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**LEGISLATIVE HEARING TO EXAMINE S. 2911,
SUPER POLLUTANTS ACT OF 2014**

HEARING
BEFORE THE
COMMITTEE ON
ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE
ONE HUNDRED THIRTEENTH CONGRESS

SECOND SESSION

DECEMBER 2, 2014

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ONE HUNDRED THIRTEENTH CONGRESS
SECOND SESSION

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C O N T E N T S

	Page
DECEMBER 2, 2014	
OPENING STATEMENTS	
Boxer, Hon. Barbara, U.S. Senator from the State of California	1
Murphy, Hon. Chris, U.S. Senator from the State of Connecticut	3
Thomas, Hon. Carper R., U.S. Senator from the State of Delaware, prepared statement	103
WITNESSES	
Zaelke, Durwood, President, Institute for Governance & Sustainable Development	7
Prepared statement	9
Responses to additional questions from Senator Boxer	19
Fay, Kevin, Executive Director, Alliance for Responsible Atmospheric Policy ...	22
Prepared statement	25
Shindell, Drew, Ph.D., Professor of Climate Sciences, Nicholas School of the Environment, Duke University	43
Prepared statement	45
Responses to additional questions from Senator Boxer	51
Peiser, Benny, Director, The Global Warming Policy Foundation	56
Prepared statement	58
Response to an additional question from Senator Boxer	71
Responses to additional questions from Senator Vitter	72
Moore, Stephen, Chief Economist, Institute for Economic Freedom and Opportunity, The Heritage Foundation	74
Prepared statement	76
Response to an additional question from Senator Boxer	84
Responses to additional questions from Senator Vitter	84
ADDITIONAL MATERIAL	
Article; The New York Times, In Step to Lower Carbon Emissions, China Will Place a Limit on Coal Use in 2020	105

**LEGISLATIVE HEARING TO EXAMINE S. 2911,
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TUESDAY, DECEMBER 2, 2014

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

The committee met, pursuant to notice, at 2:15 p.m. in room 406, Dirksen Senate Building, Hon. Barbara Boxer (chairman of the committee) presiding.

Present: Senators Boxer, Vitter, Whitehouse, Merkley, Boozman.
Also present: Senator Murphy.

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

Senator BOXER. The committee is in order. I am delighted to call us to order, because we are looking at a bill written by two of my colleagues, Senator Murphy and Senator Collins, the Super Pollutant Act of 2014, S. 2911, which is a bipartisan bill that supports innovative technologies and policies to reduce short-lived climate pollutant emissions, otherwise known as SLCPs, which if you can pronounce that, OK. Because I won't even try.

These emissions, we are talking about black carbon, methane, hydrofluorocarbons. And recent headlines have sounded the alarm on the mounting impacts of climate change. The reason I am so excited about this bill, when Senator Murphy talked to me about it, is it is really a bipartisan breakthrough. That is very important, because we are not going to get anywhere if we just have a partisan divide on climate.

Over the past few months, we have seen everything, from the hottest August, the hottest September, the hottest October on record, to historic droughts and extreme wildfires, ravaging my home communities, to vanishing wildlife habitat in Alaska, to toxic algae blooming out of control and contaminating drinking water in Toledo, Ohio. I think it was 500,000 people had to drink bottled water because of this toxic algae, which is directly related to the heat in the water.

Yesterday, I read a story in the New York Times, it was actually the lead story, and it summed up what scientists are now telling us. They are saying if we stay on this path, our grandkids will face a grim future. They actually lay it out even in a more stark fashion, they say our grandchildren will either have a planet that is unpleasant to live in or a planet that is not inhabitable. Those both are bad choices, but we see where we are heading. That is why I am so grateful, because maybe we can start to take congressional

action here. The President is taking action, and bless him for doing it. I say that sincerely, because I know he cares so much about the future. He looks into his daughters' eyes and he knows that he in many ways has a chance to make the planet a better place. And he is doing it, despite all the opposition and hysteria about it.

Well, this hearing will focus on some common sense steps we can take to address this critical threat. S. 2911, the Murphy-Collins bill, identifies a number of practical steps by the private sector and policy measures on the Federal level that can be taken to limit pollutants that cause climate change. Action to limit these super pollutants can help slow climate change over the next several decades while also providing important co-benefits to public health. That is so key. When we cut back on climate pollution, we have co-benefits that involve making the air cleaner and less asthma and less heart disease and strokes and all those things. So it is a win-win.

Now, black carbon is a fine particulate matter that is harmful to human health and the environment. If we address that, we can help avoid the worst impacts of climate change and also reduce exposure to air pollutants, again, that cause all these respiratory and cardiovascular ailments and premature deaths.

Similarly, reducing methane leaks and emissions can prevent increases in ground level ozone pollution, which will reduce the threat to public health. We know the President has put out a really good policy on this ground level ozone pollution, which we know is smog that can worsen bronchitis, emphysema and asthma. I often say, and I will say it again, if any of us, as a Senator, visits the schools, and I know, Senator Murphy, how old are your boys now?

Senator MURPHY. Six and three.

Senator BOXER. Six and three. I say the next time you go visit their class, the older one, ask the class, how many of you kids have asthma, or how many of you kids know someone with asthma. You will be stunned to see, well, maybe you won't be stunned, I was stunned when I asked that question, I was in a school in San Francisco with Hillary Clinton way back in the 1990's. We asked the class, and way more than half of the class raised their hands. She had asked that question. And it just tells you the story. We have to protect our children from bronchitis and asthma.

So S. 2911 has all these benefits and it also supports U.S. companies that are in the forefront of producing innovative chemical substitutes for HFCs and new technologies to control black carbon and methane leaks. And it is a real win-win when we can have our private sector stepping up to the plate, doing good things and doing well financially. That is the ticket here. And that is what S. 2911 does, because they establish an interagency task force to mitigate short-lived climate pollutants, they ensure Federal agencies have plans in place to reduce HFC and methane at Federal facilities. We are the biggest landlord in the Country. If we start doing these things, it has a real impact.

It also says we should use existing Federal authorities to phase in these alternatives to HFCs and encourage HFC recovery and recycling. And also encourage substantial black carbon pollution reduction efforts in developing countries as part of the State Department's programs. It also calls for directing Federal agencies to as-

sess whether the pipeline transmission rates and new standards for pipeline systems can reduce methane leaks.

This is incredible. I once looked at this issue, how many people we could put to work just going after these leaks and have that win-win benefit. It is so good.

And I want to welcome our witnesses, and Chris Murphy, I want to particularly say thank you so much. I think what you have done is a breakthrough. Because not only is it important in addressing climate, but it is a bipartisan effort.

So would you start off, and then we will go to the rest of the panel.

**OPENING STATEMENT OF HON. CHRIS MURPHY,
U.S. SENATOR FROM THE STATE OF CONNECTICUT**

Senator MURPHY. Thank you very much, Chairman Boxer. Thank you for calling this hearing today. Thank you for your encouraging words with respect to our legislation. I am pleased to share the panel here, at least kick it off with some very able experts. Thanks to Ranking Member Vitter as well for making this hearing possible today.

We are here to discuss, as you very aptly described, SLPCs, short-lived climate pollutants. These are substances that do grave damage to the climate, often at a rate that is tens of hundreds of times the damage on a time-to-time basis that carbon dioxide does. But frankly, they are a lot less well-known than carbon dioxide. The problem posed by SLPCs, they represent an opportunity, it is an opportunity to save lives, to create a lot of jobs and to protect fragile ecosystems.

They also represent a political opportunity. I am honored to have this considered as a breakthrough, but phasing down these pollutants can be done more quickly and relatively easily when compared to the hard but desperately necessary work that we have ahead of us to slow CO₂ emissions.

As members of the committee well know, we are talking here about black carbon, methane, and hydrofluorocarbons, or HFCs. The first is a byproduct of combustion. The second is a fuel. The third is an industrial chemical.

None of them are as vital to the functioning of the world's economy as carbon dioxide. That means that adopting sensible, money-saving policies to phase down emissions of all of these will require an effort that is relatively manageable compared to the scale of the other global challenges that we face.

So that is why Senator Collins and I worked together to draft the legislation that is under consideration by the committee today, the Super Pollutants Act. If enacted, this legislation would expand existing programs to launch new initiatives needed to tackle the many ways in which SLPCs are emitted.

We are not talking about revolutionary change here. We are just talking about some common sense steps that can bring Republicans and Democrats together around cleaning up our climate. Our bill encourages USAID and development agencies to consider methane and black carbon emissions when financing projects overseas. Our bill would urge modifications in the Energy Star program to recognize refrigeration systems that use non-HFC chemicals while still

achieving energy savings. We would help coordinate interagency SLPC initiatives, so that individual departments are working in tandem when it comes to these pollutants.

Both Senator Collins and I realize that considerable obstacles confront the enactment of this or any legislation in this present congressional environment. However, we believe this legislation represents an opportunity to have an important foundation for bipartisan cooperation on climate and public health issues. That is because one can favor reductions in methane, black carbon and HFCs for reasons that frankly have little to do with climate change. There is a huge climate change component to this legislation, but Senator Collins has been a leader in pushing for the expansion of clean-burning cook stoves in the developing world. Because indoor burning of wood and animal dung kills millions and millions of people every year. Installing filters diesel truck engines similarly reduces soot emissions, while promoting the use of American-made technologies, an effort that Senator Inhofe has strongly supported for years.

Transitioning away from HFC compounds, both here and abroad, promotes the use of American technologies and manufacturing know-how. The economic benefit to this Country is great. The demand for air conditioning in India alone is anticipated to grow by a factor of 50 by 2013. Wouldn't it be better if Indians were able to meet that demand by embracing technological solutions developed in partnership with U.S. firms?

Limiting methane leaks can actually save considerable sums of money for companies and governments that are willing to recapture it and burn it themselves. Indeed, man-made methane emissions are expected to grow by 25 percent over the next 15 years. In the oil and gas industry, it is a win-win for distributors and consumers to make sure that less product leaks out of wells and pipes on its way to the end users, as Senator Boxer said.

Now, I say this not to belittle the climate impacts that reducing SLPCs could produce. Estimates show that aggressive action could prevent nearly a half a degree Celsius of warming in the atmosphere. Instead, I am making this case because tackling climate change needn't be as fiercely and reflexively partisan an issue as it has become in recent years. We can do immense good for the climate while doing good for our health and our businesses as well. SLPCs can and should represent the beginning of much-needed bipartisan goodwill on this topic.

So I would like to thank both the business and non-profit communities who have been a part of drafting this bill, for the members of the committee who have already reviewed or co-sponsored the legislation, I thank you. For those who haven't examined it in detail, I hope that they will and their staffs will do that in the coming weeks. If they think it can be improved, Senator Collins and I would love to work with the committee to do that.

Madam Chair, I have with me a statement from Senator Collins. She has another hearing today, but she would love to have entered into the record a very strong statement of support for our bill.

Senator BOXER. Without objection, so ordered.

[The prepared statement of Senator Collins follows:]

Statement of Senator Susan M. Collins
Hearing on the Super Pollutants Act of 2014
U.S. Senate Committee on Environment & Public Works
December 2, 2014

I would like to thank the Committee for holding this afternoon's hearing on the Super Pollutants Act of 2014. I am pleased to be working with my colleague Senator Chris Murphy on this bill that aims to address short-lived climate pollutants (SLCPs). These "super pollutants" – soot, refrigerants, and methane – can warm the climate at a rate thousands of times greater than carbon dioxide (CO₂).

Climate change remains a significant threat and a challenge that requires international cooperation and global solutions in order to reduce harmful emissions worldwide. I participated in a congressional delegation trip to Antarctica in January of 2006 that left a deep impression on me regarding the need to tackle global climate change, its causes, and its effect on our planet. At McMurdo Station, I met with scientists, including some from the University of Maine and Bowdoin College, who were playing important roles in climate science research.

During this trip, I also had the opportunity to visit New Zealand briefly. We could clearly see the glacial moraines, where dirt and rocks had been pushed up in piles around the glacial terminus in 1860. I thought it was remarkable to stand in a place where some 140 years ago I would have been covered in tens or hundreds of feet of ice, and then to look far up the mountainside and see how distant the edge of the ice had become.

It is my hope that today's hearing on the Super Pollutants Act will bring to light efforts already underway to reduce emissions from SLCPs and areas for improved coordination. While these pollutants persist for a short time span in the atmosphere when compared to CO₂, they do a great deal of harm. The most common refrigerant compound used in cars and refrigerators warms the climate at 1,300 times the rate of CO₂; soot, including the black carbon emitted from traditional cookstoves, can warm the climate over a thousand times faster than CO₂; and methane warms the climate 34 times faster than CO₂. Reducing SLCPs alone could slow climate warming by as much as 0.5 degrees Celsius, avoid two million premature deaths each year, and save 30 million tons of crops annually.

With improved coordination, SLCPs can be tackled quickly and effectively with U.S. innovation and technologies. The U.S. is already a leader in the technologies needed to drive reductions in SLCPs and is well-positioned to employ alternatives to the chemicals used in refrigeration and air conditioning, replace soot-generating traditional cookstoves and diesel engines, and harness fugitive methane seeping out of landfills, wastewater plants, and pipelines.

The Super Pollutants Act aims to help reduce SLCPs in our atmosphere by taking a number of steps to enable federal agencies to work with the business and non-profit communities to speed the adoption of super pollutant-reducing technologies and policies, all while supporting American-led innovations to reduce these pollutants. It would foster interagency cooperation on super pollutants, prioritize commonsense emissions reduction strategies, and employ existing

federal authorities and diplomatic programs through the recycling of high-global warming potential (GWP) refrigerants, the mitigation of methane leaks, and expanding access to diesel-scrubbing technologies.

Interested stakeholders in both the business and NGO communities have endorsed the legislation's approach. A leading provider to building systems worldwide, United Technologies Building and Industrial Systems, stated that the bill "promotes both ozone protection and improved energy efficiency of newer systems." DuPont said the bill reflects "the kinds of common sense approaches" that both businesses and NGOs support. The Director of the Climate and Clean Air Program at the National Resources Defense Council noted the need for "adding legislative muscle to the fight to curb key pollutants." The Alliance for Responsible Atmospheric Policy also commended the bill's use of "market-oriented solutions" to address super pollutants.

I am hopeful that today's hearing will provide a platform to learn more about super pollutants and ways the federal government can work with the private sector and the non-profit community to tackle these pollutants while protecting public health and creating jobs.

Thank you again for convening this hearing.

Senator MURPHY. So I look forward to testimony today. Again, I thank you, Chairwoman Boxer, for bringing us together and again express my gratitude for the attention and the time of the committee today.

Senator BOXER. Thank you so much, Senator. You are free to stay, I know you have a crazy schedule as well.

But I will move on, with Mr. Durwood Zaelke, President, Institute for Governance & Sustainable Development. Welcome, sir.

STATEMENT OF DURWOOD ZAELEKE, PRESIDENT, INSTITUTE FOR GOVERNANCE & SUSTAINABLE DEVELOPMENT

Mr. ZAELEKE. Thank you, Madam Chair, for the opportunity to testify today.

Solving climate change may be hard. But getting started is easy. The Super Pollutants Act that we are discussing today gets us started solving the fast half of climate change. And it will help us build the on-ramp, the bipartisan on-ramp, to solving even more difficult parts of climate change involving fossil fuels and CO₂ emissions.

As Senator Murphy said, there are many reasons to support this bill. Climate is the first and perhaps the most important. But if you want to see other reasons, look to the public health benefits. The World Health Organization tells us that seven million people a year die from black carbon air pollution and millions more are made so sick they can't go to work, they can't go to school, the asthma that the Chairwoman mentioned. Cutting black carbon can save at least two million of these lives and it can make other citizens of the world healthier and more productive.

There is no dispute about the health benefits of black carbon. You can see it, you can taste it. It kills people and cutting it will save lives and improve health. California has already done this. California has cut black carbon by 90 percent and it has pioneered the development of the technology that the rest of the world needs to cut its black carbon.

China, for example, has just mentioned that they are going to be putting \$277 billion into cleaning up their air pollution. That is a tremendous market for U.S. technology. The rest of Asia needs the same technology, India in particular, but also Africa and Latin America. The whole world does. This is a tremendous opportunity.

We could also look to the benefits for crop productivity. Methane and the photochemical smog it creates damages crops. When we lose crops around the world, we create conflicts that often our military has to go help solve. So we can bring tremendous benefits on that side as well.

Finally, the Super Pollutants Act will help us reduce this third super pollutant, the HFCs. There are some efforts underway already in the U.S. and elsewhere. Europe, for example, has a law that goes into effect next month that will cut HFC emissions by 79 percent by 2030.

At the global level, the U.S. has led the effort to use the Montreal Protocol to phase down HFCs. This will level the playing field and prevent a patchwork of regulations that our industries would have to face. The Montreal Protocol was first negotiated under President Ronald Reagan. It is widely regarded as the most effi-

cient and effective international environmental agreement we have ever created. It has already phased out nearly 100 damaging chemicals by nearly 100 percent. It has ever country of the world as a party, developing and developed. And they all have mandatory obligations under this treaty. They all have nearly 100 percent compliance as well.

As we phased out the prior chemicals, the CFCs under the Montreal Protocol and now the HCFCs, no one noticed. No one was inconvenienced. No one's air conditioner didn't work or refrigerator didn't work. In fact, they became more efficient and the consumer saved money. So this treaty has been incredible, not only in putting us back on the path to solving this stratospheric ozone challenge but also in helping us with climate. This treaty has already done five to ten times more in climate mitigation than the Kyoto Protocol. And it stands ready to do even more by phasing down the HFCs.

Just to give you the scale, the combined effort to phase down the short-lived climate pollutants will avoid about .6 degrees of warming by the mid-century. That is compared to an aggressive effort to cut CO₂, which will avoid about .1 degree, a lot less. By the end of the century, they begin to equalize. We have to do both, of course.

So we are ready to do the next big piece with HFCs. And it will give us perhaps the single biggest and fastest piece of climate mitigation in the world, and it will incredibly inexpensive.

If you go back to the early efforts—

Senator BOXER. I am going to ask you to wrap up your statement.

Mr. ZAELKE. I will wrap up, and thank you.

In conclusion, the Super Pollutant Act can help save millions of lives, improve crop yields, promote U.S. industry, cut near-term warming in half through the middle of the century. Just as important, the Act can help create the bipartisan momentum that we so desperately need to solve the rest of climate change.

Thank you, Madam Chair.

[The prepared statement of Mr. Zaelke follows:]



Institute for Governance & Sustainable Development

Testimony of Durwood Zaelke
the U.S. Senate Environment and Public Works Committee
In Support of the Super Pollutant Act

Introduction

This testimony is submitted in support of the Super Pollutants Act (the Act),¹ which aims to promote interagency cooperation in regard to super pollutants, methane, black carbon, and hydrofluorocarbons (HFCs), and to help prioritize emissions reduction strategies using existing federal authority and programs. The Act would enable federal agencies to work with business and non-profit communities to speed the adoption of super pollutant-reducing technologies and policies, all while supporting US technology innovations and investments to reduce these pollutants at home and abroad.

The Act would establish an interagency task force to review policies and measures to promote, and to develop best practices for, the reduction of these super pollutants. The task force would coordinate and optimize the federal government's existing efforts to address these super pollutants; reduce overlap and duplication of such efforts; and encourage federal operations, programs, policies, and initiatives to reduce super pollutants. The task force proposal is supported by a broad group of U.S. non-governmental organizations (NGOs).² The Act will make a significant contribution to climate protection, public health, and agriculture productivity in the US and abroad, and will help spur US innovation and investment in control technology markets at home and abroad.

Background

Reducing HFCs, black carbon, and methane can cut the rate of global warming in half for the next 40 years (more than 0.6°C in cumulative warming by 2050 and up to 1.5°C by 2100).³ This will significantly reduce near term climate impacts, including reducing the rate of sea-level rise. It also will save millions of lives every year and improve public health, while also increasing agricultural yields.

Because these super pollutants are cleared from the atmosphere in a short period of time, they are also known as "short-lived climate pollutants" or SLCPs. Their short lifetime means that reducing them can produce fast benefits for the climate, for public health, and for agriculture. This is in contrast to carbon dioxide, approximately a quarter of which remains in the atmosphere for thousands of years.⁴ Both the super pollutants and carbon dioxide must be cut as quickly as possible to protect the climate system from the growing impacts already occurring, although they deliver their climate benefits on different time scales, with the super pollutants being able to avoid significantly more warming in the near term than carbon dioxide.⁵

One of the super pollutants, black carbon soot, is a traditional air pollutant, and another, methane, contributes indirectly to air pollution as the principal precursor to local photochemical smog.⁶ Reducing these pollutants will save millions of lives every year, protect tens of millions of tons of crop yields, and contribute to sustainable development.⁷ The U.S. has a number of opportunities domestically to achieve fast, low-cost reductions in super pollutants using existing authorities, as well as procurement policy, voluntary industry agreements, public-private partnerships, and other strategies described below. The importance of mitigating each of the super pollutants is summarized below, along with an overview of select mitigation opportunities the task force might consider.

HFC Mitigation

HFCs are factory-made gases with a warming effect hundreds to thousands of times that of CO₂.⁸ The average atmospheric lifetime of the mix of HFCs currently used is 15 years.⁹ HFCs are produced as substitutes for ozone-depleting substances (ODSs) in air conditioning, refrigeration, insulating foams, solvents, aerosol products, and fire protection.¹⁰ Unless a production and consumption phase-down of HFCs is implemented in the near-term, HFC emissions will increase dramatically and undermine efforts to curb the long-term driver of climate change—CO₂ emissions.¹¹ If not controlled, HFC emissions could correspond to up to 20% of CO₂ forcing under the IPCC business-as-usual scenarios in 2050.¹² If CO₂ was constrained from business-as-usual to a 450 ppm stabilization pathway, the radiative forcing of uncontrolled HFCs in 2050 could be as much as 40% of the CO₂ forcing, which would cancel nearly the entire benefit gained from controlling CO₂.¹³

Phasing down HFC production and consumption globally would provide climate protection equivalent to preventing between 87-146 billion tonnes of CO₂ emissions by 2050.¹⁴ Phasing out HFC production would also avoid the build-up and eventual emissions of HFCs contained in existing refrigeration and air conditioning equipment, chemical stockpiles, foams, and other products, collectively known as ‘HFC banks.’ A fast phase down of HFCs by 2020 would avoid an additional 39–64 GtCO₂-eq of emissions.¹⁵ The U.S. and many other countries have proposed phasing down HFC production and consumption under the Montreal Protocol, widely regarded as the most efficient and effective environmental treaty yet created.¹⁶ The treaty has not only put the stratospheric ozone layer on the path to recovery by mid-century, it also has provided the most climate protection to date by phasing out CFCs, and now HCFCs, for a net of 135 GtCO₂-eq.¹⁷ More than 100 countries now support phasing down HFCs under the Montreal Protocol, including China and India.¹⁸

Historically, refrigerant transitions under the Montreal Protocol are accompanied by significant improvements in the energy efficiency of the refrigerators, air conditioners, and other products and equipment using the refrigerants.¹⁹ The phase-out of CFCs under the Montreal Protocol, which began in the mid-1980s, catalyzed substantial improvements in air conditioning and refrigerant energy efficiency—up to 60% in some subsectors.²⁰ These efficiency improvements were the result of replacing old products and equipment with a new generation of higher efficiency machines utilizing next generation refrigerants.²¹ When refrigeration and air conditioning manufacturers redesigned their systems to be CFC-free, many took the opportunity to improve the efficiency of their designs.²² For example, the U.S. EPA estimated that CFC-free chillers were up to 50% more energy efficient in the U.S. and over 30% more efficient in India than the CFC-based machines they replaced.²³ Similar improvements are expected with an HFC phase down, which will contribute significantly more climate mitigation, while also reducing consumers’ operating costs for their air conditioners and other appliances. Currently, low-GWP alternatives exist for all major sectors.²⁴

Select U.S. HFC Mitigation Options

- *Develop HFC industry partnership/coalitions to support the adoption of low-GWP alternatives.* The Task Force could develop public-private partnerships modeled after the *Industry Cooperative for Ozone Layer Protection (ICOLP)* with ad-hoc working groups of experts that can quickly identify, develop, perfect and implement substitutes for high-GWP HFCs worldwide.²⁵ This could include the *Consumer Goods Forum*, comprised of 400 retailers, manufacturers, and service providers who have committed to begin phasing out HFC refrigerants beginning in 2015, and *Refrigerants Naturally!*, comprised of global refrigerated beverage and food marketers, working to replace high-GWP HFCs with low-GWP substitutes for new purchases of point-of-sale units and large refrigeration installations.²⁶
- *Update Environmentally Preferable Purchasing (EPP) standards to exclude high-GWP HFCs.*

The Environmentally Preferable Purchasing (EPP) program was created by the EPA in 1993 to help U.S. agencies meet their obligations for green purchasing.²⁷ The EPP program could update its list of designated green products and develop purchasing guidelines to help eliminate products made with and containing high GWP HFCs.

- *Update voluntary green certification and rating standards to eliminate high-GWP HFCs.*

The Task Force could work with certification programs, such as the Energy Star Building program and LEED, to reduce or eliminate the use of high GWP HFCs in new building construction and remodels.

- *Reduce HFC emissions from mobile air conditioning.*

The Task Force could propose improvements to refrigerant containment with better parts and manufacturing quality control, by shifting from do-it-yourself to professional refrigerant servicing, by requiring use of improved recovery and recycle machines, and by creating incentives for refrigerant destruction when vehicles are dismantled at the end of useful life.

- *Prioritize utilization of low-GWP HFC insulation and refrigerants through Federal Housing and Energy Efficiency Loan Programs.*

The Task Force could work with these loan programs to ensure that, where possible, the programs eliminate the use of high-GWP HFCs and promote the adoption of efficient low-GWP alternatives in construction or improvements that they fund or support.

- *Reduce HFC emissions from supermarket refrigeration.*

The EPA could encourage more stringent voluntary standards for the maximum acceptable GWP for refrigerants in the supermarket sector, and work to expand the coverage of the GreenChill partnership, particularly within the companies that make up the Consumer Good Forum.

- *Reduce access to, and non-essential use of, HFC aerosol products.*

The Task Force could expand the list of prohibited non-essential and frivolous aerosol products and establish industry-government partnerships with manufacturers to agree on standardized warning labels highlighting concern for climate and permitting use of high-GWP HFC aerosol products only where technically necessary.

- *Align minimum efficiency standards for refrigeration and air conditioning with HFC reductions.*

The EPA and the Department of Energy (DOE) could work together to phase down HFCs and secure significant gains in energy efficiency in air conditioning and refrigeration by aligning their timetables.

- *Remove barriers to the adoption of low-GWP alternatives in the air conditioning and refrigeration sectors.*

The DOE could work to remove barriers to the adoption of low-GWP alternatives in the air conditioning and refrigeration sectors by supporting research and development, technical validation, and market introduction programs for low-GWP HFC alternatives.

Methane Mitigation

Methane is a powerful greenhouse gas with a 100-year global warming potential 28 times that of CO₂ and an atmospheric lifetime of approximately 12 years.²⁸ In 2011, the U.S. is estimated to have emitted 567.3 MMt CO₂-eq of methane, down from 578.3 MMt CO₂-eq in 2011.²⁹ Methane accounted for approximately 8.6% of all U.S. CO₂-eq emissions in 2012.³⁰ Significant reductions of methane emissions can be achieved quickly and cost-effectively utilizing currently available technologies. In the U.S., the greatest opportunities for methane mitigation come from: 1) recovery of emissions from the oil and natural gas sectors; 2) landfill gas capture and utilization; and 3) the recovery of coal mine ventilation gases. Further emissions mitigation opportunities exist in the

capture and utilization of emissions from manure, and the control of enteric fermentation. A number of methane reduction opportunities were identified in the 2014 U.S. Climate Action Plan Strategy to Reduce Methane Emissions.³¹

Select U.S. Methane Mitigation Options

- *Promote methane capture for oil and gas production leases on public lands.*

Federal land management agencies and the Bureau for Land Management, in particular, could encourage the use of all technically and economically viable control technologies for oil and gas production, including hydraulic fracturing (“fracking”), on public lands.

- *Expand composting and zero-waste programs.*

The Task Force and the EPA could work with municipalities and businesses with existing zero-waste and composting programs that include methane capture to develop best practice models for expanding these programs and to support other municipalities and businesses setting zero-waste or composting goals.

- *Capture coal mine ventilation gas.*

The EPA could promote the capture of coal mine emissions by establishing federal standards for performance for coal mine emissions.

- *Control methane emissions from anaerobic digestion of manure.*

The EPA could work to expand information exchanges with key stakeholders regarding the cost-effectiveness and availability of technologies to control and utilize emissions from the anaerobic digestion of manure, through its AgSTAR program.

- *Remove regulatory barriers for development of methane-based renewable energy.*

The Task Force could work with expert organizations and agencies to remove regulatory barriers to deployment of methane-based renewable energy by continuing to expand and standardize grid interconnection rules and modern net metering laws for small clean energy generators.

- *Capture and combust methane emissions at dairies.*

The EPA could expand existing voluntary measures in the AgSTAR program to provide dairy farms with the technical expertise and information necessary to implement methane control technologies where they are effective.

- *Capture and utilize methane emissions from wastewater treatment.*

The Task Force could work with the Department of Energy Office of Energy Efficiency and Renewable Energy to expand energy production from biogas at all technically feasible wastewater treatment facilities and increase access to technology and financing through programs such as the Federal Energy Management Program’s Super Energy Savings Performance Contracts (ESPC).

- *Improve rice field management to reduce methane emissions.*

Emissions of methane from rice fields can be reduced through a number of management techniques such as dry seeding and post-harvest rice straw removal and baling. The EPA should develop a voluntary program, similar to the successful AgSTAR program, to educate farmers on cost-effective rice field management techniques.

- *Study anti-methanogen vaccines and feed supplements for livestock.*

To achieve near-term reduction of methane emissions from livestock, the Super Pollutant Tack Force could support research into safe and cost-effective methods for reducing enteric fermentation including anti-methanogen vaccines and modified feed mixes.

Black Carbon Mitigation

Black carbon is a potent climate-forcing aerosol that remains in the atmosphere for only a few days or weeks.³² Black carbon is a component of soot and is a product of the incomplete combustion of fossil fuels, biofuels, and biomass.³³ Black carbon contributes to climate change in several ways: it warms the atmosphere directly by absorbing solar radiation and emitting it as heat; it contributes to melting by darkening the surfaces of ice and snow when it is deposited on them; and it can also affect the microphysical properties of clouds in a manner that can perturb precipitation patterns.³⁴ Recent estimates of black carbon's radiative forcing confirm that it is the second leading cause of global warming after CO₂.³⁵ The total climate forcing of black carbon is 1.1 W m⁻², second only to CO₂ (1.7 W m⁻²).³⁶

The main sources of black carbon are open burning of biomass, diesel engines, and the residential burning of solid fuels such as coal, wood, dung, and agricultural residues.³⁷ In 2000, global emissions of black carbon were estimated at approximately 7.5 million tons, with a large uncertainty range.³⁸

Thanks to modern pollution controls and fuel switching, black carbon emissions in North America and Europe were significantly curbed in the early 1900s.³⁹ However, the U.S. is still estimated to be the source of approximately 8% of all global black carbon emissions.⁴⁰ Approximately 50% of these emissions come from the transportation sector, primarily mobile diesel engines.⁴¹ Open biomass burning constitutes the second largest source of black carbon in the U.S., at 35% of total emissions.⁴² To address these and other sources of black carbon emissions in the United States, the Super Pollutant Task Force could focus on: continuing to reduce transportation particulate emissions particularly from super-emitting on- and off-road vehicles; expanding the use of battery and grid power for parked highway trucks; encouraging a switch to low-lack carbon fuels; requiring shore-power for at-berth ocean-going vessels and vessel speed reduction (VSR) near port; and banning open burning of agricultural biomass.

Select U.S. Black Carbon Mitigation Options

- *Reduce transportation particulate emissions.*

The task force could review the Diesel Emission Reduction Act (DERA), with an aim to produce vehicle turnover as soon as feasible.

- *Expand the use of battery and grid power for parked highway trucks.*

The EPA could work with state and local authorities to identify and support opportunities for expansion of truck stop electrification projects and provide incentives for truck owners to retrofit existing trucks compatible with electrification technologies.

- *Require shore-power from at-berth ocean-going vessels.*

The EPA could work with State Port Authorities to support the implementation of at-berth short power regulations similar to California's.

- *Reduce port congestion.*

The Task Force could work with industry associations and port authorities to develop and implement best practices for improving on- and off-short port efficiency including expanding the use of virtual arrival systems.

- *Require vessel speed reduction (VSR) near port.*

The EPA could work with other coastal states and port authorities to facilitate the expansion of VSR guidelines, priorities, and regulations for all coastal waters, including the Great Lakes.

- *Control open burning of agricultural biomass.*

The Task Force could develop training and outreach programs for farmers and land managers to educate them on techniques and best practices for eliminating the need to burn agricultural biomass, and develop tools to expand the use of biochar technologies.

- *Set stronger standards for wood-burning stoves and fireplaces.*

The Task Force should explore opportunities to expand the U.S. EPA BurnWise program, identify technical options to improve existing EPA standards both in the Residential Wood Heater program and through the voluntary Fireplace Partnership Program, and encourage states and local regulatory agencies to adopt equal or better standards for wood burning stoves and fireplaces.

Super Pollutant/SLCP Resources

Zalke, D. & N. Borgford-Parnell (2013) *Addressing Short-Lived Climate Pollutants U.S. SLCP Climate Action Supplement*.

Zaelke, D. & N. Borgford-Parnell (2014) *Primer on Hydrofluorocarbons*.

Zaelke, D. & N. Borgford-Parnell (2013) *Primer on Short-Lived Climate Pollutants*.

Carvalho S., Andersen, S. O., Brack, D., & Sherman N. J. (2014) ALTERNATIVES TO HIGH-GWP HYDROFLUOROCARBONS.

Molina, M., Zaelke, D., Sarma, K. M., Andersen, S. O., Ramanathan, V., & Kaniaru, D., *Reducing abrupt climate change risk using the Montreal Protocol and other regulatory actions to complement cuts in CO₂ emissions*, PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES (2009).

Xu, Y., Zaelke, D., Velders, G. J. M. & Ramanathan, V., *The role of HFCs in mitigating 21st century climate change*, ATMOSPHERIC CHEMISTRY AND PHYSICS (2013).

Hu, A., Xu Y., Tebaldi, C., Washington, W. M. & Ramanathan V., *Mitigation of Short-lived climate pollutants slows sea-level rise*, NATURE CLIMATE CHANGE (2013).

Bond T. C. *et al.*, *Bounding the role of black carbon in the climate system: a scientific assessment*, Accepted for publication in the Journal of Geophysical Research-Atmospheres (2013).

Shindell, D. *et al.*, *Simultaneously Mitigating Near-Term Climate Change and Improving Human Health and Food Security*, SCIENCE (2012).

Zaelke, D., Andersen, S. & Borgford-Parnell, N., *Strengthening Ambition for Climate Mitigation: The Role of the Montreal Protocol in Reducing Short-lived Climate Pollutants*, REVIEW OF EUROPEAN COMMUNITY & INTERNATIONAL ENVIRONMENTAL LAW (2012).

Velders G. *et al.*, *Preserving the Climate Benefits of the Montreal Protocol by Limiting HFCs*, SCIENCE (2012).

Victor D., Kennel C., & Ramanathan V., *The Climate Threat We Can Beat: What It Is and How to Deal With It*, FOREIGN AFFAIRS (2012).

Anenberg S. *et al.*, *Global Air Quality and Health Co-Benefits of Mitigating Near-Term Climate Change through Methane and Black Carbon Emission Controls*, ENVIRONMENTAL HEALTH PERSPECTIVES (2012).

UNEP, THE MONTREAL PROTOCOL AND THE GREEN ECONOMY: ASSESSING THE CONTRIBUTIONS AND CO-BENEFITS OF A MULTILATERAL ENVIRONMENTAL AGREEMENT (2012).

UNEP, NEAR-TERM CLIMATE PROTECTION AND CLEAN AIR BENEFITS: ACTIONS FOR CONTROLLING SHORT-LIVED CLIMATE FORCERS (November 2011).

UNEP, HFCs: A CRITICAL LINK IN PROTECTING CLIMATE AND THE OZONE LAYER (November 2011).

- UNEP & World Meteorological Organization, INTEGRATED ASSESSMENT OF BLACK CARBON AND TROPOSPHERIC OZONE (2011); and SUMMARY FOR DECISION MAKERS (2011).
- National Research Council of the National Academies, CLIMATE STABILIZATION TARGETS: EMISSIONS, CONCENTRATIONS, AND IMPACTS OVER DECADES TO MILLENNIA (2011).
- U.S. EPA, REPORT TO CONGRESS ON BLACK CARBON (2012).
- U.S. EPA, REDUCING BLACK CARBON EMISSIONS IN SOUTH ASIA: LOW COST OPPORTUNITIES (2012).
- Wallack, J. S., & Ramanathan, V., *The Other Climate Changers: Why Black Carbon and Ozone Also Matter*, FOREIGN AFFAIRS (2009).
- Clare, D., Pistone, K., & Ramanathan, V., *Getting Rid of Black Carbon: A Neglected but Effective Near-Term Climate Mitigation Avenue*, GEORGETOWN J. INT'L AFFAIRS (2010).
- Ramanathan, V., & Xu, Y., *The Copenhagen Accord for limiting global warming: Criteria, constraints, and available avenues*, PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES (2010).
- Lenton, T., *The potential for land-based biological CO₂ removal to lower future atmospheric CO₂ concentrations*, CARBON MANAGEMENT (2010).
- Velders G. et al., *The large contribution of projects HFC emissions to future climate forcing*, PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES (2009).
- Velders G. et al., *The importance of the Montreal Protocol in protecting climate*, PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES (2007).
- Fahey, D., & Hegglin M.I., TWENTY QUESTIONS AND ANSWERS ABOUT THE OZONE LAYER (2011).
- Andersen, S., Halberstadt, M. & Borgford-Parnell, N., *Stratospheric Ozone, Global Warming, and the Principle of Unintended Consequences—An Ongoing Science and Policy Success Story*, 43RD ANNUAL A&WMA CRITICAL REVIEW (2013).
- Ramanathan, V., *Black Carbon and the Regional Climate of California*, REPORT TO THE CALIFORNIA AIR RESOURCES BOARD (2013).

¹ Super Pollutant Act of 2014, S.2911, 113th Congress (2014).

² Zaelke D. & Borgford-Parnell N. (2014) ADDRESSING SHORT-LIVED CLIMATE POLLUTANTS: U.S. SCLP CLIMATE ACTION SUPPLEMENT; see also The Connect U.S. Fund (2012) *A Call to the President to Sustain and Enhance U.S. Global Leadership*; Bachmann J. & Seidel S., DOMESTIC POLICIES TO REDUCE THE NEAR-TERM RISKS OF CLIMATE CHANGE (2013) ("As a first step under this initiative, the Administration could issue a new Executive Order, direct agencies to begin advancing the regulatory and program actions identified below, and establish an interagency Short-Lived Climate Pollutant Task Force to coordinate and monitor implementation of this effort and to identify additional actions going forward."); and World Resources Institute (2013) CAN THE U.S. GET THERE FROM HERE? USING EXISTING FEDERAL LAWS AND STATE ACTION TO REDUCE GREENHOUSE GAS EMISSIONS.

³ Xu Y., Zaelke D., Velders G., Ramanathan V., *The role of HFCs in mitigating 21st century climate change*, ATMOSPHERIC CHEMISTRY AND PHYSICS 13:6083-6089, 1 (2013).

⁴ Solomon S. *et al.*, CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (2007); see also Archer D *et al.*, *Atmospheric lifetime of fossil fuel carbon dioxide*, ANNU. REV. EARTH PLANET. SCI. 37:117-34 (2009); and Matthews H. D. & Caldeira K. *Stabilizing climate requires near-zero emissions*, J. GEOPHYSICAL RES. 35:4 (2008); and Hansen J. *et al.*, *Climate change and trace gases*, PHIL. TRANS. R. SOC. 365:1925-1954 (2007).

⁵ UNEP/WMO (2011) INTEGRATED ASSESSMENT OF BLACK CARBON AND TROPOSPHERIC OZONE; Xu Y., Zaelke D., Velders G., Ramanathan V., *The role of HFCs in mitigating 21st century climate change*, ATMOSPHERIC CHEMISTRY AND PHYSICS 13:6083-6089, 1 (2013) (calculating that cutting the short-lived pollutants can avoid up to 0.6C of warming by 2050, compared to 0.1C for aggressive mitigation of carbon dioxide).

⁶ UNEP/WMO (2011) INTEGRATED ASSESSMENT OF BLACK CARBON AND TROPOSPHERIC OZONE, 57; see also UNEP (2011) NEAR-TERM CLIMATE PROTECTION AND CLEAN AIR BENEFITS: ACTIONS FOR CONTROLLING SHORT-LIVED CLIMATE FORCERS ("Methane contributes around 50 per cent of the increases in background ozone, with smaller contributions from non-methane volatile organic compounds and carbon monoxide"); and Royal Society (2008) GROUND-LEVEL OZONE IN THE 21ST CENTURY: FUTURE TRENDS, IMPACTS AND POLICY IMPLICATIONS: SCIENCE POLICY REPORT.

⁷ Shindell D. *et al.*, *Simultaneously mitigating near-term climate change and improving human health and food security*, 335 SCI. 183, 183 (2012); and UNEP/WMO, INTEGRATED ASSESSMENT OF BLACK CARBON AND TROPOSPHERIC OZONE (2011); see also Lim S. *et al.*, *A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010*, 380 THE LANCET 9859 (2012) ("The joint effects of air pollution are also likely to be large. Household air pollution from solid fuels accounted for 3.5 million (2.7 million to 4.4 million) deaths and 4.5% (3.4-5.3) of global DALYs [disability-adjusted life years] in 2010 and ambient particulate matter pollution accounted for 3.1 million (2.7 million to 3.5 million) deaths and 3.1% (2.7-3.4) of global DALYs.... The effects of ambient ozone pollution, which increases the risk of chronic obstructive pulmonary disease, were smaller than those of household air pollution from solid fuels or ambient particulate matter pollution (0.2 million [0.1 million to 0.3 million] deaths and 0.1% [0.03-0.2] of global DALYs in 2010).") Total annual deaths from air pollution is 6.8 million.

⁸ Hodnebrog Ø. *et al.*, *Efficiencies Of Halocarbons And Related Compounds: A Comprehensive Review*, rev. geoPHYS, 333 (2013).

⁹ UNEP, HFCs: A CRITICAL LINK IN PROTECTING CLIMATE AND THE OZONE LAYER, 10 (2011).

¹⁰ UNEP, HFCs: A CRITICAL LINK IN PROTECTING CLIMATE AND THE OZONE LAYER, 10 (2011).

¹¹ Velders G., *et al.*, *Preserving Montreal Protocol Climate Benefits by Limiting HFCs*, 335 SCI. 922 (2012); see also TECHNOLOGY AND ECONOMIC ASSESSMENT PANEL, TASK FORCE DECISION XX/8 REPORT, ASSESSMENT OF ALTERNATIVES TO HCFCs AND HFCs AND UPDATE OF THE 2005 TEAP SUPPLEMENTAL REPORT DATA 2009; and Velders G., *et al.*, *The Large Contribution of Projected HFC Emissions to Future Climate Forcing*, PROC. NAT'L. ACAD. SCI. Early Ed. (2009).

¹² Velders G. *et al.*, *The large contribution of projected HFC emissions to future climate forcing*, 106 PROC. NAT'L. ACAD. SCI. 10949 (2007) ("Global HFC emissions significantly exceed previous estimates after 2025 with developing country emissions as much as 800% greater than in developed countries in 2050. Global HFC emissions in 2050 are equivalent to 9-19% (CO₂-eq. basis) of projected global CO₂ emissions in business-as-usual scenarios and contribute a radiative forcing equivalent to that from 6-13 years of CO₂ emissions near 2050. This percentage increases to 28-45% compared with projected CO₂ emissions in a 450-ppm CO₂ stabilization scenario business-as-usual scenarios from 2010 to 2050"); and UNEP, HFCs: A CRITICAL LINK IN PROTECTING CLIMATE AND THE OZONE LAYER (2011) ("In a further comparison, the HFC radiative forcing in 2050 (not shown) of 0.25-0.40 W m⁻² corresponds to 7-12% of the CO₂ values."); see also Velders G. *et al.*, *Preserving Montreal Protocol Climate Benefits by Limiting HFCs*, 335 SCI. 922 (2012).

¹³ UNEP, HFCs: A CRITICAL LINK IN PROTECTING CLIMATE AND THE OZONE LAYER (2011) ("The increase in HFC radiative forcing from 2000 to 2050 can also be compared to the radiative forcing corresponding to a 450 ppm CO₂ stabilization scenario. The reduction in radiative forcing necessary to go from a business-as-usual scenario (as in IPCC-SRES, Figure 3.3) to such a stabilization scenario is of the same order of magnitude as the increase in HFC radiative forcing. In other words, the benefits of going from a business-as-usual pathway to a pathway in which CO₂ stabilizes at 450 ppm can be counteracted by projected increases in HFC emissions."); see also Velders G., *et al.*, *The large contribution of projected HFC emissions to future climate forcing*, PROC. NAT'L. ACAD. SCI. Early Ed. (2009).

¹⁴ See Velders G., *et al.* *The large contribution of projected HFC emissions to future climate forcing*, PROC. NAT'L. ACAD. SCI. USA 106:10949 (2009) (Dr. Velders' updated calculations show that as of 2013 the amendments can provide 76 to 134 billion tonnes CO₂-eq. by 2050.).

¹⁵ Velders G. J. M., et al. (2014) *Growth of climate change commitments from HFC banks and emissions*, *ATMOS. CHEM. PHYS. Discuss.* 14:4563-4572

¹⁶ Proposed amendment to the Montreal Protocol submitted by the Federated States of Micronesia, UNEP/OzL.Pro.WG.1/34/5 (16 May 2014); and Proposed amendment to the Montreal Protocol submitted by Canada, Mexico and the United States of America, UNEP/OzL.Pro.WG.1/34/4 (10 May 2014).

¹⁷ Velders G. J. M., et al. (2007) *The importance of the Montreal Protocol in protecting climate*, *PROC. NAT'L. ACAD. SCI. U.S.A.* 104:4814-4819.

¹⁸ UNEP (2010) *DECLARATION ON THE GLOBAL TRANSITION AWAY FROM HYDROCHLOROFLUOROCARBONS (HCFCs) AND CHLOROFLUOROCARBONS (CFCs)*. There are a number of agreements between the U.S. and China and the U.S. and India on the phase down of HFCs, see Zaelke, D. & N. Borgford-Parnell (2014) *Primer on Hydrofluorocarbons* for a full list of policy statements supporting the phase down of HFCs.

¹⁹ Speech, Shende R. 2009 *USEPA's Stratospheric Ozone Protection and Climate Protection Awards* (21 April 2009) ("Humanity has already benefited by about 60% improvement in energy efficiency in domestic refrigerators since the industry started looking at their design in order to change from CFC-12."); see also U.S. Envtl. Prot. Agency (2002) *BUILDING OWNERS SAVE MONEY, SAVE THE EARTH: REPLACE YOUR CFC AIR-CONDITIONING CHILLER*, 7 ("The most energy-efficient new chillers will reduce electric generation and associated greenhouse gas emissions by up to 50% or more compared to the CFC chillers they replace."); U.S. Envtl. Prot. Agency (2002) *BUILDING OWNERS SAVE MONEY, SAVE THE EARTH: REPLACE YOUR CFC AIR-CONDITIONING CHILLER*, 2 ("Building owners around the world have saved millions of dollars in electricity bills by upgrading air conditioning chiller installations and through concurrent investments to reduce building cooling load. Today's chillers use about one-third or less electricity compared to those produced just two decades ago. Building owners can typically pay back the investment cost of replacing an old CFC chiller in five years or less in virtually all locations that cool for more than three months a year."); and Todesco G. (2005) *CHILLERS + LIGHTING + TES: WHY CFC CHILLER REPLACEMENT CAN BE ENERGY-SAVINGS WINDFALL*, *ASHRAE JOURNAL*, 10 ("These CFC chillers serve an estimated 3.4 billion to 4.7 billion ft² (315 million to 440 million m²) of commercial floor space with a total electricity consumption of 49,000 to 66,000 GWh/year, and an annual electricity operating cost of \$3.4 billion to \$4.8 billion. In addition, the cooling and lighting loads in these buildings contribute an estimated 3,600 to 9,200 MW to the summer peak demand of North American utilities. The electricity consumption and peak electrical demand can be reduced significantly by replacing the remaining CFC chillers with new efficient plants. The performance of chillers has improved significantly in the last 12 years compared to chillers manufactured in the 1970s and 1980s.")

²⁰ Shende R., 2009 *USEPA's Stratospheric Ozone Protection and Climate Protection Awards* (2009) ("Humanity has already benefited by about 60% improvement in energy efficiency in domestic refrigerators since the industry started looking at their design in order to change from CFC-12."); and U.S. Envtl. Prot. Agency *BUILDING OWNERS SAVE MONEY, SAVE THE EARTH: REPLACE YOUR CFC AIR CONDITIONING CHILLER*, 7 (2002) ("The most energy-efficient new chillers will reduce electric generation and associated greenhouse gas emissions by up to 50% or more compared to the CFC chillers they replace.")

²¹ U.S. Envtl. Prot. Agency, *Building owners save money, save the earth: replace your CFC air conditioning chiller*, 2 (2002) ("Building owners around the world have saved millions of dollars in electricity bills by upgrading air conditioning chiller installations and through concurrent investments to reduce building cooling load. Today's chillers use about one-third or less electricity compared to those produced just two decades ago. Building owners can typically pay back the investment cost of replacing an old CFC chiller in five years or less in virtually all locations that cool for more than three months a year."); and Todesco G. *CHILLERS + LIGHTING + TES: WHY CFC CHILLER REPLACEMENT CAN BE ENERGY-SAVINGS WINDFALL*, *ASHRAE JOURNAL*, 10 (2005) ("These CFC chillers serve an estimated 3.4 billion to 4.7 billion ft² (315 million to 440 million m²) of commercial floor space with a total electricity consumption of 49,000 to 66,000 GWh/year, and an annual electricity operating cost of \$3.4 billion to \$4.8 billion. In addition, the cooling and lighting loads in these buildings contribute an estimated 3,600 to 9,200 MW to the summer peak demand of North American utilities. The electricity consumption and peak electrical demand can be reduced significantly by replacing the remaining CFC chillers with new efficient plants. The performance of chillers has improved significantly in the last 12 years compared to chillers manufactured in the 1970s and 1980s.")

²² York International, *Taking the bite out of CFC replacement by improving air conditioning efficiency* (press release 14 February 1996) ("Now that production of chlorofluorocarbons (CFCs) has ended, the majority of commercial and institutional building owners and industrial plant managers have a chance to turn adversity into opportunity. That's the premise of a white paper being offered by York International Corp., a major manufacturer of chillers -- the large refrigeration machines at the heart of most large-building air conditioning systems. While there's no escaping eventual replacement or conversion of the 60,000 or more air conditioning systems in the U.S. that use CFCs as refrigerants, the good news, according to York International, is that the energy efficiency of these systems can be dramatically improved with new technology, meaning quicker paybacks and long-term cost savings. The savings, in fact, have been calculated to range between \$200,000 and \$2 million, depending on local weather conditions, over a 25-year operating life.")

²³ U.S. Envtl. Prot. Agency, *BUILDING OWNERS SAVE MONEY, SAVE THE EARTH: REPLACE YOUR CFC AIR CONDITIONING CHILLER*, 7 (2002).

²⁴ Carvalho, S., S. O. Andersen, D. Brack, N. J. Sherman, *ALTERNATIVES TO HIGH-GWP HYDROFLUOROCARBONS* (November 2014); see also Montreal Protocol Technology and Economic Assessment Panel, *TEAP 2010 Progress Report Volume 1*, (2010) ("Systems using low-GWP alternatives are able to achieve equal or superior energy efficiency in a number of sectors, such as domestic refrigeration, commercial refrigeration and some types of air conditioning systems. In the case of industrial refrigeration, for example, hydrocarbon and ammonia systems are typically 10-30% more energy efficient than conventional high-GWP HFC systems."); and Schwarz W. et al., *Preparatory study for a review of Regulation (EC) No 842/2006 on certain fluorinated greenhouse gases*, Annexes to the Final Report (2011).

²⁵ UNEP (2006) *METHODOLOGICAL AND TECHNICAL ISSUES IN TECHNOLOGY TRANSFER*, 5.5.7.

- ²⁶ The Consumer Good Forum, *About*, (2013); *and Refrigerants Naturally! Who We Are*, (2013).
- ²⁷ U.S. Eenvtl Prot. Agency, *Environmentally Preferable Purchasing (EPP)*; *see also* U.S. Eenvtl Prot. Agency (1999) *FINAL GUIDANCE ON ENVIRONMENTALLY PREFERABLE PURCHASING*.
- ²⁸ IPCC, *CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS*, 129, 132, (2007).
- ²⁹ U.S. Eenvtl Prot. Agency, *INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–2012*, online database (2014).
- ³⁰ U.S. Eenvtl Prot. Agency, *INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–2012*, online database (2014).
- ³¹ U.S. (2014) *CLIMATE ACTION PLAN STRATEGY TO RECUE METHANE EMISSIONS*.
- ³² U.S. Eenvtl. Prot. Agency, *REPORT TO CONGRESS ON BLACK CARBON*, xx (2012); *and* UNEP/WMO, *INTEGRATED ASSESSMENT OF BLACK CARBON AND TROPOSPHERIC OZONE* (2011).
- ³³ U.S. Eenvtl. Prot. Agency, *REPORT TO CONGRESS ON BLACK CARBON*, xxi (2012).
- ³⁴ Bond T. C. *et al.*, *Bounding the role of black carbon in the climate system: a scientific assessment*, Accepted for publication in the *J. OF GEOPHYS. RES.–ATMOS.*, doi:10.1002/jgrd.50171 (2013).
- ³⁵ Bond T. C. *et al.*, *Bounding the role of black carbon in the climate system: a scientific assessment*, Accepted for publication in the *J. OF GEOPHYS. RES.–ATMOS.*, doi:10.1002/jgrd.50171 (2013) (“We estimate that black carbon, with a total climate forcing of +1.1 W m⁻², is the second most important human emission in terms of its climate-forcing in the present-day atmosphere; only carbon dioxide is estimated to have a greater forcing.”) (This study confirms earlier estimates by Jacobson (2001) and Ramanathan and Carmichael (2008), which also concluded that BC is the second largest contributor to global warming after CO₂; *and* Jacobson M. Z., *Strong radiative heating due to the mixing state of black carbon in atmospheric aerosols*, *NAT.* 409:695–69 (2001); *and* Ramanathan V. & Carmichael G., *Global and regional climate changes due to black carbon*, *NAT. GEOSCI.* 1:221 (2008); *see also* U.S. Eenvtl. Prot. Agency, *REPORT TO CONGRESS ON BLACK CARBON* 4, 18 (2012) (“The sum of the direct and snow/ice albedo effects of BC on the global scale is likely comparable to or larger than the forcing effect from methane, but less than the effect of carbon dioxide; however, there is more uncertainty in the forcing estimates for BC....”).
- ³⁶ Bond T. C. *et al.*, *Bounding the role of black carbon in the climate system: a scientific assessment*, Accepted for publication in the *J. OF GEOPHYS. RES.–ATMOS.*, doi:10.1002/jgrd.50171 (2013).
- ³⁷ U.S. Eenvtl. Prot. Agency, *REPORT TO CONGRESS ON BLACK CARBON*, 4, 18 (2012).
- ³⁸ Bond T. C. *et al.*, *Bounding the role of black carbon in the climate system: a scientific assessment*, Accepted for publication in the *J. OF GEOPHYS. RES.–ATMOS.*, (2013) (“With this method, a bottom-up estimate of total global emissions in the year 2000 is about 7500 Gg BC yr⁻¹, with an uncertainty range of 2000 to 29000 Gg yr⁻¹.”); *see also* U.S. Eenvtl. Prot. Agency, *REPORT TO CONGRESS ON BLACK CARBON*, 4, 18 (2012).
- ³⁹ United Nations Environment Programme & World Meteorological Organization (herein after UNEP/WMO) *INTEGRATED ASSESSMENT OF BLACK CARBON AND TROPOSPHERIC OZONE*; *see also* U.S. Eenvtl Prot. Agency, *INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–2010* (2012).
- ⁴⁰ U.S. Eenvtl Prot. Agency, *REPORT TO CONGRESS ON BLACK CARBON*, 2 (2012) .
- ⁴¹ U.S. State Dept, *U.S. CLIMATE ACTION REPORT 2010: FIFTH NATIONAL COMMUNICATION OF THE UNITED STATES OF AMERICA UNDER THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE*, 30 (2010) .
- ⁴² U.S. Eenvtl Prot. Agency, *REPORT TO CONGRESS ON BLACK CARBON* (2012).



Institute for Governance & Sustainable Development

**Durwood Zaelke's Responses to Follow-Up Questions from the
Senate Committee on Environment and Public Works**

1. Your testimony describes a number of policy options for reducing HFC, black carbon, and methane emissions. Are cost-effective technologies readily available now to reduce significantly the emissions of these short-lived climate pollutants?

Yes, many cost-effective technologies are readily available now to significantly reduce emissions of short-lived climate pollutants and, in the case of tropospheric ozone, to reduce ozone precursors. In addition to cost-effective technologies, there are also existing policies and practices that can significantly reduce short-lived climate pollutants immediately.

With respect to black carbon, methane and tropospheric ozone, measures that include both technological and policy changes to reduce these pollutants are detailed in the United Nations Environment Program's 2011 report, *Integrated Assessment of Black Carbon and Tropospheric Ozone*; UNEP's 2011 report, *Near-term Climate Protection and Clean Air Benefits: Actions for Controlling Short-Lived Climate Forcers*; and UNEP's 2011 assessment of HFCs, *HFCs: A Critical Link in Protecting Climate and the Ozone Layer*.

Chapter Five of UNEP's *Integrated Assessment of Black Carbon and Tropospheric Ozone* provides extensive detail on both the technologies and policies that can reduce black carbon, methane and tropospheric ozone pollution. Perhaps most importantly, this chapter highlights sixteen measures that, if implemented globally, could achieve approximately 90% of the overall mitigation potential of these pollutants.

With respect to HFCs, there are also numerous cost-effective alternatives and substitutes to these chemicals. Because HFCs are factory-made greenhouse gases manufactured for a variety of purposes, alternatives to these various chemicals differ depending on the application and the circumstances where the chemicals are used. For some HFC uses there are a wide variety of safe and cost-effective alternatives that can be employed immediately. For other uses, there are alternatives available, but these may be limited based on manufacturing capacity and consumer demand. The global phase down of HFCs that has been proposed is that industry will accelerate innovation and speed commercialization of alternatives for these other HFC uses. Consumers will be able to use safe alternatives to HFCs that are produced at large economy of scale and sold at affordable prices.

For detailed information on the availability of alternatives to HFCs and the status of those currently under development, please see *Alternatives to High-GWP Hydrofluorocarbons*, a November 2014 report on this topic by my organization.

2. Your testimony stated that U.S. action on climate is absolutely necessary to ensure other countries like China and India agree to act to curb their emissions. Have recent U.S. actions to reduce carbon pollution and U.S. international diplomatic leadership resulted in China and India's altering their actions and positions on reducing short-lived climate pollutants?

Yes, U.S. leadership and actions in the U.S. are helping spur China and India to reduce climate pollution, including SLCPs. U.S. climate leadership has been important for leveraging mitigation from the other major economies. This includes U.S. leadership in forming the Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants (CCAC), a forum that has helped educate other countries about the benefits of fast action to reduce SLCPs. As the CCAC explains, in fact, a key U.S. contribution to international action on SLCPs has been to highlight for all countries, including China and India, the rapid, *localized* benefits from SLCPs reductions that can be achieved. For example, as much as 98% of the health benefits achievable from reductions in emissions of black carbon accrue to the region where the cuts are made. In this sense, one of the benefits from the U.S. calling for action on SLCPs has been to avoid the "first-mover" challenge that has been a detriment to action on longer-lived pollutants such as carbon dioxide; for as soon as countries recognize that the primary benefits of SLCP reductions accrue mostly to the places making the reductions, there is less of an interest to insist that other countries act first and more of an interest in determining how one's own country can move forward as quickly as possible. This, in turn, leads to faster action by all countries, which can then build momentum for increased cooperation, including on the longer-lived pollutants. Where China and India have taken action to reduce SLCPs, has often been as a result of these countries seeking to achieve their own sustainable development objectives, such as reducing particulate air pollution.

3. The 1990 Clean Air Act required EPA to develop and implement regulations for the responsible control of ozone-depleting substances in the U.S. to help restore the ozone layer. The phase-out for Class I ozone depleting substances was implemented 4-6 years faster, included 13 more chemicals, and cost 30 percent less than was predicted at the time the 1990 Clean Air Act Amendments were enacted. Was the U.S. a world leader in taking these steps? In your opinion has the EPA's phase-out of ozone depleting substance been a success?

Yes, the U.S. has been a world leader in phasing out ozone-depleting substances, and the EPA's phase out of ozone-depleting substances has been a resounding success. For example, technical centers of excellence organized by SAE International screened and tested the alternatives to HFCs used in motor vehicle air conditioning and with the cooperation of the EPA selected HFO-1234yf (global warming potential—GWP-- <1) to replace HFC-134a (GWP = 1300) and U.S. firms have also been at the front of innovations in refrigerant leak detection, recovery and recycling of HFC refrigerants, and other technology that will enjoy expanding sales while reducing the cost of product ownership by increasing efficiency and reliability and by reducing the frequency of service. U.S. companies have organized under the leadership of the Alliance for Responsible Atmospheric Policy to support the HFC amendment to the Montreal Protocol that will support jobs and profits from new technology and improved service.

4. Your testimony mentioned efforts to phase-down production and consumption of HFCs through an amendment to the Montreal Protocol. If adopted, would this amendment require only the United States to phasedown production and consumption of HFCs?

No. If adopted, the proposed amendment to the Montreal Protocol would require all countries to phase down their production and consumption of HFCs, although developing countries historically have been given more time to do their phase downs. Two groups of countries have proposed phasing down the production and use of HFCs under the Montreal Protocol: the Federated States of Micronesia, Morocco and the Maldives, as well as the North American countries (Canada, Mexico and the United States). Both of these groups' proposals would require all countries to phase down production and consumption of HFCs. However, as in previous phase outs under the Montreal Protocol, the timelines and sources of finance for the phase down may differ between developed and developing countries. It is also worth noting that in addition to the proposals submitted under the Montreal Protocol, leaders of almost all countries have signed the Rio + 20 outcome statement, *The Future We Want*, which was issued in June 2012 and adopted by the UN General Assembly by resolution on 11 September 2012. This document supports "a gradual phase-down in the consumption and production of hydrofluorocarbons." So it is widely recognized that a phase down of HFCs will need to be global and will require action by all countries. In summary, the climate benefits are clear, climate-friendly alternatives are available, and U.S. companies and citizens are ready and able to take the lead in cost effective solutions that create jobs and enhance profits while protecting the climate.

Respectfully Submitted,



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Senator BOXER. Thank you, Mr. Zaelke.

I am going to just tell you what the plan is here. Senator Whitehouse is going to run this hearing. I have been called to a hearing on sexual assault on college campuses, and I need to run there. My hope is to run there and back, but one never knows. He has graciously said he is going to take this.

Colleagues who are here, Senator Boozman, Senator Whitehouse, Senator Murphy was here, Senator Murphy started off, he gave his statement. He also put in the record a statement by Senator Collins and made the point this is our first real bipartisan breakthrough on an issue dealing with the climate. But as was pointed out, it is a lot more than climate, it is about a lot of other things as well.

So I am going to hand this over to Senator Whitehouse and he will run this. I just want to thank you all so much. I am excited about this bill.

Senator Whitehouse, why don't you take it from here.

Senator WHITEHOUSE.

[Presiding] Very well, and Mr. Fay, we will turn to you.

STATEMENT OF KEVIN FAY, EXECUTIVE DIRECTOR, ALLIANCE FOR RESPONSIBLE ATMOSPHERIC POLICY

Mr. FAY. Thank you, Senator.

I serve as Executive Director of the Alliance for Responsible Atmospheric Policy. We appreciate the opportunity to testify today.

The Alliance, originally organized in 1980, is a coalition of manufacturers, businesses and trade associations which make or use fluorinated gases in their course of business. Today, Alliance member companies are leading the development of next generation, climate-and ozone-friendly technologies and applications.

The U.S. fluorocarbon using and producing industries contribute more than \$158 billion annually in goods and services to the U.S. economy, and provide employment to more than 700,000 individuals.

S. 911 would help to focus government activities on the so-called short-lived climate pollutants, including HFCs, further congressional understanding and identify potential future steps. Our comments today are specifically in relation to the provisions governing HFCs.

The Alliance commended the sponsors of the legislation upon its introduction. We did so because the legislation would one, recognize the appropriate role of the Montreal Protocol in advancing ozone protection while reducing greenhouse gas emissions calibrated to the pace of technology developments and the availability of proven energy efficient alternatives. Two, acknowledges the important role of effective refrigerant management and recovery and re-use of refrigerant as near-term approaches that can achieve significant HFC emissions reductions. And three, close the HCFC-22 exception that permits the use of ozone-depleting residential air conditioning units. The legislation promotes both ozone protection and improved energy efficiency of newer systems.

The highly successful Montreal Protocol Treaty is grounded in scientific understanding, includes an effective technology and economic assessment process and recognizes the special needs of de-

veloping country economies. The Protocol identifies long-term objectives and achieves its environmental protection benefits in a sensible approach, guided by economic feasibility.

As a result of our experience under the Protocol over the last 27 years, we believe it can play an instrumental role in also reducing the greenhouse gas contributions of ODS substitutes. This approach is far preferable for uniform treatment of HCFs than command and control regulations by the United States and other nations, or the market-fracturing approach that will result if the major economies were all to choose different means of achieving HFC greenhouse gas reductions.

We believe with the appropriate policy signals and flexible implementation, it is possible to achieve a substantial reduction of HFC greenhouse gas contribution over the next several decades. That is why in September of this year, the Alliance announced its intent to "take actions and support policies to achieve an 80 percent reduction of global HFC emissions on a GWP-weighted basis by 2050."

The legislation acknowledges the Protocol's success and encourages addressing HFCs through an amendment. We would concur.

The bill also encourages the utilization of Section 608 of the Clean Air Act as a means of reducing service emissions of current HFC-using equipment and promoting refrigerant recapture and reuse. We know that the majority of HFC emissions occur during the service, maintenance, repair and disposal of air conditioning and commercial refrigeration units. Moreover, this equipment operates most efficiently when properly charged and maintained, minimizing energy consumption and related greenhouse gas emissions. In reducing the contribution of HFCs to climate change, initiating proper refrigerant management practices remains the lowest-hanging fruit.

The legislation also calls attention to the important role of the fluorocarbon compounds with regard to energy efficiency of the air conditioning units and refrigeration equipment in which they are utilized. Ninety-five percent of the greenhouse gas contribution of this equipment is derived indirectly as a result of its lifetime energy consumption.

In the transitions achieved to date, and the pending transition to low-GWP compounds, it is imperative that this be part of the technology assessment process, and must include coordination with energy efficiency standards processes and appropriate modifications to building codes and standards.

The last item highlighted in S. 2911 is language to close an exception for what are known as the dry-22 units. In a rulemaking 5 years ago, EPA defined uncharged condensing units to be a service component not otherwise subject to the Clean Air Act prohibition to place in commerce equipment that relies on HCFC-22, which is phased out under the protocol. As a result of this rule modification, the manufacture of these units increased significantly at a time when their phase-out was nearly complete. The manufacturing community has recently advised EPA of its unanimous position that the manufacture of these units should be phased out. The language in the bill would effect this change and the Alliance would be supportive.

U.S. industry has been at the forefront of the technology advances over the last several decades on ozone protection and climate protection. We are now investing in the innovation of low-GWP compounds and technologies that will allow us to achieve ozone protection, climate protection and energy efficiency goals. We have embraced this new challenge. However, much work remains to be done. Technology pathways have not been identified for all the critical uses. Industry leaders recently highlighted the multi-billion dollar investments to be made over the next decade in order to achieve these goals. U.S. industry leadership and an effective global approach on the Montreal Protocol will be key to this achievement.

S. 2911 is a useful legislative vehicle with regard to HFCs because it helps focus the attention of the relevant U.S. Government departments and agencies on key issues in that regard, including effective assessment of low-GWP alternatives for responsible refrigerant management and the market support of Montreal Protocol amendment as an appropriate path forward.

We appreciate the opportunity to testify before you today. We look forward to working with you in the next Congress as these issues are addressed and will be happy to answer any questions.

[The prepared statement of Mr. Fay follows:]



The Alliance
for Responsible Atmospheric Policy

**STATEMENT OF
THE ALLIANCE FOR RESPONSIBLE ATMOSPHERIC POLICY**

Kevin Fay, Executive Director

December 2, 2014

Legislative Hearing on S. 2911, "Super Pollutants Act of 2014"

Senate Environment and Public Works Committee

Good Afternoon. My name is Kevin Fay. I serve as Executive Director of the Alliance for Responsible Atmospheric Policy, a US industry coalition organized in 1980 to address the issue of stratospheric ozone depletion. We appreciate the opportunity to testify at this legislative hearing on S. 2911, the "Super Pollutants Act of 2014."

The Alliance is composed of manufacturers, businesses and trade associations, which make or use fluorinated gases in their course of business. Today, Alliance member companies are leading the development of next generation, climate- and ozone-friendly, technologies and applications. According to a recent study, the US fluorocarbon using and producing industries contribute more than \$158 billion annually in goods and services to the US economy, and provide employment to more than 700,000 individuals with an industry-wide payroll of more than \$32 billion. The Alliance represents more than 100 companies across several sectors engaged in the development of economically and environmentally beneficial international and domestic policies regarding fluorinated gases. The Alliance is proud of its extensive history of working in a constructive manner with the U.S. Environmental Protection Agency (EPA) on the protection of stratospheric ozone and the mitigation of climate change. Further, we are also proud of our work towards the development and implementation of the Montreal Protocol on Protection of the Earth's Ozone Layer.

The Montreal Protocol has achieved impressive success in ozone and climate protection due to a combination of internationally-negotiated CFC and HCFC production and consumption reduction mechanisms paired with domestic implementation measures to control emissions. With hydrofluorocarbons (HFCs) receiving significant consideration under the United Nations Framework Convention on Climate Change (UNFCCC) and potentially under the Protocol as well as expanding domestic measures under current authorities, it is critical to have a comprehensive approach to address their potential climate change contribution, including HFCs already in use in the installed equipment base.

Upon the introduction of S. 2911, the Alliance commended the sponsors of the legislation and encouraged further sponsorship and consideration. We did so because the legislation:

- **Recognizes the appropriate role of the Montreal Protocol in advancing ozone protection, while reducing greenhouse gas emissions, calibrated to the pace of technology developments and the availability of proven, energy-efficient alternatives.**
- **Acknowledges the important role of effective refrigerant management, and recovery and re-use of refrigerant, as near-term approaches that can achieve significant HFC emission reductions.**
- **Closes the HCFC-22 exception that permits the use of ozone-depleting residential air conditioning units. The legislation promotes both ozone protection and improved energy efficiency of newer systems.**

The Montreal Protocol has been highlighted as one of the most effective multilateral environment treaties ever implemented. It is the only treaty in the United Nations system to which every nation in the world is a party. We believe the treaty has been successful because it is grounded in scientific understanding, includes an effective technology and economic assessment process, and recognizes the special needs of developing country economies. The Protocol identifies long-term objectives and achieves its environmental protection benefits in a sensible approach guided by economic feasibility.

The short-lived climate pollutants (SLCPs) that are addressed as part of S. 2911, are also being addressed in a global program called the Climate and Clean Air Coalition (CCAC). CCAC is a partnership of governments, quasi-public agencies and organizations, the private sector, and environment non-governmental organizations (NGOs).

S.2911 would help to focus government activities on the SLCPs and further Congressional understanding of its activities, as well as identify potential future steps. Our comments today are specifically in relation to the provisions governing HFCs.

Support for a Montreal Protocol Amendment on HFCs

Addressing HFCs is one of the key initiatives of the CCAC program. The primary goal is to support the amendment of the Montreal Protocol to utilize its mechanisms and institutions to achieve a gradual phasedown of HFC use and emissions. That effort is buttressed with three other components: government procurement policies which encourage the acquisition of low-GWP technologies as they become available; and two components developed by the private sector, a global refrigerant management initiative and efforts to support development of low-GWP technologies throughout the food cold chain while increasing the utilization of food preservation technology on a global basis.

As a result of our experience under the Montreal Protocol over the last 27 years in achieving the elimination of ozone depleting substances(ODS), we believe that the protocol can play an instrumental role in also reducing the greenhouse gas contribution of ODS substitutes. This approach is far preferable for uniform treatment of HFCs than command and control regulation by the United States and other nations, or the market-fracturing approach that will result if the major economies were to all choose different means of achieving HFC greenhouse gas reductions.

HFCs have provided the ability to rapidly reduce reliance on ODS, and recent scientific assessments have concluded the Earth's ozone layer is on the mend. They are not currently a significant portion of overall global GHG emissions. However, concern for future growth,

particularly in major developing country economies, signals a potential for a significant increase in the HFC greenhouse gas contribution between now and 2050. We believe with the appropriate policy signals and flexible implementation, it is possible to achieve a substantial reduction of HFC greenhouse gas contribution over that timeframe. That is why in September of this year, the Alliance announced its intent **“to take actions and support policies to achieve an 80% reduction of global HFC emissions on a GWP-weighted basis by 2050.”**

Since then, we have also launched the Global Refrigerant Management Initiative (GRMI) and the Global Food Cold Chain Council (GFCCC), as part of our efforts under the Climate and Clean Air Coalition to achieve near-term emission reductions as we work on the Montreal Protocol amendment process.

The Montreal Protocol, in its programs to eliminate ODS, has already proven to be the most significant and cost-effective greenhouse gas reduction policy adopted to date. We believe that this success can be repeated as we work to achieve the long-term transition to low-GWP compounds and technologies that also continue to improve the energy efficiency profile of the important user technologies.

S. 2911 acknowledges this success and encourages governments and the private sector to carry on in an equally successful manner that is both environmentally effective and economically sensible.

Global and Domestic Refrigerant Management Initiatives

The legislation also encourages the utilization of Section 608 of the Clean Air Act as a means of reducing service emissions of current HFC using equipment and promoting the recapture and reuse of refrigerant through recycling and reclamation. We know that the majority of refrigerant emissions occur during the service, maintenance, repair and disposal of air-conditioning and commercial refrigeration units. Moreover, that equipment operates most efficiently when properly charged and maintained, minimizing energy consumption and related greenhouse gas emissions.

As industry we are moving forward with global measures to promote the responsible use of refrigerants. At the September 23 UN Climate Summit, the Alliance, in conjunction with the Air-Conditioning, Heating and Refrigeration Institute and ABRAVA, the Brazilian Association for HVAC-R, launched the Global Refrigerant Management Initiative to reduce leaks and service emissions throughout the industry's global supply chain through better education, training and certification. This initiative has already received the support of industry associations from 9 countries and the EU, representing 4 continents, and is expected to continue expanding in 2015.

Such voluntary actions are important, but can be bolstered by sound policies. That is why in January of this year, the Alliance submitted a petition to extend the regulations under Section 608 of the Clean Air Act to HFCs and other substitutes for class I and class II ozone-depleting substances. These policies have proven effective in limiting ODS emissions and promoting refrigerant re-use; now it is time to bring consistency to stationary refrigerant management regulations by extending them to HFCs and other substitutes for class I and class II ozone-depleting substances.

As a result of the Alliance's petition, EPA recently initiated a stakeholder process to address the related issues and develop a response to the Alliance's petition. The first stakeholder meeting was attended by industry representatives from all facets of the air conditioning and refrigeration industry. While a variety of views were expressed on implementation issues, there was no opposition to the overall objective from the industries in attendance.

In reducing the contribution of HFCs to climate change, initiating proper refrigerant management practices remains the lowest hanging fruit.

Importance of Energy Efficiency

The legislation also calls attention to the important role of the fluorocarbon compounds with regard to the energy efficiency of the air conditioning and refrigeration equipment in which they are utilized. It is well understood that 95% of the greenhouse gas contribution of this equipment

is derived indirectly as a result of its lifetime energy consumption. In the transitions achieved to-date, and the pending transition to low-GWP compounds and technologies, it is imperative that this is part of the technology assessment process. It is also why the Alliance, at the September White House HFC Industry Roundtable, urged Administration officials from the Department of Energy and EPA to better coordinate the next phases of technology transition so that the introduction of low-GWP technologies is in synch with coming rounds of energy efficiency standards. This will allow the industry to more effectively meet these important, but sometimes competing, environmental objectives.

On a related point, the legislation also calls for a study on alternatives to the high-GWP compounds and technologies, including the identification of standards or regulatory barriers that could prevent or slow the introduction of low-GWP alternatives. This study will be useful in two important respects—highlighting the need for coordination of the HFC phasedown with the cycle of energy efficiency standards changes; and identifying issues such as building codes and standards, that could slow the uptake of the developing new technologies. Some of the substitute technologies have a range of characterizations for flammability: non-flammable, mildly flammable, and highly flammable. Safety standards need to be modified to take this into account in order to amend building codes to allow for the installation of such new and beneficial technologies.

The Alliance has established a task force with EPA and DOE to identify issues associated with this codes and standards modification process. This task force will work to ensure modifications, but this process is slow. Officials will need to be mindful of this as they promote the transition to the new technologies.

Dry-22 Condensing Units

The last item highlighted in S. 2911 is language to close a loophole for what are known as “dry-22 units.” In a rulemaking five years ago, EPA defined uncharged condensing units (“dry”) to be a service component not otherwise subject to the Clean Air Act prohibition to place in commerce equipment that relies on HCFC-22, an ODS that is subject to phase-out under the Montreal

Protocol and the Clean Air Act. As a result of this modification to the rules, the manufacture of these units increased significantly at a time when their phase-out was nearly complete.

A diversity of views existed on the wisdom of the EPA rule modification, and there was not a unanimous view among the affected industry on how to address it. After long consideration, however, the manufacturing industry has recently advised EPA of its unanimous position that the manufacture of these units should now be phased out. The language in S. 2911 would effect this change. This is important because the Montreal Protocol just now imposes on developing countries the initiation of the phase-out of HCFC-22 and other HCFCs. In order for consistency of approach, the Alliance believe it to be constructive that US regulations not appear to be creating loopholes that other countries might wish to emulate. The Alliance supports the language in S. 2911 with regard to dry-22 units.

Industry Innovation and Leadership

Unlike other greenhouse gases, HFCs are intentionally manufactured as valuable industrial gases that help provide important societal services and products. These services and products are important contributors to health, safety, comfort, and productivity. As concern for climate change has increased, industry has recognized the need to alter the projected growth scenarios of HFCs while continuing to achieve global ozone layer protection, and maintaining the availability of these services and products.

U.S. industry has been at the forefront of the technology advances over the last several decades and is now investing in the innovation of low-GWP compounds and technologies that will allow us to achieve ozone protection, climate protection and energy efficiency goals. However, much work remains to be done. Technology pathways have not been identified for all of the critical uses. In the September HFC Roundtable announcements, industry leaders highlighted the multi-billion dollar investments to be made over the next decade in order to achieve these goals. U.S. industry leadership and an effective global approach under the Montreal Protocol will be key to this achievement.

Summary

S.2911 is a useful legislative vehicle with regard to HFCs because it highlights the key issues associated with the introduction of low-GWP compounds and technologies, encourages responsible refrigerant management practices, and emphasizes support for the Montreal Protocol as the most effective means of achieving a gradual HFC phasedown between now and 2050. It helps focus the attention of the relevant US Government departments and agencies, educate members of Congress, and advance the market friendly model of the Montreal Protocol.

As with the effort to eliminate ozone depleting substances, U.S. industry has embraced the technology challenge that must be met in order to achieve this environmental objective. Transitions in many of the key user industries are already underway through a combination of voluntary initiatives and policy proposals and adjustments. The history of efforts to protect the ozone layer and now to address the potential climate impacts of ODS substitutes such as HFCs has been one of significant US leadership, both from the government and the private sector. Alliance members have deemed it far more effective to control our destiny and achieve these objectives through measures that allow for achievement of goals over the long-term while minimizing near-term economic disruption.

Legislation such as S. 2911 furthers this effort by stimulating dialogue and education on issues and matters with which we are concerned. The Alliance appreciates the opportunity to testify before you today, we look forward to working with you in the next Congress as these issues continue to be addressed, and we are happy to answer any questions that you may have.



The Alliance
for Responsible Atmospheric Policy

**Alliance To Pursue Long-Term Greenhouse Gas Reduction Goal
Announcement Made During White House Roundtable**

Washington, DC, September 16, 2014 - The Alliance for Responsible Atmospheric Policy today announced support for policies and actions with a goal to reduce global hydrofluorocarbon (HFC) emissions by 80 percent by 2050. "As technology companies, we firmly believe with the right global policies and incentives we can develop and deploy solutions that are both environmentally and economically effective to prevent ozone depletion and global warming emissions," said Robert Wilkins of Danfoss and Alliance Chairman.

The announcement was made during an industry leadership roundtable coinciding with International Day for the Preservation of the Ozone Layer. The event convened representatives from system manufacturers, end users, and fluorocarbon producers in a roundtable briefing of Obama Administration officials. The discussion focused on industry support for a phasedown of HFCs through an amendment to the global Montreal Protocol and technology development and investment commitments from key industry leaders.

In today's announcement, the Alliance stated that it believes a global approach under the Montreal Protocol, the 1987 treaty adopted to address depletion of the Earth's ozone layer, provides the best forum with established institutions to deal with the technical complexities of reducing global emissions of HFCs while maintaining the phase-out of ozone depleting substances such as HCFCs. The Alliance advocated a goal of reducing global HFC emissions by 80 percent by 2050 to be achieved through a Montreal Protocol amendment, highlighted American industry efforts to develop the technologies to realize those reductions and emphasized the need for greater initiatives from the public and private sectors to encourage proper refrigerant management.

HFCs were introduced in order to achieve a rapid phase out of ozone depleting substances and are used widely in air conditioners, refrigerators, foam insulation, technical aerosols, fire protection systems and other critical uses. The demand for these technologies continues to grow due to expansion of developing country economies and the added health, safety, comfort and productivity benefits these technologies provide.

Alliance member companies, which represent more than 95 percent of U.S. HFC production and a significant majority of the manufacturing and other user industries, are committing billions of dollars in research and development and commercialization of new technologies, while also continuing to improve energy efficiency performance. Additionally, the Alliance pledged to work cooperatively with the US EPA and others around the world by sponsoring ongoing technology workshops and initiating efforts to reduce emissions due to leaks and servicing. Earlier this year, the Alliance petitioned the US EPA to expand its regulations governing emissions of ozone depleting substances to also cover HFCs.

"We are technology companies whose products provide comfort, health, food safety and increased productivity. While HFCs have allowed us to eliminate ozone depleting substances, we recognize there is concern if their use were to grow unabated around the globe. We believe an amended Montreal Protocol can most effectively promote the availability of low-GWP replacement compounds and technologies," added Wilkins.

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The Montreal Protocol treaty was first signed on September 16, 1987, and is considered to be one of the most-effective multi-lateral environment treaties ever negotiated. It is the only treaty in the United Nations system to which every country is a signatory. The Protocol's success has been a result of its reliance on sound scientific reviews, ongoing technology assessments and a funding mechanism to assist developing countries. A hallmark of the treaty is the decades-long cooperation among governments, industry and the environment community.

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About the Alliance for Responsible Atmospheric Policy

The Alliance is an industry coalition organized in 1980 to address the issue of stratospheric ozone depletion and the production and use of fluorocarbon compounds. The organization is composed of manufacturers and businesses, including their trade associations that rely on HCFCs and HFCs. According to a recent study, the US fluorocarbon using and producing industries contribute more than \$158 billion annually in goods and services to the US economy, and provide employment to more than 700,000 individuals with an industry-wide payroll of more than \$32 billion. Today, the Alliance coordinates industry participation in the development of reasonable international and government policies at the nexus of ozone protection and climate change.

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The Alliance *for Responsible Atmospheric Policy*

Alliance Actions in Support of Global HFC Emission Reduction Goal

The Alliance for Responsible Atmospheric Policy is an industry coalition representing more than 95 percent US HFC production and a significant majority of the user industries. The Alliance will lead a comprehensive effort to reduce global HFC greenhouse gas emissions by 80% by 2050. This reduction is relative to current emissions, while currently relying on consumption as a surrogate for emissions. The following are key actions that will facilitate this reduction.

Montreal Protocol HFC Amendment Support

The Alliance will support the negotiation of an amendment under the Montreal Protocol to utilize the institutions of the Protocol to manage a global phase down of HFCs on a GWP-weighted basis.

Technology Assessments and Workshops

The Alliance will work with EPA, other interested governments, international agencies, private sector organizations and civil society to organize a series of sector-specific workshops. Participating stakeholders will share information on the technical and policy aspects of the transition from high-GWP HFCs. Starting in summer 2015, the first four workshops will focus on the food cold chain, air-conditioning, foams and then combined, fire suppression, solvents and aerosols. These workshops will help guide and inform the reduction schedule.

Refrigerant Management Promotion

The Alliance will work with industry partners, including air-conditioning industry associations, to launch efforts to promote responsible voluntary management of refrigerants when designing and servicing HFC-using air conditioning and refrigeration equipment. The Alliance will also work with public bodies, including EPA, to promote policies which encourage responsible refrigerant management as well as recovery, reclamation and reuse. These efforts will reduce refrigerant leakage and direct emissions of HFCs as well as containing demand for HFCs for servicing.

Building Codes and Safety Standards

The Alliance will form a Building Codes and Safety Standards Task Force focused on the intersection of building codes and safety standards and next generation refrigerants and blowing agents. This public-private group will engage national standards and model code bodies as well as state and local regulatory bodies on the environmental and economic importance of adopting codes and standards revised for low-GWP refrigerant technologies.

Monitoring and Evaluation

The Alliance will join partners in the US government in participating in effective programs that allow for the monitoring of the results and success of the phasedown efforts on a global basis.

September 2014

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FOR IMMEDIATE RELEASE

Alliance Outlines CCAC Action Plan at UN Climate Summit

New York, NY – September 23, 2014 The Alliance for Responsible Atmospheric Policy, the leading coalition of US companies producing and using hydrofluorocarbons (HFCs), today presented the four-point action plan of the Climate and Clean Air Coalition (CCAC) to reduce global HFC greenhouse gas emissions. The presentation was made as part of the CCAC High Level Assembly meeting as well as at the UN Secretary-General's Climate Summit in New York City. The presentations were made by Kevin Fay, Executive Director of the Alliance for Responsible Atmospheric Policy along with Mike Lamach, Chairman and CEO of Ingersoll Rand, and John Mandyck, Chief Sustainability Officer for United Technologies Building and Industrial Systems, speaking to the formation of the Global Food Cold Chain Council.

The CCAC action plan consists of support for beginning negotiations in 2014 of an amendment to phase down the production and consumption of HFCs under the Montreal Protocol, the promotion of gradual public procurement of climate-friendly low-global warming potential alternatives to HFCs when feasible and support for private-sector organized efforts, including a Global Refrigerant Management Initiative on HFCs in servicing and a Global Food Cold Chain Council to reduce HFC emissions and increase efficiency in the cold food supply chain.

“Collectively, these policy efforts and initiatives have the potential to reduce the equivalent of more than 90 Gigatons of CO₂equivalent by 2050, or more than two years of global greenhouse gas emissions,” said Alliance Executive Director Kevin Fay. “The hallmark of these activities is that they will also continue the tradition of government, NGO, and industry cooperation under the Montreal Protocol that has made that treaty one of the most effective global environment agreements in history.”

A substantial number of CCAC partners and non-partners, including nation-states, intergovernmental organizations, nongovernmental organizations, civil society organizations and private sector entities, have pledged their support for this action plan. The announcement of the four-point plan at the Climate Summit is expected to grow the number of signatories.

The Alliance and other private sector partners participated last week in an HFC Industry Leadership Roundtable at the White House. At that meeting, Alliance member companies and others announced their voluntary commitments to introduce new low- global warming potential (GWP) compounds and technologies to replace the high-GWP compounds and technologies currently in use, and to continue to improve energy efficiency as well. The Alliance pledged to take actions and support policies to reduce global HFC emissions by 80 percent by 2050. The industry leaders advocated for the North American-proposed amendment to the Montreal Protocol as the best means of achieving a global phase-down of HFCs while increasing research and development of the next generation of refrigerants.

About the Alliance for Responsible Atmospheric Policy

The Alliance is an industry coalition organized in 1980 to address the issue of stratospheric ozone depletion and the production and use of fluorocarbon compounds. The organization is composed of manufacturers and businesses, including their trade associations that rely on HCFCs and HFCs. According to a recent study, the US fluorocarbon using and producing industries contribute more than \$158 billion annually in goods and services to the US economy, and provide employment to more than 700,000 individuals with an industry-wide payroll of more than \$32 billion. Today, the Alliance coordinates industry participation in the development of reasonable international and government policies at the nexus of ozone protection and climate change.

About CCAC

The Climate and Clean Air Coalition to Reduce Short-Live Climate Pollutants is a partnership of governments, intergovernmental organizations, representatives of the private sector, the environment community, and other members of civil society. The coalition seeks to supplement global mitigation measures to address the contributions of methane, black carbon and HFCs to climate change.

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FOR IMMEDIATE RELEASE

**Refrigeration Industry Leaders Organize Global Refrigerant Management Initiative
Initiative Marks Milestone Toward Reducing HFC Greenhouse Gas Emissions**

New York, NY – September 23, 2014 Three of the world's leading refrigeration associations - The Alliance for Responsible Atmospheric Policy, the Air-Conditioning, Heating and Refrigeration Institute (AHRI), and the Brazilian Association for HVAC-R (ABRAVA), today announced the formation of the **Global Refrigerant Management Initiative** at the United Nations Secretary-General's Climate Summit.

The leakage of refrigerant during the servicing of equipment is the largest source of hydrofluorocarbon (HFC) emissions around the globe. This Initiative will work to identify opportunities to educate the industry's global supply chain on ways to improve the management of refrigerants and to reduce leaks and service emissions, particularly where current leak rates are the greatest. In addition, the initiative will promote the recycling, recovery, reclaiming and end of life destruction of refrigerants and develop policies to promote proper refrigerant management.

"Leaks from equipment installation and servicing are the largest source of HFC emissions around the globe," said Kevin Fay, Alliance Executive Director. "We have established this initiative because it is incumbent on all sectors of our industry to work with our governments to educate the individuals who install, service, and replace HVAC-R equipment on how to handle these refrigerants responsibly and to create a culture of responsible care."

In addition to these leading organizations, this private-sector organized effort will include participation from refrigerant organizations from Australia, Canada, China, Colombia, the European Union, Japan, Mexico and South Korea - a true global coalition that represents 90 percent of refrigeration and air conditioning equipment sold around the globe. The initiative will also work with CCAC (Climate and Clean Air Coalition) partners to develop and implement broad-based public and private sector collaborative programs to reduce HFC emissions by building awareness, training and implementation guidance for proper management, servicing and refrigerant end-of-life practices.

"Environmental stewardship is a hallmark of our industry," said AHRI President Stephen Yurek. "This initiative furthers our commitment to providing for the health, safety, and comfort of people around the world in the most responsible way possible," he said.

The growth of HFC emissions has been identified as a significant concern. HFCs are compounds introduced to rapidly replace ozone depleting substances being phased out by the Montreal Protocol. Currently, HFCs only comprise about 1 percent of global greenhouse gas emissions.

However, unabated, HFCs are expected to increase to greater than 10 percent of greenhouse gas emissions by 2050. ABRVA International President, Samoel Vieira de Souza said that “There is no question that emissions are a concern of the entire supply chain.”

The Alliance and AHRI participated last week in an HFC Industry Leadership Roundtable at the White House. At that meeting, Alliance member companies and others announced their voluntary commitments to introduce new low- global warming potential (GWP) compounds and technologies to replace the high-GWP compounds and technologies currently in use, and to continue to improve energy efficiency as well. The industry will invest \$5 billion over the next decade to research, develop, and commercialize low-GWP technologies new refrigerants and the equipment in which they will be used. The Alliance pledged to take actions and support policies to reduce global HFC emissions by 80 percent by 2050. The industry leaders advocated for the North American-proposed amendment to the Montreal Protocol as the best means of achieving a global phase-down of HFCs while increasing research and development of the next generation of refrigerants.

About the Alliance for Responsible Atmospheric Policy

The Alliance is an industry coalition organized in 1980 to address the issue of stratospheric ozone depletion and the production and use of fluorocarbon compounds. The organization is composed of manufacturers and businesses, including their trade associations that rely on HCFCs and HFCs. According to a recent study, the US fluorocarbon using and producing industries contribute more than \$158 billion annually in goods and services to the US economy, and provide employment to more than 700,000 individuals with an industry-wide payroll of more than \$32 billion. Today, the Alliance coordinates industry participation in the development of reasonable international and government policies at the nexus of ozone protection and climate change.

About the Air-Conditioning, Heating, and Refrigeration Institute

The Air-Conditioning, Heating, and Refrigeration Institute (AHRI) is the trade association representing manufacturers of air conditioning, heating, commercial refrigeration, and water heating equipment. An internationally recognized advocate for the industry, AHRI develops standards for and certifies the performance of many of these products. AHRI's 312 member companies manufacture quality, efficient, and innovative residential and commercial air conditioning, space heating, water heating, and commercial refrigeration equipment and components for sale in North America and around the world.

About the Brazilian Association for HVAC-R

The Brazilian Association for HVAC-R (ABRAVA), headquartered in Sao Paolo, Brazil and founded in 1962 is a national association of equipment manufacturers, designers, installers and technicians, as well as retailers of parts and components from around the country. Its mission is to ensure technological and competitive development of refrigeration, air conditioning, ventilation and heating sectors of the country, defending their legitimate interests and promoting the responsible use of equipment and refrigerants to reduce global warming, preserve the environment and improve quality of life.

Supporting organizations:

Brazilian Association for HVAC-R (ABRAVA, Brazil); Air-conditioning, Ventilation and Refrigeration Association (ACAIRE, Colombia); Air-conditioning, Heating, and Refrigeration Institute (AHRI, United States); Alliance for Responsible Atmospheric Policy (United States); National Association of Refrigeration Industry Manufacturers (ANFIR, Mexico); Air-conditioning and Refrigeration Equipment Manufacturers Association (AREMA, Australia); China Refrigeration and Air-conditioning Industry Association (CRAA, China); European Partnership for Energy and the Environment (EPEE, European Union); Heating, Refrigeration and Air-conditioning Institute (HRAI, Canada); Japan Refrigeration and Air-conditioning Industry Association (JRAIA, Japan); Korea Refrigeration and Air-conditioning Industry Association (KRAIA, South Korea); Refrigeration and Air-conditioning Manufacturers Association (RAMA, India); and Refrigerants Australia (Australia)

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FOR IMMEDIATE RELEASE

Refrigeration Industry Leaders Organize Global Food Cold Chain Council

Initiative to Reduce Food Spoilage, Increase Efficiency, and Reduce HFC Emissions

New York, NY – September 23, 2014 A coalition of major companies that comprise the supply chain necessary to move cold food products from field to market around the world today announce the organization of the **Global Food Cold Chain Council**. This initiative seeks to reduce greenhouse gas emission in the processing, transportation, storage and retail display of cold food and to stimulate demand for climate-friendly technology. The announcement was made by the Alliance for Responsible Atmospheric Policy, with the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) and other private sector partners at the United Nations Secretary-General's Climate Summit held in New York City.

This private sector initiative will promote efforts that stimulate demand for climate-friendly technologies while reducing refrigerant emissions, and minimizing food spoilage, and enhancing energy efficiency in the food cold chain. The initiative will also work with partners in the CCAC (Climate and Clean Air Coalition) to develop and implement broad-based public and private sector collaborative solutions to reduce hydrofluorocarbon (HFC) emissions in the cold food chain across developed and developing countries. The council will work with individual businesses, associations, governments, and civil society.

“The food cold chain is responsible for nearly one third of global HFC emissions. The GFCCC is part of the Alliance's comprehensive approach to achieving the global reduction of high-GWP HFCs,” said Alliance Executive Director Kevin Fay.

The growth of HFC emissions has been identified as a significant concern. HFCs are compounds that were introduced to replace ozone depleting substances being phased out by the Montreal Protocol. Currently HFCs only comprise about 1 percent of global greenhouse gas emissions. However, unabated, HFCs are expected to increase to greater than 10 percent of greenhouse gas emissions by 2050.

A more climate-friendly cold chain will not only reduce its own carbon footprint, it will extend food supplies to feed more people and reduce the estimated 3.3 billion metric tons of CO₂-equivalent in food waste every year. If it were a country, food waste would be the third largest emitter of greenhouse gases.

The Alliance and AHRI participated last week in an HFC Industry Leadership Roundtable at the White House. At that meeting, Alliance member companies and others announced their voluntary commitments to introduce new low- global warming potential (GWP) compounds and technologies to replace the high-GWP compounds and technologies currently in use, and to continue to improve energy efficiency as well. The industry will invest \$5 billion over the next decade to research, develop, and commercialize low-GWP technologies new refrigerants and the equipment in which they will be used. The Alliance pledged to take actions and support policies

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Senator WHITEHOUSE. Thank you, Mr. Fay. I appreciate your testimony.

Before we turn to Dr. Shindell, would it be possible to get a list of the membership of the Alliance for Responsible Atmospheric Policy? You have some pretty strong participants, and I think it would help if there was a record of that.

Mr. FAY. Surely.

Senator WHITEHOUSE. Thank you.

Dr. Shindell, if you please.

STATEMENT OF DREW SHINDELL, PH.D., PROFESSOR OF CLIMATE SCIENCES, NICHOLAS SCHOOL OF THE ENVIRONMENT, DUKE UNIVERSITY

Mr. SHINDELL. Thank you for the opportunity to testify.

We have heard that the World Health Organization has recently estimated that seven million die every year from poor air quality, making it the leading environmental cause of premature death worldwide. In many parts of the world, it is the single leading cause for women and children. It is a silent killer, but it is out there. In the United States it is responsible for over 100,000 deaths per year.

Of all the sources of the emissions that lead to poor air quality in the United States, coal burning is the single largest, causing, by my calculations, about 47,000 premature deaths per year. That happens to be larger than the total number of Americans killed in all the years of the Vietnam War by hostile fire. So we hear a lot up here on Capitol Hill about things like the war on coal; what we forget is coal's war on us. There is a heavy toll, not just from coal and not just in terms of death from air quality. One hundred eighty thousand non-fatal heart attacks per year, 150,000 cases of hospitalization for respiratory and cardiovascular disease, all of these health care costs are passed on to the American people.

And it is not just the American people, it is American business, 18 million lost work days every year due to poor air quality, 11 million missed school days for our children. Air quality is a pressing issue at the same time that climate change's toll continues to mount.

The good news here is that there are solutions in many cases, especially when it comes to the short-lived climate pollutants that are the heart of this bill. In the study for the U.N. environment program that I led, we found that aggressive action to reduce methane and soot, along with the related emissions that come out with soot, would, as we have heard this morning, reduce climate change over the next, by mid-century or so, by about half a degree. The climate has already warmed by nearly a degree, and most of the nations of the world have pledged to reduce, to keep the warming to about 2 degrees. So although half a degree may not sound like much, it is really a big deal.

At the same time, the other benefits of targeting these pollutants have enormous consequences. Over the next 25 years, they would save about a billion tons of agricultural yield. In the United States alone, more than a hundred million tons of crop losses due to ozone pollution could be saved by phasing in strong reductions in methane and soot and its related emissions. Over a quarter million

American lives could be saved by phasing in these same aggressive measures to reduce emissions of these pollutants.

I am gratified to see that the bill that has been proposed and that we are discussing here today looks at many of the exact same measures that were included in the study that I have just quoted from, specifically targeting methane emissions from the oil and gas industry, from coal mining and from municipal waste, and targeting emissions of soot and related compounds from diesel engines, from cook stoves and from small industries.

It is also particularly important to look at emissions in the Arctic, a particularly sensitive region of the planet to warming, and a place where particles can have an extra powerful effect on leading to a warming planet.

Some areas in particular, as Senator Boxer mentioned this morning, have solutions where the finance and the industrial, or the economic motivation is especially strong. In particular, for the oil and gas sector, what is being proposed in many cases is simply the best practices that are already put into place by much of American industry being extended to the rest of the industry that is not yet using those and around the world. So sharing our technology, our industries' practices that already have been shown to work, taking those and spreading those around for the common benefit.

At the same time, use of low-sulfur fuels allows greater control of particulate emissions. A recent study that we completed on the use of kerosene for lighting in the developing world shows that in many countries, for example in India, kerosene is heavily subsidized by the government. The financing required to adopt an alternative is already there and simply needs to be redirected. U.S. leadership can help make that come to pass.

I would just like to close by pointing out that we pay a great deal of attention to problems and catastrophes when they are local and when they occur suddenly. An example, the faulty ignition switches in the General Motors cars. These killed approximately 20 people, the precise number is still a bit debated, over the last decade or so. At the same time, the cars manufactured by GM produced air pollution that killed about 40,000 Americans. We don't pay attention to that nearly enough, so I am grateful to see a bill that targets this pollution that is leading to climate change, air quality, agricultural loss.

I thank you for your efforts.

[The prepared statement of Mr. Shindell follows:]

Societal Benefits from Reductions in Emissions of Methane and Black Carbon

Drew Shindell

Written Testimony to the Senate Committee on the Environment and Public Works
Hearing on the "Super Pollutants Act of 2014"

Dec. 2, 2014

Society faces multiple problems arising from the emission of pollution into our atmosphere, including wide ranging impacts on both public health and climate change. Swift and large reductions in carbon dioxide emissions are vital if we are to avoid the worst consequences of climate change in the longer-term, for example from 50 to 100 years from now. At the same time, we are already experiencing effects of climate change that go well beyond global warming, such as shifts in rainfall patterns, rising sea levels, and more intense storms and heatwaves. Hence in parallel, reductions in emissions of other pollutants, including methane and black carbon (also referred to as soot) merit immediate, forceful action as these improve air quality while simultaneously slowing the rate of climate change over the next several decades.

Air pollution is literally killing people. It is the leading environmental cause of premature death, leading to ~7 million premature deaths per year (outdoor and indoor) globally ¹. Air pollution in the US causes about 135,000 premature deaths, 180,000 non-fatal heart attacks, 150,000 cases of hospitalization for respiratory and cardiovascular disease, ~130,000 emergency room visits for asthma, 18 million lost work days and 11 million missed school days ². Many of the compounds contributing to air pollution also drive climate change ³.

Multiple, peer-reviewed scientific studies have shown that aggressive reductions of those air pollutants that cause warming, in particular methane and black carbon, can reduce the rate of warming over the next several decades by approximately half ⁴⁻⁶. A strategy to quickly and dramatically reduce these pollutants hence complements efforts to reduce carbon dioxide, as carbon dioxide reductions have little effect over the next few decades due to how long this gas stays in the atmosphere, which can be hundreds to thousands of years, and the time it will take to change human systems so that they generate less carbon dioxide. Slowing near-term climate change would benefit those already suffering from the impacts of climate changes. It would also improve the chances for both biological and human systems to adapt to the pace of change. Benefits of black carbon reductions are especially large in and near snow and ice covered regions such as the Arctic or the Himalayas.

At the same time, in comparison with projected emissions based on current legislation worldwide, an analysis of one approach to implementing these reductions showed that the improved air quality under such a strategy could save ~45 million lives and increase crop yields by about 1 billion metric tons due to

ozone reductions ^{4,7,8}. China, India and the United States are projected to see the largest gains in crop yields due to the cleaner air, with over 100 million tons of increased yield in the US. The economic value of the benefits of methane emissions reductions is well above the typical costs of emissions controls, which are less than \$250, and sometimes emissions reductions can even be made at a cost savings ⁹. Though hydrofluorocarbons (HFCs) do not directly cause poor air quality, curtailing the rapid growth in emissions of these compounds can provide substantial benefit in terms of reducing near-term climate change ⁶.

Thus efforts to control emissions of methane, black carbon (and co-emissions) and HFCs can provide multiple, large benefits to society. Since neither the damages attributable to climate change nor those due to degraded air quality are incorporated in our current economic markets, emissions reductions are a textbook example of a societal good that could benefit from government intervention. In part this is because the damages due to air pollution are not paid by the emitter, so that there is no economic incentive for emissions reductions, even in cases when emissions controls would be less expensive than the damages they would prevent. The damages are instead paid by those who bear increased health care costs and food prices. The emissions reduction measures described in prior work ⁴ along with use of low-global warming substitutes instead of HFCs can greatly reduce the damages from climate change over the next few decades while saving tens of millions of lives and hundreds of millions of tons of crops in comparison with business as usual, all at relatively modest cost.

In particular, reducing methane emissions from the oil and gas industry, coal mines and municipal waste and black carbon-related emissions from diesel vehicles, cookstoves, kerosene lighting and small industries such as brick kilns and coke ovens have been identified as actions that would provide great societal benefits ^{4,5,9-11}. In addition, the Arctic is extremely sensitive to the warming climate, and emissions of black carbon and other particles (or particle precursors) can have an especially large impact there ^{12,13}. Hence the specific actions in the Super Pollutants Act of 2014 to target many of these activities, to reduce emissions from polar shipping and to encourage use of low-global warming HFC substitutes are, based on the scientific evidence, likely to lead to substantial societal benefits on multiple fronts. The bill's efforts to promote financing would also address an important barrier to implementation ^{5,9}.

Emission reduction efforts targeting these pollutants are currently being pursued by many nations, intergovernmental and non-governmental organizations, especially via the Climate and Clean Air Coalition. Additional US leadership in this area could help inspire others to step up their activities to put into place these urgently needed emissions reduction measures, all of which are developed and in use but need to be much more widely applied to reap the full potential societal benefits. International success in reducing emissions of methane, black carbon (and co-emissions) and HFCs would provide clear benefits to the public. Success could demonstrate that emissions can indeed be successfully reduced through concerted action across

government, industry and civil society for the sake of protecting the climate (at least in part). Success would also highlight how consideration of the full environmental consequences of emissions, including both climate change and air pollution, can guide development and implementation of optimal solutions to both problems.

References:

- 1 Lim, S., Vos, T. & Flaxman, A. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010 (vol 380, pg 2224, 2012). *Lancet* **381**, 1276-1276 (2013).
- 2 Fann, N. *et al.* Estimating the National Public Health Burden Associated with Exposure to Ambient PM_{2.5} and Ozone. *Risk Analysis* **32**, 81-95, doi:10.1111/j.1539-6924.2011.01630.x (2012).
- 3 Myhre, G. *et al.* in *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (eds T. F. Stocker *et al.*) (Cambridge University Press, 2013).
- 4 Shindell, D. *et al.* Simultaneously Mitigating Near-Term Climate Change and Improving Human Health and Food Security. *Science* **335**, 183-189 (2012).
- 5 United Nations Environment Programme and World Meteorological Organization. Integrated Assessment of Black Carbon and Tropospheric Ozone. (Nairobi, 2011).
- 6 Xu, Y., Zaelke, D., Velders, G. & Ramanathan, V. The role of HFCs in mitigating 21st century climate change. *Atmospheric Chemistry and Physics* **13**, 6083-6089, doi:10.5194/acp-13-6083-2013 (2013).
- 7 Anenberg, S. C. *et al.* Global Air Quality and Health Co-benefits of Mitigating Near-Term Climate Change through Methane and Black Carbon Emission Controls. *Environmental Health Perspectives* **120**, 831-839, doi:10.1289/ehp.1104301 (2012).
- 8 Schmale, J., Shindell, D., von Schneidmesser, E., Chabay, I. & Lawrence, M. Clean Up Our Skies. *Nature* **515**, 335-337 (2014).
- 9 UNEP. Near-term Climate Protection and Clean Air Benefits: Actions for Controlling Short-Lived Climate Forcers. 78 (United Nations Environment Programme (UNEP), Nairobi, Kenya, 2011).
- 10 Bond, T. C. *et al.* Bounding the role of black carbon in the climate system: A scientific assessment. *Journal of Geophysical Research-Atmospheres* **118**, 5380-5552, doi:10.1002/jgrd.50171 (2013).
- 11 Scientific Advisory Panel. Kerosene Lamps and SLCPs. 15p, (Climate and Clean Air Coalition, 2014).
- 12 Quinn, P. K. *et al.* Short-lived pollutants in the Arctic: their climate impact and possible mitigation strategies. *Atmos. Chem. Phys.* **8**, 1723-1735 (2008).
- 13 Quinn, P. K. *et al.* AMAP, 2011. The Impact of Black Carbon on Arctic Climate. 72 pp (Arctic Monitoring and Assessment Programme (AMAP), Oslo, 2011).

COMMENT

CLIMATE Cloud modelling needs collaborative global computing power **p.338**

GEOLOGY A history of how we got to grips with Earth's great age **p.340**

GENETICS A biography of p53, the tumour-suppressor gene **p.341**

EVOLUTION Updates to theory must encompass microbes, viruses and energy **p.343**



A woman in Jharkhand, India, burns raw coal into charcoal, which emits toxic gases that harm her health and affect the climate.

Clean up our skies

Improve air quality and mitigate climate-change simultaneously, urge **Julia Schmale** and colleagues.

In December, the world's attention will fall on climate-change negotiations at the 20th United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties in Lima, Peru. The emphasis will be on reducing emissions of long-term atmospheric drivers such as carbon dioxide, the effects of which will be felt for centuries. At the same time, the mitigation of short-lived climate-forcing pollutants (SLCPs) such as methane, black carbon and ozone — which are active for days or decades — must be addressed (see 'Compounds of concern').

SLCPs cause poor air quality and are responsible for respiratory and cardiovascular diseases. Particulate matter in the atmosphere is the leading environmental cause of ill health, and air pollution is causing about 7 million premature deaths annually¹. Interactions between warming, air pollution and the urban heat-island effect (which causes cities to be markedly warmer than their surrounding rural areas) will raise health burdens for cities worldwide by mid-century². Air pollution also damages ecosystems and agriculture.

Current air-quality legislation falls short.

Existing measures would prevent just 2 million premature deaths by 2040. We estimate that around 40 million more such deaths would be avoided if concentrations of methane, black carbon and other air pollutants were halved worldwide by 2030 (see 'Clean air').

This is not an 'either-or' decision: coordinated action on both climate change and air pollution is necessary. And it is tractable: for example, electric-car sharing or shifting from fossil fuels to renewable power generation would reduce consumption and overall emissions and lead to behavioural

COMMENT

► shifts that are beneficial in both the near and long term³.

But defining joint CO₂ and SLCP reduction goals is difficult. Researchers need to spell out the benefits and trade-offs of separate and joint air-pollution and climate-change mitigation in terms of public health, ecosystem protection, climate change and costs. A suite of mitigation policies must be designed and applied on all scales — from cities to the global arena.

DOUBLE JEOPARDY

Studies^{4,5} estimate that rigorous reductions of global methane and black-carbon-related emissions by 2030 could prevent around 2.4 million premature deaths per year that result from air pollution, and save 50 million tonnes of crops through avoided ozone damage (methane is a precursor for ozone production). Global mean temperature rise would be slowed by about 0.5 °C by mid-century. The rate of sea-level rise would be reduced by 20% in the first half of this century by such measures alone, and by 50% in the second half if CO₂ and SLCP mitigation are combined⁶.

Lower air pollution also has societal benefits. Methane captured from landfills or manure can be used to run residential stoves, for example. In developing countries, replacing conventional cooking stoves with clean-burning technologies allows people — women and children, in particular — to invest time in education or financially rewarding work, rather than spending time collecting wood or other materials for basic family needs⁷.

All SLCPs must be reduced in concert. Sulphate aerosols cool the climate, as happens following volcanic eruptions. But delaying sulphur dioxide mitigation as a way to temporarily mask global warming is problematic. Greater stresses on people's health and the environment already result from

today's enhanced particulate concentrations and acidified rain. Coordinated action to mitigate SLCPs and CO₂ is hampered by fragmented policies. For example, energy ministries tend to focus on CO₂ reductions and environment ministries manage air quality.”

Anthropogenic emissions of methane are predicted to increase by about 25% (more than 70 million tonnes annually) by 2030⁸, yet the gas is hardly regulated. Methane is covered by the Kyoto Protocol, but most countries' controls focus on CO₂. In the European Union (EU), for example, methane is not covered by the national emissions ceiling directive, the directive on ambient air quality or the EU Emissions Trading System. The EU's industrial emissions directive omits major sources of the gas, such as cattle farming. Air-quality policies in the EU and

the United States have been partially successful in reducing periods of extreme ozone concentration. But average regional concentrations have not declined in the past two decades across Europe, and there is still no legally binding limit, only a target. Trends in the United States are mixed and vary seasonally; in east Asia, surface ozone is increasing.

For black carbon, there are almost no regulatory obligations to report emissions or measure ambient concentrations. Few regional and local assessments have been made. Little change in global black carbon emissions is predicted by 2030, because reductions in North America, Europe and northeast and southeast Asia and the Pacific will be offset by increases in south, west and central Asia and in Africa¹.

Unlinked and narrow air pollution and climate-policy interventions can have mixed results on both fronts. In the EU, for example, legislated vehicle-emissions limits have reduced particulate concentrations by 45% between 1995 and 2008 and are projected to reduce black carbon by more than 90% by 2025 compared with 2000. Yet CO₂ emissions from the ever-growing transport sector are rising. And air quality is not under control. Unregulated residential emissions from biomass heating are rising, and will account for 80% of black-carbon emissions in Europe in 2025.

Also problematic are lax targets. For example, the annual EU limit for particulate matter smaller than 2.5 micrometres (PM_{2.5}) that will be binding by 2015 is

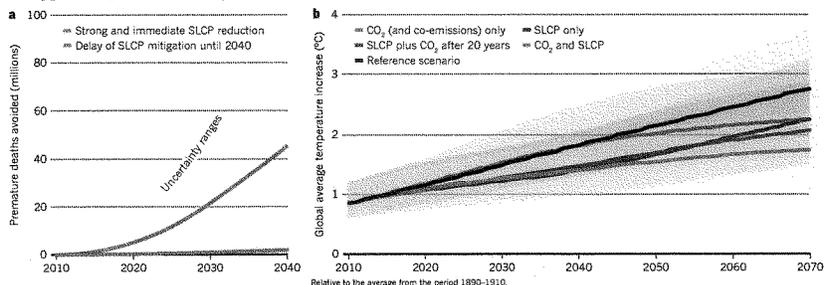
COMPOUNDS OF CONCERN

Common air pollutants and industrial chemicals have major influences on the climate, human health and agriculture even though they persist for only a short time in the atmosphere.

SUBSTANCE	MAIN EMISSION SOURCES	CHARACTERISTICS
 Methane	Oil and gas production Livestock farming Landfills and waste-water treatment Rice cultivation	Lifetime: 10 years Health: Precursor of ozone production, hampers plant metabolism Climate: Second most important climate forcer after CO ₂
 Lower-atmospheric ozone	Traffic and transport Residential heating and cooking Agricultural and forest fires Brick production Oil and gas production	Lifetime: One month Health: Causes respiratory diseases, hampers plant metabolism Climate: Greenhouse gas — formed photochemically through reactions involving methane, nitrogen oxide, carbon monoxide and volatile organic compounds
 Black carbon	Traffic and transport Residential heating and cooking Agricultural and forest fires Brick production Oil and gas production	Lifetime: Days Health: Causes respiratory diseases, carcinogenic Climate: Warms lower atmosphere, changes precipitation, melts snow and ice it is deposited on
 Sulphur dioxide and nitrogen oxides	Traffic and transport Residential heating and cooking Agricultural and forest fires Brick production Oil and gas production	Lifetime: Days Health: Components of particulates, ozone precursors, cause acidification and eutrophication of ecosystems, cause respiratory and cardiovascular illnesses Climate: Contribute to negative radiative forcing, mask global warming
 Hydrofluorocarbons	Air conditioning Refrigeration Foam-blowing Fire suppression Solvents	Lifetime: Months to decades Climate: Strong greenhouse gases

CLEAN AIR

More than 40 million deaths from respiratory and cardiovascular diseases could be prevented by 2030 by halving the concentration of short-lived climate-forcing pollutants (SLCPs) in the atmosphere immediately (a). Joint approaches to mitigating SLCPs and carbon dioxide are more effective than separate measures in limiting global average temperature rise* (b).



2.5 times higher than that recommended by the World Health Organization (WHO). And the current PM_{10} (particulates smaller than 10 micrometres) limit is twice that recommended by the WHO. If the EU meets its limit on PM_{10} , no further action to meet the legal requirements will be needed, because the $PM_{2.5}$ value will also be met.

Some coordinated efforts to reduce air pollution and slow climate change have begun. The Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants (CCAC), formed in 2012, now includes 42 nations, the European Commission and more than 50 organizations. It focuses on mitigating methane and black-carbon emissions for transport, brick, oil and natural-gas production, household cooking and heating. Since 2009, the Arctic Council runs task forces to reduce black-carbon and methane emissions to slow climate change in the region, and has produced two reports in addition to a scientific assessment of black carbon in the Arctic. But so far, only Norway has developed a national action plan to reduce SLCPs.

None of these efforts addresses structural and behavioural changes. Coordinated action to reduce SLCPs and CO_2 simultaneously is not an objective, because it is assumed that parallel reductions will happen under different policy umbrellas.

DOUBLE DUTY

Effective mitigation of SLCPs will require detailed assessments of the multiple impacts of emitted air pollutants together with CO_2 , their sources, their atmospheric interactions and their potential for mitigation⁸.

Combined efforts at the city and state level will be particularly important because this is where most people are exposed to air pollution, and 75% of global CO_2 emissions

is generated in cities. Positions and task forces should be created to promote joint emissions-reduction strategies across municipal and regional departments. For example, climate policies that encourage combined heat and power plants with low power capacities for cities — thus potentially exempting them from air-quality regulations⁹ — should be avoided.

Scaling up and coordinating local efforts and national strategies are necessary. For example, local efforts in the Arctic can be only partly effective because the region is subject to imported pollution from the residential and transport sectors of countries at lower latitudes.

Global organizations such as the CCAC, the World Meteorological Organization and the WHO could assume coordinating roles. Arctic Council member states should take a leadership role in national actions to reduce black carbon and methane at their next ministerial meeting in 2015. The European Commission should propose ambitious emissions limits for methane to the national emissions ceiling directive.

It is important that steps to limit SLCPs do not distract from CO_2 mitigation, and vice versa. We calculate, building on work⁷ by D.S. and colleagues, that a delay of 20 years in reducing CO_2 emissions would result in 0.4°C more warming by the end of the century than if measures were put in place immediately, with the result that the 2°C temperature mark would be crossed in the mid-2060s rather than just after 2100 (see ‘Clean air’).

The 2015 Conference of the Parties meeting in Paris needs to pursue its primary mission to reduce CO_2 for the climate’s sake. That said, the scientific community must speak out against recommendations — explicit or implicit¹⁰ — to exclude SLCPs from discussions of climate-change mitigation or to delay their reduction. Tens of millions of lives are at stake, along with damage to agriculture, ecosystems and cultural heritage. ■

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1. Lim, S. et al. *Lancet* **380**, 2224–2260 (2012).
2. Harlan, S. L. & Rucicelli, D. M. *Curr. Opin. Environ. Sustain.* **3**, 126–134 (2011).
3. Williams, M. *Carbon Mgmt* **3**, 511–519 (2012).
4. United Nations Environmental Programme and World Meteorological Organization *Integrated Assessment of Black Carbon and Tropospheric Ozone* (UNEP, WMO, 2011).
5. Shindell, D. et al. *Science* **335**, 183–189 (2012).
6. Hu, A., Xu, Y., Tebakdi, C., Washington, W. M. & Ramanathan, V. *Nature Clim. Change* **3**, 730–734 (2013).
7. US Environmental Protection Agency *Reducing Black Carbon Emissions in South Asia: Low Cost Opportunities* (2012).
8. Schmale, J., van Aardenne, J. & von Schneidmesser, E. *Atmos. Environ.* **90**, 146–148 (2014).
9. Pierrehumbert, R. T. *Annu. Rev. Earth Planet. Sci.* **42**, 341–379 (2014).
10. Bowerman, N. H. A. et al. *Nature Clim. Change* **3**, 1021–1024 (2013).

**Follow-Up Questions and Answers:
US Senate Committee on the Environment and Public Works**

Drew Shindell (Professor, Duke University)
Following the Dec 2., 2014 Hearing on the "Super Pollutants Act of 2014"

Questions from Senator Barbara Boxer (in italics)

1. Your testimony discussed the significant health benefits that can be gained by reducing short-lived climate pollutants such as black carbon and methane. Could you please explain how reducing the emissions of these short-lived climate pollutants will provide benefits to our most vulnerable populations, including children and our poorest communities?

Reductions in short-lived climate pollutants (SLCPs) provide multiple benefits that take place over differing temporal and spatial scales. They can be categorized as direct benefits to human health via improved air quality, benefits to agricultural yields via improved air quality, reduced climate damages, and broader societal benefits that are related to the changes in fuel use associated with many emissions control measures.

The public health burden of poor air quality is tremendous, with outdoor air pollution responsible for more than 3 million premature deaths per year worldwide according to the World Health Organization. As noted in my written testimony, air pollution in the US annually causes about 135,000 premature deaths, 180,000 non-fatal heart attacks, 150,000 cases of hospitalization for respiratory and cardiovascular disease, ~130,000 emergency room visits for asthma, 18 million lost work days and 11 million missed school days. Exposure to air pollution is typically greatest for those living in urban areas, but even within urban settings exposures are by no means uniform. Studies have shown that increased exposure to some types of pollution, such as diesel exhaust, is correlated with lower socio-economic status. As populations at lower socio-economic levels also generally have poorer baseline health, they are also more susceptible to the adverse effects of air pollution. In the US, reductions in soot emissions from diesel engines (and co-emitted pollutants) thus would yield large benefits for the health of children and the poor.

In many developing countries, one of the largest sources of pollutant emissions is residential burning of solid biomass fuels for cooking and heating. Solid biomass fuels are relied upon by the world's poorest few billion people, and those people suffer from both the resulting indoor and outdoor air pollution. Indoor air pollution is also deadly, with estimates from the World Health Organization again of more than 3 million premature deaths per year worldwide, with the largest culprit being cookstoves. As women and children are the ones who are exposed most heavily to cookstove smoke, they are profoundly affected. Whereas poor outdoor air quality is the leading environmental cause of premature death worldwide, poor indoor air quality is the single leading cause - of any type, not just environmental - of premature death among women and children in many developing countries. Hence reductions in emissions from diesel and gasoline engines, both in motor vehicles and in stationary generators, would have great health benefits in developed nations such as the US, while reductions in emissions from cookstoves, heatstoves, small industries such as brick kilns and coke ovens, and open waste burning would have great benefits in developing nations, with both delivering especially large benefits to the poorest and most vulnerable parts of society and to children. Reduction of solid biomass fuel used in cookstoves would have especially large benefits for women and children in developing nations.

The agricultural benefits that would be realized from improved air quality occur in response to decreases in surface ozone levels owing to both reductions of methane emissions and to reductions

in soot-related emissions (largely owing the carbon monoxide that is typically co-emitted with soot). The agricultural benefits arising from reduced methane emissions would be felt globally, whereas the benefits from reduced soot-related emissions would be greatest in and near the regions where those reductions were put in place. In either case, increases in agricultural yields would benefit those relying on agriculture directly for their income or food supply. Benefits would also be felt broadly as food prices would be lower with increased yields. As the poor spend a larger portion of their income on food than the wealthy, they would experience a greater benefit from decreased food prices.

The reduced near-term climate change that would result from decreased SLCP emissions would also deliver benefits on multiple scales. As with agriculture, the climate benefits arising from reduced methane emissions would be felt globally, whereas the benefits from reduced soot-related emissions would be greatest in and near the regions where those reductions were put in place. As the poorest within societies generally have the least capacity to adapt to the impacts of climate change, reducing the magnitude of the ongoing changes over the coming decades would provide greatest benefit to the poor. Similarly, some of the impacts of climate change, such as increases in the frequency and intensity of heatwaves, have the greatest adverse impact on the most vulnerable within societies (i.e. children, the elderly, and those in poor health).

Finally, reducing emissions of SLCPs via many of the emissions control strategies that have been suggested, for example by the United Nations Environment Programme or the Climate and Clean Air Coalition, brings additional human development benefits. Switching residential cooking away from solid biomass fuels reduces the need for wood collection in developing nations. Women and children are typically responsible for fuel gathering, so reducing the time spent on this activity can allow time for women to engage in productive jobs and for children to be educated. It also reduces the exposure of these groups to violence, especially sexual violence against women during fuel gathering. In addition, it reduces deforestation, helping to reduce long-term climate change and prevent biodiversity loss. Increased capture and use of methane from fossil fuel extraction, storage and transport as well as from improved manure and landfill management lead to increased energy security and can help keep fuel prices down. As with food security, energy security has a relatively larger impact on the poor as they spend a larger portion of their income on energy than the wealthy.

Hence overall, reductions in SLCP emissions can deliver multiple, substantial benefits to society, with especially pronounced gains for the poorest and most vulnerable and for children.

2. The recent National Climate Assessment found:

"Factors that affect ozone formation include heat, concentrations of precursor chemicals, and methane emissions, while particulate matter concentrations are affected by wildfire emissions and air stagnation episodes, among other factors. By increasing these different factors, climate change is projected to lead to increased concentrations of ozone and particulate matter in some regions."

Do you agree with this peer reviewed, scientific finding?

Yes. The National Climate Assessment involved a large number of experts in this area who examined all the scientific evidence for the effects of climate change on air pollution. Such processes produce very robust conclusions, although as consensus among the authors is required they tend to be fairly conservative. Consistent with that, this statement is rather mild, as it states only that there will be 'increased concentrations...in some regions'. There is in fact ample evidence that the increases may be large enough to have significant health impacts. Note that the IPCC Fifth Assessment Report reports a similar finding, concluding that "locally higher surface temperatures in polluted regions will trigger regional feedbacks in chemistry and local emissions that will increase peak levels of ozone and PM2.5".

3. You have served on several significant peer-reviewed assessments concerning the impacts of short-lived climate pollutants and the policy options for reducing the emissions of HFCs, black carbon, and methane. Have these peer-reviewed assessments concerning short-lived climate pollutants found that there are cost-effective technologies readily available now to reduce these emissions significantly and to slow the pace of climate change?

Yes, in particular Assessments produced under the auspices of the United Nations Environment Programme (listed below) examined both the climate response to SLCP emission reductions and their implementation cost. The Assessments examined only the application of existing technologies or practices that are already in use and could be scaled up and expanded to the rest of the world. They found that, for example, full application of those existing technologies could reduce the rate of global warming until 2050 by about half. Additional studies have demonstrated that keeping HFC emissions low would add substantially (by about 20%) to the climate benefits attributable to controls on methane and soot-related emissions studied in the UNEP Assessments. Hence these studies, along with associated peer-reviewed scientific literature, concluded that current technology can indeed reduce SLCP emissions enough to dramatically alter our near-term climate trajectory.

Studying the cost of the emissions control measures, UNEP found that many of them have negative costs overall, meaning they offer a net cost savings. This is particularly the case for the methane control measures, as the additional methane can be used as fuel (methane is the primary component of natural gas). This is also the case for many of the soot-related measures, particularly those associated with increased industrial efficiency. Barriers to implementation do exist, however, such as the upfront capital costs for methane capture equipment that would need to be installed at a landfill, manure pond, coal mine, or gas or oil well. Other measures, such as banning of agricultural waste burning, require education and enforcement rather than emissions control equipment. Retrofitting vehicles with diesel particulate filters was comparatively expensive, and so may not be affordable in all cases, as are programs to purchase and scrap high emitting older vehicles, although these can provide large benefits. Increasing emissions standards on diesel engines in situations where they are lax (sometimes requiring deployment of low-sulfur fuels if not already available) is a relatively affordable option in that sector, however, so that cost-effective alternatives are available in all identified sectors. Hence the bulk of the emissions controls could be put in place with very moderate expense or even at a cost savings, with most of the rest at quite modest costs. It is also important to stress that these analyses include only the market costs associated with these control measures. Accounting for the avoided environmental impacts (referred to as 'externalities' as they are not included in current economic markets), the benefits from all the examined measures would very likely exceed their costs.

United Nations Environment Programme and World Meteorological Organization. Integrated Assessment of Black Carbon and Tropospheric Ozone. (Nairobi, Kenya, 2011).

UNEP. Near-Term Climate Protection and Clean Air Benefits: Actions for Controlling Short-Lived Climate Forcers. (Nairobi, Kenya, 2011).

4. You served as a lead author on the Intergovernmental Panel on Climate Change's (IPCC) recent Fifth Assessment Report. Can you briefly summarize the Report's key findings concerning the dangerous and significant impacts from climate change that we are already experiencing? What will the impacts be if we do not take additional steps to reduce carbon pollution and the emissions of short-lived climate pollutants?

The IPCC's Fifth Assessment Report found that many of the climate changes scientists have been warning about are now well underway. The atmosphere and ocean have both warmed, the amounts of snow and ice have diminished, and the sea level has risen. Focusing on the atmosphere and meteorology, each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850. In the Northern Hemisphere, 1983–2012 was likely the warmest 30-year period of the last 1400 years. Precipitation has increased since 1951 over the mid-latitude land areas of the Northern Hemisphere. Extremes have also changed. It is very likely that the number of cold days and nights has decreased and the number of warm days and nights has increased on the global scale. It is also likely that the frequency of heat waves has increased in large parts of Europe, Asia and Australia. There are likely more land regions where the number of heavy precipitation events has increased than where it has decreased. And finally, the frequency or intensity of heavy precipitation events has likely increased in North America and Europe, leading to worsening flooding.

Turning to the cryosphere, Earth's snow and ice covered regions, observations show that over the last two decades, the Greenland and Antarctic ice sheets have been losing mass, glaciers have continued to shrink almost worldwide, and Arctic sea ice and Northern Hemisphere spring snow cover have continued to decrease in extent. Some of these changes have been very rapid. For example, the average rate of ice loss from the Greenland ice sheet increased roughly 6-fold from the period 1992 to 2001 to the period 2002 to 2011. Over 1901 to 2010, global mean sea level rose by 0.19 [0.17 to 0.21 range] m. It is very likely that the mean rate of global averaged sea level rise was 1.7 [1.5 to 1.9] mm yr⁻¹ between 1901 and 2010, 2.0 [1.7 to 2.3] mm yr⁻¹ between 1971 and 2010, and 3.2 [2.8 to 3.6] mm yr⁻¹ between 1993 and 2010, suggesting rates have been well above the long-term mean during recent decades.

If we do not take additional steps to reduce emissions of carbon dioxide and SLCPs, our planet's climate will change profoundly. Among the consequences are that heat waves will occur more often and last longer. In many mid-latitude and subtropical dry regions, mean precipitation will likely decrease, while in many mid-latitude wet regions, mean precipitation will likely increase by the end of this century. This implied further increases in water scarcity in the American West. Extreme precipitation events over most of the mid-latitude land masses and over wet tropical regions will very likely become more intense and more frequent by the end of this century, as global mean surface temperature increases. This suggests increased flooding is likely in the eastern US. Sea level is projected to rise by the year 2100 is by 0.52 to 0.98 m (1.7 to 3.2 ft). These and other changes associated with global warming will cause large losses to biodiversity, to coastal communities, to food security, and to other human and natural systems. Most analyses indicate that the overall costs to society will be a substantial reduction in GDP, with costs that are larger than the cost of climate change mitigation (even accounting for the fact that the damages are payable later in time). Given the clear impending damages if we do not change our course and the availability of cost-effective alternatives, only a myopic focus on near-term financial gain within specific current sectors such as the fossil fuel industry could rationalize delaying actions to lower emissions of carbon dioxide and SLCPs. In contrast, a prudent evaluation of risk, similar to the one people engage in when deciding whether or not to buy fire insurance for their home to reduce their exposure to future damages, indicates that actions to reduce carbon dioxide and SLCPs should be undertaken immediately.

Senator WHITEHOUSE. Thank you, Dr. Shindell.
Our next witness is Dr. Peiser. Please proceed, sir.

**STATEMENT OF BENNY PEISER, DIRECTOR, THE GLOBAL
WARMING POLICY FOUNDATION**

Mr. PEISER. Thank you. First of all, I would like to thank the Chairman and committee for the opportunity to testify before your committee on, and I make that absolutely clear, on unilateral policies to tackle climate change, in particular greenhouse gases. So I am not going to talk today about real air pollution, but about the challenge to come to a global policy which is the only policy that would actually tackle greenhouse gases.

My name is Benny Peiser. I am the Director of the Global Warming Policy Foundation, a non-partisan think tank based in London. And as the name suggests, our main concern are the policies adopted by governments. That is what I would like to draw your attention to, particularly the experience we are having in Europe with unilateral climate policies.

The European Union has long been committed to unilateral efforts to tackle climate change, and in the last 20 years has tried very hard, felt a duty to set a kind of example through radical bills such as this one. We have had it, as I said, for many, many years, very radical climate policymaking at home. But it was just Europe.

As a result, European governments have advanced the most expensive forms of energy at the expense of the least expensive forms of energy. And about 14 years ago, the EU adopted the so-called Lisbon Strategy with a goal of making "Europe the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth and more embedded jobs and greater social cohesion." In the same year, the EU also adopted the European Climate Change Program, which developed the EU implementation of the Kyoto Protocol.

Today, 14 years after having adopted these key policies, the economies of most EU member states are stagnating or in decline. Instead of sustainable economic growth, instead of more jobs, instead of greater social cohesion, the OECD warned last week that the crisis-ridden EU has become a major threat to the world economy. So much for Europe becoming the most competitive place on earth.

Europe's unilateral climate policies have played a crucial role in the EU's economic decline. And it is this experience with unilateral action that I want to focus upon. The other thing is, even though Europe has managed to reduce CO₂ emissions domestically, this has only happened because it shifted essentially energy-intensive and heavy industries and their emissions overseas to nations where there are no similar emission limits, where energy and labor is cheap and which are now growing much faster than the EU. As a result, Europe's manufacturers are rapidly losing ground to international competition.

The EU's unilateral climate policies pose an existential threat to Europe's industrial base. This threat is real, as the EU's outgoing industry commissioner, Antonio Tajani, has warned in no uncertain terms, that is the EU industry commissioner: "We face a systemic industrial massacre. We need a new energy policy. We have to stop

pretending, because we can't sacrifice Europe's industry for climate goals that are not realistic, and are not being enforced worldwide." That is the crux of the problem.

There is another problem, a problem that is hitting Europe's poorest most, energy poverty. In the EU, hundreds of billions of Euros for climate policies have been paid by ordinary families and small and medium sized businesses in what is undoubtedly one of the biggest wealth transfers from poor to rich in modern European history. As wealthy homeowners and landowners install wind turbines on land and solar panels on their homes and commercial buildings, low income families all over Europe have to foot skyrocketing electricity bills. This winter, millions of poor families will have to choose between eating and heating. And many can no longer afford to pay. So the utilities are cutting off their power.

Let me conclude. Europe's climate policy has burdened families and businesses with astronomical costs while shifting its heavy industry and its CO₂ emissions to other parts of the world. The EU's climate fail demonstrates beyond doubt in my view unilateral policies are a complete fiasco and don't really solve anything. Europe is ground zero for failed climate policy and here is a lesson: don't make the same mistake or you will suffer the same consequences. Thank you.

[The prepared statement of Mr. Peiser follows:]



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**TESTIMONY TO THE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS OF
THE UNITED STATES SENATE**

Hearing on the Super Pollutants Act of 2014 (S. 2911)
Washington DC, 2 December 2014

Dr Benny Peiser
The Global Warming Policy Foundation
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I would like to thank the Chairman and the Committee for the opportunity to testify before your committee on the high risks and costs of unilateral climate policies.

I am the director of the Global Warming Policy Foundation (GWPF), a non-partisan think tank and a registered educational charity based in London. The GWPF, while open-minded on the contested science of global warming, is deeply concerned about the costs and other implications of climate policies currently being advanced in Britain and by other governments around the world.

Since the GWPF was launched in the House of Lords in 2009, it has been scrutinising the economic, social and industrial implications of unilateral climate policies of the UK and the EU.

Europe's climate strategy was founded on two key assumptions: first, that global warming was an urgent threat that needed to be prevented without delay and at all costs; and second, that the world was running out of fossil fuels, which meant oil and gas would become ever more expensive and renewable energy competitive. Both conjectures, however, turned out to be wrong, and as a consequence there is growing realisation within the EU that our unilateral climate policy is misguided and economically harmful.

The growing damage of this go-it-alone approach to the economic stability of Europe and the gradual abandonment of unilateralism is the subject of my testimony.

Director: Dr Benny Peiser

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EU unilateral climate policy since 2000

The European Union (EU) has long been committed to unilateral efforts to tackle climate change. For the last 20 years, Europe has felt a duty to set an example through radical climate policy-making at home.

European leaders were convinced that the development of a low-carbon economy based on renewables would give Europe a competitive advantage.¹

It was in this political climate that the EU heads of state and government launched the so-called Lisbon Strategy in March 2000, with the goal of making Europe "the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion".

Three months later, in June 2000, the European Commission launched the European Climate Change Programme (ECCP), which developed the EU implementation of the Kyoto Protocol.

In 2002, the EU² approved the Kyoto Protocol and committed to cutting its collective greenhouse gas (GHG) emissions to 8% below 1990 levels by 2008-2012, as required by the Kyoto protocol.

Today, 14 years after the EU adopted these key policies, the economies of most EU member states are stagnating or in decline. Last week the OECD warned that the crisis-ridden EU poses a major threat to the world economy.³

Recent UN climate summits show that there is no prospect of a legally binding international commitment to cap, let alone reduce GHG emissions. In the absence of a binding agreement, any unilateral policies are bound to burden nations with heavy costs and regulatory burdens without having any effect on the trajectory of global GHG concentrations over the coming century.

Even though EU policy has managed to reduce CO₂ emissions domestically, this was only achieved by shifting energy-intensive and heavy industries overseas: to locations where there are no stringent emission limits, where energy and labour is cheap and which are now growing much faster than the EU. Most products consumed in the EU today are imported from countries without any binding CO₂ targets. It is no surprise that while the EU's domestic CO₂ emissions have fallen, if you factor in CO₂ emissions embedded in goods imported into EU, the figure remains substantially higher (Fig. 1).

¹ <http://www.renewableenergyfocus.com/view/928/wind-energy-gives-europe-a-competitive-advantage/>

² It was then still called the European Community.

³ <http://online.wsj.com/articles/eurozone-stagnation-poses-major-risk-to-global-growth-oecd-warns-1416911402>

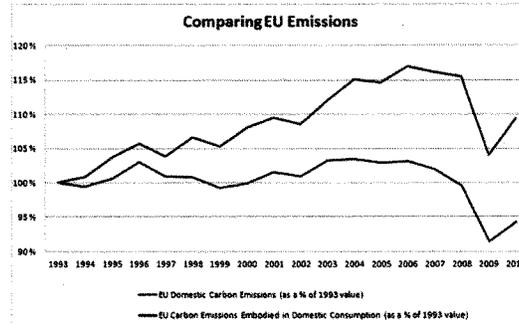


Fig. 1 EU CO2 emissions

EU CO2 emissions remain substantially higher when embedded emissions resulting from imported goods consumed in EU members states are factored in.⁴

EU policymakers naively assumed that Europe's main competitors would follow the shift from cheap fossil fuels to expensive green energy. This never happened and was never truly realistic given the existence of abundant and significantly cheaper options. Europe, as even the editors of the *Washington Post* acknowledged last year, "has become a green-energy basket case. Instead of a model for the world to emulate, Europe has become a model of what not to do."⁵

As energy prices continue to rise, Europe's remaining and struggling manufacturers are rapidly losing ground to international competition. European companies and investors are pouring money into the US, where energy prices have fallen to less than half of those in the EU, thanks to the shale gas revolution.

EU abandons unilateral climate targets

Early proclamations about the urgency of the global warming problem have run up against the reality of the near two-decade-long pause in global surface temperature rises, which was not predicted by climate models. In part as a result, climate change has dropped quite significantly down on the international agenda in recent years.

At the very least, the consistent overestimation of recent warming trends by climate models, a problem openly acknowledged in the last IPCC report, raises the possibility that model-based estimates of the environmental impacts of carbon

⁴http://www.footprintnetwork.org/en/index.php/GFN/blog/deconstructing_carbon_before_un_climate_summit

⁵ http://www.washingtonpost.com/opinions/europe-is-becoming-a-green-energy-basket-case/2013/04/21/4b1b81d0-a87e-11e2-b029-8fb7e977ef71_story.html

dioxide emissions are biased high, and that attempts to portray climate change as an imminent emergency are not based on sound empirical evidence.

Another key assumption of European climate policy was that a legally binding climate treaty would be reached and that the EU would greatly benefit from its implementation around the world. In reality, a binding agreement proved to be impossible and is unlikely to be forthcoming anytime soon.

In the meantime, the EU is stuck with extremely costly unilateral targets - an outcome described by the British government's 2009 impact assessment as the "worst case scenario, which would [raise serious questions about] the benefits of on-going unilateral action" and which is unlikely to be "sustainable in practice".⁶

Due to the failure of the international community to agree a follow-up treaty to the Kyoto Protocol, there is no longer any enthusiasm for new unilateral climate targets among most countries in central and eastern Europe. The governments of Poland, Hungary, the Czech Republic, Slovakia, Romania, Bulgaria, Latvia and Lithuania are all opposed to adopting any new CO₂ targets in the absence of a binding UN agreement.

Last year, Antonio Tajani, the EU's outgoing Industry Commissioner, warned that Europe's unilateral climate policies were pushing electricity costs to uncompetitive levels:

We face a systemic industrial massacre. We need a new energy policy. We have to stop pretending, because we can't sacrifice Europe's industry for climate goals that are not realistic, and are not being enforced worldwide.⁷

Gunther Oettinger, the EU's outgoing energy commissioner, declared in September that the EU should not adopt new binding CO₂ targets unless all major emitters would do likewise:

If there is no binding commitment from countries as India, Russia, Brazil, the US, China, Japan and South Korea, whose governments are responsible for some 70% of global emissions, I think it is not really smart to have a -40% target...If we are too ambitious and others do not follow us we will have an export of production and more emissions outside the EU.⁸

Oettinger's proposal was adopted on 23 October, when EU leaders agreed a conditional CO₂ reduction target of 40% by 2030 - provided there is a legally

⁶ http://www.openeurope.org.uk/Content/Documents/Rotten_Foundations_-_Open_Europe_Report.pdf

⁷ <http://www.telegraph.co.uk/finance/financialcrisis/10295045/Brussels-fears-European-industrial-massacre-sparked-by-energy-costs.html>

⁸ <http://www.theguardian.com/environment/2014/sep/25/europe-should-only-cut-carbon-if-world-agrees-paris-climate-deal-eu-energy-chief>

binding UN climate treaty. A special “flexibility clause” was added to the final text, allowing the Council to reassess its conditional target after the UN summit.⁹

The EU’s post-2020 targets for greenhouse gas emissions and renewable energy are contingent on a legally binding global agreement at the UN climate conference in Paris in 2015. The chances of such an agreement, however, are close to zero. China and India have made their support for such a deal conditional on a legally binding climate finance package of \$100 billion per year by 2020 as promised by President Obama at the UN climate conference in Copenhagen in 2009.¹⁰

Loss of competitiveness

Energy prices for industry

European governments have advanced the most expensive forms of energy generation at the expense of the least expensive kinds. No other major emitter has followed the EU’s aggressive climate policy and targets.

EU members states have spent about €600 billion (\$882bn) on renewable energy projects between 2005 and 2013, according to Bloomberg New Energy Finance.¹¹ Germany’s green energy transition alone may cost up to €1 trillion by 2030, the German government recently warned.¹²

As a result of these policies, energy prices have risen sharply in Europe (Fig. 2).¹³

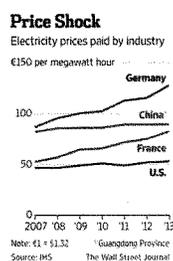


Fig 2. Industrial energy price trends

Source *The Wall Street Journal*, 26 August 2014

⁹ European Council Agreement: 2030 Climate And Energy Framework.
http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/145356.pdf

¹⁰ <http://www.foxnews.com/world/2014/09/24/climate-change-china-rebuts-obama/>

¹¹ Michael Liebreich, Bloomberg New Energy Finance Summit, New York 23 April 2013.

¹² <http://www.reuters.com/article/2013/02/20/us-germany-energy-idUSBRE91J0AV20130220>

¹³ <http://online.wsj.com/articles/germanys-expensive-gamble-on-renewable-energy-1409106602>

Electricity prices in Europe are now more than double those in the USA (Fig. 3).¹⁴

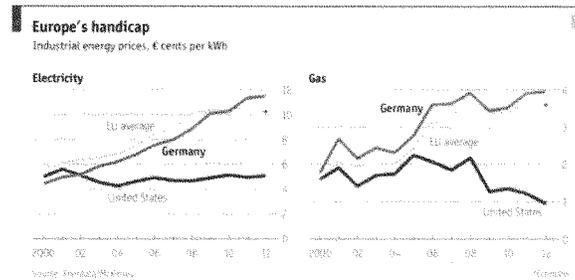


Fig 3. Industrial electricity and gas price trends

Source: *The Economist*, 15 June 2013

Lower gas and electricity prices in 2012 in the United States relative to Europe equated to estimated savings of close to \$130 billion for US manufacturing industry as a whole. The IEA estimates that electricity prices in the European Union will remain around twice those in the US in 2035.¹⁵

High energy prices lead to loss of competitiveness

Europe's manufacturers are rapidly losing ground to international competition. Energy price differentials impact industrial competitiveness significantly. In recent years, the US, together with key emerging economies, has increased its export market share for energy-intensive goods, while the EU and Japan have seen a sharp decline (Fig. 4).¹⁶

¹⁴ <http://www.economist.com/news/special-report/21579149-germanys-energie-wende-bodes-ill-country-european-leadership-tilting-windmills>

¹⁵ http://www.worldenergyoutlook.org/media/weowebiste/factsheets/WEO2013_Factsheets.pdf

¹⁶ <http://www.gastechnews.com/unconventional-gas/iea-outlook-highlights-role-of-gas-prices-in-competitiveness/>

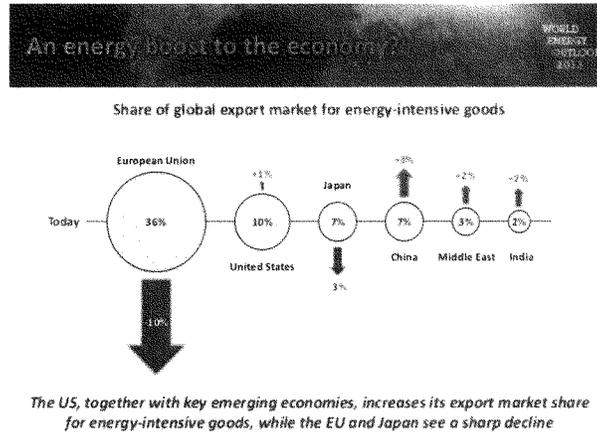


Fig. 4: Global market share for energy-intensive goods

Source: *World Energy Outlook 2013*

The situation is expected to become worse. By 2020 energy taxes may will account for half of UK energy intensive manufacturers' energy bills. The cost of government policy on energy prices paid by UK steelmakers is expected to be over 280% more than the equivalent cost for their American and Russian competitors.¹⁷

Energy intensive industry expected to decline in the EU

Energy costs are of crucial importance to energy-intensive industries such as chemical, cement, steel and glass manufacturers and oil refiners. The IEA believes that the EU and Japan will see a strong decline in their export shares in these products over time.¹⁸

The EU's key chemical industry is in sharp decline, facing extinction

The chemical industry is one of the EU's most successful sectors, boasting €527 billion in sales in 2013, making it the second-largest global producer.

High energy costs over the past two decades have contributed significantly to the loss of the EU chemical sector's competitiveness in the global export market. Lost competitiveness has eaten into the EU share of global exports, which fell to 21% in 2012 from 31% in 1991. Due to the erosion of competitiveness, the EU has slipped

¹⁷ www.eef.org.uk/~media/38010cfb140147b3ab526d6f5832cd87.pdf

¹⁸ http://www.worldenergyoutlook.org/media/weowebiste/factsheets/WEO2013_Factsheets.pdf

from third to fourth out of seven leading global chemical exporters with regard to absolute levels of competitiveness.¹⁹

In a letter to the president of the European Commission, Jim Ratcliffe, the chairman and CEO of the Ineos chemical group, recently warned that the European chemicals industry is at risk of being wiped out in a decade, with the loss of 6 million jobs if uncompetitive energy prices continued to drive the rapid closure of Europe's chemical plants. Ratcliffe pointed out that in Britain alone 22 chemical plants have closed down since 2009 and not a single new one has been built:

I can see green taxes, I can see no shale gas, I can see closure of nuclear, I can see manufacturing being driven away. It's not looking good for Europe, we are rabbits caught in the headlights, and we have got our trousers down.²⁰

While Europe's high cost policies have become an existential threat to the long-term survival of the chemical industry, cheap energy is reviving the fortunes of the industry in the US (Fig. 5). The shale revolution has significantly lowered energy costs, spurred international demand for goods derived from chemicals and has created a huge competitive advantage. US industry has gone from a trade deficit to a \$3.4 billion surplus. By 2018, the trade surplus could reach \$30 billion, according to some estimates - a tenfold increase in five years.²¹

U.S. Chemical Industry Global Cost Advantage

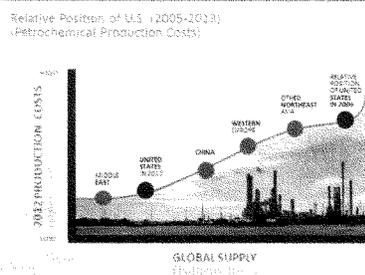


Fig 5. US chemical industry cost advantage

Source: *American Chemistry Matters*, 30 October 2014²²

¹⁹ <http://www.cefic.org/Documents/PolicyCentre/Competitiveness/Oxford-Study-2014.pdf>

²⁰ <http://www.telegraph.co.uk/finance/newsbysector/industry/10681902/European-chemicals-industry-could-be-wiped-out-in-a-decade-says-ineos-boss.html>

²¹ <http://blog.americanchemistry.com/2014/10/u-s-manufacturing-exports-surg-ing-due-to-shale-gas/>

²² <http://blog.americanchemistry.com/2014/10/u-s-manufacturing-exports-surg-ing-due-to-shale-gas/>

Steep loss of competitiveness in the steel industry

Energy costs alone represent up to 40% of the total costs of a steel plant in Europe, significantly more than in the USA, Russia, the Middle East or China. This is driving global steel investment outside the EU, where there are no such targets or green taxation to reduce CO₂ emissions.

The European steel industry employs 335,000 people. ArcelorMittal Europe estimates that their European steelmaking operations are at a \$1 billion energy-cost disadvantage compared with their counterparts in the USA. Aditya Mittal, its CEO, has recently warned that the cost of implementing the EU's 2030 climate targets unilaterally would make European steelmaking unviable. He estimates that the additional costs for the steel sector between 2020 and 2030 would be around €58 billion (\$73.76 bn) of which ArcelorMittal would have to bear €20 billion, or an average of €2 billion a year, far exceeding ArcelorMittal's European profits.²³

While global steel output is increasing, European steel production is in steep decline and continues to lose competitiveness. The EU's share of global steel production has more than halved in recent years, falling from 22% in 2001 to 10% in 2013 (Fig. 6).²⁴

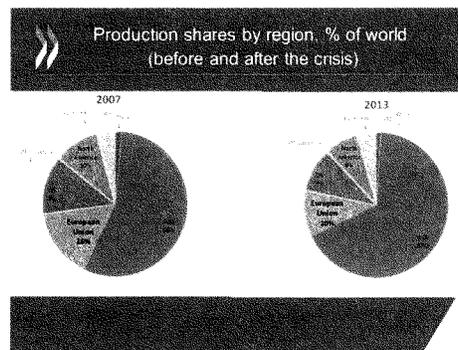


Fig 6. Outlook for the steel market

Source: OECD, March 2014

European manufacturing firms investing in the US

There has been a significant increase in the number of European manufacturers investing in the USA. It is driven by exasperatingly complex and costly environmental and other regulations, and the widening gap between energy and electricity costs in Europe and the USA. Analysts believe that the growing

²³ <http://online.wsj.com/articles/saving-european-steel-and-the-environment-too-1414001857>

²⁴ <http://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetailDoc&id=12706&no=3>

investment of European companies in North America is in its infancy and will continue so long as the energy price gap remains significant.²⁵

BASF estimates that it could save \$688 million/year in energy costs alone if its German chemical plants were situated in the USA rather than in Germany. The company has doubled its capital investment in the USA to \$1 billion/year in 2013 and has earmarked an additional \$4 billion in capital investment through 2017.

The industrial base is being lost

Governments are increasingly concerned about the growing threat that high energy prices pose to Europe's industrial base. The gap in competitiveness was the central theme of a summit of EU heads of government in Brussels in May 2014.

The data on the share of the EU manufacturing output on a global scale show that the share of manufacturing in Europe (and the US) has been consistently decreasing, while manufacturing in China has been on the rise (Fig. 7).

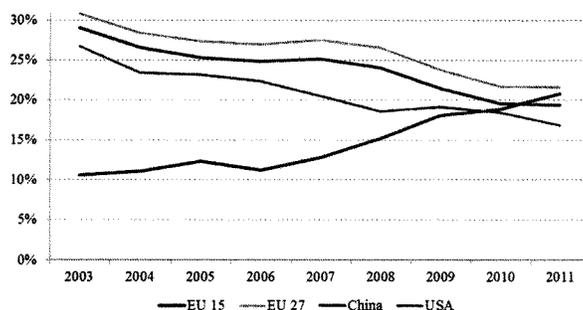


Fig. 7 Shares of global manufacturing output (before the impact of the US shale revolution)

Source: UN National Accounts Main Aggregates Database, European Commission, September 2013.²⁶

High energy prices will further cut into the EU's global share of manufacturing. In sharp contrast, US exports of manufactured products have risen by 6 percent since the start of America's shale revolution, according to a recent report by the International Monetary Fund (IMF). It is clear evidence that cheap energy - already a strong catalyst for chemical industry export growth - is benefiting U.S. manufacturing.²⁷

²⁵ <http://www.agracel.com/481-2014-trends-that-excite-agracel-1european-manufacturing-firms-moving-to-usa/>

²⁶ http://europa.eu/rapid/press-release_MEMO-13-815_en.htm

²⁷ See more at: <http://blog.americanchemistry.com/2014/10/u-s-manufacturing-exports-surg-ing-due-to-shale-gas/>

Absurd climate policy: cheap coal, expensive gas

Of all the unintended consequences of EU climate policy perhaps the most bizarre is the detrimental effect of wind and solar schemes on the price of electricity generated by natural gas.

Many gas power plants can no longer operate enough hours. They incur big costs as they have to be switched on and off for back-up. When wind and solar output increases, energy prices become more volatile which adds to the costs.

The increasing requirement of utilities to back-up renewable power has undermined the profitability of natural-gas-fired plants in much of Europe, leading to the widespread shutdown of combined-cycle gas turbine plants, which are among the cheapest form of low-carbon power generation.

Every 10 new units' worth of wind power installation has to be backed up with some eight units' worth of fossil fuel generation. This is because fossil fuel plants have to power up suddenly to meet the deficiencies of intermittent renewables. In short, renewable do not provide an escape route from fossil fuel use without which they are unsustainable.²⁸

Gas-fired power generation has become uneconomic in the EU, even for some of the most efficient and least carbon-intensive plants. At the end of 2013, 14% of the EU's installed gas-fired plants stood still, had closed or at risk of closure. If all gas plants currently under review were to close, this would amount to 28% of current capacity by 2016.

Almost 20 per cent of gas power plants in Germany have already become unprofitable and face shutdown as renewables flood the electricity grid with preferential energy. To avoid blackouts, the government has to subsidise uneconomic gas and coal power plants. Already half of the 28 EU countries have in place or are planning to subsidise fossil fuel power plants to keep the lights on.

Ironically, the EU's flagship climate policy, its Emissions Trading Scheme, has led to the collapse in carbon prices which is making coal-fired power plants much more economical than gas-fired power plants.

As a result, EU power utilities have been forced to write down their assets, with some €15 bn in 2013 alone. Instead of building new power plants in the EU, major utilities are investing in thermal power plants outside of the EU.²⁹

Paying for availability for a substantial proportion of conventional power plants has thus become unavoidable in countries with large shares (10% or more) of renewable electricity.

²⁸ <http://www.thegwpf.org/images/stories/gwpf-reports/hughes-windpower.pdf>

²⁹ <http://notalotofpeopleknowthat.wordpress.com/2014/06/05/eu-energy-markets-in-crisis/>

If you think this cannot happen in the US where gas prices are low, think again. Low gas prices are an unambiguous advantage for energy-intensive industries and existing power plants; but they cannot solve the high risk of investment in new power plants that are at risk of becoming inefficient and uneconomic as a result of renewable energy targets.

New US gas-fired power plants face the same economic problems, despite low gas prices. As the share of intermittent renewables generation increases in the US, consumers will find that they have to pay through similar mechanisms to insure adequate back-up. And these mechanisms are extremely expensive as the European experience shows.

Essentially, twice as much generating capacity is needed just to deal with the intermittency of wind and solar energy. In some US state with high renewable mandates, this inevitable rise in cost could happen fairly soon.

While gas for power generation remains cheap in the US because of the shale revolution, it is only cheap for power generation so long as gas plants can run uninterrupted and for long periods of time. If they have to be increasingly switched on and off because of high levels of intermittent renewable, gas plants will be displaced by cheap coal sooner than most people think - just as is happening in Europe right now. Of course, CO2 emissions would rise quickly and significantly too.

Rising energy poverty

According to Peter Lilley, a British MP and member of the Parliamentary Energy and Climate Change Committee, the UK's 2008 Climate Change Act is perhaps the most costly government programme since the introduction of the Welfare State, with an impact of over £17,000 per household. The revised official impact assessment for the Climate Change Act 2008 estimated the cost at up to £430 (\$675) billion. This excludes transitional costs which it says could be 1.3-2.0% of GDP up to 2020, and the cost of driving industry abroad, which it says could be significant.³⁰

Open Europe estimates that in 2013, as a direct result of the EU's unilateral climate policies, the average energy bill for a medium-sized business was increased by 9% (£130,000/ \$200,000) due to EU regulations or UK implementation of EU-defined targets. By 2020, EU-related climate regulations or targets will have increased medium sized firms' bills by 23% (£350,000/\$550,000).³¹

In the EU, hundreds of billions are being paid by ordinary families and small and medium-sized businesses in what is undoubtedly one of the biggest wealth transfers from poor to rich in modern European history. Rising energy bills are

³⁰ http://www.thegwpf.org/content/uploads/2012/10/Lilley-Stern_Rebuttal3.pdf.

³¹ http://www.openeurope.org.uk/Content/Documents/Rotten_Foundations_-_Open_Europe_Report.pdf

dampening consumers' spending, a poisonous development for a continent still struggling to recover from the financial crisis.

Germany's renewable energy levy, which subsidises green energy production, rose from €14bn to €20bn in just one year as a result of the fierce expansion of wind and solar power projects. Since the introduction of the levy in 2000, the electricity bill of the typical German consumer has doubled.

As wealthy homeowners and business owners install wind turbines on their land and solar panels on their homes and commercial buildings, low-income families all over Europe have had to foot the skyrocketing electric bills. Many can no longer afford to pay, so the utilities are cutting off their power. The German Association of Energy Consumers estimates that up to 800,000 Germans have had their power cut off because they were unable to pay the country's rising electricity bills.³²

Conclusions

On costly green energy policies "Europe made the wrong bet", the *Financial Times* warned on Friday. "There are no energy-intensive investments taking place in Europe now," the FT quoted Dieter Helm, professor of energy policy at the University of Oxford. "Why would you locate a new investment in a place with both high labour costs and high energy costs, many of which are self-inflicted?"

The EU's unilateral climate policy is absurd: first consumers are forced to pay ever increasing subsidies for costly wind and solar energy; secondly they are asked to subsidise nuclear energy too; then, thirdly, they are forced to pay increasingly uneconomic coal and gas plants to back up power needed by intermittent wind and solar energy; fourthly, consumers are additionally hit by multi-billion subsidies that become necessary to upgrade the national grids; fifthly, the cost of power is made even more expensive by adding a unilateral Emissions Trading Scheme. Finally, because Europe has created such a foolish scheme that is crippling its heavy industries, consumers are forced to pay even more billions in subsidising almost the entire manufacturing sector.

In the last few years, major economies such as Canada, Australia and Japan have begun to realise the futility of going it alone and have retreated from or abandoned their climate policies and CO₂ targets. Now even the EU has decided to walk away from its go-it-alone approach and has adopted a conditional climate pledge. It has burdened European taxpayers and businesses with astronomical costs while shifting its heavy industry and CO₂ emissions to other parts of the world.

Europe's climate policy failure demonstrates beyond doubt that its unilateralism has been a complete fiasco. The lessons of this self-defeating debacle are clear: don't make the same mistake. Policymakers would be well advised to heed this warning.

³² <http://www.spiegel.de/international/germany/high-costs-and-errors-of-german-transition-to-renewable-energy-a-920288.html>



The Global Warming Policy Foundation

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29 January 2014

US Senate
Committee on Environment and Public Works
Washington DC, USA

Dear Senators Boxer and Vitter,

Please find below my answers to your questions relating to my recent testimony at the *Hearing on the Super Pollutants Act of 2014 (S. 2911)*

Question from Senator Barbara Boxer

1) Questions about climate science are of little relevance to the subject of my testimony. Moreover, the GWPF does not take a collective position on either scientific or policy questions. This response therefore represents my own views.

The NCAA is a long report and there are areas of agreement and disagreement. I agree that the global climate is changing. Climate always changes. It also exhibits long-term persistence. Therefore NCAA's statements about global climate change are a statement of the obvious.

I accept that anthropogenic emissions of carbon dioxide and other greenhouse gases have a warming effect and are thus contributing to climatic changes. How significant the anthropogenic effect is in comparison to natural factors remains difficult to quantify.

The attribution of recent climate changes primarily to human CO₂ emissions is based on computer simulations of the Earth's climate (global climate models or GCMs). The reliability of climate models is therefore one of the central questions of the climate debate.

Director: Dr Benny Peiser

Board of Trustees: The Rt Hon Lord Lawson (Chairman), Lord Donoughue, The Rt Hon Lord Fellowes,
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Questions from Senator David Vitter

1) Every 10 new units' worth of wind power installation has to be backed up with some eight units' worth of fossil fuel generation. This is because fossil fuel plants have to power up suddenly to meet the deficiencies of intermittent renewables.

The increasing requirement of utilities to back-up renewable power has undermined the profitability of natural-gas-fired plants in much of Europe, leading to the widespread shutdown of combined-cycle gas turbine plants.

Gas-fired power generation has become uneconomic in the EU, even for some of the most efficient and least carbon-intensive plants. Almost 20 per cent of gas power plants in Germany have already become unprofitable and face shutdown as renewables flood the electricity grid with preferential energy.

To avoid blackouts, European governments are forced to subsidise uneconomic gas and coal power plants. Already half of the 28 EU countries have in place or are planning to subsidise fossil fuel power plants to keep the lights on. These policies, which differ from country to country, are collectively referred to as "capacity mechanisms" because they are broadly designed to pay companies for having the capacity to generate power when the wind isn't blowing or the sun isn't shining.

Paying for availability for a substantial proportion of conventional power plants has thus become unavoidable in countries with large shares (10% or more) of renewable electricity.

2) In October 2014, the European Council agreed new EU-wide CO2 emissions and renewables targets for 2030 which will be offered as a conditional pledge during the 2015 international climate negotiations in Paris. EU leaders have committed to reduce greenhouse gas emissions by at least 40%, and increase energy efficiency and renewables by at least 27% by 2030 - provided there is a legally binding UN climate agreement.

A special "flexibility clause" was added to the final text, making it possible for the European Council to review the targets after the UN summit in December 2015.

The European Commission stated clearly that the EU targets should be offered conditionally, stating "that the EU should pledge the 40% reduction in early 2015 as part of the international negotiations on a new global climate agreement due to be concluded in Paris at the end of 2015."

In short, the 2030 targets adopted by EU leaders are not legally binding but conditional on the outcome of UN climate conference in Paris. The Polish government has warned that it is likely to veto the 2030 targets if the UN conference does not adopt similarly binding targets for all major emitters.

3) Please see my written testimony

4) Please see my written testimony

5) Both the US-China agreement and the agreement adopted at the recent UN climate summit in Lima are further proof, if any was needed, that developing and emerging nations do not accept any legally binding caps, never mind reductions of their CO2 emissions.

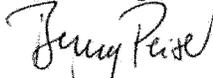
The US-China agreement and the Lima agreement are based on a voluntary basis which allows both China and the US to set their own voluntary CO2 targets and policies without any legally binding caps or international oversight. These intended and nationally determined contributions are likely to be revised as political and economic conditions change in coming years

In contrast to the Kyoto Protocol, the Lima agreement opens the way for a new climate agreement in 2015 which will remove legal obligations for governments to cap or reduce CO2 emissions. A voluntary agreement is likely to remove the mad rush into unrealistic decarbonisation policies that are both economically and politically unsustainable.

6) The global surface temperature 'pause' was not predicted by climate scientists nor by climate models. The IPCC has admitted that they do not know what is causing it or for how long it will continue.

It is now widely understood that if this standstill in global surface temperature continues for much longer, the models used by the IPCC will have to be re-assessed. The ongoing global warming standstill provides the international community with a golden opportunity to consider more effective and cost-effective climate policies.

With best regards



Dr Benny Peiser
Director, The Global Warming Policy Foundation

Senator WHITEHOUSE. Thank you for your testimony, Dr. Peiser. Our final witness, Mr. Steve Moore. Please proceed.

STATEMENT OF STEPHEN MOORE, CHIEF ECONOMIST, INSTITUTE FOR ECONOMIC FREEDOM AND OPPORTUNITY, THE HERITAGE FOUNDATION

Mr. MOORE. Thank you, Senators, for the opportunity to testify this afternoon.

I am the Chief Economist at the Heritage Foundation. I am not an environmental expert, but I am an expert on what is happening with the U.S. economy. I thought I would spend my time and devote my remarks to how the fossil fuel revolution that is going on in this Country has really so dramatically changed the economic outlook in our States. I know some of you represent States that are part of this oil and gas revolution that has played such a vital part in our economic recovery.

Let me start by stating a simple fact that is almost undeniable, that the whole world of energy production changed almost overnight six or 7 years ago with the introduction of shale oil and gas and the technologies that allow us to get at oil and gas in the United States that has been stored there for hundreds of thousands of years but we never had the technology to get at it.

If you look at the chart in my testimony, the first chart, you can see the ramifications of this for our energy production and also our energy imports. This has been a seismic change. The United States over the last 6 years has increased its oil and gas output by almost 50 percent in the last 6 years. That is something, by the way, that no one would have predicted possible as recently as four or 5 years ago.

President Obama, just as recently as two or 3 years ago, said the United States was running out of oil and gas. I would amend that to say, Mr. President, with all due respect, American isn't running out of oil and gas, we are running into it big time. We have hundreds of years of supply.

You can also see the big reduction in imports, which is a huge lift to the American economy.

The second point I would like to make is maybe the most important, that without the shale oil and gas revolution, it is quite possible the United States never would have exited the recession. That is how important this energy revolution has been to the American economy.

And if you look at the second chart in my testimony, I think it underscores this point. If you look at all employment, this goes through the end of 2013, you can see that virtually on net, all the new jobs created in the U.S. economy over the last six or 7 years have come from the oil and gas industry. We just 2 months ago got to the point where in all industries where we replaced all the jobs that were lost during the recession. Without the oil and gas industry, we would have been in a much, much worse situation and the recession would have lasted much, much longer.

The third point I would like to make is that many people a number of years ago bet on green energy. Dr. Peiser made a great point on this, that European countries did go all in on green energy 10 or 15 years ago and it hasn't worked. What you are seeing is right

now if you look at what is happening in Germany, Germany's industrial production fell the last quarter. This is the second quarter in a row that Germany has had net zero industrial growth and many of the experts believe that one of the reasons that German manufacturing and Germany industrial production has fallen so dramatically, so far behind the United States, is because of the fact that they are trying to use green energy, which is much, much more expensive. When you are competing in international markets and your energy prices are much higher, you suffer.

By the way, I would make a side point that one of the real strong elements of the U.S. economy today is the U.S. economy is going through a manufacturing renaissance that a lot of people would not have predicted. It is going on in Michigan, it is going on in Indiana, my home State of Illinois, it is going on in Ohio and Pennsylvania. A lot of this industrial manufacturing rebound in autos and steel and other vital industries like plastics and chemicals is a direct result of the energy boom.

The next point I would like to make is that shale gas is reducing U.S. greenhouse gas emissions. This is something that most Americans are not aware of, because the media doesn't talk a lot about this. But if you look over the last 10 years, the United States has reduced our CO₂ emissions more than any other industrialized country that we compete with. This is according to the U.S. Energy Information Agency, and you can see in the chart that we have reduced our carbon emissions. The EU has reduced their emissions but not as much as we have. And of course, China and India are out through the roof in their CO₂ emissions.

The lesson here by the way is that when you shift to shale gas, natural gas as a form of electricity production, you dramatically reduce your greenhouse emissions. So the shale gas is a wonder fuel, because it is cheap, it is abundant, it is made in America and it is clean-burning.

In my last minute or so, I would like to make this point about income inequality. As an economist, as you all know, this has become one of the No. 1 issues for Americans, is the gap between the rich and poor. One of the points I would like to stress to you all is that by making anything that makes electricity production more expensive, it makes it more expensive for people to heat their home, makes their utility bills more expensive, actually makes income inequality worse. Because the poor spend a much higher fraction of their income on electricity than the rich do.

So we ought to look at this energy boom as also something that is reducing income inequality in the United States. By the way, if we adopt policies and regulations that make electricity more expensive, we are making the income inequality problem worse.

Thank you.

[The prepared statement of Mr. Moore follows:]

Testimony

Stephen Moore
Chief Economist
Heritage Foundation

SENATE COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

Legislative Hearing To examine the following items:
S.2911, Super Pollutants Act of 2014

TUESDAY, DECEMBER 2, 2014

My name is Stephen Moore and I am the chief economist at the Heritage Foundation. Neither I nor the Heritage Foundation receive any federal funding.

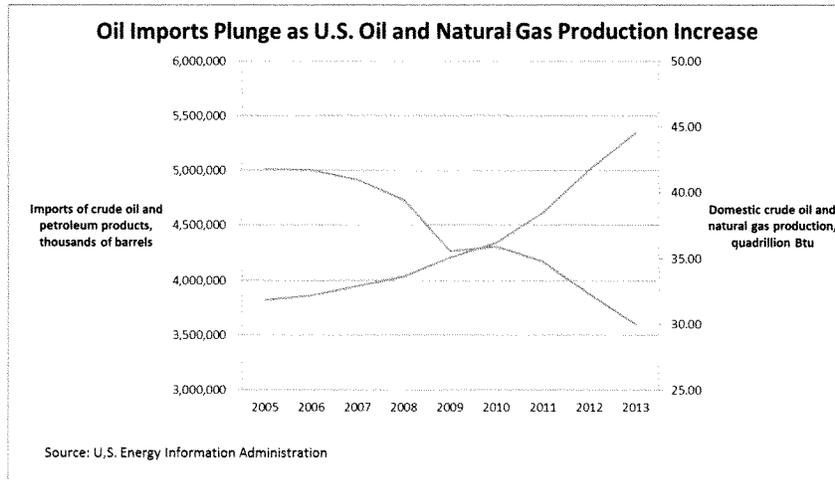
I was asked to comment on the importance of the U.S. Fossil fuels industry on the U.S. Economy and the importance of ensuring that government regulation does not impede this critical industry's growth in future years.

1. The fossil fuels boom is vital to American economic growth.

America is currently experiencing the greatest oil and gas boom in the history of our nation. Over the last seven years U.S. Domestic production of natural gas and oil has increased by nearly 70 percent. This spectacular surge in domestic fossil fuel production was unpredicted even by experts in the industry as recently as 2008-2009. Almost no one saw it coming. The spectacular revival of U.S. Energy development is a result of America's technological prowess, entrepreneurial spirit, and a commitment in the industry to expanding domestic output.

Fracking and horizontal drilling have been game-changing technological improvements that have made shale oil and gas an affordable and abundant domestic energy source. The U.S. has hundreds of years of supply with existing technology, and the drilling procedures keep improving dramatically. As U.S. Production has risen, American reliance on foreign oil

has fallen drastically. See chart. Oil imports are down by more than one third in the past eight years and by year 2020 net imports could be down to zero. This means the elusive goal of energy independence is easily within our grasp in the near term.

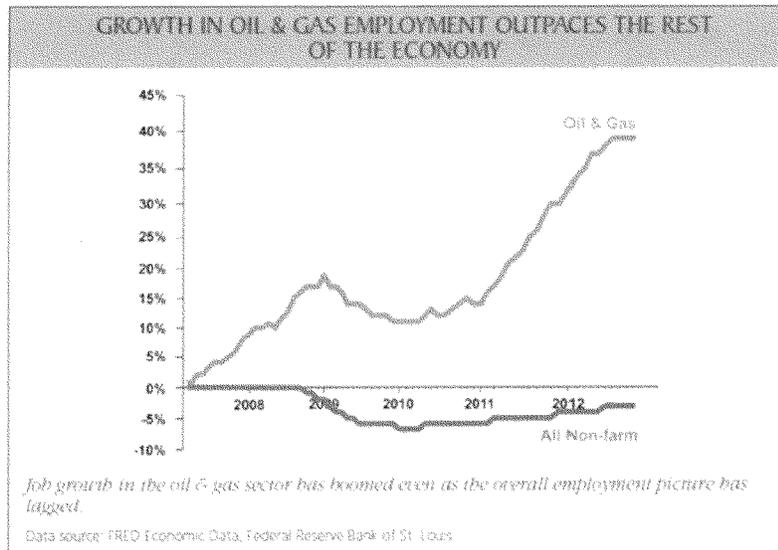


Those who once thought that the U.S. is running out of fossil fuels and that we would soon drill our last barrel of oil have been proven dead wrong. Thanks to the giant shale oil and gas plays in North Dakota, Texas, Oklahoma, Wyoming, West Virginia, Pennsylvania and Ohio, America isn't running out of oil and gas, as President Obama wrongly declared a few years ago, we are running into it.

2. Without the surge of oil and gas development, the Great Recession would not have ended.

The economic ramifications of this fossil fuels revolution are hard to overstate. It is not far from an exaggeration to say that without the surge in shale oil and gas, the great recession of 2008-09 would have lasted several more years. Figure 1 shows the gigantic increase in employment

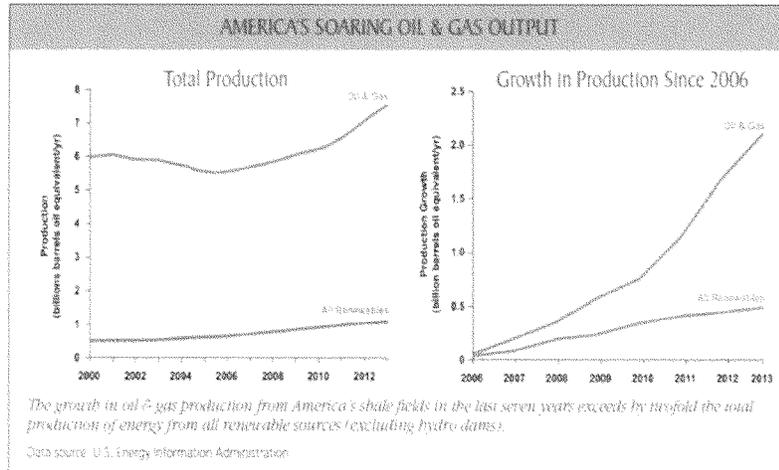
attributable to oil and gas since 2008. The contribution to the U.S. Annual GDP has been in the hundreds of billions of dollars.



Turn off fossil fuel development in America and you turn off the lights on the U.S. Economy - literally and figuratively.

3. Green energy has so far been an inconsequential form of energy production.

Figure 2 shows that almost all the increase in energy production in the US has been from fossil fuels - not so-called "green energy." Despite \$70 billion in direct federal taxpayer subsidies under Presidents George W. Bush and Barack Obama, renewable energy remains mostly a niche market. We have an \$18 trillion industrial economy - it cannot be powered with windmills and solar paneling anytime soon.



This was the conclusion of energy scientists from Google who were in charge of the search engine company's renewable energy research. They very recently acknowledged the unworkability of "green energy" on an economy-wide scale. According to engineers [Ross Koningstein](#) and [David Fork](#), last month:

Starting in 2007, Google committed significant resources to tackle the world's climate and energy problems. A few of these efforts proved very successful: Google deployed some of the most energy-efficient data centers in the world, purchased large amounts of renewable energy, and offset what remained of its carbon footprint.

Google's boldest energy move was an effort known as RE<C, which aimed to develop renewable energy sources that would generate electricity more cheaply than coal-fired power plants do. The company announced that Google would help promising technologies mature by investing in start-ups and conducting its own internal R&D. Its aspirational goal: to produce a gigawatt of renewable power more cheaply than a coal-fired plant could, and to achieve this in years, not decades.

Unfortunately, not every Google moon shot leaves Earth orbit. In 2011, the company decided that RE<C was not on track to meet its target and shut down the initiative. The two of us, who worked as engineers on the internal RE<C projects, were then forced to reexamine our assumptions.

At the start of RE<C, we had shared the attitude of many stalwart environmentalists: We felt that with steady improvements to today's renewable energy technologies, our society could stave off catastrophic climate change. We now know that to be a false hope—but that doesn't mean the planet is doomed. They believe the savior could be nuclear energy.

Meanwhile, solar and wind power have received massively greater federal subsidies than oil, gas and coal. A study by the Institute for Energy Research finds that per kilowatt of electricity produced, taxpayer subsidies have been five to ten to twenty times higher for wind and solar energy than for fossil fuels.

4. Shale gas is reducing U.S. greenhouse gas emissions.

This is the environment committee so I should add that although shale oil and gas drilling remains controversial, these breakthroughs in drilling have played a major role in reducing green house gases. The conversion of U.S. Utilities from coal to Natural gas has moved America into the position of reducing our greenhouse gas emissions more than any other industrialized nation. This was a point President Obama made last month and he was right. Coal has also become cleaner, which is reducing U.S. emissions. Here are the changes in greenhouse gas emissions for major nations:

Greenhouse Gas Emitters

Change in Co2 Emissions 2000-2011	
United States	-6.50%
EU-27	-5.60%
Australia	10.10%
Russia	19.30%
India	74.10%
China	156.70%

U.S. Energy Information Administration, 2014.

In other words, the green protesters have it all wrong on fracking and horizontal drilling. These technologies greatly reduce greenhouse gas emissions and make climate change, less, not more probable in the future.

5. The fall in oil prices is a major stimulant to the U.S. Economy and is reducing income inequality.

One other economic windfall from America's fossil fuels renaissance is worth mentioning given the developments of recent weeks and months. I am referring to the steep decline in gas prices.

The crude oil price has fallen to as low as \$66 a barrel at the end of November from nearly \$105 a barrel this Summer - a Godsend for consumers. A rule of thumb is that every penny reduction in gas prices represents more than \$1 billion in annual savings to American consumers.

So we are nearing a \$100 billion a year oil price reduction stimulus to the economy. This is a REAL and durable stimulus, because this extra money injected into the economy never has to be paid back.

The typical household in America spends about \$5,900 a year on energy. Cutting these costs by 30 percent means a near \$1,800 windfall for each family.

On the Democratic side of the aisle, where there is an emphasis on reducing "income inequality," it is critical to understand that lowering energy costs helps the poor far more than the rich. This is because Census Bureau data find that the rich spend far less than half of their income on energy than the poor. So any policy - such as cap and trade, severe EPA emissions regulations, environmental treaties - would hurt the poor far more than the rich. Any measure to slow down domestic fossil fuel

production is nothing more than a regressive tax on those with low incomes.

One study cited in *The Wall Street Journal* found that the savings to the poor from the reduction in natural gas prices were two to three times bigger than the benefits from the Low Income Home Energy Assistant program. And yet shale gas and oil costs taxpayers nothing.

Since energy is a basic input into everything we produce and consume, lower oil prices make EVERYTHING cheaper - from a candy bar to a computer to an airline ticket. Low domestic energy costs - especially from shale gas - is helping revitalize American manufacturing across the country.

6. Government regulation of the oil and gas industry poses a major threat to the revival of the U.S. Economy.

Congress must resist regulations, mandates, and treaties that would jeopardize this treasure chest of domestic energy resources.

In the recent elections, the American voters made it clear, they want jobs to be job number one in America. Yet the new Clean Power Plant rule and the alleged deal President Obama signed with China over climate change threaten tens of thousands of jobs right out of the gate. For example, EPA rules aim to reduce carbon dioxide (CO₂) emissions from U.S. power plants by 30 percent. That's an enormous and costly burden on our power generating utilities. According to Energy Ventures Analysis, an energy research firm, the annual costs for residential, commercial and industrial energy customers in America would be about \$173 billion higher in 2020 —a 37% increase. Average annual household gas and power bills would increase by \$680 or 35%. The poor will take a pounding and all the benefits from today's falling gas prices will be reversed.

Similarly, the climate change pact with China sought by President Obama is little more than unilateral economic disarmament by the United States. Beijing has one quest and that is to replace America as the globe's economic superpower. Raising energy prices and transitioning to highly inefficient forms of electricity production in China is in consistent with that goal, and it's doubly unlikely to happen at a time when the Chinese economy has showed signs of slowing down.

Meanwhile, the Obama administration and the Environmental Protection Agency are deadly serious about strangling U.S. Energy security and production with new anti-carbon mandates.

China is building coal burning energy plants nearly every month. They are trying to figure out how to do fracking so they can get at their oil and gas resources. They are importing huge amounts of coal from the U.S. They just signed a \$300 billion pipeline deal with Putin to transport billions of barrels of gas to China.

Does any of this sound like the agenda of a nation that is ready to swear off fossil fuels?

Europe and in particular Germany bought into the renewable energy/green jobs charade a decade ago. Now their economy is cratering in part because their energy costs have skyrocketed. Industrial production fell last quarter in Germany and high energy prices are a major reason why. Europe's green energy bubble has burst. The U.S. must not follow the policies of the losers.

Americans want a clean environment. We demand clean air and clean water to keep our society healthy. The reductions in pollutants over the last fifty years have been nothing short of miraculous. This committee has done much to ensure that is the case.

But environmental rules need to be made in ways that won't cripple our fossil fuels-driven economy. The top priority now must be to accelerate economic growth, create more jobs, and expand incomes for those in the middle class. No industry is helping achieve that goal more today than our domestic energy producers.

Responses from Steve Moore

Questions from Barbara Boxer:

1. I have no expertise on weather changes and climatology. So I have no professional opinion about whether and how the climate is changing. As an economist, I would say that if climate change is happening, and if it is happening in ways that endanger the planet, solutions are much more likely to come from technology and scientific innovation than any international governmental agreements. As we get richer and more technologically advanced, our capacity to deal with issues like severe weather events is greatly enhanced. Death rates from severe weather events have fallen dramatically over the past century.

Questions from Senator David Vitter:

1. The shale revolution has been the biggest economic story of the last five years. We are seeing the big economic dividend/windfall from this drilling revolution through much lower gas prices at the pump. The oil price in the last six months has fallen from \$105 a barrel in the summer to less than \$60 at the time of this writing. This has put about \$50 billion more into the hands of consumers. It holds down prices and inflation.

Also, the massive increase in US oil and gas production since 2008 has lowered energy prices for US producers. Manufacturing is on a major recovery path in no small part thanks to low electric power costs here relative to other industrialized nations we compete with.

2. China is not committed to reducing its carbon emissions. The December international climate change meetings in Peru did not lead to any resolution on nations cutting their emissions. The BBC described the final agreement as "a weak and ineffectual compromise" while green groups complain that it actually "weakens international climate rules."

China and India, the two major carbon emitters, refused to agree to caps.

In less than one month, Barack Obama's "epic deal" with China president Xi Jinping to reduce greenhouse gas emission standards has been exposed as a sham. Su Wei, China's lead climate negotiator admitted in Lima: "we do not have any clear road map of meeting [emissions] target for 2020."

The lesson of Lima is that the rest of the world is not going to cut its carbon emissions any time soon. China and India, with two billion people, have nearly doubled their carbon emissions over the last decade with no end in sight and this has negated any progress in the U.S. and Europe.

3. Europe is a case study in the heavy economic costs of relying on green energy. Germany in particular has acknowledged that its heavy reliance on wind and solar power has raised electric power costs and damaged the manufacturing base. Germany is now looking to reverse course and rely more heavily on much more economical fossil fuels.

Some European manufacturers are relocating outside of Europe and into the United States where energy is cheaper. US natural gas prices of \$4 are about half the price in Europe and about one-third the

cost in Asia. This has given the US a major competitiveness advantage thanks to smart drilling techniques employed in the US.

Senator WHITEHOUSE. Thank you very much, Mr. Moore. I appreciate your testimony. I thank the entire panel for being here.

Let me first ask Dr. Shindell, you testified that aggressive reductions in methane and black carbon could reducing warming rates over the next decade by about half. You are at Duke University now, which is in North Carolina, which has a coastline which is experiencing some sea level rise. Could you correlate the reduced warming rates as a result of reducing methane and black carbon emissions to the sea level rise that we are seeing in Rhode Island and you are seeing down in North Carolina?

Mr. SHINDELL. Yes, thank you.

Sea level rise is a cumulative process, as heat goes steadily into the oceans. So it is a function of how much we have changed climate or emitted things like carbon dioxide in the past as well as our future emissions. So it would be somewhat less than temperature, which is a bit of a faster response. But it would be of similar magnitude, say on the order of maybe 40 percent rather than 50 percent. So a very, very large difference.

Senator WHITEHOUSE. And you have been a scientist at NASA for the last 20 years or so?

Mr. SHINDELL. Correct.

Senator WHITEHOUSE. You were at the Goddard Institute, a pretty prestigious place?

Mr. SHINDELL. Yes.

Senator WHITEHOUSE. There is a theory that is brooding around Congress that the science of climate change is being fabricated by a global cabal of scientists who are eager to get their hands on research grants and get attention. You been watching the scientific discussion on climate change for many years now from a very prestigious location. As you have watched this debate develop, is there any truth to that theory that we sometimes hear here?

Mr. SHINDELL. There is not only no truth to that theory, there is overwhelming evidence to the contrary. Not only did I work at a NASA institute, but NASA along with other space agencies around the world launches the instruments, and we watch the planet from satellites. We see everything all around the world. And the satellites don't lie. They tell you that the ice caps are shrinking. They tell you that the ocean is rising. They tell you that the temperature is going up. They tell you that the atmosphere is getting wetter as the air holds more water vapor.

They even show that carbon dioxide is rising and they show that methane is increasing. All of the things we are talking about today.

It has been analyzed by independent science bodies from almost every country in the world, almost everybody with credibility, with expertise in the subject matter says that yes, the evidence is overwhelming. The IPCC group sponsored by nations around the world says that the evidence is unequivocal.

Senator WHITEHOUSE. Not a word one usually hears in science.

Mr. Moore, you founded the Free Enterprise Fund with the well-known economist Dr. Arthur Laffer, who was associated with the Reagan administration. Your bio on the Heritage Foundation website identifies Dr. Laffer as having a profound influence on your thinking. Dr. Laffer has supported a carbon fee on economic grounds, if, big if, it is offset with reductions and other taxes.

Mr. MOORE. Right.

Senator WHITEHOUSE. Let me quote him, what we had to say in support: "I do it for pure economics. I am worried about economic growth in the United States and the creation of jobs, output and employment. If you tax people who work, you are going to get less people working. What the carbon tax would do is remove the tax from people who work and put it on a product in the ground. That would be very beneficial for the economy, pure and simple."

Do you agree with Dr. Laffer?

Mr. MOORE. I am familiar with the report that you are talking about that Dr. Laffer put together. There is a big debate among conservative free market economists about whether a swap, where you taxed carbon and you reduce taxes on, say, capital or work, would be something that would be economically efficient. It is something I would certainly be open-minded to. I would have to see the details of the plan. It is certainly true, when you tax something, you want to tax bad things and you want to lower taxes on good things. So work and effort and capital investment are good things, and pollution is obviously a bad thing. So if a deal were well constructed, it might be something there might be bipartisan agreement on.

Senator WHITEHOUSE. You said in your testimony shale gas is reducing greenhouse gas emissions. Why is that a good thing?

Mr. MOORE. Why is it?

Senator WHITEHOUSE. Yes.

Mr. MOORE. Well, because carbon emissions, as a goal we want to reduce carbon emissions. I am not an expert on global warming. But other experts here know far more than I do about that.

Senator WHITEHOUSE. And you don't dispute them? You believe that reducing greenhouse gas emissions is a worthy goal?

Mr. MOORE. Reducing carbon emissions?

Senator WHITEHOUSE. Greenhouse gas emissions was the phrase you used. So I am using your own words.

Mr. MOORE. I think it probably should be a goal, and my point, when you asked me why is it that we are reducing our carbon emissions due to natural gas is because we are converting, as you know, Senator, we are converting electricity production in the United States away from coal and far more toward natural gas. I think next year will be the first year we produce actually more electricity from natural gas than from coal. That has been a positive development.

Senator WHITEHOUSE. The microphone now goes to the distinguished Ranking Member, Senator Vitter of Louisiana.

Senator VITTER. Thank you, and thanks to all of our witnesses. I am sorry I was late. I was on the floor to actually help pass something into law, which doesn't happen every day. I came here as soon as I could, and thank you for all of your testimony.

I will start with Dr. Peiser. Thank you, Dr. Peiser, particularly for traveling so far to be with us.

You brought up with me and my staff the serious concern of the cycle of subsidies that seems to occur once renewable energy mandates are initiated. How has subsidizing renewable energy led to subsidizing other energy sources and industries in Europe? Why

does this seem to occur as a direct and natural consequence of these climate regulations?

Mr. PEISER. The problem, a lot of unintended consequences of well-intended policies occurred mainly because most policymakers were told that the science is settled and therefore the policies are settled. That is, I think, the biggest problem in Europe, that with the kind of hammer of the science, very poorly thought-through policies were adopted. Regardless of the science, the policies make no sense. And even a carbon tax, if I may say so, would not make any sense if it is just adopted by the U.S. Because it has exactly the same effect, that it would drive energy-intensive industries to locations where there is no carbon tax. So a carbon tax would only make sense if it were adopted universally so that there is a level playing field.

In Europe, what has happened is because there is now a situation where there is a lot of renewable energy which is expensive because of the subsidies. But what it is happening, and that is a risk that the U.S. faces even with cheap shale gas, is that conventional power plants are no longer running efficiently. They are only used, or many of them used for backup or only 70 percent. They run uneconomically, they are loss-making.

So what is happening in Europe, the governments in Europe are now subsidizing conventional, have to subsidize conventional power plants to keep them open, to keep the lights on. Now that we have subsidized renewable and we have subsidized conventional power plants, the energy price obviously goes up dramatically, has doubled in the last 10 years by and large. And the industry comes and says, we can't survive with these energy prices, so they are subsidized as well.

That is the sad, sad situation based on well-intentioned policies, policies that have caused a lot of damage, not just to industry but also to a lot of families.

Senator VITTER. OK. And can you also discuss exactly how the opt-out provisions of the new EU deal on climate works, and if you believe member states are beginning to recognize the economic challenges they face in looking for basically a way out, at least in the face of China and India not having anything similar or rigorous?

Mr. PEISER. We have for the first time that I can remember a European leadership that seems to be more skeptical about these policies than the U.S. Administration. I can't recall any time that that has ever happened, because Europe always adopted much more aggressive and much more green policies. Here, the EU leaders have made their targets for 2030 conditional on a legally binding U.N. agreement in Paris. And they have agreed that unless there is this agreement that is binding, and I understand there are now big problems even as we speak in Lima about this very issue, the Europeans will revisit their targets.

So the targets are conditional on a binding agreement, whereas the U.S. Administration seems to be quite happy to go it alone.

Senator VITTER. OK. And Mr. Moore sort of related to that in terms of unilateral versus something else. Could you comment on President Obama's recent deal with China and what did China get out of the United States in the deal?

Mr. MOORE. I am deeply skeptical that China will ever meet these targets that were allegedly agreed to. Actually, if you read the statement by the Chinese president, it says we intend to do this, which is hardly an iron-clad agreement. If you look at that chart, Senator, it is that chart on the third or so page of my testimony, you can see that the last 10 years, while we have reduced our carbon emissions by about 6 percent, China has increased theirs by 156 percent. That doesn't sound like a country that is getting very serious about reducing their carbon emissions.

We do know that China is building substantial numbers of new coal-burning power plants. They are buying a lot of coal from the United States. They also, as I am sure you read, they have a new agreement with Russia where they are going to spend several hundred billion dollars on pipelines to pipeline oil and gas from Russia into China. As I said in my testimony, that doesn't sound like the actions of a country that intends to substantially reduce its fossil fuels production.

Senator VITTER. And in fact, beyond that, couldn't an argument be made that they almost have an incentive to increase their peak several years out, because reductions are measured from a peak?

Mr. MOORE. Look, if their economy continues to grow at the rate that it has, what has happened in China over the last 25 years, one of the great economic miracles of human history, where they have been growing at a 12 to 13 percent compounded rate. Not many economists think they can keep that up. But even if their growth rate falls in half, they are still growing at 6 to 7 percent.

They are going to consume a whole lot, they are going to need coal, they are going to need oil, they are going to need gas, they are going to need nuclear power. And they may also use green energy as well if it can be done and produced in a way that is cost-efficient. I think the point that Dr. Peiser and I are making is that right now it is not cost-efficient. It is substantially higher in cost to generate electricity from wind and solar than it is from coal, natural gas and nuclear power.

Senator VITTER. OK, thank you.

Senator WHITEHOUSE. Senator Merkley and then Senator Boozman.

Senator MERKLEY. Thank you.

Dr. Moore, you are familiar as an economist with the concept of externalities. In Oregon right now we are seeing a fire season that has grown by about 60 days over a couple of decades. We are seeing greater pine beetle damage to our forests. We are seeing problems with the reproduction of seafood, particularly oysters, because of the 30 percent more acidic ocean water. And we have a great drop in the snow pack in the Cascades, which is leading to significant water shortages in the Klamath Basin.

These are externalities that it didn't sound to me like you have calculated into your analysis. Why is that?

Mr. MOORE. You are right, there are externalities with any form of energy production, no question about it. So the tremendous amount of water that is used by modern drilling techniques is certainly a cost. As I said, there are costs to nuclear power in terms of the risk of accidents, there are costs from oil in terms of oil

spills. Obviously wind and solar have external costs as well. We have to kind of balance in the cost and the benefits.

You are quite right, taking in those costs may reduce some of the benefit that I documented by some degree, but not substantially in my opinion. Because we are talking about costs, for example, of energy production from coal and natural gas that is very substantially lower than the cost of producing, say, from windmills or solar paneling.

Senator MERKLEY. I would certainly encourage you to actually look at these externalities seriously. For example, the impact on coral reefs around the world from the greater acidity and the warmer oceans is having a big impact on fisheries around the world. Just these examples, they are multitudinous. And when you add up the costs, it suggests that maybe the calculation is that the costs do exceed the benefit. These are not captured in the price of carbon burning.

I wanted to turn to Dr. Shindell. I read recently, and you mentioned space-based analysis of what is going on on the earth. I believe that I read about satellite data that was related to tracking methane concentrations. I think it referred to a methane bubble in areas where fracking has occurred. There is enough fugitive methane from fracking that it has started to become detectable. Are you familiar with that particular part of the problem?

Mr. SHINDELL. Yes, thank you. What we heard before was that natural gas has a lower greenhouse gas emission than coal. In fact, what is really the case is natural gas has lower carbon dioxide emissions than coal. But methane is a much more powerful greenhouse gas, and hence the focus of part of this bill. Indeed, it only takes a few percent methane leakage to more than offset any benefits that you get from carbon dioxide. So industry tends to report, and in many cases it seems accurate, that their leak rates are extremely low from oil and gas operations, often less than 1 percent.

However, when you measure from aircraft flying overhead, or look down from satellites, often you see far larger methane amounts that are very inconsistent with those estimates derived from industry. They imply several percent.

In fact, you even see places like some towns in Wyoming that have severe ozone levels, greater than, say, New York or Los Angeles, even though there is not a lot of industry, there are not a lot of vehicles. So it is clearly all the pollution coming from the oil and gas extraction operations in the vicinity.

So that is the beauty of having these space-based observations. Researchers are not allowed to go in except where industry permits them to take measurements at the wellhead, at the gas facility. But from the air, you can really see that there are at least, in many cases, or at least in some cases, there are extremely high levels, which means that natural gas is actually contributing more to climate change than coal.

But again, we have the technology to clean it up. So if we use best practices that are in place in some places, if we use those elsewhere, we could really make a big difference.

Senator MERKLEY. Thank you.

Mr. Fay, by various analyses, there is a translation of, if you will, gigatons of carbon dioxide that translates into certain parts per

mission, about eight gigatons, translates into one part per million in the atmosphere. And by some calculations, to have a 50 percent probability of staying within the 2 degrees Centigrade, we can only burn about 500 to 600 gigatons, or create that much carbon dioxide by burning fossil carbon.

If you look at it that way, and on our current trend, we would expend that entire carbon budget within 16 to 20 years. Is that a reasonable way of looking at this particular issue?

Mr. FAY. I am not the carbon guy, but I guess I would have to say that from the industry perspective, we have tried to look at this at longer than a 16 to 20 year timeframe. Because some of these are very long-term issues to resolve. The Montreal Protocol that we have dealt with in the ozone-depleting compounds is now almost 30 years old. And we have identified paths forward for reducing the HFCs that are substitutes that are out there and growing rapidly between now and 2050. It can be done in a cost-effective way, it can increase energy efficiency which can help reduce carbon dioxide output as well.

But I think it is important to take a long-term view in terms of what is achievable and identify goals and objectives that you can reach. I think that is what the industries that are involved in the HFC side have done and have proposed.

Senator MERKLEY. Mr. Fay, thank you very much.

Senator WHITEHOUSE. Senator Boozman.

Senator BOOZMAN. Thank you, Mr. Chairman.

Mr. Moore, you mentioned the problem of income inequality being made worse by high electricity prices impacting single moms, people on fixed incomes. Can you talk a little bit about heavy manufacturing, what that would do to jobs? It sounded like in Mr. Peiser's testimony that in Europe, you have a situation where they are moving jobs offshore to beat the standards that are on them. Here, it looks to me like you have a possibility of meeting the standards, but also in this global economy making it such that without that on you, then your cost point would make it such that you could be competitive.

Can you talk a little bit about that? And the other thing, too, is you have a dirtier world than ever because they are moving them to places where they are not going to do what we do, and we can be proud of our reductions, and we need to continue our reductions. But they are not going to do what we do, and what Europe has done.

Mr. MOORE. So let me answer the first part of our question, which is about this issue of inequality. The big story of the U.S. economy over the last six to 8 weeks, of course, has been the massive and dramatic reduction in gasoline prices. We know why that is happening, gasoline prices are falling primarily because the United States output has increased so significantly.

Now, I just did the calculations on this, Senator. Every time the gasoline price at the pump falls by one penny, by one penny, that is a \$1 billion tax cut for the American consumer. So that means that low income people who don't have to spend \$70 to fill up their tank, but are only spending say, \$50, because we had a 40 percent reduction in the gasoline price, that means they could spend it on

other things. I think Christmas sales are going to be high as a result of these reductions in gas prices.

So this is a big stimulus to the economy. My point was, the people who benefit the most are people at the bottom, because they are paying three to four times the percentage of their income on electric utilities than a wealthy person.

Now, the other point that is related to this, which I find interesting, you here in the Senate debate oftentimes the Low Income Heating and Energy Assistance Program, that is a big program of importance in the State of Rhode Island. There have been some calculations, I can get you the studies on this, that show that the reduction in the natural gas price, because of fracking and horizontal drilling, that reduction in the price in terms of utilities, that has benefited poor, low income Americans, the bottom fifth, to three times as much as the Low Income Heating and Energy Assistance Program.

So think of this gas boom as three times more important for low income people than LIHEAP. So that is a big benefit to the poor.

I think Dr. Peiser could probably answer the second part of your question better than I can.

Senator BOOZMAN. About heavy manufacturing moving overseas and how that affects jobs.

Mr. PEISER. Well, we all know what happened to the textile industry in Europe. It doesn't exist anymore, because it went to cheap labor countries. And there was a big piece in the Financial Times last week saying, cheap energy is the new cheap labor. Manufacturing that requires a lot of energy moves to countries where energy is cheap. That is happening now. The European policymakers are desperate, not because of energy poverty and inequality, they never care about that, but that the industry now is moving away and that European companies, instead of investing in Europe, are investing in North America because of cheap energy. That drives them crazy.

And the other thing is that in Germany, heavy industry is subsidized to the tune of \$3 billion Euros per year. So they are essentially exempt from the energy price that the ordinary families have to pay.

So ordinary families and small businesses are hit twice over. First they have to pay for the extremely high energy price and then they have to pay for the subsidies for the industry, just to stay there.

As I said in my testimony and I have explained it in more detail, if you ever wanted to develop a policy that is most damaging to your country and to your industry, you couldn't make a better policy than the one Europeans have adopted. It is as dramatic as that. And for the first time, European leaders are willing to speak out. This was a taboo issue in Europe. It is not like in the U.S. I understand in the U.S. it is a very partisan issue, very, very heavily debated. In Europe, it was whole party, complete consensus and no one dared ask awkward questions. This has changed. People are beginning to ask these questions, why did we do that and why did no one else follow us.

Senator BOOZMAN. Thank you, Mr. Chairman. I don't think anybody on this panel minds asking awkward questions.

Senator WHITEHOUSE. Thank you, Senator Boozman.

I appreciate very much the testimony of the witnesses. I would ask unanimous consent that my opening statement be made a part of the record, which it was not, because I was not here at the beginning.

[The prepared statement of Senator Whitehouse follows:]

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

Good afternoon. Thank you Chairman Boxer and Ranking Member Vitter for holding this important hearing, and to Senator Murphy [and Senator Collins if she attends] for joining us today and working across the aisle on the Super Pollutants Act. I am pleased to be an original co-sponsor of the bill and hope to see more practical and bipartisan legislation to protect the environment and manage the ever-worsening problem of climate change.

Climate change is a clear and present danger for the American public and the world. Measurements of the atmosphere and oceans reveal dramatic, even unprecedented, changes in the climate. According to the National Oceanic and Atmospheric Administration, the first 10 months of 2014 have been the hottest since record keeping began, and 2014 is on track to be the hottest year on record. We're already seeing that unchecked emissions of greenhouse gases are pushing the climate into new, costly, and potentially dangerous territory.

While we cannot ignore the dominating effect of carbon pollution on the climate, super pollutants like HFCs, black carbon, and methane also contribute to the problem. These super pollutants trap much more heat, ton-for-ton, than carbon dioxide.

Let's consider methane. The latest scientific findings show that the warming potential of methane is 28 times that of carbon pollution when measured over 100 years and 84 times greater over 20 years. Methane is also the second most abundant greenhouse gas emitted by human activities after carbon pollution, and the bulk of U.S. emissions—about 30 percent—are from oil and natural gas production.

Methane that's leaked, vented and flared from oil and gas systems pollutes the environment and wastes a finite resource. Methane is, after all, the principal component of natural gas. Oil and gas producers who fail to prevent emissions of methane are wasting energy and losing potential profits. According to Ceres, in 2012 alone, North Dakota oil and gas producers flared more than \$1 billion worth of natural gas in the Bakken. Addressing methane emissions from oil and gas production and distribution will provide significant economic and environmental benefits.

Some super pollutants are also linked to diminished air quality and threaten public health. For example, the list of health effects from black carbon exposure includes asthma, bronchitis, lung cancer, and premature death. In my home State of Rhode Island, the number of children and adults that suffer from asthma are both higher than the national average. We also have one of the highest rates for lung cancer in the Northeast. Lost school and work days, as well as the costs of inhalers and emergency room visits, add up. Reducing black carbon emissions has traditionally enjoyed bipartisan support in this committee and I believe this bill provides us another opportunity to work together in a bipartisan manner to address this public health threat.

Until there is an economy-wide price on carbon pollution, methane, and other greenhouse gases, we need to use all the tools at our disposal to deal with climate change. This bill aims to do just that. By supporting common-sense measures to reduce the emissions of these powerful greenhouse gases, it can help us reduce the threat of climate change and improve environmental quality.

Thank you Chairman Boxer and Ranking Member Vitter for holding this hearing, and to our distinguished panel of experts for joining us today to help us understand to the risks of super pollutant emissions as well as how we stand to benefit from reducing them.

Senator VITTER. Mr. Chairman, if I could follow you with the same unanimous consent, request for my opening statement.

Senator WHITEHOUSE. Absolutely. That will be done.

Senator WHITEHOUSE. And there is a Politifact that was done with respect to the minority leader's statement that the U.S.-China climate deal means China won't have to do anything for 16 years. And the conclusion of Politifact was that that was a mostly false

statement. I ask unanimous consent that the relevant Politifact be made a part of the record as well. Without objection.
[The referenced information follows:]

11/19/2014

Mitch McConnell says U.S.-China climate deal means China won't have to do anything for 16 years | PolitiFact

Tampa Bay Times
PolitiFact.com



The climate-change agreement between the United States and China "requires the Chinese to do nothing at all for 16 years."

— Mitch McConnell on Wednesday, November 12th, 2014 in a media availability

Mitch McConnell says U.S.-China climate deal means China won't have to do anything for 16 years

By Louis Jacobson on Wednesday, November 19th, 2014 at 10:29 a.m.

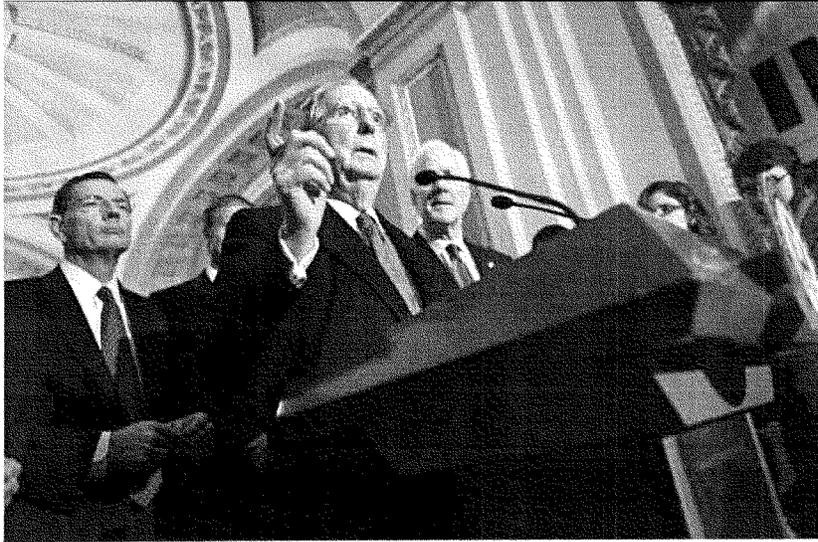


President Barack Obama and President Xi Jinping of China greet children during the State Arrival Welcome Ceremony at the Great Hall of the People in Beijing, China, Nov. 12, 2014. (White House photo)

<http://www.politifact.com/truth-o-meter/statements/2014/nov/19/mitch-mcconnell/mitch-mcconnell-says-us-china-climate-deal-means-c/>

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Sen. Mitch McConnell, R-Ky., answers questions following the weekly Republican policy luncheon at the U.S. Capitol on Nov. 13, 2014.

11/19/2014

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Smoke rises from the Colstrip Steam Electric Station, a coal-burning power plant in in Colstrip, Mont.

During a recent visit to China, President Barack Obama and Chinese President Xi Jinping announced a potentially landmark climate change agreement between the two countries, which are among the world's biggest economies and biggest emitters of greenhouse gases.

Greenhouse gases, and notably carbon dioxide, are produced when burning fossil fuels such as coal and oil for energy. When these gases build up in the atmosphere, most scientists say, they trap heat and raise surface temperatures, leading to changes in climate such as climbing sea levels.

For years, one of the key arguments made by opponents of U.S. efforts to cut carbon emissions has been that rising emissions from other big and fast-growing economies, such as China, could swamp any reductions the United States makes. The agreement with China potentially weakens that argument.

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But congressional Republicans, including incoming Senate Majority Leader Mitch McConnell, R-Ky., weren't pleased with the terms of the accord. McConnell, who represents a coal-producing state, said so on Nov. 12, 2014, while talking to reporters covering a meeting with newly elected members of his Republican conference.

"The president continues to send a signal that he has no intention of moving toward the middle," McConnell said. "I was particularly distressed by the deal he's reached with the Chinese on his current trip, which, as I read the agreement, it requires the Chinese to do nothing at all for 16 years, while these carbon emission regulations are creating havoc in my state and other states across the country."

Several readers asked us to check whether McConnell is right that the bilateral agreement "requires the Chinese to do nothing at all for 16 years."

We turned to the announcement released by the White House on Nov. 12. Here's the relevant portion:

"Today, the presidents of the United States and China announced their respective post-2020 actions on climate change, recognizing that these actions are part of the longer range effort to transition to low-carbon economies, mindful of the global temperature goal of 2°C. The United States intends to achieve an economy-wide target of reducing its emissions by 26%-28% below its 2005 level in 2025 and to make best efforts to reduce its emissions by 28%. China intends to achieve the peaking of CO₂ emissions around 2030 and to make best efforts to peak early and intends to increase the share of non-fossil fuels in primary energy consumption to around 20% by 2030. Both sides intend to continue to work to increase ambition over time."

Boiled down, the key tasks for China in this deal are: 1.) an intention to max out carbon dioxide emissions around 2030, if not sooner, and; 2.) an intention to increase to about 20 percent the proportion of non-fossil fuels, such as renewables, in China's energy mix.

When we asked for backup on his claims, McConnell's office made two reasonable

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points.

First, his office noted that the agreement is based on intentions, rather than on ironclad promises with enforcement mechanisms. They pointed to a column by Robert A. Manning, a senior fellow at the Atlantic Council, an international-affairs think tank, and a veteran of President George W. Bush's State Department. Manning wrote that "this is not a binding agreement and includes no benchmarks to measure progress or penalties to encourage it."

The second point McConnell's office makes is that China may already have been planning to make these emissions cuts anyway.

According to a report in Reuters, the 2030 peak date was "in line with forecasts already made by several state-backed think-tanks, with the China Academy of Social Sciences saying in a study last week that slowing rates of urbanization would likely mean that industrial emissions would peak around 2025-2030 and start to fall by 2040."

In theory, China could "simply shut down a lot of plants on Dec. 31, 2029," Jonathan R. Nash, a law professor at Emory University, told PolitiFact. "In that case, the agreement itself doesn't obligate China to take action before 2030."

Experts said this is theoretically possible, but, in the real world, unlikely.

It will take "significant work" for China to reach the 2030 target, said Ann Carlson, an environmental law professor at UCLA. "You can't stop your emissions immediately. Imagine if China said they would stop emissions today. That would require massive changes to implement -- no increases in driving unless cars were cleaner, no new economic growth without cutting emissions elsewhere, and so on. For China to achieve a cap in emissions by 2030, they will have to begin to find clean energy replacements very soon or seriously limit economic growth."

Michael Oppenheimer, a professor of geosciences and international affairs at Princeton University, agreed.

11/19/2014

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"Given the inertia in the economic and energy systems of China and its recent rates of emissions growth, there is absolutely no way that could happen without ... an earlier slowing of emissions growth," he said. "No sensible policy would allow" any different course, he said.

But as questionable as it is to suggest that China could do nothing until Dec. 31, 2029, and still meet the targets, there's still a second task for China -- to increase non-fossil fuels to about 20 percent of the nation's energy mix by 2030. Because no such infrastructure can be created overnight, China will have to start work on this part well before December 2029.

Indeed, such efforts already appear to be under way, said Michael B. Gerrard, a law professor at Columbia University who has studied the issue. "China is engaged in a massive program of building wind, solar and nuclear energy plants," he said.

Our ruling

McConnell said the climate-change agreement between the United States and China "requires the Chinese to do nothing at all for 16 years."

McConnell's staff has a point that the agreement isn't binding and may simply be codifying changes China had already planned to make. Still, his claim is at best an exaggeration.

While it's theoretically possible that China could meet its emissions target simply by shutting down major plants on Dec. 31, 2029, experts say it would be much less risky to China's economy to spend the next 16 years working toward the goal, rather than doing it overnight.

But even if China did choose to make a literal overnight shift on emissions, that still doesn't account for China's pledge to increase non-fossil-fuel use to 20 percent of its energy mix. Building that infrastructure cannot be done overnight and will take years to carry out, experts said.

11/19/2014

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The statement contains an element of truth but ignores critical facts that would give a different impression, so we rate it Mostly False.



About this statement:

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Washington Post, "GOP congressional leaders denounce U.S.-China deal on climate change," Nov. 12, 2014

White House, "U.S.-China Joint Announcement on Climate Change," Nov. 11, 2014 (Nov. 12, Beijing time)

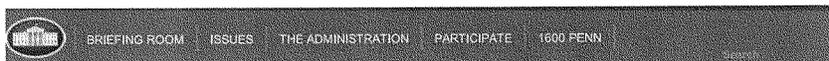
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12/2/2014

FACT SHEET: U.S.-China Joint Announcement on Climate Change and Clean Energy Cooperation | The White House

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The White House
Office of the Press Secretary

For Immediate Release

November 11, 2014

FACT SHEET: U.S.-China Joint Announcement on Climate Change and Clean Energy Cooperation

President Obama Announces Ambitious 2025 Target to Cut U.S. Climate Pollution by 26-28 Percent from 2005 Levels

Building on strong progress during the first six years of the Administration, today President Obama announced a new target to cut net greenhouse gas emissions 26-28 percent below 2005 levels by 2025. At the same time, President Xi Jinping of China announced targets to peak CO₂ emissions around 2030, with the intention to try to peak early, and to increase the non-fossil fuel share of all energy to around 20 percent by 2030.

Together, the U.S. and China account for over one third of global greenhouse gas emissions. Today's joint announcement, the culmination of months of bilateral dialogue, highlights the critical role the two countries must play in addressing climate change. The actions they announced are part of the longer range effort to achieve the deep decarbonization of the global economy over time. These actions will also inject momentum into the global climate negotiations on the road to reaching a successful new climate agreement next year in Paris.

The new U.S. goal will double the pace of carbon pollution reduction from 1.2 percent per year on average during the 2005-2020 period to 2.3-2.8 percent per year on average between 2020 and 2025. This ambitious target is grounded in intensive analysis of cost-effective carbon pollution reductions achievable under existing law and will keep the United States on the right trajectory to achieve deep economy-wide reductions on the order of 80 percent by 2050.

The Administration's steady efforts to reduce emissions will deliver ever-larger carbon pollution reductions, public health improvements and consumer savings over time and provide a firm foundation to meet the new U.S. target.

The United States will submit its 2025 target to the Framework Convention on Climate Change as an "Intended Nationally Determined Contribution" no later than the first quarter of 2015.

The joint announcement marks the first time China has agreed to peak its CO₂ emissions. The United States expects that China will succeed in peaking its emissions before 2030 based on its broad economic reform program, plans to address air pollution, and implementation of President Xi's call for an energy revolution.

China's target to expand total energy consumption coming from zero-emission sources to around 20 percent by 2030 is notable. It will require China to deploy an additional 800-1,000 gigawatts of nuclear, wind, solar and other zero emission generation capacity by 2030 – more than all the coal-fired power plants that exist in China today and close to total current electricity generation capacity in the United States.

Building on Progress

In 2009, U.S. greenhouse gas emissions were projected to continue increasing indefinitely, but President Obama set an ambitious goal to cut emissions in the range of 17 percent below 2005 levels in 2020. Throughout the first term, the Administration took strong actions to cut carbon pollution, including investing more than \$80 billion in clean energy technologies under the recovery program, establishing historic fuel economy standards, doubling solar and wind electricity, and implementing ambitious energy efficiency measures.

Early in his second term, President Obama launched an ambitious Climate Action Plan focused on cutting carbon pollution, preparing the nation for climate impacts, and leading internationally. In addition to bolstering first-term efforts to ramp up renewable energy and efficiency, the Plan is cutting carbon pollution through new measures, including:

- **Clean Power Plan:** EPA proposed guidelines for existing power plants in June 2014 that would reduce power sector emissions 30% below 2005 levels by 2030 while delivering \$55-93 billion in net benefits from



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Senator WHITEHOUSE. Anything further to be made a part of the record?

The record of the hearing will remain open for an additional 2 weeks for anything else that anybody cares to add. I know Mr. Fay is going to be sending us the list of his membership. I appreciate very much the association's testimony in support. I know a lot of work went into this.

This was a potentially kind of an interesting breakthrough moment, to have a bipartisan bill that actually addresses climate change. So I will close by remarking on that. I think that is a good sign that the wall that has divided us is starting to come down in a few ways, the reality of climate change is being acknowledged, the forcing role of greenhouse gases is being acknowledged and now we are debating solutions, which I think is a much healthier conversation than having parallel realities.

With that, we will be adjourned.

[Whereupon, at 3:29 p.m., the hearing was adjourned.]

[Additional material submitted for the record follows.]

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

I would like to thank the Chairman for holding this hearing and thank Senators Murphy and Collins for their legislation that addresses so called short-lived climate pollutants.

I've been working across the aisle for years to address many of these pollutants and welcome this legislation.

Pollutants such as HFCs and black carbon are called short-lived climate pollutants because they don't stay in the air for a long time. But despite their short time in the air, we know they do great damage to our health and to our climate.

That is why reducing these harmful pollutants are a win-win-win. We lessen the threats posed by climate change; we improve public health; AND we create economic opportunities in this country.

And though short-lived climate pollutants isn't the easiest thing to say, some of these pollutants are the easiest and most cost effective climate pollutants to clean up.

For example, the No. 1 source of black carbon in the United States is old, dirty diesel engines. We can retrofit or replace these old, diesel engines with new, American-made technology and reduce black carbon emissions by more than 90 percent.

Without assessing climate benefits, our diesel retrofit programs authorized through the Diesel Emissions Reduction Act are some of the most cost-effective clean air programs we have today. In fact, DERA provides more than \$13 in health and economic benefits for every Federal dollar spent.

I've been proud to work with former Senator Voinovich and Senator Inhofe on reducing black carbon pollution from our diesel engines.

This bill takes another approach to addressing black carbon and I look forward to hearing more.

Before I finish, I would be remiss not to mention the benefits of reducing the short-lived climate pollutant called hydrofluorocarbons—or HFCs. I am pleased to see language in this bill that addresses these pollutants.

As many of you remember, in the 1970's and 80's we faced another global environmental crisis—there was a hole in the ozone and it was growing at an alarming rate. Most scientists believed many of the compounds used globally in refrigerants, aerosols and solvents were to blame.

As a result, the global community came together to phaseout ozone depleting compounds—known as the Montreal Protocol. Since the ratification of the Montreal Protocol, we have seen a 97 percent reduction in the global consumption of controlled ozone depleting substances.

Because HFCs are easy to use, efficient, and safe for the ozone many countries, including ours, transitioned ozone-depleting substances to HFCs. Unfortunately, HFCs have a high global warming potential.

If HFCs usage continues unchecked, HFCs could account for approximately 20 percent of greenhouse gas pollution by 2050. So by using HFCs, we are address one global environmental problem, while contributing to another.

Luckily, companies in this country are already producing replacements for HFCs that can be used just as safely without damaging our climate.

Since 2007, I've worked with my colleagues, stakeholders and the EPA to find a glide path to reduce the usage of HFCs in this country. Although we haven't passed legislation, I am heartened to see the Administration work with industry and the international community to reduce HFCs here at home and globally.

In closing, I believe the Murphy-Collins legislation is an important next step to building on the work we've done here at home—through programs like DERA—and globally to reduce short-term climate pollutants

The New York Times <http://nyti.ms/1t7o1RR>



ASIA PACIFIC

In Step to Lower Carbon Emissions, China Will Place a Limit on Coal Use in 2020

By EDWARD WONG NOV. 20, 2014

BEIJING — China plans to set a cap on coal consumption in 2020, an important step for the country in trying to achieve a recently announced goal of having carbon dioxide emissions peak by around 2030.

The State Council, China's cabinet, released details of an energy strategy late Wednesday that includes capping coal consumption at 4.2 billion tons in 2020 and having coal be no more than 62 percent of the primary energy mix by that year.

Worldwide, coal burning for industrial use is the largest source of carbon dioxide emissions, which are the biggest catalyst of global climate change. China is the biggest emitter of greenhouse gases in the world, and it uses as much coal each year as the rest of the world combined.

In theory, coal consumption might increase beyond 2020, but some researchers say economic trends show the rate of growth in coal use slowing in coming years and peaking about 2020. That means the State Council's timeline is consistent with the findings of those researchers. The numbers announced Wednesday might be further formalized in China's next five-year plan, whose details will be released around March.

Last week, President Obama and President Xi Jinping of China announced a joint pledge to cut or limit carbon dioxide emissions from his country.

China said it would reach an emissions peak "around 2030" and energy from sources other than fossil fuels would make up 20 percent of the total mix

by that year. That announcement was praised by environmental advocates as a significant political move by the two nations.

Environmental advocates on Thursday welcomed the State Council's announcement this week. But, as with the "around 2030" pledge on peak emissions, they said China could make a greater effort — for example, China could cap coal consumption even earlier or at a lower level.

"We think it's definitely a positive sign, in line with what they've said they're going to do," said Alvin Lin, China climate and energy policy director in the Beijing office of the Natural Resources Defense Council, an advocacy group based in New York.

But "we'd like to see it a bit lower than that," he said, "if you're trying to meet the air pollution and air quality targets that they have set, and if you consider all the other environmental and health impacts of coal and the greenhouse gas emissions of coal."

Some Chinese officials began tackling the problem of coal burning with vigor in 2013, when the public outcry over toxic smog — Chinese cities are among the world's most polluted — reached a high pitch. In September 2013, the government announced that provinces in populous parts of eastern China would try to cut coal consumption.

Analysts for Greenpeace East Asia said the amount of coal consumed in the first nine months of 2014 might actually have dropped by 1 to 2 percent compared with the same period last year, based on data from a national coal industry association. The miasmic air remains poisonous, though; the United States Embassy air monitor in Beijing labeled the air quality on Wednesday and Thursday "hazardous."

Last year, China consumed 3.61 billion tons of coal, and coal made up 66 percent of the primary energy mix. Li Shuo, a researcher at Greenpeace East Asia, said those figures indicate that China's goals for 2020 should be more ambitious.

"What they laid out is a reference point, and then they will work from there to squeeze out more stuff," he said.

China's recent announcements on coal consumption and the 2030

emissions peak could weaken arguments in the United States by opponents of President Obama's climate change policy, who often ask why America should act if China is not committed, said Alex L. Wang, a law professor at the University of California at Los Angeles who studies Chinese environmental policy and regulations.

"Opponents of climate change regulation in the U.S. have long used China's emissions as an excuse for inaction on the U.S. side," he said. "Last week's joint announcement is the beginning of the end for this line of argument."

Correction: November 24, 2014

An earlier version of a picture caption with this article misspelled the name of the coal mine and misstated its location. It is the Tashan coal mine, not Tahsan, and it is in Shanxi Province, not Shaanxi Province. (The two provinces are neighbors.)

Correction: November 24, 2014

An earlier version of the above correction misspelled the name of the coal mine as Tahsan.

A version of this article appears in print on November 21, 2014, on page A4 of the New York edition with the headline: In Step to Lower Carbon Emissions, China Will Place a Limit on Coal Use for 2020.

