painted by Dr. Rajendra Pachauri and his IPCC team, there is generally a huge gap between vision and implementation.

I see a tremendous market for three big ideas globally:

1. Increasing renewable sources, supporting distributed generation and energy storage
2. Aggressively reducing energy usage by using
    a. intelligent building controls,
    b. energy efficient and environmentally clean lighting (LEDs)
    c. Improving HVAC & digital motor controls and
3. Building efficiencies and weatherization

The good news is these technologies exist today. In the U.S. alone, we have numerous SMEs with solutions in hardware, software and integration ideas that can reduce our energy consumption in buildings. The challenge is for us to help the inventors to break the various barriers so they can access markets worldwide – NOW! One such barrier could be the IPR and our current paradigm of handling it.

Besides making the process extremely time consuming and tedious, our current approach to IP is contradictory to the 'collaborative solution seeking' mindset we need to solve this global challenge immediately. SME's seldom have the time or resources to dedicate eons of time to this process. Some do, most don't. Their ideas rarely make it. Not only has the SME lost the immediate business opportunity, we as global communities have lost one more idea we can build on. In lighting Science, we have spent several million dollars and at least 18 months, wrestling with totally unnecessary IP battles. This valuable money and time applied to technology development and collaboration could have resulted in badly needed energy saving solutions.

IPR now has a dampening effect on the SME community and really has kept us from opening up our full potential as a community of inventors and innovators. If we have to accelerate commercialization of new technologies to contain climate change, our paradigm on IPR will definitely have to change. So what do we do?

I believe there are a few things we could do, to help us build solutions globally to mitigate the effects of climate change, while preserving the opportunity for inventors to gain economically from their IP. The recommendation is to deal with all such patents outside of our 'normal channel'.

- An IP clearinghouse segmented by technologies (e.g. carbon sequestration, wind turbines, etc.) can provide a means for wider access on reasonable terms.
    1. Voluntary participation, but to take, one must contribute.
    2. The clearinghouse would license to the contributed IP on reasonable terms.
    3. Preferably private rather than public, not for profit, not unlike ASCAP and BMI for music copyright administration.
    4. Requires independent panel of technology and IP experts to blindly (with respect to the IP owner and the prospective licensee) set the royalty rate for access to the IP [not statutory rates].
    5. Since the IP rights tend to be national rather than international, can be implemented on a country by country basis.
- Governments can jump-start such a clearinghouse by contributing their own IP (e.g. in the U.S., I P from government sponsored research and the national laboratories).
- Universities may also participate rather than individually pursuing licensing programs.
- Part of the proceeds might be used to support patenting for individual and small inventors.
- Need not be confined to patent rights -- could also be early and full sharing of know-how.
- Market principles should be kept in mind -- the idea is to remove some of the barriers to downstream access, but not remove the incentives for innovation and IP. [Imagine if all the money spent in stent or cell phone or blackberry patent fighting was instead used for further development or deployment].

- The clearinghouse would level the playing field with respect to access and IP licensing cost, remove distracting litigation, but still reward IP commensurate with value.
- Participants may emphasize their participation in the clearinghouse with a certification trademark -- it would designate that they recognize that the problem is big, that the solution is needed as soon as possible, and that they will not let their IP rights slow further development or deployment by others.

Breaking down geographic barriers and building global communities of Innovation among SME's will enable us to generate more meaningful solutions faster.

Such an exchange with basic arbitrage built in, will also enable SMEs to access markets in other parts of the world, where they would not normally be focused on. This will also encourage cross pollination of ideas and enable inventors to build better mousetraps, faster.

With respect to the upcoming international negotiations, and specifically addressing the spreading of climate change technologies, I am concerned about the time it will take to reach consensus for any collaborative effort given our current approach – of protecting IP along geographic boundaries. Most conversations at a global level, approach this from a protectionist framework. Enabling market forces of demand and supply to play out globally, and enabling technology inventors to collaborate more openly, is imperative for us to rapidly spread appropriate technologies worldwide. This change in approach will have to begin with a shift in how we look at IPR in this environment of such a massive global challenge.

Perhaps our resolve and willingness to set meaningful targets for emission reduction could influence how we can drive a more collaborative approach in Copenhagen. Such forward thinking discussions combined with proposals to enable rapid innovation across boundaries can be a great mechanism for us to spur innovation and rekindle the economy. I am afraid we will shy away as a global community, from making bold decisions, when anything less will leave us far short of what is required. I'll be happy to answer any questions you may have.

**Summary of Key Points in the testimony:**

- Urgent need to act on climate change – as a global community
- We have to break down barriers between sectors and countries – collaborative approaches are going to be key. Tackling climate change has to go beyond geographic boundaries and "business as usual" mindset
- There are tremendous business opportunities to take our ideas to emerging economies like BRICA and the Middle East. Opportunities also exist for Small and Medium enterprises (SME's) to create new markets around the world – specifically in areas of energy generation, distribution and application.
    1. The developing economies around the world, for a long time now, have been battling an increasing gap between demand and supply of energy. They are viewing the renewable sources as a great opportunity to bridge that gap and are planning to do it with greater sense of eco-responsibility
    2. Countries in the middle east are redrawing their energy roadmaps and are paying very close attention to usage, not only energy generation
    3. All this is activity is generating a rapidly growing interest in new products and new solutions
    4. Governments in these countries are strongly encouraging conversion to energy efficient technologies/solutions – creating markets for the right solutions
- While markets are being created locally in these countries, there is little technology flow or collaborative approach to the climate change challenge
- Among other barriers, I believe our current paradigm on IP renders it more of a barrier and is limiting the flow of technology across geographic boundaries and is seriously slowing down our ability to get to creative solutions
- I personally believe an extension of IP sharing and collaborative innovation can lead to effective solutions faster
- Businesses need assurances of IP protection to justify investment in technology Businesses also need assurance of freedom to operate [infringement actions] and at reasonable cost [reasonable royalties]

## So what's the solution?

Governments can enable collaborative innovation to battle climate change; one possibility is to create an 'IP bazaar/clearing house' for all technologies contributing to reduction of GHG emissions. Creation of an open innovation platform, supported by a 'global fund' to ensure value flow to the inventors and innovators, will foster cross discipline and cross geography collaboration more freely, thus building the ability for innovators around the world to connect in pursuit of solutions towards fighting climate change.

- One possibility is to create an 'IP bazaar' or an 'Global IP Xchange' for all technologies contributing to reduction of GHG emissions, climate change technology (CCT). This exchange will be a clearing house for all patents relating to CCT.
- Potentially all inventors would submit their patent ideas to this exchange and also search the exchange for other patents to build on and license from.
- It would also be smart to create a fund to finance patenting, cross licensing as well as providing basic economic assistance to all valid innovations.
- The clearinghouse could also have a certification trademark, for example like energy star or good housekeeping. The idea being that if you contribute to the clearinghouse, you get to use the certification mark which shows that you are putting the good of the planet over personal gain without conscience.

Breaking down geographic barriers and building global communities of Innovation among SME's will enable us to generate more meaningful solutions faster.

The CHAIRMAN. We appreciate that, Mr. Rao. We will have plenty of time to ask you questions.

Our next witness today is Mr. Robert Nelsen, co-founder and managing director for ARCH Venture Partners. His company has significant experience in the early sourcing, financing, and development of emerging technology companies.

As a part of ARCH Venture Partners, Mr. Nelsen has contributed to the development of over 130 companies, including leaders in the fields of solar and biofuels. These companies hold over 1,200 U.S. patents and patent applications.

We thank you for joining us today, Mr. Nelsen.

**STATEMENT OF ROBERT T. NELSEN**

Mr. NELSEN. Good morning. Thank you, Chairman Markey and Ranking Member Sensenbrenner.

My name is Robert Nelsen, and I am the co-founder and managing director of ARCH Venture Partners. ARCH has spun more companies out of U.S. universities and national laboratories than any other venture capital firm. I have been involved in founding 30 companies over 23 years, including companies that are the standard of care in breast imaging, the leader in K–6 mathematics, the leading genomics company, and Sapphire Energy, the leader in algae biofuels.

Please for a moment imagine a world with oil made here in the U.S.A. with just $CO_2$ and sunlight on desert land powering conventional cars and jets. Imagine a world where solar energy costs 6 to 8 cents a kilowatt hour with no subsidy. That time is now. Those technologies exist today, and that innovation is happening in our research universities and labs and in start-ups, not in big companies. Big companies don't do that anymore, and they don't take the risks.

This bottle of algae oil from Sapphire Energy has 200 patents behind it and $100 million of private capital just to start. It will compete with Exxon and the Middle East and China. Sapphire has a huge lead now because of U.S. innovation and patents, and we are hiring hundreds of people in New Mexico and California.

Without those patents, no money would come, no plants, no jobs. With a strong world patent system and the right voluntary incentives for global cooperation, we can use this green crude to make poor countries oil exporters; and we want to do that.

I believe the only way to get to energy independence and solve global warming is through technology. Four to five inventions in the next one to ten years will change everything: algae biofuels at scale, solar that competes on cost, new batteries, new lighting with 10× less electricity consumption. It will happen only in the U.S. Almost all of the major breakthroughs in energy are happening here, not just 50 percent of the patents but almost all of the major breakthroughs only because of strong IP protection, only because of huge private venture capital investments that follow Federal research.

Now imagine a world where we allow Big Oil to run over the innovators because of weakened patent laws and weakened enforcement, where we accidentally harm our own clean industries by using compulsory licensing instead of incentives, where we increase

taxes on investors who create new companies, jobs, and solve our policy goals, like reducing carbon. That could be our trajectory.

The light at the end of the tunnel is this committee and others who are saying, wait a minute, policy goals actually matter. We need to support and reward the innovators. We need funding support for scale-up, and we need support in other committees of Congress so that we do not inadvertently and accidentally hurt energy innovation. We need the right policies and incentives for global cooperation so we can deploy our solutions rapidly to the world, while still protecting jobs at home. We may even need something like a World Green Bank to help fund the deployment of green technologies in developing countries.

Our greatest global competitive advantage in the next decade is energy innovation. Regardless of your position on global warming, we will lead the world in innovation, and we will become more secure as a result. Venture capital investment in energy is solely dependent on our patent system and protection of intellectual property. Without that investment, we all lose. Without a healthy venture capital environment, our policies will fail. With policies that encourage that investment, we are more secure, more prosperous, and we will have a greener and cleaner environment for the benefit of the global community.

Thank you.

[The statement of Mr. Nelsen follows:]

**"Climate for Innovation: Technology and Intellectual Property in Global Climate Solutions" in the House Select Committee on Energy Independence and Global Warming**

**July 29, 2009**

**Testimony of**
**Robert T. Nelsen, Co-founder and Managing Director**
**ARCH Venture Partners**

## Introduction

Chairman Markey, Ranking Member Sensenbrenner, Members of the Committee thank you for the opportunity today to present the venture capital industry's views on the importance of intellectual property protection to the pioneering investors and innovators in clean technology and other science-based companies in the United States. Often these are the companies which transform the research of our great universities and national laboratories into commercially viable products that change the way we work and live. The path to commercialization is long and arduous. It is paramount to adequately reward those who travel this path so that they will continue to take the risks necessary to maintain a vibrant innovation ecosystem. Intellectual property protection is a critical ingredient to this process.

I am the Co-founder and Managing Director of ARCH Venture Partners, one of the most prolific developers of early-stage university and national laboratory start-up companies in the world. Over the course of more than 20 years, we have created over 130 companies from basic research at academic institutions, including leading companies in biofuels, solar energy, education, semiconductors, software, internet, personalized medicine, stem cells, and biomedicines. These companies hold over 1200 U.S. patents and patent applications. ARCH was founded by Walter Massey, former head of the National Science Foundation and President of Morehouse College, now Chairman of Bank of America, and Steven Lazarus, former Associate Dean of the Chicago Booth Business School at The University of Chicago. We have offices in San Francisco, Seattle, Austin, Boston, and Chicago.

**Innovation, Venture Capital, and Economic Growth**

The United States is propelled by innovation. Our pioneering spirit has historically set our economy apart from those of all other countries. We commend our government for understanding the dynamics associated with scientific discovery and supporting these efforts historically through policy making. As a nation, we invest over $100 billion of taxpayer money every year into research at our universities and laboratories. This work takes place even as large companies in the private sector reduce their fundamental research investment. It is imperative to feeding our discovery pipeline here in the U.S. and worthy of substantial protection.

The venture capital industry also plays an important role in this innovation life cycle. Our job is to invest substantial sums of money, mostly from institutional investors, into those innovative ideas with the most promise to become commercially viable. We seek out these ideas from labs, identify those which hold the greatest potential, and build management teams and companies to bring the product to market.

Our model of innovation works well. The venture capital ecosystem, in combination with our universities and national laboratories, have now created companies that represent more than 12 million jobs and equate to 21% of U.S. GDP. These companies, all which were once small start-ups, comprise many of the most innovative entities in the United States including Genentech, Amgen, Intel, Google, and Cisco. In the past three decades we have invested billions of dollars into companies operating in the information technology and life sciences sectors.

Within the last three years our industry has committed itself to investing in the clean technology sector, building companies in the renewable energy, conservation, purification, and power management spaces. Just as we built the biotechnology, semiconductor and software sectors, we hope to do the same by creating a clean technology economy here in the United States and abroad. In 2008, venture capitalists invested more than $4 billion into clean tech start-up companies, making it the fastest

growing industry segment for the year. The collaboration among venture capital funds, start-up enterprises, and university research continues to be the envy of the world and one of the primary keys to our economic future.

**Risk and Intellectual Property Protection**

Despite our successes, risk is a significant part of our equation. Our investment time horizon is long term, with most companies requiring continuous capital infusions for a period of 5-10 years. During that time, we must navigate technology and market risks, regulatory approvals, and competition. To wit, approximately 1/3 of our companies fail. However, those that succeed do so in a large enough way to balance the failures. We rely on the successes to make a return for our investors so that we may continue to operate and fund new deals.

Intellectual property is the key to this process. Our investment model is based on the ability of companies to become profitable and ultimately stand on their own without our capital. Patents help to significantly mitigate the risk of bringing new inventions to market and allowing companies to reach this goal. In fact, private venture capitalists invest largely based on the strength of those patents. Without these patents, there would be no venture capital investment, leading to no job creation, no energy independence, and no breakthroughs in climate change. The game is ours to lose.

Now is a critical time to safeguard our intellectual property policy. Out of the many patents that will be filed in the coming years, there will be a handful of world-changing inventions that can crucially alter the course of our future. These are the jewels we need to protect and include inventions that:

- reduce carbon or allow for its reuse;
- relieve us of foreign oil dependence;
- prevent and treat pandemics;

- address chronic diseases and life threatening conditions including diabetes and Alzheimer's, saving 40% of the future Medicare budget; and
- allow us to use electronic information more efficiently and effectively across all industry sectors.

**Supporting Clean Technology Investment**

As it relates specifically to clean technology, the issue we need to collectively explore is how to protect the truly pioneering inventions that we need in order to continue to lead the world scientifically and economically, while distributing innovations globally. We can all agree that it is in everyone's best interest to widely deploy ground breaking green technologies; yet we must temper this enthusiasm with the reality that no investor in this country will put money into an innovation that is going to be quickly copied as soon as it hits the market.

Pioneering clean-tech inventions requires a huge investment upfront, and relies solely on original intellectual property protection to attract investors. By their very nature these inventions challenge entrenched industries and markets, and take orthogonal approaches to intractable societal problems. One example of this dynamic is Sapphire Energy's algae oil. This company is working on a true breakthrough, made by harnessing the energy from the sun and capturing CO2, to grow algae on non-agricultural land using non-potable water to make gasoline, diesel, and jet fuel. Sapphire has revolutionized plant biology to coax algae into making "green crude," which can be refined at scale, just like crude oil. Over 200 patents and patent applications back the technology, and it has attracted some of the largest investors in the world. This money is invested solely in the breakthroughs that are protected by those patents.

Sapphire is currently hiring hundreds of employees to scale up their process to produce billions of gallons of crude in the coming decade. Their first task is to help to shore up our energy security here in the United States. Their plans also contemplate a number of partnerships in the developed and the developing world. We can make poor countries oil

exporters with the right private partnerships. All these partnerships are dependent on patents, and the investment needed will be in the tens to hundreds of billions of dollars. The only way to attract that type of money into the developing world is with patented technology backed by the U.S., or the investment will never come, and innovation will not happen.

Without significant venture capital investment of $100,000 to $150 million, these promising technologies such as Sapphire Energy that underpin the future of our country and our world will not be developed. Only after these seed and early stage investments have demonstrated the viability of an idea can they attract even larger commitments, which can range from $200 million to billions of dollars. Intellectual property is a requirement for obtaining this level of investment. The same applies in foreign lands, where we need the support and strength of the U.S. government to prevent the loss and outright theft of intellectual property, and to encourage forward-looking government-to-government cooperation. Essentially, the wrong policies could increase the original business risk to the point that the first investment is never made as the risk becomes too great that the intellectual property would not be protected. In addition, large companies may take advantage of the increased market power they gain with weaker intellectual property laws and delay investment in small companies. Thus, these technologies may never get to scale and ultimately benefit the public.

**Putting Forth the Right Policies**

Policy making has a large impact on our very small industry. The type of seed venture capital and pioneering work we do is already a tentative business, and small perturbations in the system can have large effect in investment, innovation, and U.S. competitive advantage. We are not immune to the recession. Many predict that as much as half of U.S. venture capital firms will disappear as a result of the current downturn. The venture industry needs public policies that continue to support our investment in the riskiest but most promising ideas our country's innovators have to offer.

Like many effects of policy, the business reality of any weakening of intellectual property laws, talk of compulsory licensing, and increasing taxes on early-stage investors, will take effect immediately in the game theory of the negotiation. In the meantime, the uncertainty and tilt toward lower innovation and entrenched market leaders, will serve to quash the breakthrough innovations and solutions we need to solve the pressing problems we face.

Imagine a world where we share our inventions with other countries, and because of weakened patent laws, other nations are able steal the United States' scientific jewels. Or a world where we allow large entrenched corporations to run over the small innovators who lose their one competitive advantage because of weakened patent laws. This is our potential trajectory if we give way to less intellectual property protection. We must support innovation by ensuring that inventors and investors are protected and rewarded for the risks that they take over a long period of time.

Understanding that it is going to take hundreds of billions of dollars to bring these technologies to market, we know that private industry will not invest in innovation that will be made available to everyone. And it is unlikely that the governments' will come up with the hundreds of billions in place of the private sector.

If the United States is going to be the assumed innovator in clean technology, we need to create an enabling environment that takes advantage of this country's innovators and the speed of privately developed energy solutions. We must also foster the ability of governments to cooperate to speed the applications toward certain problems, in certain geographies, or in the developing world. There already exists an established set of universal intellectual property rules by which all other governments should play. The missing ingredient for the developing world is a set of incentives for new technologies to be deployed there, like a World Green Bank, modeled on the U.S. Green Bank that can help finance alternative energy projects in the developing world. The voluntary programs will be more effective, attract more private capital to developing countries, and will not derail the cycle of innovation.

**Conclusion**

The necessity for fundamental, not incremental, scientific breakthroughs is increasing. Without major discoveries that change the productivity and economics of alternative energy, our efforts for energy independence and climate control will certainly fail. These discoveries and commercialization are predicated on venture investment. And I can say today with certainty that venture investment would not continue into a space where patents and intellectual property are not protected. The risk is too great even for the industry that prides itself in taking on many risks to bring innovation to life.

In these hard economic times, we are still the best innovators, and our venture capital industry is the envy of the world. Think about this—venture funded companies in the United States in just the last 40 years comprise almost the GDP of Germany. Our path to a future economy that is sustained by high productivity gains and the creation of new industries is clear. But we must think about the health of this fragile innovation infrastructure and ensure that our policies protect it. As we consider intellectual property laws, patent protection and other legislation, we must continuously ask ourselves how it affects investment as the harm of unintended consequences to the most competitive and important industries could be real and fast, ceding strength to foreign competitors.

We applaud the Committee for proactively seeking the right path to continued innovation in the U.S. and exercising your collective power to stand up for the intellectual property that underpins United States competitive advantage. We truly have an historic opportunity to innovate and lead the world in the creation of a new U.S.-led industry, with million of jobs here at home, positive global environmental impact, and enhanced energy security. Your actions or inaction will have real effects on the survival of clean-technology and other innovative industries in their tentative relationships with the goliaths of the energy world and foreign countries.

Whether you believe that climate change is the imperative, or that energy security is the key, innovation solves both problems. We all have a stake in protecting it.

The CHAIRMAN. Thank you, sir.

Our next witness is Ms. Jennifer Haverkamp, who is managing director for international policy and negotiations at the Environmental Defense Fund.

Previously, Ms. Haverkamp served for 8 years as the Assistant U.S. Trade Representative, where she was responsible for reconciling U.S. trade policy and environmental policy. She has taught international environmental law at Johns Hopkins University; and we welcome you here, Ms. Haverkamp.

**STATEMENT OF JENNIFER HAVERKAMP**

Ms. HAVERKAMP. Thank you very much.

Good morning, Mr. Chairman and members of the committee. It is an honor to be with you here today.

Here is my message: Concerns about intellectual property rules are solvable problems. In fact, a strong climate policy will lead to a blossoming of new intellectual property.

In my statement I will make three points.

Point one, the most important driver of U.S. technology development and U.S. competitiveness is a strong domestic climate policy. I know this is a hearing about intellectual property rights, but really I think what we are talking about is our economic competitiveness, our concern that sharing our own clean tech overseas will let economic competitors get ahead by stealing our secrets.

The truth is they don't need to steal our ideas to outcompete us in the new energy economy. They can simply seize the opportunity first; and Europe, Japan, and others are racing ahead right now when it comes to new carbon technologies.

How do we get back in the game? By putting a cap on greenhouse gas emissions, as this House has moved to do. That will create an enormous domestic market for low-carbon technology. And the alternative is to sit tight and watch our foreign competitors take a commanding lead in the new energy economy, and that would be a terrible mistake.

Think about this: China's seventh richest man, Shi Zhengrong, is worth $1.43 billion and is a low-carbon solar entrepreneur. And, during 2008, China became the largest solar panel producer in the world, with 95 percent of its production destined for export.

I brought one graphic which my colleague will post there. The chart reflects the geographic distribution of patents around the world. And, as Congresswoman Blackburn noted, the circle on the left, the green half of the circle, is U.S. patents from the years 2002 through 2008. We lead the world in clean energy patents, but we have a much smaller share of production, only 9 percent in 2005 for solar. The problem here isn't theft of our IP; it is that we don't have the right national policies.

Of course, where valid concerns about IP exist, they must be addressed. But we are not going to build a clean energy economy just by having a lot of pieces of paper from the Patent Office. We need factories and installers, and we get that by putting a cap on carbon.

Point two, in the U.N. climate negotiations, intellectual property discussions have so far displayed strong rhetoric that limited analytical basis. IP rights are becoming a flash point in the U.N. cli-

mate negotiations, where IP is one part of the broader issue of tech transfer.

Over the years, developing countries have been promised and have had high hopes for tech transfer, but they have mostly been disappointed. As others have noted, the parties to the international negotiations hold sharply divergent perspectives on IPR. Many developing countries argue that IPR restricts their access to climate-friendly technology and seeks special treatment and relaxing of the rules. They see the situation as analogous to life-saving medications like those for HIV and AIDS.

But there are big differences between pharmaceuticals and low-carbon technologies. Unlike pharmaceuticals, many of the tools necessary to reduce carbon emissions and adapt to a warming planet are not leading-edge, unique solutions. They are existing technologies, unprotected by patents even in the developed world.

Consider three main ways of emissions reductions: The first, energy efficiency, typically involves things that don't require IP licenses: putting up insulation, caulking air holes, installing more efficient windows, appliances, that sort of thing.

The second, clean energy production, likewise does not appear to be significantly hemmed in by patent protection. Many companies in different countries compete to offer renewable energy equipment. In wind, for instance, there are at least 20 different firms scattered in many countries competing to sell wind turbines. When a technology depends crucially on a single patent, such as a drug to treat HIV and AIDS, this doesn't happen.

Finally, consider a third way, sequestering carbon in farms and forests. To our knowledge, there are no exclusive rights, for example, in planting more trees, flooding rice patties less often, or using less fertilizer.

It is also important to remember that getting a patent, unlike copyrights, requires a time-consuming and often costly application process in each individual country. Thus, unless an inventor has obtained a patent in a particular country, he or she won't have any patent rights to enforce there.

For these reasons, it is not clear whether there are enough IPR problems for climate-friendly technologies to support significant modifications or exceptions to the rules.

It is also important to keep in mind when evaluating the developing countries' proposals in the U.N. negotiations that countries are in the midst of what has finally ripened into an actual negotiation, with parties ramping up their rhetoric and staking out strong positions in anticipation of future compromise.

Point three, we need to be vigilant for emerging problems from either side of the issue, potential infringement of IPR rights or potential IPR barriers to technology access. As I have noted, the case remains to be made in favor of climate-specific modifications to the rules. The urgency of the climate problem demands, however, that climate-friendly technologies be widely available and that breakthrough innovations be quickly and widely disseminated. Accordingly, we must continue to monitor the situation and respond swiftly if IPR rules are found to be blocking effective tech transfer. But, should that happen, the fora that specialize in IPR rules, the World Intellectual Property Organization and the TRIPS agreement, ap-

pear better positioned than the U.N. climate talks to address that issue.

In closing, cooperative research and development can play a crucial supporting role in tech transfer; and the recently announced U.S.-China jointly funded center for CCS research is a good example of that. It helps set the stage for constructive U.N. negotiations toward the end that we must achieve, a global deal to reduce greenhouse gases from all major sources.

[The statement of Ms. Haverkamp follows:]

Corrected

Statement by

Jennifer A. Haverkamp
Environmental Defense Fund
July 29, 2009

Regarding
"Climate for Innovation: Technology and Intellectual Property
In Global Climate Solutions"

Submitted to the
U.S. House of Representatives
Select Committee on Energy Independence and Global Warming

## Introduction

I am honored to be here today as this Committee discusses how clean technology can help achieve global climate solutions -- and how intellectual property rules can either facilitate or hinder the availability of innovative technologies in the developing world.

My testimony today will make the case that concerns about intellectual property rules are solvable problems that need not get in the way of strong climate policy. U.S. climate legislation will be a driver of technology innovation, which U.S. companies will be able to export as well as use at home, without compromising intellectual property protection. In the UN negotiations so far, intellectual property discussions display strong rhetoric but limited analytical basis. We need to continue monitoring developments for problems that may arise on either side of the debate – potential barriers to technology access, and potential infringements of IPR rights. Finally, cooperative approaches to technology development are a promising avenue to explore.

## I. The most important driver of U.S. technology development and U.S. competitiveness is a strong domestic climate policy

This is a hearing about intellectual property rights, but really, I think we are talking about our economic competitiveness. The concern I hear, at a very basic level, is that we should not share our own clean tech overseas because our competitors might get ahead by stealing our secrets.

If only it were that easy. The truth is that while the integrity of our intellectual property is obviously important, our economic competitors don't need to steal our ideas to outcompete us in the new energy economy. They can do it in the standard way: our competitors can simply seize the opportunity first.

Demand for low-carbon technologies is soaring, globally, helped by policy decisions in the European Union, Japan, China, India, and other nations to cut pollution, increase energy security, and even gain advantage in new markets. At home, however, we're still debating the role we're going to play in this new economy. Are we going to adopt a cap on carbon, stimulating enormous domestic demand for the technologically advanced products that American firms are well-positioned to produce? Or are we going to sit on that idea for a few more years, and let our competitors use the time to open up an insurmountable lead in the race to supply the low-carbon economy?

Three years ago, New York Times columnist Thomas Friedman reported that China's seventh-richest man—Shi Zhengrong, a gentleman worth $1.43 billion—runs Suntech, a company that makes silicon photovoltaic solar cells. One of China's richest citizens is a low-carbon entrepreneur! As Mr. Friedman wrote at the time, "It should only happen in America."

The story on Mr. Shi wasn't a fluke. During 2008, China became the world's largest solar panel producer in the world, with 95 percent of its production destined for the export market.[1] Suntech, with a market capitalization of $3.6 billion, is now China's largest solar module producer.[2]

And what about intellectual property (IP) in this area, during that time? The following chart says it all:

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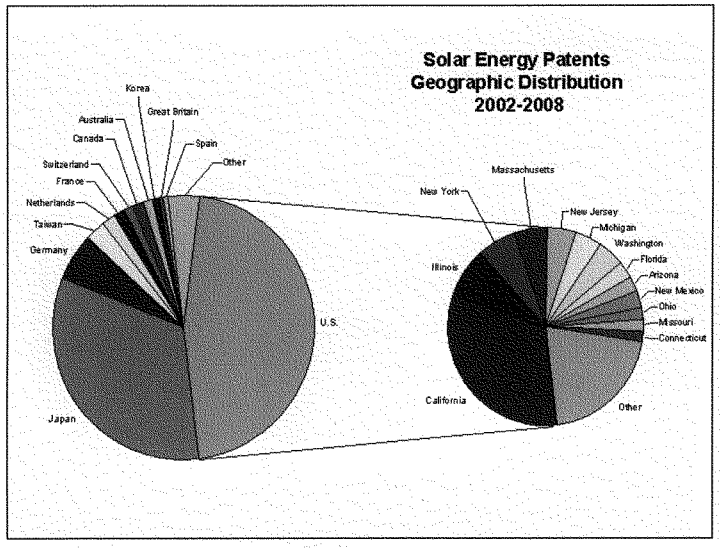
[1] United Nations Environmental Programme 2008, available for purchase at www.unep.org/publications/Annual_Reports.asp.

[2] www.forbes.com/2009/07/16/china-green-energy-business-energy-china.html.




Source: Clean Energy Patent Growth Index, 4th Quarter, 2008, available at http://cepgi.typepad.com/heslin_rothenberg_farley

From 2002-2008 the United States led the world in solar energy patents. But our market share of production? About 9 percent as of 2005. This isn't about IP theft: Japan, with about a third of the total patents, locked up over a third of the solar market production during the same period of time. Europe has about 28 percent of the market share, with a slightly smaller representation in patent filings.[3] Our good ideas just aren't translating into market share.

Recognizing that any market, including the clean tech market, is complicated, and that more than one factor goes in to a pattern like this, it's safe to say that the demand for these products is elsewhere, and so is the production. Since 2005, the United States has dropped from third to fifth in total global solar production. Nine of the ten largest photovoltaic manufacturers are foreign companies.[4] Our competitors are not beating us by stealing our ideas. Indeed,

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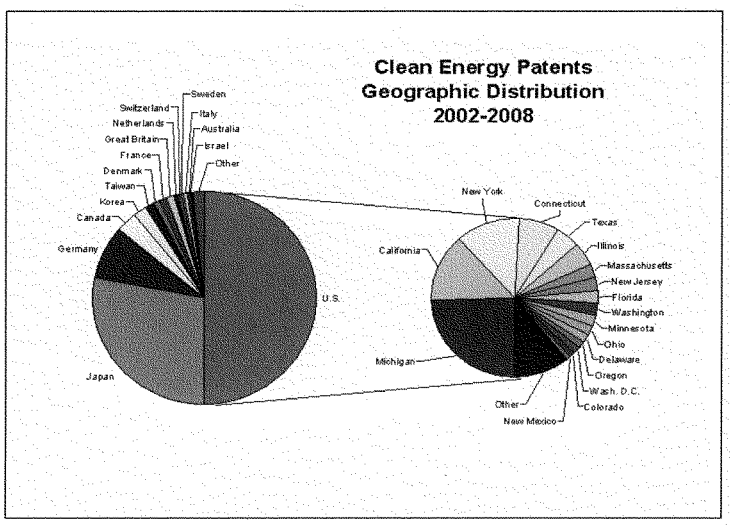
[3] http://www.earth-policy.org/Indicators/Solar/2007.htm, and Clean Energy Patent Growth Index, http://cepgi.typepad.com/heslin_rothenberg_farley_/.

[4] www.earth-policy.org/Indicators/Solar/2007.htm.

intellectual property disputes in this area are infrequent, so far. They're beating us the old fashioned way, by investing in production and seizing market share.

I've used the solar industry to make the point, but to be clear, this is not an isolated circumstance in which we have the ideas but not the economic edge. At the aggregate level in the clean tech sectors, which include wind, solar, fuel cells, geothermal, and other clean renewable energy technologies, the picture is even starker. As the following picture shows, we clearly dominate the field in intellectual capital not just in the solar industry, but in the clean energy sector as a whole:




Source: Clean Energy Patent Growth Index, 4th Quarter, 2008. www.cepgi.com

Time and space do not permit me to break down each industry, but the trend represented by the solar industry example persists. We lag in these key areas, where our competitors are making big investments, while we struggle with a course of action. Valid concerns about IP do exist in some areas, and these must of course be addressed. But to focus on IP issues at the expense of the bigger picture—our failure to provide incentives crucial to developing a market for our domestic entrepreneurs—is to miss the forest for the trees. Intellectual property disputes in the clean tech area are not numerous; the sector doesn't compare to, say, pharmaceuticals with respect to IP disputes. It's much more that our competitors are making decisions—sometimes

controversial, but decisions nonetheless—that are boosting their production capacity, driving down prices, and capturing market share that will be difficult for us to regain. It's a classic story, albeit one in which our nation has traditionally been the victor.

We, too, need to make some decisions. The incentive we are lacking is the clear policy signal that tells our entrepreneurs, our venture capitalists, our innovators, our market leaders that it's time to put their money down and invest the intellectual and material capital in reducing greenhouse gas emissions. This is not a problem that many of our chief economic competitors still have. Just to give you a sense of it: a little more than a year ago, China announced plans for 30 gigawatts of wind capacity by 2020.[5] Far from lagging on its ambitious goals, it appears that China will meet that goal far ahead of schedule – by the end of 2010.[6]

The companies in the countries we will have to catch up to are capitalizing on the rapidly increasing demand in Europe and Asia. They are building production at home, and doing business both at home and with our competitors. Suntech, the Chinese company I mentioned earlier, makes 90 percent of its product for export. India's Suzlon Corporation, one of the leading wind energy manufacturers in the world, makes its turbines for China and Europe. Where are our exporters? Back in the pack. Not where they should be.

Since signing the Kyoto Protocol in 1997, Europe and Japan have increased the number of clean-tech patents at a rate of 9 percent per year. There was no such increase in the United States, which has not ratified the Protocol, nor in Australia, which waited until 2007 to do so.[7] At home, until the President signs cap and trade climate legislation into law, we lack the clear market signal that creates innovation.

This isn't a theoretical possibility; we have seen it work before, in the case of the sulfur dioxide emissions that cause acid rain. Once we started requiring utilities to reduce their

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[5] http://blogs.wsj.com/environmentalcapital/2009/07/06/wind-power-chinas-massive-and-cheap-bet-on-wind-farms/.

[6] http://www.nytimes.com/2009/07/03/business/energy-environment/03renew.html?_r=2&pagewanted=2&ref=business .

[7] Dechezleprêtre, et al. Invention and Transfer of Climate Change Mitigation Technologies on a Global Scale: A Study Drawing on Patent Data. CERNA Research Programme on Technology Transfer and Climate Change, February 6, 2009.

emissions, the number of pollution control patents increased dramatically.[8] We gave innovation another shot in the arm when we adopted the path-breaking cap-and-trade system for sulfur dioxide in the 1990s. That program demanded results without restricting the technological means to achieve them. The result was to redirect R&D towards scrubbers that removed more pollution, while giving electric utilities a strong economic incentive to adopt more cost-effective scrubbers.[9] In many cases, the biggest changes spurred by cap-and-trade were not patented technologies at all, but process innovations that cut pollution at much lower cost than anyone had expected.[10]

Just a few weeks ago, John Doerr, a giant in the venture capital world and no stranger to the world of intellectual property, said this before the Senate Environment and Public Works Committee:

> "What do Amazon, Ebay, Google, Microsoft and Yahoo have in common? They are the five worldwide leaders in internet technology and they are all American. But when it comes to wind, the most mature of the clean energy sectors, of the top five manufacturers (Vestas, GE, Gamesa, Enercon and Suzlon) – only one is American.
>
> In a broader context, the U.S. is now home to only one of the ten largest solar PV producers in the world, one of the top ten wind turbine producers and two of the top ten advanced battery manufacturers. . .
>
> I am here to tell you that our government's energy and climate policies are our principal obstacle to success. To repeat: Our nation's current policies are the principal obstacle to creating even more new jobs in the next great industry, clean technology.
>
> - We have no long term market signal that tells companies and consumers that we value low carbon energy.
> - We have no policies to discourage sending hundreds of billions of dollars a year overseas for energy.

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[8] Margaret R. Taylor, Edward S. Rubin, and David A. Hounshell, *Effect of Government Actions on Technological Innovation for $SO_2$ Control*, Environmental Science and Technology 37(2): 4527-4534 (2003), available at http://pubs.acs.org/doi/abs/10.1021/es034223b.

[9] David Popp, *Pollution control innovations and the Clean Air Act of 1990*, Journal of Policy Administration and Management, 22(4): 641-60 (Fall 2003); Nathaniel O. Keohane, *Environmental Policy and the Choice of Abatement Technique: Evidence from Coal-Fired Power Plants*,, working paper (2005).

[10] Dallas Burtraw, *Innovation Under the Tradable Sulfur Dioxide Emissions Permits Program in the U.S. Electricity Sector*, Resources for the Future Discussion Paper 00-38 (September 2000).

> • We do not have adequate sustained R&D to be a serious competitor in this huge business.
>
> Believe me, today's policies stifle American innovation and competitiveness. But good policy can flip this dynamic around, and give our country and companies a fighting chance in the new global energy economy."[11]

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Doerr doesn't mention intellectual property.

## II. National and International Regimes for Enforcement of Intellectual Property Rights

Of course, in some circumstances, IP protection is a central concern: it can be difficult for a firm to justify making costly investments to achieve technological breakthroughs if one's competitors can immediately exploit the resulting innovations. To solve this problem, the U.S. and most other countries have created national patent, copyright, trademark, and trade secret laws to enable inventors, authors, and other IP developers to enjoy certain exclusive rights in their creations. These laws give IP owners a limited set of exclusive rights, such as a 20-year term of protection for patentable inventions. And the national laws of most countries are woven together in a framework of international conventions, many of which are administered by the World Intellectual Property Organization (WIPO), based in Geneva.

Starting about 20 years ago, IP owners in developed countries led a successful effort to incorporate minimum IP standards into international trade agreements. The result was the 1994 Agreement on Trade-Related Aspects of Intellectual Property ("TRIPS"), which requires all members of the World Trade Organization ("WTO") to enact laws with relatively high certain levels of IP protection. Because membership in the WTO is important to countries that want to enjoy the benefits of low trade barriers for their own exports, the incorporation of TRIPS into the WTO has had a substantial impact on adoption of IP legal regimes.

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[11] Statement of John Doerr before the U.S. Senate Committee on Environment & Public Works, *Ensuring and Enhancing U.S. Competitiveness while Moving toward a Clean Energy Economy* (July 16, 2009).

The TRIPS Agreement sets minimum standards of protecting copyrights and related rights, trademarks, geographical indications, industrial designs, patents, integrated circuit layout designs, and undisclosed information. It also sets minimum standards for enforcement of IP property rights through civil suits, border actions, and, in some cases, criminal prosecution. By virtue of their membership in the WTO, more than 150 nations are also parties to the TRIPS Agreement. Among major GHG emitters, only Russia has yet to join the WTO. TRIPS does, however, give developing countries a period of time to bring their laws into compliance. TRIPS also allows countries to bring enforcement actions in the WTO against other countries for violation of their TRIPS obligations.

In the United States, Congress has directed the U.S. Trade Representative to seek to protect the IP rights of American companies by, among other things, publishing a "Watch List" and a "Priority Watch List" of countries in which piracy of IP is widespread.

### III. How the House Climate Bill Deals with Clean Tech for Developing Countries

It is strongly in our national interest to help the developing world reduce its greenhouse gas emissions. All the countries of the world share a single atmosphere, and only with large reductions from all major emitters can the world avoid the most dangerous consequences of climate change. Ultimately, the cuts in emissions must be large, and collective.

Once America puts a cap on carbon, we can expect U.S. firms to play a leading role in developing low-carbon solutions for our own economy. The solutions will include both business innovations (such as third-party financing of energy efficiency) and technological breakthroughs (such as finding ways to get more kilowatts out of an hour of sunlight). And American firms can play a critical role in ensuring that developing countries have the tools they need to reduce their own emissions. Putting a price on carbon emissions in the developing world will create business opportunities both in those countries and for American firms that can help solve problems both here and there.

In crafting H.R. 2454, the American Clean Energy & Security Act, the House recognized the value of the United States helping developing countries reduce their heat-trapping gas emissions. Among other things, the bill allocates a small number of emissions

allowances to "international clean technology deployment." At the same time, the House bill calls on the Administration to ensure continued protection of the IP rights of American firms.[12]

## IV. Do IP Rules Need to be Modified to Encourage Developing Countries to Reduce Emissions?

As developed countries have pushed for stronger protection of IP rights under international agreements, some developing countries, as well as some scholars (such as Prof. Joseph Stiglitz),[13] have criticized this trend. The biggest flashpoint has been pharmaceuticals, such as drugs for treating HIV/AIDs. While IP rights owners stress the need for exclusive rights to justify the high costs of research and development, critics have attacked pharmaceutical companies for insisting on pricing life-saving drugs at levels that are beyond the reach of most people in developing countries. In 2001, the WTO Ministerial Conference issued the Doha Declaration on the TRIPS Agreement and Public Health, which confirmed that developing countries have flexibility under TRIPS to take necessary steps to protect public health in their countries, including compulsory licensing in appropriate cases.

In the global climate discussions, some developing countries and various observers have raised concerns about IP barriers to their access to technologies for emissions reductions and adaptation, and likened the situation to that of essential medicines. There are, however, major differences between pharmaceuticals and low-carbon technology. On the pharmaceutical side, life-saving drugs are typically protected by patents, not only in developed countries like the United States but also in most or all developing countries. And these products often have no substitutes: there may be only one drug that can provide the medical benefit.

By contrast, many of the tools necessary to reduce carbon emissions and adapt to a warmer planet are not leading-edge, unique solutions, but existing technology unprotected by patents even in the developed world. To the extent there are patents on the relevant tools in developed countries, they usually cover "add-on" technologies, and there are often a variety of

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[12] H.R. 2454 at 1219 (Section 444, "Determination of Eligible Countries"). The "findings" and "purposes" sections of Subtitle D, "Exporting Clean Technology," also strongly urge protection of IP. H.R. 2454 at 1212 (Section 441) (findings), and at 1216 (purposes).

[13] Joseph Stiglitz, *Scrooge and intellectual property rights* (1996), available at www.bmj.com/cgi/content/full/333/7582/1279.

different companies offering similar products. Finally, according to a recent study (discussed below), firms often do not even apply for patent protection in developing countries, presumably because the benefits are not seen as worth the cost, and therefore the firms could not enforce rights they had not acquired.

Energy experts tell us that, unlike for some diseases, there is no single technical fix (or "miracle drug") that will result in a massive reduction in carbon emissions, whether in the United States or abroad. Rather, as the famous "wedges" analysis by Professors Socolow and Pacala shows, there are many different steps that people and businesses will need to take to reduce their carbon emissions.[14]

At the broadest level, there are three principal ways of reducing greenhouse gas concentrations in the atmosphere: (1) improving energy efficiency, (2) generating energy in ways that produce fewer (or no) carbon emissions, and (3) sequestering carbon in plants or the soil.

The first – energy efficiency – is not usually a high-tech proposition; rather, the task is typically to put up insulation, caulk air holes, install more efficient windows, use more efficient heating and cooling equipment, install more efficient appliances and lighting, install programmable thermostats and motion sensors, paint roofs white, and the like. Few, if any, of these activities require IP licenses. Nor, unlike HIV/AIDS medications, do the prices of the relevant products (such as insulation material or energy-efficient furnaces) reflect substantial IP components. It seems unlikely, therefore, that IP protection is a significant barrier to adoption of energy efficiency in developing countries. That does not mean there are no barriers to energy efficiency in the developing world – and it is in our interests to help overcome the real barriers that do exist. (One important way is through collaborative development.) The point here is simply that IP rights do not appear to be significant obstacles in this area at this time.

The second way of reducing emissions – clean energy production – likewise does not appear to be significantly hemmed in by patent protection. Many companies in different countries compete to offer the equipment needed to generate energy using photovoltaic (PV) solar, concentrating solar, wind turbine, and geothermal technology. In the most recent year for which data are available, at least 20 different firms, scattered in many countries, competed to sell

[14] S. Pacala and R. Socolow, *Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies*, Science, Vol. 305, at 968 (2004).

wind turbines.[15] And a recent market research study found 47 different companies manufacturing solar panels.[16] When a technology depends crucially on a single patent – such as for a drug to treat HIV/AIDS – this does not happen. And in looking at these industries, Wall Street analysts, like John Doerr in his testimony, typically do not mention IP as a limiting factor.[17] The analogy to pharmaceuticals – where a single pharmaceutical company may sell a unique life-saving product at a price far in excess of the costs of producing and distributing the drug – therefore appears weak.

To be sure, some cutting-edge clean energy technologies may, over time, raise concerns about whether IP protection is a barrier to widespread adoption of a clean energy technology. Some have raised concerns that capturing carbon dioxide at power plants and factories, and burying it underground – carbon capture and sequestration, or CCS – could be one such area. And others have raised concerns that broad patent claims on synthetic biology products could stymie the development of cellulosic biofuels. Those concerns appear speculative at this point, however: CCS can be implemented at this stage using a variety of competing tools and techniques, and commentators raising concerns about biofuels do not cite actual enforcement efforts.

Finally, the third tool – sequestering carbon in farms and forests -- similarly appears to pose few IP constraints. The House bill, H.R. 2454, includes in Section 503, a list of potential agricultural offset activities. A review of that list reveals few, if any, activities that raise IP issues. To our knowledge, there are no exclusive rights, for example, in planting more trees, flooding rice paddies less often, or using less fertilizer.

Because some degree of climate change is inevitable even if the world takes immediate steps to reduce carbon emissions, both developed and developing nations will need strategies and

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[15] Environmental Leader, *Wind Turbine Market Share Revealed*, www.environmentalleader.com/2009/03/05/wind-turbine-market-share-revealed/.

[16] Photovoltaic Reports, *Worldwide Solar Cell Manufacturing Facilities & Production Capacity 2007 – 2013* (August 2008), summarized at www.photovoltaics-reports.com/products/fuji71793-solar-cell.html.

[17] *E.g.*, Seeking Alpha, *Solar Stocks: Citi Says Still Too Early to Buy* (2009), http://seekingalpha.com/article/124616-solar-stocks-citi-says-still-too-early-to-buy (summarizing Citigroup report); Economic Times, *Merrill Lynch puts Rs 103 target on Suzlon* (2009), http://economictimes.indiatimes.com/Markets/Stocks/Stocks-in-News/Merrill-Lynch-puts-Rs-103-target-on-Suzlon/articleshow/4210768.cms.

technologies for adaptation to climate change's effects. In some instances, these methods may raise IP issues (e.g., specially-engineered crop varieties). In most cases, though, it appears that adaptation will require financial and human resources, and currently available technologies, to a much greater extent than protected IP. For example, the major ways of adapting to change in agriculture, forestry, and fisheries include changing sowing dates, planting different species, adding irrigation systems, managing forest fires, and using different inputs (such as changing fertilizer or field operations).[18] These methods seldom implicate patented technology.

In addition, it's important to remember that patents, unlike copyrights, can generally be obtained only by pursuing a time-consuming and often costly application process in each individual country. Thus, unless an inventor has taken the necessary steps to obtain a patent in a particular country, he or she will have no patent rights to enforce there. A recent study requested by the European Commission, in which the authors looked for patents relating to seven emissions-reducing energy technologies, concluded:

> "[P]atent rights can not possibly be an obstacle for the transfer of climate change technologies to the vast majority of developing countries: there are hardly any patents on these technologies registered in these countries. A relaxation of the property rights regime for the relevant technologies in these countries would not improve technology transfer to these countries."[19]

To date, therefore, there is not a substantial body of evidence of current IP barriers to development of clean energy, implementation of energy efficiency, or deployment of adaptation responses in developing countries. That could change, of course, and perhaps proponents of altering IP arrangements for climate-friendly technology will make a stronger case in the future. Should a new "must have" technology emerge, some fraction of the funds available under H.R. 2454 to help developing countries reduce their carbon emissions could be used to acquire necessary IP rights in the marketplace.

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[18] FAO International Working Group on Climate Change, *Adaptation to climate change in agriculture, forestry and fisheries: Perspective, framework and priorities*, available at ftp://ftp.fao.org/docrep/fao/009/j9271e/j9271e.pdf.

[19] Copenhagen Economics A/S and The IPR Company Aps , *Are IPR a Barrier to the Transfer of Climate Change Technology?* (Jan. 2009) (commissioned by the European Commission), available at www.eurosfaire.prd.fr/7pc/doc/1236588421_climate_change_ipr.pdf.

Finally, it is difficult to reconcile the contention that IP rights are blocking development of clean energy technology with China's extraordinary progress over the past few years in developing wind and solar power. According to a recent *New York Times* article, "China has built the world's largest solar panel manufacturing industry" and is "now building six wind farms with a capacity of 10,000 to 20,000 megawatts apiece."[20] To put this in perspective, as of April 2009, the entire state of Texas had about 8,000 megawatts of wind capacity.)

## V. Intellectual Property and Technology Transfer in the UN Climate Negotiations

IP rights issues arise frequently in the UN climate negotiations, in the context of technology transfer to developing countries. In the most basic terms, developing nations need help from industrialized nations to accelerate their transition to low-carbon economies -- and industrialized nations may be reluctant to share their most promising technological developments on terms they fear will lead to IP losses.

Disagreement on how to address IP rights ("IPR") has the potential to significantly impede the negotiations, in part because of spillover from earlier disputes over costly medicines, and also because of the prominence of the broader issue of tech transfer, of which IPR is but a part. Indeed, the issue of tech transfer is central to resolving negotiations on a global climate agreement that is itself instrumental to effectively reducing global emissions and averting dangerous climate change. Fortunately, this issue can be addressed in a way that helps the developing countries reduce their emissions and creates market opportunities for our innovative companies without compromising their intellectual property.

First, what do we mean by "technology transfer"? There is no single definition, but it is generally understood to refer to the transfer of systematic knowledge for the manufacture of a product, for the application of a process, or for the rendering of a service.[21] Importantly, it refers not just to the physical sharing of a given technology's hardware, but also more broadly to the process of ensuring that those on the receiving end have the skills and know-how to effectively

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[20] Keith Bradsher, *China Builds High Wall to Guard Energy Industry*, New York Times, (July 13, 2009), available at www.nytimes.com/2009/07/14/business/energy-environment/14energy.html.

[21] Draft International Code on the Transfers of Technology, 1985. http://stdev.unctad.org/compendium/documents/totcode%20.html.

use the technology and scale it up within their country. Thus, capacity building, training, and access to technical information about the technology are as important as financing acquisition of the hardware itself, or access to its IPR.

From most developing countries' perspective, the world is long overdue in addressing tech transfer for climate change. Since 1992, in the UN Framework Convention on Climate Change (UNFCCC) itself, developed countries – including the United States – committed to "take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how" to developing countries, and to "support the development and enhancement of [their] endogenous capacities and technologies."[22] The Kyoto Protocol, agreed in 1998, echoes this commitment.[23] Parties have taken decisions to promote the development and transfer of environmentally sound technologies at each annual Ministerial meeting, but over the years little has in fact been done to fulfill that commitment.

Tech transfer to developing countries was in fact a primary purpose of the Kyoto Protocol's Clean Development Mechanism (CDM). The CDM allows a developed country (or regulated entity within it) to satisfy its own emissions reduction obligation by financing emissions reduction projects in developing countries that lack emissions reduction obligations of their own. The CDM has not, unfortunately, lived up to expectations. Establishing whether, on a project-by-project basis, certain activities indeed reduce emissions below what would otherwise have happened has been cumbersome. Also, while many CDM projects have served a useful purpose, they have managed to deliver neither emissions reductions nor clean technology at anywhere near the scale required, and they have mostly been limited to a small number of countries (China, India, Brazil, and South Africa). Especially going forward, when all major emitters need to contribute equitably to addressing climate change, new mechanisms and incentives must be developed for the major GHG-emitting developing countries. Governments are currently debating exactly these questions, as CDM reform is one element of the UN climate negotiations.

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[22] UNFCCC Article 4.5.

[23] Kyoto Protocol Article 10.c

Technology transfer's centrality to the Copenhagen climate negotiations is by virtue of it being one of the four "pillars" of the Bali Action Plan, the negotiating roadmap that countries agreed to in December 2007. The Bali Action Plan calls for negotiations on the issues of i) mitigation (emissions reductions), ii) adaptation to the effects of climate change, iii) technology transfer, and iv) financing of mitigation, adaptation, and tech transfer for developing countries. In particular, it calls for enhanced action on technology development and transfer, including "effective mechanisms and enhanced means for the removal of obstacles to, and provision of financial and other incentives for, scaling up of the development and transfer of technology to developing country Parties," as well as "[w]ays to accelerate deployment, diffusion and transfer of affordable environmentally sound technologies."[24]

Most of the current focus in the UN negotiations is on how to accomplish tech transfer, through financing and other means. So far the bulk of proposals on finance have come from developing countries. This has contributed to tension between the factions, with developing countries objecting that they are being pressed to address the top concern of industrialized nations, namely direct emissions reductions, without those industrialized nations' serious engagement in return on the developing countries' top priorities. To complicate things further, developed countries are being pressed for financing and other assistance in the face of the worst global economic crisis in decades. Despite these challenges, however, there have recently been encouraging signs of progress. Developed countries participating in the U.S.-led Major Economies Forum (MEF, consisting of the 17 major GHG emitters, both developed and developing) have engaged more seriously on financing issues. And President Obama, host of the upcoming G-20 finance ministers' meeting in Pittsburgh in September, has called on the G-20 to bring climate financing proposals to that forum, filling a void in industrialized nation engagement in this issue.

Statements and written submissions by the parties to the international negotiations reflect sharply divergent perspectives regarding the role IPR plays in the tech transfer negotiations. Many developing countries, most notably those comprising the negotiating block known as the G-77, have long argued that IPR acts as a barrier to their access to climate-friendly technology.

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[24] UNFCCC CP.13 Decision: Bali Action Plan Article (1)(d) (i)&(ii).

Representative of developing country views is a joint submission by China and the G77 on tech transfer, which calls for compulsory licensing, and more: "All necessary steps shall be immediately taken in all relevant fora to mandatorily exclude from patenting climate-friendly technologies held by Annex II countries which can be used to adapt to or mitigate climate change."[25] (Annex II countries are those 24 industrialized Parties, including the United States, that have undertaken financial obligations under the UN Framework Convention on Climate Change.) Developing countries have also called for the adoption of a Declaration on IPRs and Environmentally Sound Technologies in relevant fora; the use of the full flexibilities contained in the TRIPS Agreement, including compulsory licensing, to access technologies with IPR protections; steps to ensure sharing of publicly funded technologies and related know-how; and the creation of a "Global Technology Pool for Climate Change" that ensures access to technologies, including on royalty-free terms.[26]

Developed countries (in particular, Japan, Canada, Australia, Switzerland and the US) have responded to these substantial proposals with a strong defense of robust IPR regimes and opposition to compulsory licensing. They have also resisted the developing countries' calls for new institutional arrangements, in particular, the G77 and China's proposed "global technology pool."

In evaluating the developing countries' proposals on IPR, it is important to keep in mind that countries are in the midst of what has finally ripened into an actual negotiation, with parties ramping up their rhetoric and staking out strong positions in anticipation of future compromise.

Much of the discourse around IPR and climate contains echoes of the controversy that surrounded TRIPS' effect on developing countries' access to essential medicines, and that led to the 2001 Doha Declaration on the TRIPS Agreement and Public Health described above. Some countries (such as Bolivia), and some interested observers, are calling for an analogous UN climate Ministerial Declaration, and otherwise asserting that climate change is a public

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[25] Proposal by the G77 & China for a Technology Mechanism under the UNFCCC (2008) available at http://unfccc.int/files/meetings/ad_hoc_working_groups/lca/application/pdf/technology_proposal_g77_8.pdf.

[26] Sangeeta Shashikant, *Developing countries call for no patents on climate-friendly technologies,* Third World Network, Bonn News Update No. 15, June 11, 2009; available at www.twnside.org.sg/title2/climate/news/Bonn03/TWN.Bonn.update15.doc.

emergency – akin to a disease epidemic – justifying special treatment under the rules.[27] But for the reasons outlined in section III above, it is not clear that IPR has yet presented problems for climate-friendly technologies that would support such action.

The 2001 Doha Declaration is, despite a healthy debate on its effectiveness, an encouraging sign that the IP regime contains a fair amount of flexibility for responding to special circumstances. This bodes well for the discussions over tech transfer in the climate negotiations. Indeed, the TRIPS agreement itself recognizes the need for balance between the protection of intellectual property and the transfer of technology for public welfare purposes. Specifically, Article 7 of TRIPS states that the objective of the protection and enforcement of IP should be to contribute "to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare . . . ." And Article 8 of TRIPS recognizes that measures "may be needed to prevent the abuse of intellectual property rights by right holders or the resort to practices which . . . adversely affect the international transfer of technology." TRIPS also requires developed country WTO Members to "provide incentives to enterprises and institutions in their territories for the purpose of promoting and encouraging technology transfer to least-developed country Members." (TRIPS Article 66.2)

While the case remains to be made for climate-specific modifications or reinterpretations of the IPR rules, the importance to us all of widely – and quickly – disseminating climate-friendly technologies means we must continue to monitor the situation. Policymakers on both sides of the debate would need to respond swiftly if it became apparent that IPR rules, in some narrow but important circumstances, were blocking effective tech transfer. Should that happen, the other fora (WIPO, the WTO TRIPs Agreement), with their flexibility provisions and the requisite expertise and mandates, appear better positioned than the UNFCCC to address the issue.

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[27] For a good discussion of this issue, see Frederick Abbott, *Innovation and Technology Transfer to Address Climate Change: Lessons from the Global Debate on Intellectual Property and Public Health*, ICTSD Global Platform on Climate Change, Trade Policies and Sustainable Energy (2009), available at http://ictsd.net/downloads/2009/07/innovation-and-technology-transfer-to-address-climate-change.pdf.

## VI. Linking Tech Transfer and Emissions Reductions Abroad

In the context of the climate talks, countries have tabled numerous proposals designed to facilitate tech transfer, such as capacity building, joint R&D, and technology clearinghouses, and of which IPR is but a small part. But an essential driver of tech transfer to developing countries is the domestic emissions reduction policies that those countries themselves adopt at home. Demand for clean technology cannot be mandated from abroad; it must be created from within. Thus, an integral component of tech transfer will be the emission reductions plans, or "nationally appropriate mitigation actions" (NAMAs), that developing countries commit to undertake as part of the Copenhagen agreement, and the amount of tech transfer that actually takes place will be linked to – and depend on – the level of those commitments' ambition.

The Bali Action Plan calls for developing countries' NAMAs to be "supported and enabled by" developed country technology, financing, and capacity building. It is widely recognized that the vast bulk of financing in this area will need to occur through developing country participation in private enterprise, including the global carbon market.

The Waxman-Markey bill's carbon market is an excellent example of how this can work: the international allowances and offsets provisions create the opportunity for those developing countries that commit to emissions reductions (e.g., a cap on total emissions for one or more sectors of their economies) to sell carbon credits to U.S. regulated entities. And the developing country's emissions reduction commitments will, in turn, generate domestic demand for the clean technologies needed to achieve those reductions. It is the push-pull of these incentives, more than flexible IPR rules or technology clearinghouses or government-sponsored capacity building workshops, which will achieve the emissions reductions we need by getting the technology to where it is urgently needed.

I would like to mention, before concluding this discussion, that cooperative research and development can play a crucial supporting role in tech transfer, and that developing countries' proposals for such cooperation in the UN negotiations should be carefully considered. For all the focus on existing technologies, leading-edge innovators around the world are pursuing breakthrough solutions and should be spurred forward. Important progress can and should be made collaboratively between the best minds in the industrialized and developing worlds. An

example of the sort of clean technology cooperation worth expanding came during Energy Secretary Steven Chu's recent trip to China, where the U.S. and China announced a jointly funded $15 million research center and directed it to increase research on CCS.[28] Such cooperation helps set the stage for constructive UN negotiations toward the end we must achieve – a global deal to reduce greenhouse gases from all major sources.

**Conclusion**

Mr. Chairman and members of the Committee, I thank you for the opportunity to speak to you today. The issue of intellectual property protections is an important component of what will ultimately become a global agreement to move our world to a more stable climate. I hope I have expressed to you that this issue, while it is important, is also manageable and need not delay or hinder our active engagement in crafting a global solution to climate change. I welcome your questions on my testimony.

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*Environmental Defense Fund is a leading national nonprofit organization representing more than 500,000 members. Since 1967, we have linked science, economics and law to create innovative, equitable and cost-effective solutions to society's most urgent environmental problems. Environmental Defense Fund is dedicated to protecting the environmental rights of all people, including future generations. Among these rights are clean air, clean water, healthy food and flourishing ecosystems. We are guided by scientific evaluation of environmental problems, and the solutions we advocate will be based on science, even when it leads in unfamiliar directions.*

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[28] Saqib Rahim, *China: Will meaningful actions follow ambitious new carbon policies?* (July 24, 2009), ClimateWire.

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

Our final witness is Dr. Mark Esper, executive vice president of the Global Intellectual Property Center and vice president of the Europe and Eurasia Department of the U.S. of Chamber of Commerce. Previously, Dr. Esper worked as a senior scholar at the National Institute for Public Policy. He also served as executive vice president of the Aerospace Industry Association of America.

Thank you, Dr. Esper, for joining us this morning. We look forward to your testimony.

**STATEMENT OF MARK ESPER**

Mr. ESPER. Chairman Markey, Ranking Member Sensenbrenner, members of the committee, I appreciate the opportunity to testify today on behalf of the Chamber of Commerce Global Intellectual Property Center and its members.

The Global IP Center and its members believe that strong intellectual property rights are integral to driving the innovation and creativity necessary to create jobs, save lives, advance economic growth and development around the world, and generate breakthrough solutions to global challenges such as climate change.

Our Nation's Founders recognized the link between strong IP rights and innovation more than 200 years ago and explicitly gave Congress the power to protect IP rights in the constitution. As a result, America has led the world in innovation for generations.

Today, the United States IP is worth between $5 and $5.5 trillion. IP accounts for more than half of all U.S. exports, helping drive 40 percent of the United States economic growth; and, as of 2008, IP-intensive industries employed more than 18 million Americans. But beyond driving job creating and economic growth, strong IP rights have created a secure framework for investment in research that led to solving some of the world's most difficult problems, from disease and famine to water scarcity and energy security, just to name a few.

In addition to protecting and incentivizing inventors, strong IP rights are also integral to promoting technology deployment and diffusion by providing a clear legal framework by which companies can transact business.

Despite these facts, threats to innovation and IP rights exist around the globe. In an effort to promote domestic industries or appeal to narrow political interests, some governments are actively engaged in attempts to weaken the current IP system.

The United Nations Framework Convention on Climate Change is the latest front where some are attempting to portray IP rights as a barrier to solving climate change. The GIPC believes these critics have once again turned reality on its head. Robust IP rights are not an obstacle, as some allege, but instead play a fundamental role in encouraging innovative solutions to climate change mitigation and adaptation.

IP protection also helps facilitate tech transfer by providing companies a commercial incentive to engage in foreign direct investment, joint ventures, co-production, cooperative research endeavors, and licensing agreements with local partners.

There now is a clear commitment by the developing world to address global warming through some form of binding international

agreement. As either a negotiating tactic to block any international agreement or condition that will be used to advance their own economic development and technological prowess, China, India, and other developing nations are using the issue of tech transfer as a major lever in current U.N. negotiations. As a result, among the options included within the current U.N. negotiating draft is language related to IPR as compulsory licensing, patent exclusions, and other exceptions for green technologies.

Incorporating any of these proposals into the final U.N. agreement would not only have a negative impact on the development and diffusion of climate change mitigation and adaptation technologies but would also put American workers and the U.S. economy at a competitive disadvantage.

Some countries claim that IP rights are a major barrier to the diffusion of technology. Such claims are quite misleading. To begin, IP rights cannot be a barrier to tech transfer if the patents are not protected in the first place, which is often the case in many least-developed countries.

Ironically, one of the real barriers to tech diffusion is not strong IP rights but the lack of them. Indeed, a report commissioned recently by the European Commission states that "U.S. multinational companies are more active in engaging and transferring intangible assets to their own affiliates in the country if the country has strengthened its IP legislation."

Another major obstacle to tech transfer is a country's absorptive capacity, meaning a country's ability to not only receive the technology but then have the various means, from physical to human capital, to deploy and employ it effectively.

Lack of access to capital in domestic and international markets is another barrier to tech transfer. Other obstacles to tech transfer are often self-imposed through tariff and non-tariff barriers.

A 2008 report by the OECD stated that Brazil, Russia, India, and China have "significant barriers to trade in carbon abatement technology," often imposing tariffs quoted above 10 percent on these technologies.

A recent report by the U.S. Chamber of Commerce stated that "many companies impose tariffs of up to 70 percent on climate-friendly goods and services, impeding access to cutting-edge technologies."

Given the real and very serious obstacle to tech transfer, a number of remedies are readily apparent. The U.S. could take a number of actions from, for example, urging developing countries to strengthen their IP laws and enforcement, working with countries in the developing world to improve their absorptive capacity, and working with our trading partners and others in the developing world to remove all tariff and nontariff barriers to trade.

These are just a few ideas. I included more in my written testimony, and we can discuss additional ones later.

But the fact is that technology development and deployment and diffusion cannot be mandated. It is a long-term process that occurs largely and most effectively within the private sector along voluntary, commercially viable, not de-compliant terms.

The Global IP Center applauds the House of Representatives and its Members who have taken a number of steps to ensure IP pro-

tection is a priority within the UNFCCC negotiations, particularly Ranking Member Sensenbrenner and Representatives Blackburn, Larson, and Kirk. As a result of these efforts, there are currently three House-passed bills containing provisions aimed at protecting IP for green technologies.

While the Chamber views these provisions as positive, enacting them does not guarantee that IP rights will be protected in Copenhagen, nor does it foreclose the likelihood that other nations may, down the road, seek to use a narrowly tailored exception in the current WTO agreement on trade-related aspects of intellectual property rights to expropriate IP-protected American innovations. As such, we believe it is critical that Congress continue to send the administration and our negotiating partners clear and forceful signals that IP rights is not an area where the United States is willing to make concessions in Copenhagen.

Let me wrap up by saying that reduced global carbon emissions is a major challenge that will require many new technologies and unprecedented cooperation among the world's nations to achieve. At a time when job creation, economic growth, and problem solving are paramount, it is important more than ever to protect an IP-based incentive system that has worked extremely well for centuries and driving innovation, developing solutions, and deploying those technologies as broadly as possible.

The Congress has taken a number of positive, constructive steps in this direction, but more can and should be done if we are to be successful at the end of the day.

Thank you.

[The statement of Mr. Esper follows:]

# Statement of the U.S. Chamber of Commerce

ON: "Climate for Innovation: Technology and Intellectual Property in Global Climate Solutions"

TO: The Select Committee on Energy Independence & Global Warming

DATE: Wednesday, July 29, 2009

The Chamber's mission is to advance human progress through an economic, political and social system based on individual freedom, incentive, initiative, opportunity and responsibility.

The U.S. Chamber of Commerce is the world's largest business federation, representing more than three million businesses and organizations of every size, sector, and region.

More than 96 percent of the Chamber's members are small businesses with 100 or fewer employees, 70 percent of which have 10 or fewer employees. Yet, virtually all of the nation's largest companies are also active members. We are particularly cognizant of the problems of smaller businesses, as well as issues facing the business community at large.

Besides representing a cross-section of the American business community in terms of number of employees, the Chamber represents a wide management spectrum by type of business and location. Each major classification of American business -- manufacturing, retailing, services, construction, wholesaling, and finance – is represented. Also, the Chamber has substantial membership in all 50 states.

The Chamber's international reach is substantial as well. It believes that global interdependence provides an opportunity, not a threat. In addition to the U.S. Chamber of Commerce's 112 American Chambers of Commerce abroad, an increasing number of members are engaged in the export and import of both goods and services and have ongoing investment activities. The Chamber favors strengthened international competitiveness and opposes artificial U.S. and foreign barriers to international business.

Positions on national issues are developed by a cross-section of Chamber members serving on committees, subcommittees, and task forces. More than 1,000 business people participate in this process.

**Testimony of Dr. Mark T. Esper**
**Executive Vice President,**
**Global Intellectual Property Center**
**U.S. Chamber of Commerce**

Chairman Markey, Ranking Member Sensenbrenner, Members of the Select Committee:

I appreciate the opportunity to testify today on behalf of the U.S. Chamber of Commerce's Global Intellectual Property Center (GIPC). The Global IP Center and its members believe that strong intellectual property rights (IPRs) are integral to driving the innovation and creativity necessary to create jobs, save lives, advance economic growth and development around the world, and generate breakthrough solutions to global challenges such as climate change.

## I. Introduction and Background

Our Nation's founders recognized the link between strong intellectual property (IP) rights and innovation more than 200 years ago, and explicitly gave Congress the power to protect the IP rights of "Authors and Inventors" in Article I of the U.S. Constitution. As a result, America has led the world in innovation for generations, bringing inventions to market that have improved peoples' lives and the livelihood all around the globe. Today, America leads the world in patent applications. Indeed, the United States' intellectual property is worth between $5.0 and $5.5 trillion—more than the nominal GDP of any other country. IP accounts for more than one-half of all U.S. exports, helping drive 40% of the United States' economic growth. And as of 2008, IP-intensive industries employed more than 18 million Americans in jobs that often paid 40% more than those of the average non-IP industry worker.

But beyond driving job creation and economic growth, strong IP rights have created a secure framework for investment in research that led to solving some of the world's most difficult problems: from disease and famine, to water scarcity and energy security, just to name a few. Intellectual property rights provide the incentive to transform ideas—from a back-of-the-envelope concept to the most complex mechanical design or chemical formula—into products and services that advance human development, while simultaneously contributing a wealth of new knowledge that permit inventors and entrepreneurs to solve new problems.

New medicines to treat chronic diseases; advanced technologies to help clean our environment and reduce CO2 emissions; cutting-edge information technologies that keep families connected and businesses functioning; and state-of-the-art computer hardware and software that facilitate the search for answers. These are just a few examples of IP-protected technologies that are improving the lives of people around the world.

In addition to protecting and incentivizing inventors, scientists, researchers, and companies big and small, strong IP rights are also integral to promoting technology deployment and diffusion. Without the assurance that IP rights will be respected—and effort, creativity, and investment rewarded as a result—commerce between companies and countries will suffer, investment will

diminish, and the technologies needed to achieve our various goals will fail to achieve their full potential.

Strong IP rights also help advance human progress given the fact that, in exchange for sole, temporary rights to benefit from one's invention, the inventor must share information about the technology—rather than keep it secret—so that others may reach the same level of knowledge and build upon that achievement. As a recent expert study concluded, "The granting of IP rights is therefore one of society's important drivers for innovation and economic growth."[1]

## II. Global Threats to IP and Innovation

Despite these facts, threats to innovation and IP rights exist around the globe. In an effort to promote domestic industries or appeal to narrow political interests, some governments are actively engaged in attempts to weaken the current IP system. Meanwhile, some well-meaning activists and NGOs argue that strong IP rights are barriers to technology dissemination—completely ignoring IP's role in innovation and technology transfer. They are actively promoting their misinformed views in governments and multilateral organizations around the world, ignoring the real obstacles to progress, such as high tariffs, poor infrastructure, political corruption, limited human capital, and other roadblocks to technology deployment.

The United Nations Framework Convention on Climate Change (UNFCCC) is the latest front where some are attempting to portray IP rights as a barrier to solving climate change. The GIPC believes these critics have once again turned reality on its head. Robust IP rights are not an obstacle, as some allege, but instead play a fundamental role in encouraging innovative solutions to climate change mitigation and adaptation; they are instrumental in facilitating the transfer of environmentally sound technologies and know-how to developing countries. Accordingly, any climate change agreement that weakens IP protections will surely hamper our efforts to address global warming by dampening R&D investment and slowing technology development and deployment at a time when both are needed most.

As you know, the global demand for energy is projected to rise by as much as 50% over the next 25 years. Simultaneously meeting the demand for affordable energy and reducing global greenhouse gas emissions can only be accomplished through significant innovations in the clean energy technology sectors. This will be a costly undertaking, which is why we must preserve strong IP rights to help attract the massive investment and research needed to develop and commercialize new clean energy and green technologies.

And contrary to the assertions of some who have portrayed IP protection as an impediment to technology transfer, IP protection actually helps facilitate tech transfer by providing companies a commercial incentive to engage in foreign direct investment, joint ventures, co-production, cooperative research endeavors, and licensing arrangements with local partners. Conversely, weak IP regimes discourage these joint ventures and other collaborative efforts. Private companies, who will generate nearly all of the new technologies needed to address global

[1] Copenhagen Economics and the IPR Company. *Are IPR A Barrier To The Transfer Of Climate Change Technology* (Copenhagen Economics, January 2009), p. 9.

warming, obviously have an inherent interest in encouraging the diffusion of their technologies in the marketplace. But to do so they must also have confidence that their investments—their intellectual property—will be properly protected.

A report prepared for and commissioned by former U.K. Prime Minister Tony Blair and The Climate Group entitled "Intellectual Property Rights: The Catalyst to Deliver Low Carbon Technologies," drew a number of conclusions, including that IPRs, particularly patents, "will be a catalyst, not a barrier, to creating and deploying low-carbon technologies," and that "Threats to strong IPRs, such as easily-obtained compulsory licensing, are likely to be a strong disincentive to invest."[2]

## III. Attempts to Undermine IP in UN Climate Change Negotiations

There now is a clear commitment by the developed world, led by the United States and Europe, to address global warming through some form of binding international agreement. Many in the developing world, however, led by China and India, are focused on their own development and economic growth. Beijing and New Delhi affix blame on the developed world for causing global warming, and hence responsibility for remedying the problem, officially eschewing any responsibility themselves. This despite the fact that China is the world's top CO2 emitter, and India itself ranks in the top five.

Indeed, about 80% or more of the expected growth in global carbon dioxide emissions to 2050 is expected to occur in developing countries, with China, India, and Southeast Asia leading the way. To be environmentally effective, therefore, any new accord must involve the active participation of developing countries.

Citing the principle of "common but differentiated responsibilities and respective capabilities," developing countries expect to be compensated for activities they undertake to reduce emissions. China, India, South Africa, and others are pressing the U.S. and other developed countries to transfer anywhere from 0.5% to 1.0% of their gross domestic product each year to bankroll climate change programs in developing countries.

Developing countries also are trying to use the negotiations to weaken intellectual property protections through compulsory licensing of advanced energy technologies, ostensibly to remove barriers to "technology transfer." Without IP rights, there's very little incentive for companies to invest in costly research and development.

As either a negotiating tactic to block any international agreement, or a condition that will be used to advance their own economic development and technological prowess, China, India, and other developing countries are using the issue of technology transfer as a major lever in current UN negotiations. These countries have made various statements that would not only undermine innovation and the global IP system, but also prevent us from addressing global warming effectively.

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[2] Harvey, Ian. "Intellectual Property Rights: The Catalyst to Deliver Low Carbon Technologies." A Breaking the Climate Deadlock Briefing Paper. (The Climate Group, 2008), p. 3.

For example, Shyam Saran, India's Special Envoy on Climate Change for the Prime Minister said in July 2008 that "India wants climate change technologies to be treated as public & common goods." And Zhou Dadi, of the Energy Research Institute of the People's Republic of China, stated in November 2007 that "If you really want to help China to speed up the technology transfer process, we have to really think about how to help China cover the high costs. Most of them are not based on material, they're based on intellectual property rights." Indeed, at a Beijing international conference in November 2008, both China and India proposed that compulsory licensing should be permitted for carbon abatement technologies.

As a result, among the options included within the current United Nations Framework Convention on Climate Change (UNFCCC) draft text related to IPRs are compulsory licensing, patent exclusions, and other exceptions for green technologies.[3] A report in the June 11, 2009 edition of the TWN Bonn News Update entitled "Developing countries call for no patents on climate-friendly technologies" stated that "In their text submitted on 10 June, G77 and China proposed that 'All necessary steps shall be immediately taken in all relevant fora to mandatorily exclude from patenting climate friendly technologies held by Annex II countries which can be used to adapt to or mitigate climate change".[4] If any of these provisions are included in a final climate change agreement, China, India and other countries could claim the legal right to expropriate—to simply take—the "green" technologies developed by American and other companies. In other words, after years of research and development and millions (if not billions) of dollars invested by U.S. companies to develop the latest wind turbine, solar panel, lithium-ion battery, or other "green technology," these inventions could be taken outright by Chinese or Indian companies, manufactured abroad, and sold around the world at a cost that need not recoup any R&D expenses. The impact on development of clean energy technologies is obvious: few companies in the developing world would continue to invest in these climate change technologies if their profit incentive is removed through the legalized theft of their IP.

The impact on America's economy would be severe: workers in green tech industries—not to mention those in supporting sectors—would lose their jobs. Indeed, it is hard to see how America would ever create the five million green jobs President Obama has talked so much about. What is even more troubling is the fact that green technologies are not currently defined in the UNFCCC negotiating text, which creates a tremendous amount of uncertainty and leaves open the possibility that any technology—from cell phones and computers, new heating and lighting systems, to bicycles—that consumes less energy than its predecessor, or emits less CO2 or other harmful byproducts, could also be expropriated. This would not only make American workers and industries in green technologies vulnerable to foreign expropriation of their products, but exposes a broader array of U.S. firms and industries as well.

## IV. Sacrificing IP Rights for Domestic Gain at America's Expense

[3] See paragraphs 188 and 189 on pages 48-49 of the UNFCCC Negotiating Text, dated 19 May 2009, and available online at http://unfccc.int/resource/docs/2009/awglca6/eng/08.pdf

[4] "Developing countries call for no patents on climate-friendly technologies." TWN Bonn News Update, 11 June 2009, p. 1. See also www.twnside.org.sg.

The Global IP Center believes that incorporating any of the aforementioned proposals into the final UN agreement would not only have a negative impact on the development and diffusion of climate change mitigation and adaptation technologies in both developed and developing countries, but would also put American workers and the U.S. economy at a competitive disadvantage.

For example, China, India, and Brazil are seeking to benefit from exceptions to IP laws despite their considerable competitive prowess in certain green technologies. According to a recent study by Copenhagen Economics that was commissioned by the European Commission and published in January 2009, China holds the largest market share of solar energy patents at 38%.[5] And according to a recent report in the *New York Times*, China considers renewable energy a "strategic industry" that it is "protecting" to "make sure its companies dominate globally."[6] Chinese companies such as Suntech, Sinovel, China Wind Systems, and Gold Wind are leading the way in renewable energies with Beijing's assistance and protectionist measures, such as high tariff and non-tariff barrier, and staggering local content requirements.

Indian companies such as Suzlon and Tata-BP are also among the world leaders in clean technology, ranking India fifth in total installed wind power. And Brazil is a world leader in biofuels, with Petrobras funding energy and carbon storage research and developing innovative biofuel technologies.

These countries are expending large amounts of public and private funds on green technologies, increasingly exporting these technologies abroad, and competing well with firms from the U.S., Japan, and Europe. But let me be clear, all of this innovation is a good thing. The more innovation and the more competition we have in the global marketplace, the greater likelihood we will create the breakthrough technologies needed to address climate change in a timely manner, and at the greatest choice and lowest prices possible to the consumer. What is underpinning this vibrant global marketplace, however—and often forgotten in this equation—are strong IP rights that protect the investments and ideas of these firms, and incentivizes them to research, develop, manufacture and deploy their goods and services.

One would think that, given the investments and innovation occurring in China, India, Brazil, and other parts of the developing world, these governments would be pressing to protect IP rights in UNFCCC negotiations, not undermine them. But just the opposite is happening. When one considers that their proposals for patent exclusion should only apply to developed countries, one can only surmise that they are using the lever of IP and "developing country" status to acquire technologies they currently do not have, and/or to gain an commercial advantage over their competitors in the developed world. Either way, American firms and workers will be put at a further competitive disadvantage if the developed world is compelled to surrender its technologies through a weakening of IP laws coming out of the UNFCCC negotiations.

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[5] Copenhagen Economics and the IPR Company. *Are IPR A Barrier To The Transfer Of Climate Change Technology* (Copenhagen Economics, January 2009), p. 5.

[6] Bradshear, Keith. "In China, a shield goes up for energy firms." The Global Edition of The New York Times, 15 July 2009, p. 13.

## V. The Real Barriers to Technology Transfer

Some countries claim that IP rights are a major barrier to the diffusion of technology, and in the case of climate change, an obstacle to their CO2 abatement efforts. Such claims are quite misleading. To begin, IP rights cannot be a barrier to technology transfer if the patents are not protected in the first place, which is often the case in many least developed countries. According to the Copenhagen Economics study, companies often do not seek patent production in countries where there is "no economic rationale for competition or counterfeiters to set up production."[7]

That said, the report's authors also concluded that many of the climate change adaptation and mitigation technologies and measures available to developing countries are either off patent, or not patented at all, with reforestation being a prime example. So again, it is hardly the case that IP rights are an obstacle to technology transfer.

Ironically, one of the real barriers to technology diffusion is not strong IP rights, but the lack of them. Indeed, the Copenhagen Economics report states that "US multinational companies are more active in engaging in transferring intangible assets (that might or might not be protected by IP rights) to own affiliates in a country, if the country has strengthened its IP legislations."[8] The report also cites another study that suggests "trade is stimulated by strengthened IP legislation." All of the evidence suggests, the Copenhagen Economics study concludes, "that a sound and enforced IPR system may be a prerequisite for technology transfer."[9]

Another major obstacle to technology transfer is a country's absorptive capacity, meaning a country's ability to not only receive the technology, but then have the various means—from physical to human capital—to deploy and employ it effectively. Strong educational backgrounds may be needed to apply the know-how often needed to install, operate, and maintain a new technology. And in some cases, special infrastructure may be necessary to accommodate a renewable technology. The Copenhagen Economics report cites the example of windmills, which require specialized technologies to handle the power fluctuations generated by changes in the wind, as a case in point.

The Copenhagen Economics report also lists "Lack of access to capital in domestic and international markets" as a barrier to technology transfer.[10] While they cite past problems with servicing debt as a reason for lack of capital, other explanations can include official corruption, instability of governments, and a lack of strong IP protections and an effective legal and judicial framework that raise the risk levels for investment. Indeed, a 2008 study by Park and Lippoldt found that while technology transfer was enhanced by stronger levels of patent protection, other complementary factors such as "infrastructure, effective government policies and regulations, knowledge institutions, access to credit and venture capital, skilled human capital, and networks for research collaboration" were also necessary.

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[7] Copenhagen Economics, p. 15.
[8] Copenhagen Economics, p. 27.
[9] Copenhagen Economics, p. 28.
[10] Copenhagen Economics, p. 30.

Other obstacles to technology transfer are often self imposed through tariff and non-tariff barriers. A 2008 report by the OECD cited in the Copenhagen Economics report stated that Brazil, Russia, India and China have "significant barriers to trade in carbon abatement technology," often imposing tariffs "above ten percent" on these technologies.[11] The report adds that these countries apply "burdensome pre-shipment inspection and informal 'additional payment.'" Other barriers included "customs inspections, quantitative import restrictions and import surcharges or border taxes," along with limited consumer information and regulatory instability.[12]

A recent report by the U.S. Chamber of Commerce stated that "many countries impose tariffs of up to 70% on climate-friendly goods and services, impeding access to cutting edge technologies."[13] The report adds that countries such as the Philippines, Nigeria and Egypt have non-tariff barriers on clean coal technology, for example, "equivalent to triple-digit tariffs." And India's non-tariff barriers on fluorescent lamps are equal to a 100% tariff.[14] In fact, a 2007 report by the World Bank entitled International Trade and Climate Change concluded that by removing these types of barriers, trade in green technologies and services could rise 7-14% annually, and could facilitate investment.

Further underscoring this point is a report by the World Business Council for Sustainable Development that cited a study of Technology National Assessments that "identified economic and market barriers (80%) as the most significant obstacles to technology transfer. *IPR was noted to be the least important concern*" [emphasis added]." For these developing countries, capacity building and economic development will be the most important factor in allowing them to acquire and employ clean technology.

Finally, trade policy can contribute in a meaningful way to efforts on climate change through trade liberalization and not trade restrictions. For example, the United States and the European Union submitted a forward leaning proposal as part of the ongoing Doha Round of World Trade Organization (WTO) negotiations to increase global trade in and use of environmental goods and services. It would place priority action on technologies directly linked to addressing climate change and energy security. This important initiative complements and supports the objectives of and the process under the UNFCCC.

## VI. Real Solutions to Technology Transfer

Given the real and very serious obstacles to technology transfer, a number of remedies are readily apparent. The United States could take the following actions, which would have the combined, salutary effect of protecting a time-proven system of IP rights that drives innovation, creates jobs for American workers, primes our own economic growth and transition to a greener and cleaner economy, and helps address global warming:

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[11] Copenhagen Economics, p. 31.
[12] Ibid.
[13] Wenk, Christopher, and Westerman, Stephanie. *The Nexus of Climate Change and Trade: Don't Break the Rules.* (U.S. Chamber of Commerce, April 2009), p. 5.
[14] Ibid.

- Urging developing countries to strengthen their IP laws and enforcement, and providing technical and other assistance as necessary to help in that endeavor;

- Working with countries in the developing world to also improve their absorptive capacity for new technologies by enhancing their physical infrastructure and human capital, and reducing their corruption, inefficiency, and political instability;

- Making the improvement and enforcement of strong IP rights an important component of all U.S. bilateral and multilateral Free Trade Agreements, with the US-Korea FTA serving as a good model;

- Working with our trading partners and others in the developing world to remove all tariff and non-tariff barriers to trade in climate change and mitigation technologies;

- Considering providing grants, low-interest loans, or other forms of financial assistance to the least developed countries that cannot afford advanced green technologies, but need them nonetheless; and,

- Providing financial, tax and other incentives to U.S. companies to trade or partner with firms in developing countries that need access to IP-protected green technologies, or that want to conduct joint research.

These are just a few ideas that can facilitate tech transfer as we strive to address global warming. The fact is, however, that technology development, deployment and diffusion cannot be mandated. It is a long term process that occurs largely (and most effectively) within the private sector along voluntary, commercially viable and IP-compliant terms.

And technology transfer can take many forms. According to the World Business Council on Sustainable Development, "Technology is transferred to developing countries through foreign direct investment (80% of capital inflow to developing countries), commercial cooperation agreements, joint ventures, licensing and local training and technology cooperation. Companies will optimize their operations using some form of technology diffusion.[15]

Tech transfer involves the interactions between companies and individuals, not governments. In most cases, technology diffusion involves the simple marketing and distribution of patented products in the global marketplace. However, it could also involve a co-production agreement between the patent holder and a (foreign) partner, or even a licensing agreement between the patent holder and a second (or third) party to manufacture or distribute the good under certain terms and conditions. There are many other variations that may be utilized, but the core principles underlying any such tech transfer arrangement is that IP rights are respected, the agreement is commercially reasonable and viable, and that all parties undertake such an agreement voluntarily.

[15] "IPR and technology transfer: myths and realities." World Business Council for Sustainable Development fact sheet, p. 4.

In many of the arrangements worked out between partners, and especially between sellers and buyers, ongoing cooperation is often required beyond the "sale" itself. This cooperation includes any number of activities over a period of time to deliver, install, implement, adapt, maintain, and upgrade the technology. It may require transfer of technical know-how, trade secrets, and manufacturing specifications that are not disclosed in patent documents. It may also require a certain level of technological ability in the receiving company, and compliance with regulatory requirements in the target country.[16] It could also include the temporary employment of specialists, technicians, and managers from the firm that holds the patent, or the training of the buyer's workforce.

Indeed, independent research has found transfer of technology to be a multi-stage process that needs to include, *inter alia*, incentives to innovate; incentives to transfer; and, incentives to implement and use the technology.[17] However, the bottom line is that effective tech transfer requires an extended relationship that touches upon all aspects of technology deployment, at all levels, so as to maximize the effectiveness of the invention and its value to the consumer, as well as safeguard the reputation of the company, the performance of its product, and improvement of the brand. Technology transfer cannot be compelled if it is to be effective; it must be a mutually agreeable relationship among all parties.

## VII. The Role of Congress

The Global IP Center applauds the U.S. House of Representatives and its Members who have taken a number of steps to ensure IP protection is a priority within the UNFCCC negotiations, particularly Ranking Member Sensenbrenner, and Representatives Blackburn, Larsen, and Kirk. As a result of these efforts, there are currently three House-passed bills containing provisions aimed at protecting IP for green technologies[18].

While the Chamber views these provisions as positive, enacting them does not guarantee that IP rights will be protected in Copenhagen, nor does it foreclose the likelihood that other nations may, down the road, seek to use the narrowly tailored exceptions in the current WTO Agreement on the Trade Related Aspects of Intellectual Property Rights (TRIPS) to expropriate IP-protected American innovations related to clean technology.

As such, we believe it is critical that Congress continue to send the administration and our negotiating partners clear and forceful signals that IP rights is not an area where the United States is willing to make concessions at Copenhagen. Through both unambiguous statements and binding legislation, it is critical that our negotiators know not to succumb to appeals for greater exceptions, limitations, or flexibilities in longstanding IP rights—that there is no room

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[16] See, e.g., International Technology Transfer & Intellectual Property Rights, Peter Magic, University of Texas, http://www.cs.utexas.edu/users/fussell/courses/econtech/public-final-papers/Peter_Magic_International_IP_Rights.pdf, and footnotes.

[17] See, e.g., Technology Transfer and Domestication in the Arab World, Abu-Ghazaleh Intellectual Property and Hams Madanat, July 2006, http://www.tagorg-theinstitution.com/Files/2006/Reports-Studies/Technology_Transfer_and_Domestication_in_the_Arab_World_July_6_2006.pdf

[18] H.R. 2410, H.R. 2454, and H.R. 3081

for such ambiguities. Further, we must make clear that the United States will not allow the WTO TRIPS agreement to be misinterpreted or misapplied, either in letter or spirit, by other nations.

Given the stakes involved to America's workers, our economy, and the environment, it is critical that strong IP rights not be sacrificed at the altar of UNFCCC negotiations. If anything, they should be strengthen and improved—a pre-requisite for technology transfer no less. Strong IP rights are absolutely critical to achieve the goals we all share, and so they must be protected and promoted.

## V. Conclusion

If implemented, current proposals by some developing countries to include compulsory licensing and other forms of forced technology transfer in any future climate change agreement will surely harm innovation when it is needed most. Such proposals will certainly stifle research and development, and dissuade investment in new, advanced technologies. Without these technologies, addressing global warming will be exceedingly difficult, if not impossible.

Further, the proposals being put forth now by some governments also undermine the entire fabric of the international IP system, putting at risk a time-proven framework of laws, rules and norms that has served mankind well for decades, and setting a dangerous precedent that could affect our collective ability to address other problems in the future. Instead of targeting IP, we must focus on the real barriers to technology transfer, and pursue multiple options with our trading partners to promote effective technology diffusion over the long run.

Reducing global carbon emissions is a major challenge that will require many new technologies and unprecedented cooperation among the world's nations to achieve. At a time when job creation, economic growth, and problem solving are paramount, it is more important than ever to protect an IP-based incentive system that has worked extremely well for centuries in driving innovation, developing solutions, and deploying those technologies as broadly as possible. The Congress has taken a number of positive and constructive steps in this direction, but more can and should be done if we are to be successful at the end of the day.

Thank you.

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The CHAIRMAN. Thank you, Dr. Esper, very much.

I now recognize the gentleman from Wisconsin, Mr. Sensenbrenner.

Mr. SENSENBRENNER. Thank you very much, Mr. Chairman.

In my opening statement I refer to the current U.N. negotiating text at the Bonn meeting next month, including proposals to "exclude from passing developing countries environmentally sound technologies to adapt to or mitigate climate change."

A second to require "compulsory licensing for environmentally safe and sound technologies."

A third, to ensure "access to intellectual property protected technologies and associated know-how in developing countries on non-exclusive royalty free terms."

Now, obviously, this goes directly opposite to what everybody has said here.

What would be your recommendation to Mr. Stern and the U.S. negotiating team when they go to Bonn next month on how to deal with this issue, aside from saying what is in the text is a non-starter?

I open it up to anybody who wishes to take a crack at it.

Mr. Nelsen.

Mr. NELSEN. I will take a shot.

I do think you have to have an alternative other than just saying no.

One of the things I was looking at as a model was something like the Asian Development Bank, some possible private or private-public sector incentive system, essentially. So for a developing country, if there is a breakthrough technology, that there is some way, maybe modeled after the Green Bank here, that would incentivize U.S.—primarily U.S.-breakthrough technologies to go to developing countries and possibly loan guarantees or some other way that sort of entices me, instead of going to another developed country to deploy my technologies, to deploy in developing countries still with IPR protections. I think with the overarching goal being that the technologies are still proprietary and protected, but there are incentives to deploy versus disincentives.

Personally, I think it is going to be very hard because of the amount of dollars that are going to be invested in these technologies to deploy billions and billions. If there is not some kind of intellectual property rights there, people won't do the investment in the developing country, so we will have exactly the opposite effect that the developing countries are thinking it will have, some incentive structure.

Mr. SENSENBRENNER. Mr. Nelsen, I appreciate that. The message that I got out of our recent trip to China is either, quote, give us a compulsory license or, if you won't do that, we will just steal the technology anyhow. Either alternative, one which is legal and one which is not, would mean that the actual manufacture of the technologies that were developed as a result of American innovation would not be made by American workers for use in Third World countries.

How do we solve that problem? Because we want to develop jobs here in this industry; and with either the compulsory license or what we heard in China, we will be developing the technologies,

but the Chinese will be using their workers and paying them slave labor wages, so they will end up monopolizing the market.

Mr. NELSEN. I think we can do both. I think there are plenty of incentives that are being created here at home to be able to deploy green technologies. I think the Green Bank is one way of kind of getting some incentives for things to stay here.

So, at least with this oil, we are going to start in Texas and Oklahoma and New Mexico and other places. But it isn't necessarily a loss for us if China makes this oil under the right construct. If China is making domestic oil, that means they are probably interfering in less things outside of China and Africa and other places. It might not be a bad thing.

I personally think, with China, it is a different case than some of the other developing countries. I think it needs to be dealt with at a high level, probably in some sort of SED construct or some specific government-to-government relationships where IPR is really addressed at an extremely high level.

When we are making our business decisions about China, we are waiting. And we are waiting for government help and we are waiting probably to try to get China to invest some of their own foreign reserve in things like this so that they feel invested and that we feel protected.

Mr. SENSENBRENNER. That is a big problem. Because if they can get it free, why would they invest their money in that rather than something else?

I think I have made my point. My time is up. Thank you, Mr. Chairman.

The CHAIRMAN. Mr. Inslee.

Mr. INSLEE. This is a little bit off topic, but we had discussion yesterday about some multiple technologies. There was a question asked yesterday about the relative prospects of two paths for transportation fuels, one of a solar-powered, electrical-powered vehicle transportation system, and an alternative or adjunct path of a solar-powered photosynthetic biofuels path to a transportation system.

The gentleman who was talking was comparing the relative efficiencies of photosynthesis to photovoltaic or concentrated solar systems. I wonder if you want to comment on your view how we should look at those two potential paths, Mr. Nelsen.

Mr. NELSEN. Just real briefly. I think there are going to be multiple solutions. So they are not substitutes for each other. But I think people often confuse electricity with transportation fuels. So if you are comparing a transportation fuel to something, you need to compare it to a battery that stores electricity. You can't compare solar photovoltaics to a transportation fuel. Basically, you have to say it is a gallon of gas compared to a battery. And, right now, a gallon of gas is 200 times more dense than the best battery. So if you have a battery that equals a gallon of gas and it was a Duracell battery, it would be 9 feet high. So far, there isn't anything that replaces most transportation fuels.

Mr. INSLEE. Thank you.

Mr. Rao, when we were in Hong Kong or north of Hong Kong, we saw an American company, CERES, doing work on LED lighting elements; and, as I understand it, they intend to do some man-

ufacturing in China. What is your current view of the relationship of your intellectual property in a China context? What do you view the current status is? How confident would you be of manufacturing in China or allowing that intellectual property to be available?

Mr. RAO. With respect to the LED technology, sir, we have been waiting for that particular reason, because our confidence level wasn't too high. However, we have seen technologies grow in China and take advantage of the massive local market. At the end of the day, they are able to invest in manufacturing in China if they are able to create the market in China. We are finding low-cost options for LED technology coming from China, and we are beginning to have conversations with people to actually either cross-license or work together.

As Mr. Nelsen mentioned, most of us here in the U.S. are in a wait-and-see approach as to what happens in places like China. In the meantime, however, their markets are growing at a very rapid pace. They are not waiting for people like us to come in. They are getting it. They are taking it one way or the other and will continue doing that, whether it is through their own schools and universities or it is through partnerships. So that is why I brought up the sense of urgency for us to move forward.

If we don't take the action and create some kind of a mechanism on the commercial side to take advantage of our technologies and IP, then I believe we will be left behind, which is one of the reasons we are jumping ahead and having those conversations.

Are we very confident of protecting our IP in China? No. But is that the reason not to do something? I don't believe so either. I am not sure of the exact answer, but we will have to get out there and start putting our technology out there so it leads the world.

Most of the core technologies in demand side, whether LED lighting or not, is here today to lower energy consumption. As American enterprise, if we are able to get out there and make that lead and have other countries and companies follow, I think we will continue to stay in the leadership.

Mr. INSLEE. So do you look at yourself as sort of between a rock and a hard place? If you wait and allow other companies to develop these markets in China, you are left at the starting gate. If you move to China now, you could lose your intellectual property. Is that the conundrum you are in?

Mr. RAO. That is it exactly. So people look for alternatives, whether it is Thailand or Indonesia, where there is more of a perceived protection of IP. I am not sure if it is true or not. There is less of a flow. Or what we do is we keep gen one products here in the U.S. and maybe older technology we take it to other parts of the world so you don't lose your current technology.

The other thing about being between a rock and a hard place, sir, is the fact that if we are able to create markets here locally, we can stimulate innovation at a much more rapid rate. That is one thing that is keeping us behind. A couple of us mentioned here we are slow to create markets in energy and climate-related technologies here in the U.S. That will be our number one challenge. If we don't do that, we will be left behind. China and India and the Middle East are doing that today.

Mr. INSLEE. We have a little bill that we hope will become law in the fall that will help in that regard.

Thank you very much.

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

Mr. CLEAVER. Mr. Nelsen, are you familiar with Midwest Research Institute?

Mr. NELSEN. Just generally.

Mr. CLEAVER. The Midwest Research Institute, MRI, has a division called Solar Tech; and it serves as a neutral place where companies, research organizations, or utilities can collaborate on or come and challenge and conduct proprietary research necessary to be successful. I am wondering whether or not you think it would be feasible for us in some future legislation to award incentives to companies that create neutral places as a part of their U.S. marketing strategy? I mean, where the innovators can come to make sure that there is a neutral party to kind of manage, oversee, negotiate, to prevent thievery?

Mr. NELSEN. I think that is a good idea in the U.S.

When you talk about exporting ideas like that globally, I think it is a great idea to have applications development or, as Ms. Haverkamp mentioned, a place, a joint effort we are doing in China, and there are some things in Europe. There is a lot of interesting ways we can think about ideas like that on a global basis focused on applications.

My point earlier was that most of the big breakthroughs are still going to happen in the U.S. So we have to do two things. We have to protect the big breakthroughs, and we have to develop the applications.

I think when you talk about these joint research institutes and potential neutral ground, those are better for the applications than they are for the breakthroughs. Because no matter what you do in foreign countries, you won't be able to replicate the $1 trillion or $2 trillion investment the U.S. has in our research infrastructure that is pretty much not duplicatable anywhere else in the world.

Mr. CLEAVER. Thank you.

Ms. Haverkamp, you mentioned the benefits of including international allowances and offsets in the Waxman-Markey climate bill, which we proudly passed over here in the House. And if we could figure out a way to eliminate the Senate constitutionally, I think we could make a lot of progress, but that is just a personal opinion. But you also mention that the Kyoto Protocol international offset program, the clean development mechanism, has not lived up to expectations.

What can you share with this committee that might improve our international offset program before the final passage of our Waxman-Markey bill?

Ms. HAVERKAMP. Thank you for the question. I think what is especially important is that the international offsets that are allowed to be used by U.S. companies satisfy scientific requirements for their environmental integrity, and I think the bill proposes a process for that happening. There are some kinds of offsets, like the reductions in deforestation from tropical forest countries, that you can be sure are keeping carbon out of the atmosphere, and the bill

in a very good way creates a lot of space for deforestation credits to come into the system.

With respect to emissions reductions from projects in developing countries along the lines of the clean development mechanism, I think there are a couple of things that should happen. One is to make these reductions happen at a greater scale is to move to more broader what are called sectoral crediting, where you are trying to achieve reductions across an entire industrial sector rather than a particular facility.

The other thing that I think the bill does which I applaud is that while preserving the clean development mechanism projects for the smaller, poorer countries, it has a mechanism for the largest emitters graduating out of the ability to sell their credits into our market. And I think that is especially important for the atmosphere, because the major emitting developing countries need to move as soon as they can toward real emissions reductions. And CDM projects are, frankly, shifting emissions from one part of the world to another rather than an overall reduction globally in emissions.

Thank you.

Mr. CLEAVER. Thank you.

Mr. Esper, do you think that further nation-to-nation collaboration, such as the U.S. and China are doing on carbon capture and sequestration, or promises for future collaboration will significantly help negotiations with developing nations at Copenhagen?

Mr. ESPER. Well, I think it is important that we continue to engage China on this issue. But for the purposes of intellectual property, I think we do need to be very clear up front with the Chinese—and in some ways they have claimed leadership of the G–77 bloc—to make clear that IPRs are off the table with regard to a climate change agreement, because at the end of the day, as several of us noted, and the chairman and the ranking member have noted, if we don't protect the intellectual property rights, then we won't draw the innovation that is going to get us to the solutions.

And so I think it is critical that we continue to engage the Chinese, but be very clear and forceful up front that IP isn't on the table when it comes to addressing climate change.

Mr. CLEAVER. All right. Thank you, Mr. Chair.

The CHAIRMAN. Great. We thank the gentleman.

Mr. Rao, in your testimony you point to the tremendous business opportunities across the world for clean technology. Could you tell us in more detail about the experiences you personally had meeting this demand with your products?

Mr. RAO. Sure. Chairman, thank you for the question. Specifically I will talk about the Middle East, but I will also expand that to Southeast Asia and China where we have been having discussions. This is fresh in my mind, so I can talk about that.

The CHAIRMAN. Tell us about the barriers that you have encountered, please.

Mr. RAO. Absolutely.

This pertains specifically to energy in the aspect of demand containment, so demand-side management in terms of lighting, digital lighting, so LED lighting and controls. There are opportunities in these countries where they have recognized that controlling their

use of energy is going to be a lot faster than just adopting energy-generation technologies. As an example, in the Middle East using solar photovoltaic technology is not going to be practical because of dust settling into solar panels. So they have tried it. You know, we blindly believe that there is a lot of sun in the Middle East, so solar would be great, while actually practically on the ground it does not seem to be all that fine.

The CHAIRMAN. Would that be the same problem in the Mojave Desert in the United States; dust would settle in, and, as a result, that that is a false promise as well?

Mr. RAO. I am not sure if I am qualified to technically answer the question without a little bit more research, Chairman, but I will tell you this: If it is dust with moisture, if the humidity content is high in the Mojave Desert, which I believe it is not, at least for most of the year, that becomes an issue, because the dust with humidity settles in and cakes on these panels. That is actually putting a barrier between you and the sun rays and the actual photovoltaic cells.

The CHAIRMAN. So we are lucky there is no humidity in the Mojave Desert, so as a result we can become the solar giant because of that. And all across the Middle East, no matter whether it is 100 degrees a day and the sun is out every single day, that solar is not in their future, is that what you are saying, because of the humidity that accompanies the dust and the sun in the Middle East?

Mr. RAO. For the moment, Mr. Chairman, that is the reality as they have tried and tested. However, I am hoping——

The CHAIRMAN. Wow.

Mr. RAO. Go ahead.

The CHAIRMAN. No, I am just saying, wow, I did not know how really up the creek the Middle Eastern countries are because of their humidity accompanying there. I never knew that before.

Mr. RAO. And they are looking for solutions. So talk about technology and opportunity for innovation, if we can solve the problem of dust and humidity settling in. The same thing happens with outdoor LED lighting where the brightness of the fixtures are reduced by 40 to 50 percent because of the film of dust that gets in, caked in. So we are taking that on as a challenge to resolve those issues. That is on the energy side.

On the control side in LED lighting, interior, I believe, there are tremendous opportunities. As an example, in built environments today, with technologies that exist here in the U.S. and elsewhere, we can reduce the energy usage by at least 40 percent without major infrastructure change. They recognize that, and they have asked us to help them with implementation of this technology.

So there are specific examples. So if you talk about controls, what am I talking about specifically? Making built environments more intelligent that actually regulate the lighting, the HVAC, et cetera, based on ambient conditions of outside lighting as well as outside temperature. And very often we find in commercial buildings or in other places as well, the outside temperature is 110 degrees, but the inside temperature and air conditioning is ramped down to 65 degrees. And we have actually been in environments where you feel cold inside when it is 110 degrees outside.

The difference doesn't have to be that much to provide comfort for us as human beings to being inside. So making it intelligent actually adds a tremendous amount of savings. That is something that we ought to be doing here in the U.S. And people outside the U.S. and the Middle East and Southeast Asia have recognized that as well. They are beginning to implement those technologies.

The CHAIRMAN. Let me ask Mr. Nelsen a question. You talk about the U.S. Green Bank as a good idea to help to finance new green technologies, but you also pointed to the idea of a World Green Bank. Could you talk a little bit about how you would see that structured and how you would see the technology transfer occur in that kind of a context?

Mr. NELSEN. I think the structure would be similar in the sense that it is really an incentive process. So if you have a developing area, they can essentially partner with private companies and then apply for funding from this entity, whether it was a private entity or public entity. Something like the Asian Development Bank would be a good example of something that exists outside of the U.S.-proposed Green Bank. So if I wanted to make a million-acre algae biofuels facility in a poor country in Africa, I would approach the country, and we would jointly apply to an entity that would help partially fund it; intellectual property rights being preserved, not actually transferring the technology to anybody, but kind of a joint effort that would have some public funding.

And then with China I think it is a little bit different, so it needs to go in at probably a different level. And I actually think maybe the solution would be to have the Chinese put up some of their excess money into that kind of a structure so they feel invested.

The CHAIRMAN. So when the Chinese say they don't have any excess money, and, as a result, we should be giving them these technologies, what is our best answer to them about this debate over whether or not they have excess money?

Mr. NELSEN. I sat on a panel recently with the person that is directing the social security fund in China and the other person that happens to be in charge of the China Investment Corporation, and they have a large amount of money. And I think that one of our challenges to China and one of the ways to solve this problem is to get them invested. I mean, if they are investing billions and billions of dollars in U.S. technology that is deployed in China, and intellectual property rights are preserved in a government-to-government relation, that actually might work, because it is less likely that they are going to want to steal the technology if they have invested huge amounts of money in it.

The CHAIRMAN. Got it. Thank you.

Mr. ESPER. Mr. Chairman, I was going so say, if I can add, I think China is a special case. And going back to the idea of the Green Bank, and the demand is that the developed countries would make contributions to the bank from which, as the example was pointed out, the developing countries could draw from. But I think putting the onus on the developed countries is only half of the equation. The other half is addressing the tariff and nontariff barriers. It doesn't make much sense to contribute to the bank and allow companies or countries to draw from this, but then paying exorbitantly high tariff rates and confronting the other problems.

China is even more different, because in that case not only do you have the tariff issues and nontariff issues that you face, but in China we also note that the government has identified renewable energy as a strategic industry. So they have, in addition to tariff and nontariff barriers, other types of protectionist measures, whether it is local content requirements, IP issues, that are really aimed at improving their own economic competitiveness and their technological skills. So it is a special case that we really have to work on in particular if we are going to break down these barriers and get them to be a responsible player in addressing climate change.

The CHAIRMAN. Thank you, Dr. Esper, very much.

The gentleman from Washington State, Mr. Inslee.

Mr. INSLEE. Thank you.

Dr. Esper, could you talk about those tariff barriers right now, where they exist; the amounts; what, if anything, we do then about them; are there pockets of the worst offenders?

Mr. ESPER. Well, we have some specific examples. I think I cite in my written testimony countries such as the Philippines, China, others, where you have tariff rates at least as high as 10 percent, in some cases higher. You have other types of nontariff barriers that could equal 300 percent in terms of a tariff equivalent. So it is a big challenge when countries put those types of obstacles in front of tech transfer. That is what we say when we, rather than talking about IP and how we do compulsory licensing or tech transfer in the UNFCCC context, we really need to not focus on the red herring and look at what the real obstacles are at the country-by-country level and tackle those.

Mr. INSLEE. Let us just take the Philippines, just because you have mentioned them. Have we made any significant efforts on those tariff barriers for IP use, so there is, like, a 10 percent. I mean, we are investing gazillions of dollars in security, training people in the Philippines. It is kind of hard to accept that tariff barrier against our sales to them of high-tech material and systems. Have we made any serious attempt there, for instance?

Mr. ESPER. Well, that is a good question, and I don't have the answer for it right now. I think it is part and parcel of the strategy we need to put forward in terms of addressing the tech-transfer issue of looking at these countries, looking at where they rank on the special 301 watch lists, and asking ourselves how do we talk to them and how do we engage them in a way that will get them to reduce these tariff barriers. What levers can we use either diplomatically, through financial assistance, foreign assistance, whatever the case may be, to get them to address these issues to comport with international IP laws and to strengthen our IP enforcement?

Mr. INSLEE. Mr. Nelsen, you had an idea about the Green Banks, like the idea of maybe using a Green Bank in an international context. But you also suggested one solution is to have other companies be invested so they have got an investment in it where they benefit, if you will, from IP protection.

Were those mutually inconsistent at all, that you know we are helping finance through Green Bank, but we are also expecting people to be personally invested?

Mr. NELSEN. I think you define it based on poor countries versus wealthier countries. So there are developing countries that have large foreign currency reserves; you know, China being the obvious. So I think China and India and maybe one or two other Asian countries are separate cases. And then you have issues like Africa and other places where basically there isn't money, and so you need to probably have some kind of private-sector, public-sector matching, or similar, some quasi-public structure like the Asian Development Bank, where there is maybe—or maybe multiple different organizations coming together to do project finance that has some private matching.

Mr. INSLEE. Just to share my story from China to show I am thinking on the lines you are is that when we were meeting with the Chinese officials and, the same line, with remarkable message discipline, everyone told us the same story in China, which is that they are a developing nation, we are a developing nation, we are a developing nation. And I was with one of the officials. I noted that in driving to the meeting with him, we had gone by two Gucci stores, a Prada store and a Ferrari dealership. And I noted that just that morning, the Chinese businessmen had bought a stake in the Cleveland Cavaliers. And I said that I thought China was a developing nation just as much as Yao Ming is a developing basketball player, so I kind of share your view in that regard.

Mr. NELSEN. One of the things I have noted in my dealings with China has been that I think they are looking for the right technologies, just as we are. Once the green technologies that actually can compete on cost exist, I think they will absolutely invest their money in it. And so as you see solar come down, and as you see biofuels that are practical, it is the same process that we have here. I mean, they are going to be marginally impactful until they can compete on cost, and then I believe we will invest more, and I believe China actually will want to invest some of their foreign currency in those solutions. And that is probably actually a good thing for us in a lot of ways. But we are still going to need to go high maybe in an SED level for IP protection.

Mr. INSLEE. Thank you.

The CHAIRMAN. Mr. Rao, I really want to come back to this inability of the Middle East to produce any solar, because, as you know, it is necessitating us selling nuclear power plants to countries in the Middle East with uranium, plutonium and other nuclear bombmaking material, which is only going to escalate the tensions in the Middle East. And I am very afraid that as we send very expensive nuclear power plants to the Middle East, that we are only shortening the day that we have to send ever more troops over there as a government collapses that has one of these nuclear power plants. In the same way that in Iran and Iraq we are now facing that problem, it is almost inevitable that the same thing will occur in one of these other countries, a country that could otherwise generate electricity from solar.

So here is what I am wondering, and everyone is gone here, so I am all alone as the Chairman, and I am just wondering, you know, we have this problem with rain that used to go on the windshields of American cars, and somebody came up with the idea of a windshield wiper that would just wipe off, basically.

And then somebody came up with a brilliant, brilliant idea. It was called the intermittent windshield wiper. It would just occur every 30 seconds or so, a big patent fight over that about 50 years ago in the United States. A guy got very rich winning this patent fight, a big, big fight.

And it just seems to me that maybe someone can invent a way that intermittently the—since the very device that we are trying to protect generates electricity, it would seem that perhaps there would be a way to have an intermittent dust wiper, you know, wipe off the dust so that the electricity which is being generated by the thing that is being protected by the intermittent dust wiper would allow this country to be able to take advantage of their better natural resource rather than asking the United States to send them uranium and plutonium.

Should I get a patent on my idea, Mr. Rao? And would this idea emanating from this Chair right now constitute constructive notice to all other entrepreneurs in the world that I have the idea first? And how much more complicated than that should it be to be able to figure this out?

Mr. RAO. A couple of comments, Mr. Chairman. I think it is an excellent idea, and the only consolation is that you probably are repeating what happened at a workshop 3 days ago in Bahrain about finding alternatives for self-cleaning solar panels that actually can do the same thing. We did recognize the fact that there was a patent fight, and the discussion was we have to do more research on who holds the patent on intermittent wipers and how it can be applicable to solar panels.

The CHAIRMAN. You actually had that conversation.

Mr. RAO. Absolutely.

The CHAIRMAN. No way.

Mr. RAO. But there may be an extension. If you look at IP, so you will note that they actually had the conversation here in terms of actually bringing it, because we were looking for solutions.

The CHAIRMAN. You know, there is a part of me that really from a nationalistic perspective that I thought maybe I shouldn't share this idea with Bahrain and Saudi Arabia and other countries, maybe I should just keep it here so that we develop all these ideas, and that they not become the capital of solar, okay, because we now have them, because they don't know about this, buying our nuclear power plants. And that is a good trade advantage for us.

But maybe just out of—you know, and Ms. Haverkamp already pointed this out, and I think Mr. Nelsen as well—maybe there are other reasons we should share the intermittent dust wiper technology with these other countries so that they can capture the opportunities there.

But I just think it sounds like an eminently solvable problem, and it also solves the problem of us sending uranium and petroleum to countries that could be subject to political instability over the next 50 years, which instability would then create real problems for us as well in the transfer of nuclear bomb-making material to Third World groups that many of these countries, as you know, are already subsidizing at least indirectly.

So I just think the sooner we solve this problem—and I would like to work on this as an issue, because I think almost everyone

at this table really does believe that solar is the future, and it could become the single largest manufacturing sector in the history of the world. And I would just hate to see the countries with the most sun not being able to benefit from it because they don't understand the intermittent windshield wiper technology better.

Mr. RAO. Excellent. Thank you, Mr. Chairman. That is an excellent idea. In fact, I think what the folks in Bahrain and the Middle East are looking at is not the solar, it is just one option. It is one of several options. So, for example, they are exploring wind simultaneously as well, and they are also curtailing the use of energy itself. They are grossly negligent about how they use energy because it is so cheap. Now they are beginning to realize that.

We will work on that. I really applaud you for taking that effort, and maybe there is an idea for another patent, maybe, if you continue thinking on it.

The CHAIRMAN. Is this a patent in the control of the United States? Are you aware of that? Is the workshop, the 3-day workshop, on the intermittent dust removal technology, is that an American technology that they were discussing?

Mr. RAO. The initial patents, I believe, we are doing some research on it. The workshop wasn't on intermittent wipers, the workshop was on energy solutions as a whole. This is one aspect of it. So we have started doing research. It is about 48 hours since my last discussion on that, and I have been in a plane for 26 hours of those. So we will get that research as well.

The CHAIRMAN. Thank you.

A lot of times people say, well, you know, this is the equivalent of our putting a man on the moon. But in a lot of ways, that kind of overstates the case because we are talking about batteries, we are talking about, you know, incremental additions on already existing technologies with additional breakthroughs; kind of like in the chip industry how there is Moore's law, and it just keeps improving every year or so.

The same thing is true here with incremental new technology breakthroughs that keep improving by another 18 percent per year the efficiency of solar or wind or other technologies, which seems to be the curve that at least solar has been on since 1978. So that is the context in which I am thinking about these issues.

Maybe you could, Ms. Haverkamp, talk a little bit about the difference between the HIV/AIDS patent protections and the clean energy patent protections as you see the differences in other countries around the world in terms of those technology-transfer issues.

Ms. HAVERKAMP. Sure, my pleasure. I went into this in some more detail in my written testimony than I did orally, and I would recommend that people also look to that. But I think some of the most significant differences are that often in the pharmaceutical area to deal with a particular disease there may be just one fix that is developed, one drug that really works. There is a lot of effort to find the one thing, the silver bullet, if you will. And what people are fond of saying is that with respect to climate change, it is not going to be a silver bullet, it is going to be silver buckshot. And the examples that you see, say, in the solar area or the wind area, where there are lots of different companies with lots of different ways of addressing the problem of reducing emissions or

making the products more efficient, that is quite different from the medicine area.

But I do think it is important, in thinking back to Representative Sensenbrenner's question about the negotiations, there is a lot of baggage from the pharmaceuticals debate that countries bring to the climate debate.

The CHAIRMAN. So what is that baggage?

Ms. HAVERKAMP. I think it was a sense that in the pharmaceutical area, it was more a monopolistic situation with the few large companies that were making—they had to make incredible investments in the research to develop these products, but then there were significant financial benefits when you had that patent. And there was a fair amount of obvious human misery that could be avoided if the medicines could be made available more cheaply.

And it was—this is getting into anecdotal information, but I think one of the stories that I remember being bandied about a lot was that when the patent was about to expire, a minor change to the product could extend the patent period again. So it was looking like it was companies going out of their way to preserve their market share and make it harder for generics to come on line. And I think in the area of human health that was seen by many developing countries as unacceptable.

The good news is that in the Doha WTO Ministerial, the governments got together and came up with a decision about access to medicines that recognized that there were flexibilities in the TRIPS agreement, and in situations like this, they really ought to be used.

The CHAIRMAN. So in the negotiations on international climate agreement, intellectual property is one of the four main pillars of the negotiation. Why is it important for the United States to be a leader in resolving these issues, in your opinion?

Ms. HAVERKAMP. I would slightly amend your description of intellectual property as one of the four main pillars. One of the four main pillars is the transfer of technology, and intellectual property is one piece of that. The transfer of technology involves also the capacity building, the access to information, a whole suite of issues. And transfer of technology and addressing that is critical to getting an agreement in Copenhagen because it is, if you will, the developing country's side of the deal that we need to make. We are wanting them to reduce their emissions; they are wanting the technology and financial assistance to be able to do that. And it is in our self-interest as the United States to come up with solutions in the tech-transfer area because, as many people have said, even if our emissions went to zero, if all the developed country emissions went to zero by 2050, you aren't going to avoid dangerous climate change unless the major developing countries soon also get their emissions leveled off and in a downward path. And so we need to find the ways to share technology, share know-how with them so that they can do that as well. And I think the private carbon market can be a big player in making that happen.

The CHAIRMAN. So we can have the audience watching on television understand, what does TRIPS actually stand for, so that we can bring them into this discussion? What does T-R-I-P-S actually mean?

Ms. HAVERKAMP. I am going to trip over this. Trade-related aspects of intellectual property rights.

The CHAIRMAN. And that is the most important agreement in the international intellectual property area, would you say?

Ms. HAVERKAMP. Well, the intellectual property provisions have gone into a lot of bilateral agreements, and well before TRIPS was put into——

The CHAIRMAN. When was TRIPS put into?

Ms. HAVERKAMP. It was as part of the Uruguay Round, which was in 1994, 1995, when the WTO agreements entered into force. But before that there was a range of agreements around intellectual property that are administered by the World Intellectual Property Organization, WIPO. But I think TRIPS has been considered the most significant in creating the incentive for countries to establish strong intellectual property regimes in their domestic law.

The CHAIRMAN. So how does TRIPS as administered by WIPO impact on the clean technology transfer area? If you can put that into English for our viewing audience.

Ms. HAVERKAMP. I am sure my colleague would like to help as well. But I think that one way to say it is that the TRIPS agreement, when countries join the WTO, they take on an obligation to write into their domestic law strong intellectual property protections. And if countries do not pass those laws, or if they don't enforce those laws, then countries who are hurt by that can bring enforcement actions in the WTO to compel them to establish a good intellectual property protection regime.

The CHAIRMAN. Which, in your opinion, is the best place to address the intellectual property issues related to climate change, Ms. Haverkamp?

Then I will ask you, Dr. Esper.

Ms. HAVERKAMP. Well, I think my first caveat would be that I think that the picture is still emerging of how significant these issues are and whether and what kind of fixes might be needed. But I think that climate change is a problem that requires—that needs to be addressed across multiple fora, and the U.N. climate negotiations does not have the sufficient expertise or involvement of all the right ministries to address all the issues.

So I think that the IP issues are coming up here, but it may well be, depending on the kind of concerns that emerge, that the other fora like the WTO TRIPS agreement would be an appropriate place to address it. I think also that is just a political reality that I don't think you are going to get consensus to address these problems in the climate negotiations.

The CHAIRMAN. And Dr. Esper.

Mr. ESPER. It is a good question. I was in Geneva a few weeks ago, and this issue has been debated back and forth for some time now between the WTO and the WIPO and the UNFCCC. My sense is they are coming to some conclusion, which we fully support, that the WIPO is the best place to handle IP issues for the reasons that my colleague cited; everything from the expertise, the capacity, the ability to bring to bear all the different parties to the agreement, and to be able to address and consider any unintended consequences.

This is one area where the WHO has already acknowledged that they believe in the health care venue that the WIPO, the Intellectual Property Organization, would take the lead. So our view has been that IP is best handled in the WIPO.

But going back to your original question, I think the issue really is about tech transfer, not about IP. It just tends to be the case that for one reason or another some governments, some NGOs, jumped people on the IP issue and cited that as the problem. And I think, as I pointed out in my testimony, others have as well, IP isn't the obstacle here, it is what is going to get us innovation. When you start looking through the case-by-case, country-by-country examples, you find that certainly in the least developed countries patents aren't the problem. Many of the technology solutions aren't patented. Reforestation is certainly something that is not patented. But when you start moving up the ladder in terms of developing countries, that is where it gets a little bit trickier as they may need different types of technologies.

The CHAIRMAN. Interesting, interesting.

Mr. Rao.

Mr. RAO. Mr. Chairman, I have a slightly different view on that. I have actually given the details in the testimony of an idea. The TRIPS is administered by WIPO. And TRIPS by default actually talks about the trade-related aspects of IP. Perhaps it probably won't be a bad idea to actually make this a trade issue, because at the end of the day, IP without commercialization doesn't really mean much. IP for the sake of IP is not going to get us anywhere.

The CHAIRMAN. You don't know how as a history major, you know, all history and history majors in college envied the kids who were the science majors and the technology majors because they know what they want to do. And we are just taking satisfaction in these history and English books that we are reading. And here for just one brief moment, it only lasted until I recognized you again, I got great satisfaction. So sometimes IP just for the sake of IP does really serve a purpose, okay? It only lasted a very transitory moment. But I don't want you to underestimate the satisfaction I felt as a history major in also having that big breakthrough.

Mr. RAO. Well, perhaps maybe in the vein of Hite's law and other laws maybe we have a Markey's law, an intermittent cleaning of solar panels at some point.

The CHAIRMAN. And intermittent satisfaction from coming up with that.

Mr. RAO. From coming up with it, absolutely, I agree.

Actually I was talking about taking a different approach to IP. Instead of actually having this for the sake of IP internationally, maybe in conjunction with what Mr. Nelsen was talking about here in terms of having an IP clearinghouse as an exchange. It actually has been tried by the World Business Council on Sustainable Development, they call an eco-patent pooling. But they don't incentivize the innovators; it is more just to share ideas.

But the clearinghouse that I was talking about actually does incentivize, and this is exclusively for climate change-ready technologies now across the board. You take this out of this realm of debate, because while we are debating, we are polluting. We are actually making this War of the Worlds of a play.

So my idea was actually if you add this Green Bank, I think it was actually—I called it funding, but made this a part of the WTO effort where the clearinghouse actually takes responsibility; you pay for play, you get in. If you have an idea, you get in, and you can actually take IP as well. It lets innovators actually take advantage of ideas around the world.

The interesting thing it is not about the large companies alone. I think the backbone of our economy and most other economies is what I call the SMEs, the small medium enterprises. Innovation comes out of there. And providing them with access to ideas and incentives for getting new ideas innovation is going to make a difference for us to create jobs here as well.

The CHAIRMAN. Okay. Great. Thank you.

Mr. Nelsen.

Mr. NELSEN. I think as long as it is not compulsory, those kind of exchanges work. But for the real big breakthroughs, which are the ones that are actually going to matter to us, all the incremental stuff added up will not get you to solar that competes with existing electricity. There needs to be major innovative breakthroughs. And those are happening, but those people probably won't want to put those in.

And one final point. The difference between the HIV issue and what we are talking about is the R&D costs are great on both, but the deployment cost on these energy solutions is very large. So one biofuels plant that is just a demonstration plant in the U.S. costs more than the total manufacturing cost of all the HIV drugs that have been distributed in Africa. So it is a very different, completely different equation.

The CHAIRMAN. I was only making reference to a hearing that we had yesterday with Dr. Emanuel Sachs, who is an MIT professor who created the technology that led to the creation of the company Evergreen Solar Company. And what he did was he presented us a chart which showed how the cost of generating a kilowatthour from solar had dropped from $5 down now to about 20 cents, and that it improves about 18 percent per year technologically; and that with his new company, 1366, which is a new company in Lexington, Massachusetts, with his new state-of-the-art technology making an additional improvement, that he sees actually by the year 2020 that the generation of electricity from PV will be equivalent to that of coal, and that by 2020 we can expect that 7 percent of the electricity in the world will be generated from photovoltaic technology.

Now, you look at that, Mr. Nelsen, and your response would be——

Mr. NELSEN. My response would be that—it is a good news response—was that we have a company that is going on sun at NREL in a week that will probably do 6 cents to 8 cents a kilowatthour, so you don't have to wait 20 years.

The CHAIRMAN. We don't have to wait 20 years. No, he is saying that we will actually see by 2020 7 percent of all electricity in the world. Do you think that is a realistic goal once you get it down to 6 cents to 8 cents?

Mr. NELSEN. I think it is all about cost. And whether it is biofuels or it is solar, it is all about cost. And it looks like, I would

say, that the breakthroughs probably will be there and are almost exclusively going to be done in the U.S.

The CHAIRMAN. That is the technological breakthroughs will be made in the United States?

Mr. NELSEN. Yes.

The CHAIRMAN. And then the question becomes what are the rules for the technology transfer to get them out to other countries? And so for Bahrain it would be that we need to have windshield wipers on the technology, but assuming that we can make that breakthrough as well and cut the deal with the family that still holds the patent rights to that.

Mr. NELSEN. And I would love to be able to put a giant biofuels or solar manufacturing facility in Mali or some other poor country. I just don't want to be compelled to do it. So the question is what are the right incentives to do that?

The CHAIRMAN. And how would you be compelled?

Mr. NELSEN. If somebody told me that I had the license—you know, that I had to give away my technology to some world body versus some incentive structure, which I think could be created to get me to do that.

The CHAIRMAN. You would lose your incentive to further invest here in the United States if you were compelled then to transfer the technology overseas.

Mr. NELSEN. Exactly. And I would have suspicions that our friends in competing strategic countries would take advantage of those situations to make fungible assets like fuels other places.

The CHAIRMAN. Okay. That is great.

So here is what I would like to ask each of you to do. We will start in reverse order of the opening statements; ask each of you to give us the 1 minute you want us to remember as we are moving forward on these issues in the 130 days up to Copenhagen. The select committee will be in Copenhagen, and we will be working on the effort to have a bill put on the President's desk before he goes to Copenhagen. So please give us your 1-minute closing bit of advice.

Dr. Esper, we will begin with you.

Mr. ESPER. Great. Thank you, Mr. Chairman.

My 1-minute synopsis is this: Technology is crucial to addressing climate change, and if we want the advanced technologies that are going to get us there, what we need to do is preserve an IP system that has generated technologies over the decades. And so as we look at what is happening now at the UNFCCC more broadly, it is critical that the United States make clear that IP rights are not on the table for negotiation or for undermining. And I think the Congress can play an important role in that through passing legislation, as you have already done; through speaking to the administration, asking them to come forward; offering statements of your own, but making clear to our partners both in the developed world and in the developing world who look to us for leadership that IP rights are the solution, not the problem, and we should focus on the real problems that myself and various others here have outlined today.

The CHAIRMAN. Ms. Haverkamp.

Ms. HAVERKAMP. Thank you.

I agree tech transfer is—technology is critical to solving the climate change problem. Tech transfer is critical to that. What will make that happen are policies, U.S. Government policies, that cap on carbon that the Waxman-Markey bill represents. Similarly, in developing countries, however much technology we develop and are able to send, it won't go to developing countries unless they have domestic policies and incentives that require it to be used there.

As far as the U.N. climate negotiations, I think they have been very much at a rhetorical stage. Everyone is waiting for the United States to come to the table. Now that the U.S. is here, we need to move the negotiations into a much more thoughtful "get down into the details" stage of discussion. And I think that for the IPR issues, it is time to get more concrete; get beyond the rhetoric to what are the specific concerns that are motivating, what are the examples that are motivating countries' proposals so we can figure out what is a serious concern that needs addressing and what is negotiating bait.

The CHAIRMAN. Thank you all very much.

Mr. Nelsen.

Mr. NELSEN. The innovations are happening, they are going to happen in the U.S., there are going to be breakthroughs, and they are going to be the solution to climate change. And they are also going to be what is going to allow us to lead the next 10 or 20 years of the economy in the world. They are going to create a lot of jobs at home, and we need to protect them in a smart way, but also deploy them with incentives, not compulsory.

The CHAIRMAN. Thank you, Mr. Nelsen.

Mr. Rao.

Mr. RAO. Thank you, Mr. Chairman.

Two points I would like to make. One is what got us here necessarily won't get us there. We have to look at IP very, very differently. So we have successes over the past decade. I think this is going to be very different.

I would like to propose that we do actually look at an IP exchange combined with some kind of a funding agency that we call a World Bank or Green Bank, or whatever it is. But actually I think it should be a private not-for-profit sort of organization where it is voluntary participation, where somebody has to—to take, somebody has to contribute. I would like to propose that we take that to the next level and propose it. If not, things will continue to happen in China and Saudi Arabia and India without the U.S. presence in there, and that probably will be detrimental to us.

Thank you.

The CHAIRMAN. Well, we thank each of you. We clearly have a challenge before us. We want to protect intellectual property rights. We want to make sure that inventors in the United States have an incentive to continue to invent, and that investors have an incentive to invest in those inventors. And we have to make sure that we properly analyze the markets that we are talking about.

Ms. Haverkamp, I think, keeps pointing out that we need to create a domestic marketplace for the products that we are inventing here in the United States. What is the point of becoming the world leader in solar and wind if we don't actually not only invent them, but then deploy them here and create the markets here, create the

manufacturing jobs here, which is what the Waxman-Markey bill is all about, to create those incentives for the development of a domestic marketplace even as we then create the rules for the transfer of the technologies into the international marketplace to make sure that the inventors here benefit, but also that the world is presented with a solution to the climate change problem that will affect, unfortunately, poorer countries more gravely than the wealthier countries. And that is the balance we have to strike here.

I think we have to respond to this, and embrace the opportunity of the challenge, and to do so in a telescoped time frame. We have to engage China to make sure that China as a special case understands that we need to have some regime of protection of intellectual property put into effect so that we create the conditions for innovation here while we have a mechanism, perhaps an international Green Bank, that we can work through as a concept to be able to ensure that this technology is transferred, but with proper compensation for those who have taken the risk and have the ability to create.

So that is really the framework for our challenge going forward for the rest of this year. With the world gathering of 190 nations coming to Copenhagen, I think they will be looking to the United States to frame this correctly. But they will also be looking to China to see if we get the proper response from them so that we can be the world leaders in that negotiation.

Your hearing has been very helpful to us in the framing of the issue. We would like to stay close to you over the next 130 days so that you can help to illuminate the choices that our policymakers will have to make as we enter those negotiations.

Thank you all very much. This hearing is adjourned.

[Whereupon, at 11:28 a.m., the committee was adjourned.]

THE SELECT COMMITTEE ON
**ENERGY INDEPENDENCE AND GLOBAL WARMING**

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

Thank you,
Ali Brodsky

Ali Brodsky
Chief Clerk
Select Committee on Energy Independence and Global Warming
(202)225-4012
Aliya.Brodsky@mail.house.gov

1. What business operations does Lighting Science Group Corporation base in the US? For example, how many people do you employ here and abroad? Where are your LED bulbs and other components manufactured, i.e. how much of the work done for Lighting Science takes place in the US vs. internationally?
   - Lighting Science Group (LSG) has the following basic operations in the U.S;
     - Research
     - Product Design and Development
     - Manufacturing
     - Sales & Marketing
   - We employ 86 FTEs in the U.S and 26 FTEs outside of the U.S.
   - Our LED light bulbs and fixtures are manufactured in Florida and our display solutions (like the Times Square ball) are designed and manufactured in Sacramento, California.
   - Overall, including work done by our partners and component suppliers, about 75% of the value of our products is built outside of the U.S.
   - About 60% of the work done in manhours, is done in the U.S.
   - For products sold in the U.S., total assembly is done in the U.S., with components sourced internationally and from within the U.S.

2. How secure do you feel about the protection of your patents/technology/innovative ideas in countries with a history of IP violations?
   - Not very secure, especially when it pertains to China. However, recent developments we have been monitoring in China give us renewed hope of IPR in China improving.

3. Your proposal for the creation of an IP clearinghouse/bazaar raises several questions:
    - Are you suggesting one international clearinghouse or several national entities?
        - One global clearinghouse exclusively dedicated to technologies and innovation related to climate change
    - Who would oversee activities between them all and ensure that all were participating and sharing information fairly? (There almost certainly would be a difference in approach between nations like the US and China.)
        - With just one exchange, info flow and management becomes a relatively easier task.
        - Rules/guidelines for sharing IP into and from the exchange will be pre-determined and these guidelines will be based on milestones we should be achieving as a global community and not just on national affiliation. These guidelines should seek to normalize differences in approach between various countries.
    - How would disputes be resolved?
        - In addition to laying down global guidelines on getting IP in and out of the exchange, the governance model for the exchange should be well designed to include arbitration, dispute resolution, etc.
        - Structurally, all disputes with IP, related to the exchange and climate change will be dealt by an international arbitration panel, nominated by the board of the exchange.
    - How would members of the independent panel of technology and IP experts be selected?
        - Once the governance model is established, one of the existing intergovernmental panels/groups (IPCC, World Bank, UNDP, etc.) can establish selection criteria for the panel and proceed to fill the positions approval of the board.
        - If possible the governance model and the panel(s) should be discussed in Copenhagen this year.
    - Would this eliminate the role of the US Patent and Trademark Office in the arena of climate change technology?
        - This exchange would eliminate any direct role of the USPTO in the global IPX, however, representatives from the USPTO can be part of the governing council/board of the global IPX.
    - Have you discussed this proposal with other government or non-government entities? What reactions have you received thus far? If the reactions have been varied, have you noticed a trend - geographical or economical - between the countries that seem supportive vs. those opposed?
        - While I have discussed this proposal with several innovators and technologists in various countries, including the UK, India and China, I have not reviewed this with any governmental entities. I will be glad to lead an effort to build support and consensus for this proposal.
        - The private sector in all the countries I mentioned is very interested and enthusiastic about such an exchange. I already have volunteers from different countries to get started on this effort.

4. IP issues are approached from a protectionist framework for a reason. While technological development is necessary to mitigate and adapt to a changing climate, I am concerned about China's historic lack of respect for IPR. How do you propose to enforce IPR to protect American investors and businesses, while sharing our technology with the rest of the world, within the framework of your proposed IP clearinghouse?
    - The working principles of the Global IPX are based on IP being contributed into the exchange in order for IP to be licensed out of the exchange.
    - Countries like China will have to put IP into the exchange in order to be eligible to take IP from the exchange.
    - Such an exchange based system automatically forces participating nations to strictly honor the principles of the system or risk being shut out.
    - China or any country's lack of respect for IPR will negatively affect their capability to access IP globally and it will also negatively impact their ability to sell technology in the global market – without the good housekeeping seal, which will be promoted by the global IPX.

5) Mr. Rao, I like your emphasis on energy conservation. I'm interested in your ideas around a broader collaboration surrounding this critical technology. Can you give me some examples of the types of information that would be shared?

- I believe we have to enable rapid innovation and simultaneously encourage adoption of these new innovation(s) into our day to day lives. Collaborating on technology platforms and enabling market adoption globally, will require innovators working across geographies and other boundaries. This multinational approach will depend on data and info used across the board to really drive open innovation with speed.

- Info and data on technologies will be shared based on the IP being submitted to the IPX which will determine the level playing field. Some examples of info shared will be core technology, patent info, channel and market data, etc.

How would you protect the R&D investments of companies while sharing the critical technologies?

- As mentioned above the IPX will have a governance role as well and will deal directly with arbitration. I propose creating a 'green bank' tied to the exchange. Based on pre-determined and established criteria, companies will be paid for the IP they bring into the exchange and they now will also have access to technology from other companies – for a fee.
- This method will guarantee protection of R&D investments upto a certain level and any dialogues after this will be left to the companies. This is one approach, and I am quite sure we can develop the most appropriate variations of such an approach that has a direct bearing on the speed at which we can commercialize innovations.

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

The most significant barriers for developing countries to adopt new energy efficient technologies are: 1) access to capital for implementation and scaling, 2) a lack of basic infrastructure for deployment, and 3) the false perception that there is always a negative economic effect associated with carbon reduction.

Contrary to popular belief of some activists in Geneva, access to the latest technology via intellectual property licenses is not a barrier to adoption. The barriers to adoption relate to cost and deployment rather than the availability of technology licenses. If one freely gave away all the best technology in the United States, it would sit unused without an appropriate deployment strategy, and the necessary capital to fund it. Eventually our strategic competitors and large companies would find a way to make deals to access it, and the winners would likely be Big Oil and countries that do not need our economic support, like China and India. Meanwhile, future innovation in the United States would be mortally compromised and investment would fall.

India, China, and other smaller, developing countries, will not implement large scale carbon reduction programs if it negatively impacts economic growth. The same statement may be true in the United States. Therefore, in order to best achieve the carbon reduction on a broad scale in the developing and developed world, countries must adopt technologies that displace current practices or products with lower carbon alternatives at the same or lower long-term economic impact. Some of these technologies do exist now, and will be further improved in the future. Cost-effective wind, algae biofuel, and utility-scale solar that can compete with existing marginal energy production are in the pilot-scale phase in the United States.

2) **What policies can Congress adopt to facilitate innovation and development of new clean energy technologies? Internationally, what compensation structures could be developed to facilitate innovations, and at the same time, encourage widespread deployment of clean technology development?**

As has historically been true, most of the fundamental breakthroughs in energy technology will occur in the research laboratories of the United States. This trend is likely to continue into the next decade despite significant gains in basic research capabilities that have been achieved by our global competitors in Japan, China, and the European Union. The United States has invested literally trillions of dollars in our research infrastructure, and we have benefited from a uniquely American innovation ecosystem. This ecosystem consists of creative, risk-taking entrepreneurs and the availability of venture capital funding. Venture-backed companies funded in the last three decades today equate to 21% of GDP and employ more than 12 million Americans. This represents roughly the size of the entire German economy. U.S. venture capitalists will solve the energy problems of the day, and we will help others deploy our solutions.

Innovation and advancements in the energy technology sector have benefited greatly from the tax credits that were signed into law last year and from the many programs in the ARRA that have provided government-backed loans and grants for energy companies. We commend the attention that Congress and the White House has paid to energy policy, but there are other things that Congress can do to encourage energy innovation. My comments will focus on three areas where Congress can facilitate innovation.

1. **Increase the costs for inefficiency and offer positive financial incentives for the adoption of cleaner, more efficient energy technology and protect the innovation pipeline for unintended consequences.** The House of Representative has passed an energy bill and cap and trade bill that essentially achieves these goals. I would urge the Senate to act expeditiously to finalize their bill done so that it can be signed into law by the end of this year. The House-passed energy bill will provide significant incentives for energy conservation and will increase the cost for harmful emissions, and will incentivize the re-use of carbon.

2. **Create incentives that allow for development (grants), pilot-scale manufacturing (A** Formatted: Font: Bold **Green Bank), and deployment (carbon policies, tax policies, International Green Bank.)** Congress, especially the energy-related committees in the House and Senate, is to be congratulated for recognizing the importance of basic research and for providing robust funding to programs like the Clean Energy Deployment Administration (CEDA) that will help companies "bridge the valley of death." The Senate version of CEDA is noted as one of the better models of government backed support for the truly breakthrough energy companies.

3. **Consider policies at the macro-level and not undermine and part of the innovation ecosystem.** There exists a growing yet largely unnoticed crisis that will impair energy innovation and investment and will permanently harm the innovation infrastructure. This crisis is an accumulation of a series of legislative initiatives, which on the face seem insignificant, but taken together, could decimate key competitive advantages enjoyed by the United States and will cause energy innovation to flounder.

   Some examples of these policies are:

   - Proposed changes to patent law damages that without a "gatekeeper" function, could harm American competitiveness in energy by weakening the current protections and handing our best technology over to Big Oil and foreign competitors.

   - Changes in regulation and tax policy for early-stage venture capital firms who invest in the riskiest energy technologies that create jobs and could solve our carbon problems. These proposed changes could reduce net investment by venture capital firms, who will find their operating and tax costs increasing significantly at the time when their green tech investment is needed the most. Many will chose to invest in areas like China over time, rather than the United States.

   - The exclusion of the best energy technology development from Small Business Administration Research (SBIR) grants by capping venture-funded ideas at 8% of total grants rather than funding projects based on merit or the probability of helping to solve the current crisis. This cap is a sure way to ensure that the least innovative ideas get funding, and the best ideas get abandoned. This policy flies in the face of the American ideal that the best ideas win.

   - The deployment of existing DOE and other monies at a pace that does not reflect the urgency and magnitude of the crisis, and simply does not take enough risk.

\Overall, this is a time for big ideas and bold action or our children will be re-visiting these "green" issues and wondering why we dropped the ball. It is a time for incentivizing and supporting every aspect of America's innovation infrastructure, from basic research, applied research, long-term venture capital investment which fosters innovation and creates green jobs, and programs like CEDA, and other long term tax incentives that can foster the Green economy. The idea that venture capital—a green job creator, energy innovator, long term risk taker, and a large segment of the industrial base— should be supported and not be in a position of constant risk, especially at a time when policy makes are lauding innovation and asking for more investment in innovation. All aspects of the innovation economy need support to affect the change we need.

4. **Encouraging International Development:** Our goal for international development of green technologies should not be to try to recreate the innovation environment in the United States, nor to assume we can help create the major breakthroughs elsewhere, but to focus on applications development, manufacturing, and deployment. China, with its solar manufacturing, and Germany with its domestic solar market and manufacturing, are great examples of manufacturing and applications development and improvement of existing technologies. Those nations are not examples of the fundamental innovation in semiconductors that was based in the U.S., and of future innovations that will change the cost dynamics of solar and allow it to truly displace a large share of the world energy mix. Based on history and current projects we see in the labs around the world (which include the best labs in the EU, China, Japan, and the United States), major game-changing innovations will occur here in the United States, and the applications development and cost reduction can occur everywhere.

   The best way to facilitate deployment of fundamental U.S. innovation is to reward dispersion of technologies and incentivize cooperation. Compulsory action will hurt future innovation, and does not address either the capital or deployment issues, even with a breakthrough. Voluntary (and possibly subsidized) patent pools can help with incremental innovations, but does not solve the capital or deployment problems. A structure like the International Green Bank (see below), which rewards innovators who deploy their technology in developing countries, can help solve the capital deployment issues, and create jobs in the United States because the major innovations will emanate from here and healthy, international companies will be created. If we do not have a positive alternative that can help solve the problems realistically, we will end up in an unproductive debate over the red herring of intellectual property rights.

**3) If you were to attend the climate change negotiations in Copenhagen in December, what message would you deliver to China and India's representatives relative to IPR?**

We all have a common national goal of energy security, economic growth, and creation and implementation of carbon reducing technologies. It is in China's and India's interest, as well as in the best interest of the United States, to have major technological breakthroughs that alleviate the global competition for energy, and simultaneously reduce carbon with new energy innovations that are price competitive with current energy sources.

The only way that goal will be achieved is with major breakthroughs in energy technology. Technologies are currently being developed in the U.S. that can satisfy the goal of lowering carbon without harming the nation's economy, cutting jobs, or increasing costs for businesses. The U.S. has invested trillions of dollars in our R&D infrastructure, and will not give these technologies away. Even if the U.S. decided to try to compel businesses to license, it would be an unprecedented intervention into private markets that would stifle innovation.

Since there is a mutual incentive among China, India, and the United States to lower costs and lower carbon, the governments must cooperate to incentivize private business to deploy worldwide. This translates into investing substantial amounts of public dollars privately so that all stakeholders win if the technology succeeds and is widely dispersed. It also requires a high-level of government protection of IPR from infringement and significant, joint capital investment by the U.S., China, and India in United State's in technologies that are deployed within their borders, no matter where they have originated. Without joint investment, comes joint responsibility for IPR and for the deployment. Forums like the U.S./China Strategic & Economic Dialogue could be important for such efforts.

If China and India expect to further develop their own research infrastructure and strategic industries, they must respect existing agreements like the Treaty on Trade Related Aspects of Intellectual Property Rights (TRIPS). The importance of IPR in the energy debate is actually even more critical than that of other industries because of the huge investments that will need to be made and the complexity of the technologies. In addition, China and India's own efforts to build leadership in energy will never work without IPR protection of their own technologies. If we were to ask China if they are willing to share the IP for their solar technology industry, where they are a leader in manufacturing and deployment, the answer would and should be "no." Just as with United States' technology, other nations will respond to incentives to deploy in the developing world much more readily than penalties. Carrots will work better than sticks.

4) **Do you believe that IPR issues should be taken off the climate change discussion table in Copenhagen?**

The position of the United States should be clear — intellectual property protection provides an essential incentive for investment in the development of innovation, and efforts to devalue intellectual property are counterproductive to goals to address global warming. These efforts are also counter to U.S. interests. We have invested trillions in an innovation ecosystem that produces new technologies. The hundreds of billions more coming from the ARRA will never translate into green industries of the future unless there is a predictable and enforceable trading system that values intellectual property assets.

We will not and cannot enter into compulsory deals and all IP issues must be voluntary. We cannot sacrifice our children's future by allowing our crown jewel businesses to relinquish their lead and competitive advantage to China and India. Most less-developed countries do not have the capital or infrastructure to deploy new technologies without some subsidy. Therefore, giving IP to those countries without structure will be stripping the United States of its core competitive advantage to create the new green industries of the future.

Often we hear the argument that compulsory licensing is analogous to HIV drugs in Africa (which was solved by voluntary means). This is a misleading and dangerous comparison. While the medicines developed for AIDS cost billions to develop, as do breakthrough energy solutions which impact carbon, the total manufacturing costs of all these medicines for all the patients in Africa are less than a single biofuels refinery. Drugs, once produced, can be easily transported, and the marginal cost of providing medicines to Africa is small. The capital cost of deployment of large scale biofuels, wind, solar, and other advanced technologies can be tens of billions of dollars, and in the case of transportation fuels, those produced in one region may be transported to compete across borders.

Not only will compulsory licensing impact future investment in innovation in the United States, most of the developing world will not have the capital access to scale up the technologies even if they were given to them for free. The whole debate over compulsory licensing is missing the point and risks overlooking the real issues that need to be solved. The problem is deployment, scale, and capital access, not TRIP. The issue is being raised purely as a negotiating tactic by those who do not like the United States and EU position on carbon and feel that it will restrict growth. Thus, they are focusing on a provision that they know would cause the United States to mortgage its future to accept. We should stand up to it, and propose an alternative that is in everyone's interest.

These proposals would not benefit the poor. Even royalty bearing licenses would end up having the opposite result than what is intended. The poorest companies would have LESS capital invested because the resultant products could not be protected. Our competitors would take advantage of trillions of dollars of our own innovation to compete with us in applications, scale-up, and develop world projects with U.S. technology. Large scale transportation fuels technology transfer would benefit big multinational companies and countries with large capital reserves, which would use the developing world to deploy our advanced technology, keeping the spoils, and not enabling developing countries to profit.

Such scenarios also encourage companies to not release information on innovative technologies. The beauty of the patent system is that in exchange for patent rights, an inventor is required to publicly disclose the invention to the world. This enables other inventors everywhere to build upon this innovation and produce new technology. Closing off large parts of the world to patent rights would encourage companies to hoard technology. Patent licensing also sets the contract rules to facilitate technology transfer. The activists have it backwards. If your goal is to transfer technology, patents are not a barrier – they are essential.

5) **Would ARCH Venture partners continue to invest in new technologies as prolifically as it currently does if IPR were weakened in Copenhagen as a result of the demands of countries like China and India?**

ARCH Ventures would immediately reduce investing in greentech if we believed that compulsory licensing or weakening of the patent regime was a possible outcome of the December 2009 Copenhagen negotiations. We believe other venture investors would feel similarly. Even the serious consideration of such policies will have a material impact on investment, prior to actual enactment, due to the uncertainty that such a decision would have on future returns for venture investing. Greentech investors base investment decisions on the potential of international markets. Since most of these products (fuels,

energy) are transportable to some degree, enabling a competitor by requiring compulsory licensing of technology is akin to giving away a company's proprietary secrets. The cost of such a mandate would be borne by the innovators—and is a bad precedent if one believes our energy problems will be solved by future innovation.

6) **One of our witnesses today (Govi Rao) has proposed the creation of an IP clearinghouse/bazaar, as a means to assist innovators and their innovations? As a venture capitalist, what are your thoughts on that?**

Mr. Rao's proposal is worthy of consideration, as long as participation is voluntary. IP markets exist today and are an effective means of reducing transaction costs for mature industries with many incremental inventions like software and semiconductors. It is likely that small incentives on a world scale or even just market forces could attract private industry to invest in the energy area pool. It is also an area more fit for the nimble, transaction-oriented private sector, than large world government bodies.

Some proposals for "clearinghouses" have features that resemble patent pools. While patent pools may reduce transaction costs in some incremental technologies, they do not solve the problem of what to do with the breakthrough innovations which reduce carbon in ways that will significantly impact total carbon output. The inventors and holders of the true breakthroughs (likely companies in the United States) will be unlikely to contribute them to the pool because the return they could expect and the loss of control would not justify it, and also because they are likely to conclude that IPR is not a barrier, but a necessity to attract the large capital pools and deployment skills for scale-up in the developing world.

The key point to emphasize is that if there are truly the 5-10 breakthrough technologies that will change the climate equation, the economic incentive to broadly deploy those technologies is extremely strong. Additional incentives to move faster into the developed world can be created to accelerate the process of broad deployment further, but they must be voluntary.

7) **Mr. Nelsen, can you explain in a little more detail how you see the 'World Green Bank' working?**

The International Green Bank would be a public/private partnership funded by the G8 major industrialized nations, to provide incentives to deploy innovative green technologies in developing countries. The bank would provide loans guarantees and grants, similar to the current Senate legislation for the Clean Energy Deployment Administration (Green Bank), and analogous organizations such as OPIC, African Development Bank, and the Asian Development Bank.

The International Green Bank would provide loan guarantees and capital, which would be partially matched with private capital on a project basis, to private companies, foundations, states, or combinations thereof. The metric for obtaining grants would be based on: 1) net carbon reduction, 2) economic impact, 3) feasibility, and 4) level of long-term impact on emissions or beneficial re-use of carbon. The IGB would be independent of current United Nations structures, and would have its own Board comprised of representatives from member nations based on a ratio of contribution. The Board would administer and select private gatekeepers to qualify private, NGO, or public organizations for project funding.

Loan targets would be $400 billion over 20 years on a 5:1 leverage target (versus 10:1 for CEDA), which would represent a net contribution of $4 billion per year. Contributions would be proportional to GDP of the G8 member nations. A hypothetical example could be a breakthrough large-scale biofuel project in Africa, with technology from the United States, and funding project ownership from the home country, a major G8 sovereign wealth investor like China or India, additional private funding from the United States, and International Green Bank funding. Innovation is preserved, and all parties win.

**Responses of Dr. Mark T. Esper**
**Executive Vice President, Global IP Center**
**U.S. Chamber of Commerce**
**To Questions for the Record Submitted in Conjunction with the Hearing on July 29, 2009, Entitled: "Climate for Innovation: Technology and Intellectual Property in Global Climate Solutions"**
**Before the Select Committee on Energy Independence & Global Warming**

1) ***China and India have had at best, a checkered history of protecting IPR. How can the US protect IPR? What sort of incentives should exist for private sector development of new technology? How can we enforce IPR to protect American investors and businesses, while sharing our technology with the rest of the world?***

China and India do have poor records when it comes to protecting intellectual property (IP) rights, whether they are patents, copyrights or trademarks. But these countries are not alone, as the United States government's (USG) annual Special 301 report demonstrates. Many shortcomings of foreign governments are attributable to insufficient enforcement or poor implementation of existing statutes, while other problems are a result of bad government policy or laws.

Foreign government actions that are inconsistent with international laws or norms should be addressed through bilateral diplomacy, through international organizations such as the World Trade Organization (WTO) or World Intellectual Property Organization (WIPO), and through other plurilateral mechanisms as opportunities present themselves. Moreover, the United States must use all of the tools available to it to remedy problems, to include punitive measures if all else fails, given the importance of innovation and strong IP laws to America's economic growth and competitiveness.

The United States should also work to create new tools to protect IP rights and enhance enforcement, such as strengthening enforcement provisions by enhancing the Special 301 process, and reaching agreement on a plurilateral Anti-Counterfeiting and Trade Agreement. Appointing a new Intellectual Property Enforcement Coordinator (IPEC) at the White House, with ample authority and resources, will also go a long way toward improving U.S. government efforts to combat counterfeiting and piracy, and enhance America's role in improving IP rights around the globe. The USG should also work to strengthen IP provisions through our bilateral and multilateral free trade agreements, and protect the integrity of the WTO's Trade-Related Aspect of Intellectual Property Rights (TRIPS) agreement and other IP-related agreements.

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Robust and enforced IP rights provide the private sector with one of the strongest incentives, if not prerequisites, to innovate and be creative. This happens, as our Founding Fathers recognized in the U.S. Constitution, because artists, inventors and entrepreneurs know that their hard work, creativity and investment will be rewarded by

being granted the exclusive right to capitalize on their innovation or creation for a limited period of time. As such, it is important that such rights are not only protected in the United States, but internationally as well.

Further, it is important that the limited period of time granted under law is sufficient for patent and copyright holders to recoup their investment and make an appropriate amount of return. Moreover, tax credits for research and development, and other forms of tax policy that incentivize artists, researchers, inventors and creators, are a proven way of driving the innovation America needs to grow and remain competitive.

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Technology diffusion that complies with IP laws and norms takes many forms, and has been occurring for generations. Such transfers mostly involve the interactions between companies and individuals—not governments. In most cases, technology diffusion involves the simple marketing and distribution of patented products in the global marketplace.

However, technology diffusion could also involve a co-production agreement between the patent holder and a (foreign) partner, or even a licensing agreement between the patent holder and a second (or third) party to manufacture or distribute the good under certain terms and conditions. There are many other variations that may be utilized, but the core principles underlying any such tech transfer arrangement is that IP rights are respected, the agreement is commercially reasonable and viable, and that all parties undertake such an enterprise voluntarily.

In many of the arrangements worked out between partners, and especially between sellers and buyers, ongoing cooperation is often required beyond the "sale" itself. This cooperation includes any number of activities over a period of time to deliver, install, implement, adapt, maintain, and upgrade the technology. It may require transfer of technical know-how, trade secrets, and manufacturing specifications that are not disclosed in patent documents. It may also demand a certain level of technological ability in the receiving company, and compliance with regulatory requirements in the target country. It could also include the temporary employment of specialists, technicians, and managers from the firm that holds the patent, or the training of the buyer's workforce.

Independent research has found transfer of technology to be a multi-stage process that needs to include, *inter alia*, incentives to innovate; incentives to transfer; incentives to implement and use; legal rules to facilitate adaptation; and technical infrastructure for downstream innovation. Furthermore, implementing the technology can be a difficult process in the target country for a number of environmental, institutional, or other issues. For example, in a recent study of railway technology transfer to Indonesia, the researchers found empirical evidence that the capabilities to receive complex technology were distributed among local institutions. Thus, the full capacity to receive and implement the technology was only available by combining various local resources.

In some developing countries, technology diffusion may be hampered by more fundamental problems ranging from poor infrastructure (e.g. unimproved roads to deliver goods and inadequate sources of energy to power/keep them) to limitations on the human capital available to deliver or run the technologies. Technology transfer in the real world is not the same as going to an electronics store, purchasing an iPod, and never needing to speak to Apple. Effective tech transfer requires an extended relationship that touches upon all aspects of technology deployment, at all levels, so as to maximize the effectiveness of the invention and its value to the consumer, as well as safeguard the reputation of the company, the performance of its product, and improvement of the brand. In short, technology transfer cannot be compelled if it is to be effective; it must be a mutually agreeable relationship among all parties.

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

To begin, most of the technologies the developing world could employ to address global warming are either no longer on patent, or are not governed by any national patent system to begin with—meaning that IP cannot be a barrier if legal rights do not exist in the first place. Despite its narrow appeal, targeting the patent system is exactly the wrong approach to take if one desires to increase the diffusion of green technologies to the developing world.

The international consensus is that patents facilitate the diffusion of technology, and a wide range of studies consistently prove this point. For example, a recent comprehensive study commissioned by the European Commission on patents and environmentally sound technologies concluded that intellectual property rights as such are not what make technology too expensive for developing countries. Rather, the researchers found that the presence of a strong IPR system in developing countries is a prerequisite for technology diffusion, and that it is also a requirement for the creation of innovative new technologies within those countries.

Other research has shown that the impact of patents with respect to impeding developing countries' access to solar, wind, and biofuel technologies is not significant. The very trend cited by critics as the basis for policies that undermine IP rights—namely the skyrocketing number of patent applications for environmentally sound technologies—is proof that patents provide the incentive for innovation, and the recognized means for innovators to commercialize their products. Thus, rather than a barrier, intellectual property in fact is one of the main *facilitators* of technology diffusion.

The real barriers to technology diffusion and deployment in the developing world, most agree, involve some combination of the following (among other things):

- specially-targeted tariff and non-tariff barriers designed to exact extraordinary taxes and/or protect domestic industries;
- inadequate infrastructure that cannot power, deliver, or absorb advanced

technologies;
- insufficient numbers of educated and skilled workers who can put technology to its optimal use;
- commercial opportunism and corruption that waste scarce resources, misappropriate goods, and deter tech transfer;
- weak, non-existent, or unenforced intellectual property rights; and,
- base political gamesmanship and official cronyism.

It is imperative that technologies that can aid others and advance human development be made available around the world. It is equally important that such technology diffusion be done in an IP-friendly, commercially-viable way so that other, much-needed innovations are incentivized, developed, and sustained in the long run.

The key to preserving this time-proven process is by ensuring the *real* barriers to progress are identified and removed. Governments must no longer be allowed to distract attention from their own shortcomings or their real aims by pointing fingers at the global IP system. Instead, they must be challenged by the facts, and asked to answer to their people why they favor stifling innovation, damping entrepreneurship, and hampering economic growth and development with their policies and rhetoric.

3) ***What policies can Congress adopt to facilitate development of new, clean energy technology?***

Congress has already taken a number of steps to facilitate the development of new, clean energy technologies such as the Energy Policy Act of 2005 and the Energy Independence and Security Act of 2007. Congress should fully fund and implement the 100-plus energy technology provisions contained in these two laws. But of course, more can always be done, such as:

- Maintaining robust IP protections both in the United States and abroad provides certainty to inventors and entrepreneurs that their creativity and investment will be rewarded, which encourages development of new clean technologies.
- Supporting an Anti-Counterfeit and Trade Agreement between the U.S. and its trading partners and strengthening the Special 301 process.
- Defending IP laws, norms and rights in international forums such as the WTO, WIPO, and WHO, as well as in U.N. climate change negotiations.
- Suspending foreign assistance in some or all its forms to countries that fail to enforce or live up to their IP-related obligations under international law.
- Permanently extending the R&D tax credit.
- Approving bilateral and multilateral free trade agreements that raise the bar for IP protection in foreign markets
- Improve efficiency at the U.S. Patent and Trademark Office by, among other things, reducing the patent pendency period to facilitate faster commercialization of technologies.
- Extending all of the renewable tax credits for eight years, followed by a four year phase out to provide real certainty for capital investment.

- Establishing a clean bank mechanism that can facilitate the deployment of new and commercially untested technologies to bridge the gap between research and development and commercial deployment.

4) ***What steps can Congress take to send our UN negotiators in Copenhagen a strong and unambiguous message to hold firm in the arena of IPR protection?***

The House of Representatives has already taken a number of positive and important steps to express the will of the Congress and influence the Administration's position in Copenhagen. The House did this by including bipartisan provisions aimed at protecting IP rights related to environmental technologies in three pieces of legislation that passed this summer. Among these, unanimous House adoption of an amendment offered by Reps. Larsen and Kirk to H.R. 2410, the Foreign Relations Authorization Act, put 432 House Members on record as supporting robust IPR protections within the UN Framework Convention on Climate Change (UNFCCC) context.

It is now important that the Senate take similar legislative action to let the administration, and other parties to the UNFCCC negotiations, know the Senate's views in defense of IP rights, and that the Senate will not ratify any treaty that includes provisions that weaken or undermine IP laws, rights, or norms.

5) ***Do you believe that the UN negotiations are more focused on wealth transfer than environmental gain?***

According to the Chamber of Commerce's experts who work climate change issues, it is clear that some developing countries are proposing provisions in the UNFCCC talks to extract huge sums of financial aid from developed countries.

The draft climate change treaty directs Annex II Parties (which are developed countries, including the United States) to provide financial resources, including transferring technologies, to cover the "agreed full incremental costs" to developing countries of complying with various articles implementing the treaty. Many developing countries have been forthright in saying that their cooperation, in addition to being nonbinding, will only come with financial strings attached.

In the Bali Roadmap, developing countries agreed to consider nationally appropriate mitigation actions "in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner." This language has been interpreted in various ways, but, in general, the phrase "measureable, reportable, and verifiable" refers both to the nationally appropriate mitigation actions of developing countries and the support for "technology, financing and capacity-building" that developed countries are expected to provide.

Further, according to the Chamber's experts, these provisions have become fodder for all manner of demands by developing countries on the economies of developed countries. Developing countries are counting on large and direct transfers of wealth to support their efforts to mitigate emissions and adapt to climate change; meanwhile, developed countries have not done enough to temper these expectations.

China, India, South Africa, Bolivia, and Colombia, among others, are pushing developed countries to transfer anywhere from 0.5% to 2.0% of their GDP each year to support climate change programs in developing countries. At that rate, the contribution from American taxpayers alone would have been $71 billion to $286 billion in 2008.

Yet even that may not be enough. A report out of the Massachusetts Institute of Technology estimates that if developing countries are fully compensated for their mitigation activities through a global emissions trading scheme, the implied financial transfers from developed countries to meet a 50-by-50 goal could amount to over $400 billion annually in 2020 and about $3 trillion in 2050 (Jacoby et al. 2008). These are staggering sums of money.

And beyond wealth transfers, it is equally clear that some countries proposals to promote technology transfer by undermining IP rights is driven in part, if not wholly, to facilitate their own technological development and commercial competitiveness.

6) ***Dr. Esper, if you had to chose two things to do to both protect Intellectual Property and reduce carbon emissions globally what would they be?***

Most experts agree that technology is key to addressing climate change and improving our energy security. If that is true, then protecting and promoting strong IP rights is essential to incentivizing the research and development necessary to create these innovations. How rapidly advanced energy technologies develop and are adopted commercially will be the most important factor in determining how quickly and at what cost greenhouse gas emissions can be reduced. Studies show that existing technologies can make a start, but they are not capable of significantly reducing greenhouse gas emissions on a global scale and at an acceptable cost. New, and in some cases revolutionary, technologies will have to be developed and commercialize to achieve our goals. So the first thing that must be done is to protect IP rights in climate change negotiations, and in UN bodies such as the WIPO and WTO.

Second, the United States and other countries must increase and accelerate funding for research and development of advanced technologies. An accelerated program to improve the performance and lower the costs of advanced alternative energy technologies can, if successful, broaden the range of economically and politically viable options available to policymakers. National and international climate policy should concentrate on supporting greater energy efficiency and commercialization of low-carbon technologies for energy supply.

Together, the United States and Japan account for roughly 80% of all energy research and development spending by national governments. That has to change. Research and development into the next generation of potentially transformational energy technologies needs a substantial boost in funding, and the Chamber of Commerce's Energy Institute has recommended doubling the federal budget for advanced energy technologies and the creation of a Clean Energy Bank to invest in the commercial adoption of new technologies.

7) ***You mention in the conclusion of your written statement that Congress has taken a number of positive and constructive steps to drive innovation, develop solutions and deploy those technologies as broadly as possible, but more can and should be done if we are to be successful at the end of the day. What are those steps that should be taken?***

In addition to the proposals addressed in my written testimony, and in my oral remarks, the recommendations outlined in my response to questions #3 and #6 (above), while not exhaustive, would make a significant impact on the challenges of climate change and energy security, while preserving the IP rights so essential to driving innovation.