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# THE ADMINISTRATION'S CLIMATE PLAN: FAILURE BY DESIGN

## HEARING

BEFORE THE

## COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
## HOUSE OF REPRESENTATIVES

ONE HUNDRED THIRTEENTH CONGRESS

SECOND SESSION

September 17, 2014

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# CONTENTS

**September 17, 2014**


| | Page |
|---|---|
| Witness List | 2 |
| Hearing Charter | 3 |

**Opening Statements**

| | |
|---|---|
| Statement by Representative Lamar S. Smith, Chairman, Committee on Science, Space, and Technology, U.S. House of Representatives | 11 |
| Written Statement | 11 |
| Statement by Representative Eddie Bernice Johnson, Ranking Member, Committee on Science, Space, and Technology, U.S. House of Representatives | 12 |
| Written Statement | 14 |

**Witnesses:**

| | |
|---|---|
| The Honorable John Holdren, Director, Office of Science and Technology Policy, Executive Office of the President | |
| Oral Statement | 15 |
| Written Statement | 18 |
| Ms. Janet McCabe, Acting Assistant Administrator, Office of Air and Radiation, U.S. Environmental Protection Agency | |
| Oral Statement | 42 |
| Written Statement | 44 |
| Discussion | 51 |

**Appendix I: Answers to Post-Hearing Questions**

| | |
|---|---|
| The Honorable John Holdren, Director, Office of Science and Technology Policy, Executive Office of the President | 88 |
| Ms. Janet McCabe, Acting Assistant Administrator, Office of Air and Radiation, U.S. Environmental Protection Agency | 98 |

**Appendix II: Additional Material for the Record**

| | |
|---|---|
| Article submitted by Representative Eddie Bernice Johnson, Ranking Member, Committee on Science, Space, and Technology, U.S. House of Representatives | 106 |
| Article submitted by Representative Suzanne Bonamici, Committee on Science, Space, and Technology, U.S. House of Representatives | 113 |
| Articles submitted by Representative Eric Swalwell, Committee on Science, Space, and Technology, U.S. House of Representatives | 118 |
| Letters submitted by Representative Donna F. Edwards, Committee on Science, Space, and Technology, U.S. House of Representatives | 121 |

# THE ADMINISTRATION'S CLIMATE PLAN: FAILURE BY DESIGN

**WEDNESDAY, SEPTEMBER 17, 2014**

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
*Washington, D.C.*

The Committee met, pursuant to call, at 10:04 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Lamar Smith [Chairman of the Committee] presiding.

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States
House of Representatives
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
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## *The Administration's Climate Plan: Failure by Design*

Wednesday, September 17, 2014
10:00 a.m.-12:00 p.m.
2318 Rayburn House Office Building

Witnesses

**The Honorable John Holdren**, Director, Office of Science and Technology Policy, Executive Office of the President

**Ms. Janet McCabe**. Acting Assistant Administrator, Office of Air and Radiation, U.S. Environmental Protection Agency

# U.S. HOUSE OF REPRESENTATIVES
# COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
# FULL COMMITTEE

## HEARING CHARTER

***The Administration's Climate Plan: Failure by Design***

Wednesday, September 17, 2014
10:00 a.m. – 12:00 p.m.
2318 Rayburn House Office Building

**PURPOSE**

The Committee on Science, Space, and Technology will hold a hearing entitled *The Administration's Climate Plan: Failure by Design* on Wednesday, September 17th, in Room 2318 of the Rayburn House Office Building. The hearing will examine the role of science in the Administration's Climate Action Plan, the EPA's proposed greenhouse gas regulations for existing power plants, and other EPA rules currently under consideration by the Administration. The hearing will discuss the scientific and economic impact analyses incorporated Administration's Climate Action Plan; the scientific, technological and legal hurdles to meeting the Administration's carbon-reduction goals as well as the economic and energy security impacts of meeting those goals; and how the Administration reconciled scientific and technological concerns raised by federal science agencies, scientific advisory boards and committees, as well as the American public in formulating the Administration's Climate Action Plan and EPA's proposed greenhouse gas regulations for existing power plants among a host of other EPA regulations.

**WITNESS LIST**

- **The Honorable John Holdren,** Director, Office of Science and Technology Policy, Executive Office of the President
- **Ms. Janet McCabe,** Acting Assistant Administrator, Office of Air and Radiation, U.S. Environmental Protection Agency

**BACKGROUND**

***Global Carbon Emissions***

Sources of carbon emissions are global in nature. According to the Energy Information Agency (EIA), while the global emissions of carbon dioxide from the consumption of energy have increased annually, the United States has reduced emissions in recent years by over 500 million metric tons from 2007 to 2011.[1] In 2011, China emitted over 8.7 billion metric tons of

[1] U.S. Energy Information Administration, International Energy Statistics, *Available at:* http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=90&pid=44&aid=8

carbon, accounting for over a quarter of the world's carbon pollution.[2] In 2007, the United States was responsible for roughly 20% of global emissions, but by 2011, this had dropped to 16.8%.[3]

In September 2014, the EIA released a report titled *International Energy Outlook 2014*, which documents both current and future global energy consumption and emissions.[4] Figure 1 below illustrates the historical emissions of developed countries [OECD[5]] and non-developed countries [non-OECD] since the 1990s and projects carbon emissions through 2040. The report finds that, while OECD countries like the United States have leveled or reduced emissions, non-OECD countries have contributed the largest amounts to global carbon emissions since the mid-2000s. As the graph indicates, non-OECD countries will continue to constitute an increasingly larger share of global emissions through at least 2040.[6] Non-OECD countries are estimated to account for 69% of global carbon emissions in 2040, while OECD countries will make up 31%.[7] The continued use of fossil fuels is predicted to be the major source of carbon emissions as developing countries continue to support their economic growth.[8]

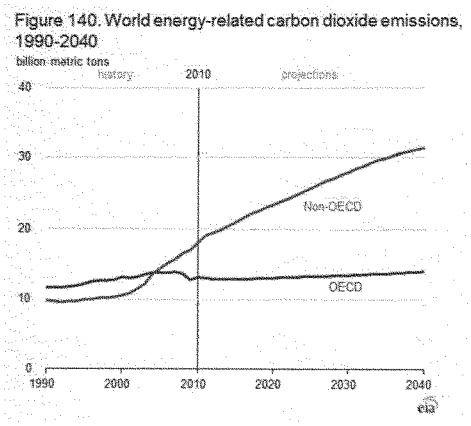



**Figure 1 Source: Energy Information Administration,** Available at: Energy Information Administration, *Available at* http://www.eia.gov/forecasts/ieo/pdf/0484(2014).pdf

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[2] U.S. Energy Information Administration, International Energy Statistics, Available at: http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=90&pid=44&aid=8

[3] Ibid.

[4] U.S. Energy Information Administration, International Energy Outlook 2014, *Available at:* http://www.eia.gov/forecasts/ieo/pdf/0484(2014).pdf

[5] The Organization for Economic Co-Operation Development promotes policies that improve the economic and social well-being of people around the world. Members of OECD are generally the most developed countries around the world. Non-OECD countries are generally still emerging economically. More information available at: http://www.oecd.org/about/membersandpartners/

[6] U.S. Energy Information Administration, Energy-Related Caron Dioxide Emissions, Overview, International Energy Outlook 2014, *Available at* http://www.eia.gov/forecasts/ieo/emissions.cfm

[7] Ibid.

[8] Ibid.

***The President's Climate Action Plan***

The White House released the President's Climate Action Plan in June 2013. The plan outlines various executive actions that the President and his Administration plan to take to reduce carbon pollution in America, prepare the United States for the impacts of climate change, and lead international efforts to combat climate change. [9]

In the Climate Action Plan, the President proposes to issue regulations and technology based standards to reduce carbon emissions.[10] This year EPA proposed regulations on new and existing power plants.[11] EPA has plans to issue regulations for refineries and other industry sectors.[12]

The plan also supports a goal of doubling renewable electricity generation by 2020[13] and modernizing the electric grid.[14] In addition, the plan takes aim at the transportation sector, building on passenger vehicle fuel economy standards by increasing standards for heavy-duty vehicles.[15] Likewise, the plan proposes to reduce greenhouse gas emissions from homes, businesses, and factories through new energy efficiency standards.[16]

The President's Climate Action Plan outlines initiatives to prepare America for the impacts of climate change.[17] The plan establishes state, local, and tribal task forces on climate preparedness.[18] The plan proposes to protect our economy and natural resources by identifying vulnerabilities of key sectors to climate change. It also promotes land and water conservation, agricultural sustainability, drought management, reduction of wildfire risks, and preparations for future floods.[19]

The plan also proposes to work with other countries to help take action to address climate change through multilateral engagements with major world economies and expanding bilateral cooperation with major emerging economies.[20] Finally, the President's Climate Action Plan will lead efforts to address climate change through international negotiations, specifically the United Nations Framework Convention on Climate Change.[21]

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[9] Executive Office of the President, The President's Climate Action Plan, June 2013, *Available at:* http://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf

[10] Ibid, Page 6.

[11] U.S. Environmental Protection Agency, Regulatory Actions, Carbon Pollution Standards, *Available at:* http://www2.epa.gov/carbon-pollution-standards/regulatory-actions

[12] U.S. Environmental Protection Agency, Regulatory Agendas and Regulatory Plans, *Available at:* http://www2.epa.gov/laws-regulations/regulatory-agendas-and-regulatory-plans#background

[13] Executive Office of the President, The President's Climate Action Plan, June 2013, Page 6.

[14] Ibid, Page 7.

[15] Ibid, Page 8.

[16] Ibid, Page 9.

[17] Ibid, Page 12.

[18] Ibid, Page 14.

[19] Ibid, Page 15.

[20] Ibid. Page 17.

[21] Ibid. Page 21.

***EPA Regulations***

Following the Supreme Court's 5-4 decision in *Massachusetts v. EPA*,[22] the Agency promulgated numerous standards and proposed rules aimed at reducing greenhouse gas (GHG) emissions. These include:

- 2009 *Endangerment Finding*, where "EPA determined that greenhouse gases endanger the health and welfare of Americans;"[23]
- *Light Duty Vehicle Rule*, in which "EPA coordinated with the National Highway Traffic Safety Administration to develop harmonized regulations to reduce greenhouse gas emissions and improve the fuel economy of light-duty vehicles;"[24] and
- *Tailoring Rule*, where "EPA set greenhouse gas emission thresholds to define when permits under the New Source Review Prevention Significant Deterioration (PSD) and title V Operating Permit programs are required for new and existing industrial facilities."[25]

Climate science—and regulatory actions informed by such science—are among the most complex and controversial issues facing policymakers. President Obama has increasingly signaled his intention to propose significant, new executive actions and regulatory measures aimed at addressing climate concerns.[26]

According to EPA, power plants are the Nation's largest source of carbon pollution and "account for roughly one-third of all domestic greenhouse gas emissions in the United States."[27] (See Figure 2)

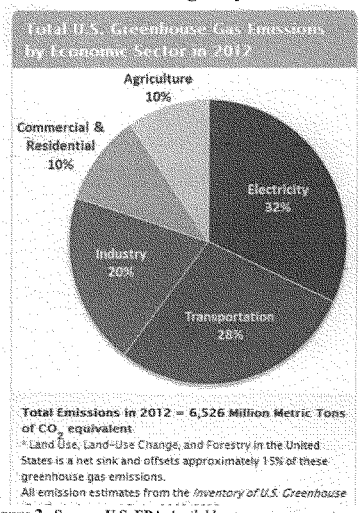



**Figure 2. Source: U.S. EPA** *Available at* http://www.epa.gov/climatechange/ghgemissions/sources.html

[22] Massachusetts v. U.S. Environmental Protection Agency, 549 U.S. 497 (2007) *available at:* http://www.supremecourt.gov/opinions/06pdf/05-1120.pdf.

[23] U.S. Environmental Protection Agency, "Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act; Final Rule." Dec. 2009. *Available at:* http://www.gpo.gov/fdsys/pkg/FR-2009-12-15/pdf/E9-29537.pdf.

[24] U.S. Environmental Protection Agency, "Light-Duty Vehicle Greenhouse Gas Emissions Standards and Corporate Average Fuel Economy Standards; Final Rule." May 2010. *Available at:* http://www.gpo.gov/fdsys/pkg/FR-2010-05-07/pdf/2010-8159.pdf.

[25] *See e.g.* U.S. Environmental Protection Agency. "Prevention of Significant Deterioration and Title V Greenhouse gas Tailoring Rule Step 3 and GHG Plant wide Applicability Limits; Final Rule" July 2012. *Available at:* http://www.gpo.gov/fdsys/pkg/FR-2012-07-12/pdf/2012-16704.pdf.

[26] See: http://www.whitehouse.gov/the-press-office/2013/06/25/remarks-president-climate-change and http://www.whitehouse.gov/climate-change for examples.

[27] U.S. Environmental Protection Agency, News Release, June 2014, *Available at:* http://yosemite.epa.gov/opa/admpress.nsf/bd4379a92ceceeac8525735900400c27/5bb6d20668b9a18485257ceb00490c98!OpenDocument

**POWER PLANT REGULATORY CONTEXT**

Section 111 of the Clean Air Act (CAA) establishes a unique technology-based mechanism for controlling emissions from "stationary sources" (i.e., power plants). Section 111 provides authority for EPA to promulgate standards which apply to new and modified sources. Specifically, EPA is directed to set standards based on "the degree of emission limitation achievable through the application of the best system of emission reduction which (taking into account the cost. . .) the Administrator determines has been adequately demonstrated."[28] In setting the standard, EPA is given some flexibility in that "emission limits may be established either for equipment within a facility or for an entire facility."[29]

Section 111 lays out different approaches for new and existing sources. Under Section 111(b), the EPA has the authority to develop a "federal program to address new, modified and reconstructed sources by establishing standards of performance."[30] In contrast, EPA explains that "section 111(d) of the Act requires states to develop plans for *existing* sources of noncriteria pollutants (i.e., a pollutant for which there is no national ambient air quality standard) whenever EPA promulgates a standard for a new source."[31]

***New Power Plants***

EPA first proposed a New Source Performance Standards (NSPS) for emissions for carbon dioxide (CO2) from power plants in April 2012. However, after more than 2.5 million comments on the original proposal, EPA decided that a new approach was warranted and rescinded the original proposal.[32] Consequently, on September 20, 2013 Administrator Gina McCarthy announced EPA's re-proposed CO2 NSPS for new fossil fuel-based electric generating units (EGUs).

Under EPA's NSPS proposal, the Agency concluded that Carbon Capture and Storage (CCS) has been adequately demonstrated as a technology for controlling CO2 emissions in full-scale commercial applications at coal-fired EGUs, while reaching the opposite conclusion—that CCS is not adequately demonstrated—in the case of gas-fired EGUs. Based on this determination, EPA proposed an emissions limit for coal-fired sources of 1,100 lb CO2/MWH and proposed standards for natural gas combined cycle sources from 1,000 to 1,100 lb CO2/MWH depending on the size and type of unit. EPA did not include modified and reconstructed plants in the proposed rule. EGUs that primarily fire biomass are exempted from

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[28] Clean Air Act § 111(a)(1), 42 USCA § 7411(a)(1) (2006).

[29] U.S. Environmental Protection Agency, Background on Establishing New Source Performance Standards Under the Clean Air Act, *Available at:* http://www2.epa.gov/sites/production/files/2013-09/documents/111background.pdf

[30] U.S. Environmental Protection Agency, Fact Sheet: Reducing Carbon Pollution From Power Plants, *Available at:* http://www2.epa.gov/sites/production/files/2013-09/documents/20130920technicalfactsheet.pdf

[31] U.S. Environmental Protection Agency, Region 7 Air Program, Section 111(d) Plans, *Available at:* http://www.epa.gov/Region7/air/rules/111d.htm

[32] Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generating Units, Proposed Rule, Preamble p. 14-5, Sep. 20, 2013. *Available at:* https://www.federalregister.gov/articles/2014/01/08/2013-28668/standards-of-performance-for-greenhouse-gas-emissions-from-new-stationary-sources-electric-utility#h-18

the proposed rule.[33] Find more information on CCS and EPA's carbon rules in hearing held last March: http://science.house.gov/hearing/subcommittee-energy-and-subcommittee-environment-joint-hearing-science-capture-and-storage.

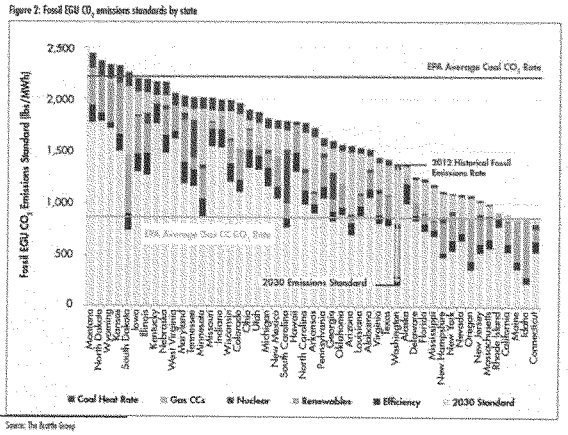
***Existing Power Plants***

On June 2, 2014, EPA issued its "Clean Power Plan" under section 111(d), which addressed carbon emissions from existing fossil-fueled power plants. Just prior to EPA's release, President Obama made these regulations the focus of his Weekly Radio Address.[34]

EPA explains the key difference between section 111(d), for existing power plants, and 111(b) for new and modified plants: "Section 111(d)'s mechanism for regulating existing sources differs from the one that CAA section 111(b) provides for new sources because CAA section 111(d) contemplates states submitting plans that establish 'standards of performance' for the affected sources and that contain other measures to implement and enforce those standards."[35]

The Agency believes the proposed Clean Power Plan will "lower the carbon intensity of power generation in the United States by approximately 30% in 2030 from carbon dioxide emissions levels in 2005. The agency predicts that under the Clean Power Plan, electricity bills will decline by "roughly 8 percent"[36] and that the amount of U.S. electricity generated by coal-fired EGUs will decline by at least 25%. To achieve this goal, EPA is giving each state a numerical carbon reduction target, based on the state's existing power generation portfolio."[37] (See Figure 3.)

Figure 2: Fossil EGU $CO_2$ emissions standards by state




Source: The Brattle Group

[33] *Id.* at 30, fn. 8.

[34] http://www.whitehouse.gov/blog/2014/05/31/weekly-address-reducing-carbon-pollution-our-power-plants

[35] U.S. Environmental Protection Agency, *Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units*, Proposed Rule, 79 FR 34832, June 2, 2014.

[36] U.S. Environmental Protection Agency, News Release, June 2014, *Available at:* http://yosemite.epa.gov/opa/admpress.nsf/bd4379a92ceceeac8525735900400c27/5bb6d20668b9a18485257ceb00490c98!OpenDocument

[37] Congressional Research Service, *EPA's Proposed Greenhouse Gas Regulations: Implications for the Electric Power Sector*. June 23, 2014. *Available at:* http://www.crs.gov/pdfloader/R43621.

Specifically, EPA set each state's required level of carbon reduction assuming that each state could recognize a set level of carbon reductions through the use of four "building blocks." Broadly speaking, the four blocks encompass:[38]

1. Installing technologies to increase efficiency at power plants.
2. Giving Natural Gas Combined-Cycle plants priority over steam-boilers.
3. Building new renewable power generation.
4. End-user efficiency technologies and programs that reduce power demand.

EPA proposes that these building blocks represent the "best system of emissions reduction" that has been adequately demonstrated for fossil-fuel power plants regulated under the EPA rule.

According to EPA, the proposed rule will be "implemented through a state-federal partnership under which states identify a path forward using either current or new electricity production and pollution control policies to meet the goals of the proposed program. The proposal provides guidelines for states to develop plans to meet state-specific goals to reduce carbon pollution and gives them the flexibility to design a program that makes the most sense for their unique situation."[39]

***Modified Power Plants***

On the same day as the 111(d) "Clean Power Plan," EPA also unveiled a separate 111(b) "Modified Source Proposal," in which EPA explained:

> *For more than four decades, the EPA has used its authority under CAA section 111 to set cost-effective emission standards that ensure newly constructed, reconstructed and modified stationary sources use the best performing technologies to limit emissions of harmful air pollutants. In this proposal, the EPA is following the same well-established interpretation and application of the law under CAA section 111 to address GHG emissions from modified and reconstructed fossil fuel-fired electric steam generating units and natural gas-fires stationary combustion turbines.*[40]

The proposed rule for Modified Sources only applies to fossil-fueled power plants that undergo major modifications or reconstruction. In contrast with the broad approach EPA utilized for existing power plants, this proposal identifies a "combination of best operating practices and equipment upgrades" as the "best system of emission reduction" and arrives at a unit specific standard requiring 2% efficiency gains.

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[38] U.S. Environmental Protection Agency, *Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units*, Proposed Rule, 79 FR 34832, June 2, 2014.

[39] U.S. Environmental Protection Agency, News Release, June 2014, *Available at:* http://yosemite.epa.gov/opa/admpress.nsf/bd4379a92ceceeac8525735900400c27/5bb6d20668b9a18485257ceb00490c98!OpenDocument

[40] U.S. Environmental Protection Agency, "Carbon Pollution Standards for Modified and Reconstructed Stationary Sources: Electric Utility Generating Units; Proposed Rule." June 2014. *Available at:* http://www.gpo.gov/fdsys/pkg/FR-2014-06-18/pdf/2014-13725.pdf.

**ADDITIONAL READING**

CONGRESSIONAL RESEARCH SERVICE. *Climate Change and Existing Law: A Survey of Legal Issues Past, Present, and Future.* March 10, 2014. *Available at* http://www.crs.gov/pdfloader/R42613.

CONGRESSIONAL RESEARCH SERVICE. *EPA's Proposed Greenhouse Gas Regulations: Implications for the Electric Power Sector.* June 23, 2014. *Available at* http://www.crs.gov/pdfloader/R43621.

CONGRESSIONAL RESEARCH SERVICE. *EPA's Proposed Greenhouse Gas Regulations for Existing Power Plants: Frequently Asked Questions.* July 3, 2014. *Available at* http://www.crs.gov/pdfloader/R43572 .

U.S. ENVIRONMENTAL PROTECTION AGENCY. *Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units*, Proposed Rule. 79 FR 34832. June 2014. *Available at* http://www2.epa.gov/carbon-pollution-standards/clean-power-plan-proposed-rule.

U.S. ENVIRONMENTAL PROTECTION AGENCY. *Carbon Pollution Standards for Modified and Reconstructed Stationary Sources: Electric Utility Generating Units, Proposed Rule.* 79 FR 34960. June 2014. *Available at* http://www.gpo.gov/fdsys/pkg/FR-2014-06-18/pdf/2014-13725.pdf.

U.S. ENVIRONMENTAL PROTECTION AGENCY. *Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generating Units, Proposed Rule.* 40 CFR Part 60. Sep. 20, 2013. *Available at* http://www2.epa.gov/carbon-pollution-standards/2013-proposed-carbon-pollution-standard-new-power-plants.

Chairman SMITH. The Committee on Science, Space, and Technology will come to order. Welcome to today's hearing titled "The Administration's Climate Plan: Failure by Design." I am going to recognize myself for an opening statement and then the Ranking Member.

Today we look at one of the most aggressive new government programs in our country's history. The Obama Administration calls it the Climate Action Plan. It empowers the Departments of Interior, Energy, Agriculture, Defense, Transportation, Housing and Urban Development, Health and Human Services, National Institute of Standards and Technologies, NOAA, FEMA, the U.S. Army Corps of Engineers, and the EPA to implement broad climate policies and programs with great cost and little benefit to the American people.

The cornerstone of the White House sweeping Climate Action Plan is EPA's power plant regulation. Extending well beyond the power plants themselves, this rule will increase the cost of electricity and the cost of doing business. It will make it harder for the American people to make ends meet. In fact, EPA's own data shows us that its power plant regulation would eliminate less than one percent of global carbon emissions. Analysis shows this would reduce sea-level rise by the thickness of a mere three sheets of paper, at best. EPA's mandates will be difficult for states to meet even under ideal circumstances. If energy prices or energy demands escalate, the costs of meeting those mandates will soar and American families will be forced to pay the bill.

Charles McConnell, a former Assistant Secretary for Energy appointed by President Obama, has taken the Administration to task for creating a plan doomed to fail. In a recent op-ed, Mr. McConnell asks, "Have we lost our minds? Has this administration convinced itself that it can mandate something that is fundamentally useless? Does the EPA think the American public and global community are not capable of seeing the illusion for what it is?"

What is clear is that by eliminating affordable, reliable power options, the regulation will increase the energy prices for the majority of Americans. That means everything will cost more, from electricity to gasoline to food. Higher costs will drive companies out of business, kill good jobs, and leave even more Americans unemployed.

Until this Administration can propose a detailed strategy, tell us the total cost, and show us exactly what we will get for the sacrifice, we are just asking the American people to waste their money. America cannot afford to drive its economy over a cliff with the hopes that the rest of the world will make the same mistake. The only economy the EPA's plan will help is that of our competitors.

[The prepared statement of Mr. Smith follows:]

PREPARED STATEMENT OF CHAIRMAN LAMAR S. SMITH

Today we look at one of the most aggressive new government programs in our country's history. The Obama Administration calls it the Climate Action Plan.

It empowers the Departments of Interior, Energy, Agriculture, Defense, Transportation, Housing and Urban Development, Health and Human Services, National Institute of Standards and Technologies, NOAA, FEMA, the U.S. Army Corps of Engi-

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Chairman SMITH. And that concludes my opening statement. The Ranking Member, the gentlewoman from Texas, Ms. Johnson, is recognized for hers.

Ms. JOHNSON. Thank you very much, Mr. Chairman, and good morning to all.

I would like to extend a warm welcome to our witnesses, Dr. Holdren and Ms. McCabe, and thank both of you for being here this morning. It is nice to see you again, and I appreciate you taking time to appear before us today.

This morning we are going to discuss the President's Climate Action Plan and a part of that plan, a proposal by the Environmental Protection Agency to cut carbon emissions from the largest source of those emissions: power plants.

I would like to begin by noting the title given to this morning's hearing by my Republican colleagues, "The Administration's Climate Plan: Failure by Design." "Failure by design" is an ironic choice of words considering my colleagues' preferred alternative appears to be doing nothing and hiding our collective heads in the sand. We all know that such inaction will not solve anything, and it doesn't—it certainly won't stop the Earth from warming, and in my opinion, the Majority's "do nothing" plan is a real example of failure by design.

I also know that some still question whether climate change is real, but surely we are now beyond debating that question. Reports based on the work of the world's top scientists such as the U.S. National Climate Assessment and those from the U.N. Intergovernmental Panel on Climate Change have sent a stark message to our nation's leaders and the international community, namely, the adverse effects of climate change are evident today and require immediate action or these adverse effects will grow dramatically worse.

To be fair, in trying to understand a phenomenon of this magnitude, the job of science will never be done. It will continue to evolve. We must always keep looking for new answers, replacing opinions with data, and projections with observations. We must continue to innovate in how we predict, measure, prevent, and adapt to climate change. That is the nature of science and of our stewardship to this planet.

However, we in Congress have to acknowledge that we are not the experts and that allowing partisan politics to distort scientific understanding of climate change is cynical and shortsighted. We may not agree on where the uncertainties within climate science lie but we should all be able to understand that vast and avoidable uncertainties will remain if we stop the progress of climate research.

Experts from industry, academia, and every level of government are calling on us to help prepare our communities for the threats they face due to climate change. We must answer their call and act.

Cutting carbon emissions from the power sector is critical to any effort to address climate change, and that is why I am supportive of the EPA's Clean Power Plan. EPA's proposal, like the rest of the President's Climate Action Plan, is a bold step forward our Nation needs. It gives states the flexibility to develop innovative policies that cater to regional differences. It is based on strategies already in use such as improving energy efficiency and encouraging the development of renewables.

Let us be clear: EPA is not imposing a specific set of measures. States will choose what goes into their plans and they can work alone or as part of a multi-state effort to achieve meaningful reductions. These are commonsense steps that will lead to a healthier environment, because acting on climate change is not only an environmental imperative, but a public health and economic one as well.

Among the many health concerns, greater risk of asthma attacks, heat stroke, and respiratory disease are all consequences of a warming climate. Likewise, energy demand, agricultural production, labor productivity, and the risks to coastal properties are just a few of the economic areas where climate change has already taken, and will continue to take, its toll.

We as a Nation must act today to address climate change if we are to preserve our quality of life for our children and grandchildren. The negative consequences of climate change are not abstract scientific predictions for the far-off future. We are facing some of these consequences now and they are affecting every American.

I look forward to working with this Administration as it puts forward policies like the Clean Power Plan and the Climate Action Plan, which will ensure a vibrant future economy and a safe and healthy environment.

Thank you, Mr. Chairman, and before and I yield back, I want to share that there is an article from ThinkProgress.org that I would like to submit to the record. While some in Congress still refuse to admit that climate change is even happening, there is evidence here where this article describes how eight major food com-

panies have accepted the reality of climate change and are prepared to address the threats posed to their products and financial interests: Chipotle, Green Mountain, Michael Foods, Big Hard Pit brands, Omega Protein, Marine Harvest ASA, and most notably, Heinz and Coca-Cola. To quote the beverage titan: "Changing weather patterns along with the increase frequency or duration of extreme weather conditions could impact the availability or increase the cost of key raw materials that the company uses to produce its products. In addition, the sales of these products can be impacted by weather conditions."

I ask unanimous consent that this article be included in the record.

[The prepared statement of Ms. Johnson follows:]

PREPARED STATEMENT OF RANKING MEMBER EDDIE BERNICE JOHNSON

Thank you, Mr. Chairman. I'd like to extend a warm welcome to our witnesses, Dr. Holdren and Ms. McCabe. Thank you both for being here this morning. It is nice to see you again and I appreciate you taking the time to appear before us today. This morning we are going to discuss the President's Climate Action Plan and a part of that plan, a proposal by the Environmental Protection Agency to cut carbon emissions from the largest source of those emissions—power plants.

I'd like to begin by noting the title given to this morning's hearing by my Republican colleagues, "The Administration's Climate Plan: Failure by Design." "Failure by design," is an ironic choice of words considering my colleagues' preferred alternative appears to be doing nothing and hiding our collective heads in the sand. We all know that such inaction will not solve anything, and it certainly won't stop the Earth from warming. In my opinion, the Majority's "do nothing" plan is the real example of "failure by design."

I also know that some still question whether climate change is real, but surely we are now beyond debating that question. Reports based on the work of the world's top scientists such as the U.S. National Climate Assessment and those from the U.N. Intergovernmental Panel on Climate Change have sent a stark message to our nation's leaders and the international community, namely: the adverse effects of climate change are evident today and require immediate action or these adverse effects will grow dramatically worse.

To be fair, in trying to understand a phenomenon of this magnitude, the job of science will never be done. It will continue to evolve. We must always keep looking for new answers, replacing opinions with data, and projections with observations. We must continue to innovate in how we predict, measure, prevent, and adapt to climate change. That is the nature of science and of our stewardship of the planet.

However, we in Congress have to acknowledge that we are not the experts, and that allowing partisan politics to distort the scientific understanding of climate change is cynical and shortsighted. We may not agree on where the uncertainties within climate science lie, but we should all be able to understand that vast and avoidable uncertainties will remain if we stop the progress of climate research.

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We as a nation must act today to address climate change if we are to preserve our quality of life for our children and grandchildren. The negative consequences of climate change are not abstract scientific predictions for the far-off future. We are facing some of these consequences now and they are affecting every American. I look forward to working with this Administration as it puts forward policies like the Clean Power Plan and the Climate Action Plan, which will ensure a vibrant future economy and a safe and healthy environment. Thank you, and I yield back.

Chairman SMITH. Thank you, Ms. Johnson, and without objection, those materials will be a part of the record, though I think you have just succeeding in reading almost all of it into the record already.

Ms. JOHNSON. That is okay.

Chairman SMITH. We will get a double dip on that.

[The information appears in Appendix II]

Chairman SMITH. I will now proceed to introduce our witnesses, and we do appreciate their being here today.

Our first witness is the Honorable John Holdren. Dr. Holdren serves as the Director of the Office of Science and Technology Policy at the White House, where he is both the Assistant to the President for Science and Technology and Co-Chair of the President's Council of Advisors on Science and Technology called PCAST. Prior to his current appointment by President Obama, Dr. Holdren was a Professor in both the Kennedy School of Government and the Department of Earth Science at Harvard. Before that, he was a member of the faculty at the University of California Berkeley, where he found and led a graduate degree program in energy and resources. Dr. Holdren graduated from MIT with degrees in aerospace engineering and theoretical plasma physics.

Our second witness is Ms. Janet McCabe, Acting Assistant Administrator for the Office of Air and Radiation at the Environmental Protection Agency. Previously, she was the Office of Air and Radiation's Principal Deputy to the Assistant Administrator. Prior to joining the EPA, Ms. McCabe was the Executive Director of Improving Kids' Environment Inc., a children's environmental health advocacy organization. She also previously served in several leadership positions in the Indiana Department of Environmental Management's Office of Air Quality. Ms. McCabe received both her undergraduate degree and law degree from Harvard.

Again, we thank you for being here today, and Dr. Holdren, we will begin with you.

## TESTIMONY OF HON. JOHN HOLDREN, DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY POLICY, EXECUTIVE OFFICE OF THE PRESIDENT

Dr. HOLDREN. Thank you very much, Chairman Smith, Ranking Member Johnson, Members of the Committee. I am genuinely pleased to be here today to discuss the ways that the Federal Government has incorporated and continues to incorporate scientific information from the most authoritative sources into the formulation and implementation of all three components of President Obama's Climate Action Plan, cutting carbon pollution in America, preparing the United States for the impacts of climate change and

leading international efforts to address the global climate change challenge.

Given the thrust of my testimony and noting Ranking Member Johnson's comments on the title of the hearing, I would like to propose respectfully an alternative one: The Administration's Climate Plan: Success through Science.

That plan rests primarily on scientific and technological understandings in three categories: first, the natural science of anthropogenic climate change and its impacts on human well-being; second, technological analysis of the options for climate change mitigation and for increasing preparedness for and resilience against the changes in climate that mitigation fails to avoid; and third, the economics associated with estimating both the costs of action and the costs of inaction on the climate change challenge.

There is an immense amount of peer-reviewed research in all three categories. An assessment summarizing the state of knowledge in all three have been carried out by a wide variety of respected national and international bodies. Examples include the reviews by the U.S. National Academies and the Intergovernmental Panel on Climate Change, the second and third U.S. National Climate Assessments, the annual State of the Climate reports of NOAA, the periodic assessment reports of the U.S. Global Change Research Program, and the first Quadrennial Energy Technology Review of the U.S. Department of Energy. These assessments and many more were drawn up in the interagency effort led by the Executive Office of the President, which developed the elements of the Climate Action Plan for the President's consideration.

A particularly accessible digest of the relevant state of knowledge as of early 2013 and a set of recommendations based on that knowledge was provided to the President and the interagency group in March of that year by the President's Council of Advisors on Science and Technology. That report's influence on the Climate Action Plan was considerable.

My written statement discusses in some detail those conclusions from the indicated scientific assessments that were and are most germane to the formulation of the Climate Action Plan and to its implementation. Given President Obama's Commitment from the beginning of his Administration to the rigorous use of the best available scientific and technical information in formulating policy, it should not be surprising that the scientific conclusions summarized in my written statement are reflected across all elements of the Climate Action Plan and continue to underpin its implementation.

Specifically, an up-to-date understanding of the natural science of anthropogenic climate change and its impacts on human well-being provides first, the motivation for seeking to develop a cost-effective plan to reduce those impacts; second, the sense of urgency for doing so at once rather than waiting; third, the understanding that such a plan must include not only measures to reduce the emissions that are driving global climate change but also measures to increase preparedness for and resilience against the climate changes that can no longer be avoided; fourth, the detailed knowledge of the sources of the offending emission and the character of society's vulnerabilities that allows appropriate specificity in de-

signing a plan; and fifth, the recognition that any U.S. plan must include a component designed to bring other countries along. These are the most basic underpinnings of the Climate Action Plan.

Further, an up-to-date understanding of technological possibilities for both mitigation and preparedness and resilience reveals that there indeed exists a wide range of options for cutting the carbon pollution that is driving climate change and for better preparing society to deal with the changes that materialize. The available technical insights about these options have enabled the Climate Action Plan to focus specifically on enabling and incentivizing progress on the implementation and, where necessary, the further development of the most promising options.

Finally, an up-to-date understanding of the results of economic assessments of the cost of taking actions of these kinds versus the cost of inaction provides the confidence that moving ahead now is the right thing to do, and more specifically, has provided the basis for the Climate Action Plan's focus on those options that are most clearly cost-effective and that bring significant co-benefits.

Because the Climate Action Plan focuses only on the low-hanging fruit that is within reach without action by Congress, the costs of implementing it will be relatively low and indeed might well be completely repaid by the co-benefits.

Of course, there is still more that could and should be done beyond the Climate Action Plan that would require the support of the Congress. I hope that that support will be forthcoming.

I thank the Committee for its interest in this critically important issue, and I will be pleased to take any questions the Members may have. Thank you.

[The prepared statement of Dr. Holdren follows:]

**Statement of Dr. John P. Holdren**
**Director, Office of Science and Technology Policy**
**Executive Office of the President of the United States**
**to the**
**Committee on Science, Space, and Technology**
**of the**
**U.S. House of Representatives**
**on**
**September 17, 2014**

## The Science Supporting the Climate Action Plan

Chairman Smith, Ranking Member Johnson, and Members of the Committee, I am pleased to be here with you today to discuss the ways in which the Federal Government has incorporated and continues to incorporate rigorous scientific information, insights, and analyses from a diversity of credible bodies into the formulation and implementation of President Obama's Climate Action Plan[1]—hereinafter CAP—to cut carbon pollution in America, prepare the United States for the impacts of climate change, and lead international efforts to address the global climate-change challenge.

The CAP rests, most fundamentally, on scientific and technological understandings, analyses, and judgments in three categories: (1) the natural science of anthropogenic climate change and its impacts on human well-being; (2) technological analysis of the possibilities (including both current status and future prospects) for climate-change mitigation—meaning measures to reduce the pace and ultimate magnitude of the changes in climate that occur—and for increasing preparedness for and resilience against the changes in climate that mitigation fails to avoid; and (3) the economics associated with estimating (a) the costs of mitigation and preparedness/ resilience measures at various levels of implementation and (b) the costs of the harm to human well-being that is not avoided by either mitigation or improved preparedness and resilience.

There is an immense amount of primary, peer-reviewed, published research in all three of these categories, and syntheses characterizing the states of knowledge about them have been and continue to be carried out by a wide variety of competent national and international bodies (including Federal agencies and scientific advisory boards and committees reporting to them). Important examples include the comprehensive reviews by the U.S. National Academies[2] and the Intergovernmental Panel on Climate Change (IPCC)[3], the recent joint review by the U.S. National Academy of Sciences and the U.K.'s Royal Society of London[4], the Second and Third U.S. National Climate Assessments[5], the annual State of the Climate reports of the U.S. National

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[1] President Obama's *Climate Action Plan*, 2013, accessible at: http://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf

[2] The National Academies reports on climate change include the four-volume set, *America's Climate Choices* (2010) and a host of other reports completed since 2010, all accessible at: http://nas-sites.org/americasclimatechoices/.

[3] Intergovernmental Panel on Climate Change (IPCC) 2007 and 2013-2014 IPCC Fourth and Fifth Assessments, accessible at: http://www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml#1

[4] Climate Change: Evidence and Causes – An Overview from the Royal Society and the U.S. National Academy of Sciences, 2014: http://dels.nas.edu/resources/static-assets/exec-office-other/climate-change-full.pdf

[5] *Global Climate Change Impacts in the United States*, 2009: http://nca2009.globalchange.gov and *Climate Change Impacts in the United States*, 2014: http://nca2014.globalchange.gov.

Oceanic and Atmospheric Administration[6], the periodic synthesis and assessment reports of the U.S. Global Change Research Program[7], and the first Quadrennial Energy Technology Review of the U.S. Department of Energy.[8] Notably, the U.S. National Climate Assessments, which are required under the Global Change Research Act of 1990, reflect substantial input from the public, outside experts and stakeholders. The most recent such Assessment, which was released in May of 2014, was the result of a three-year analytical effort by a team of over 300 climate scientists and experts, informed by inputs gathered through more than 70 technical workshops and stakeholder listening sessions held across the country. The resulting product was subjected to extensive review by the public and by scientific experts inside and outside of government.

These syntheses and many more were drawn upon in the interagency effort, led by the Executive Office of the President (EOP), which developed the elements of the CAP for the President's approval. A particularly compact and accessible digest of the relevant state of knowledge as of early 2013 and a set of recommendations based on it was provided to the President and the EOP in March of that year by the President's Council of Advisors on Science and Technology (PCAST).[9] That report's influence on the Climate Action Plan was considerable, as any reading of the two documents will confirm.

In the remainder of this testimony, I will summarize the insights from the above-listed studies that are most germane to the Climate Action Plan, addressing all three of the science and technology categories mentioned at the outset.

**The Natural Science of Anthropogenic Climate Change**

Decades of observation, monitoring, and analysis have demonstrated beyond reasonable doubt that:

(1) the Earth's climate is changing at an unusual pace compared to natural changes in climate experienced in the past;
(2) emissions of carbon dioxide and other greenhouse gases from human activities, principally the combustion of fossil fuels but also land-use change, are the principal drivers of the recent and ongoing changes in climate;
(3) climate change is already causing harm in many parts of the world (and many parts of the United States);
(4) this harm will continue to grow for some time to come, because of the time lags and inertia built into the Earth's climate system and the inertia in civilization's energy system (which prevents drastically reducing the offending emissions overnight); but
(5) there is a large difference between the amount of additional harm projected to occur in the absence of vigorous remedial action versus that expected if such action is taken promptly.

The recent measured changes in climate include a multi-decade increase in the year-round, global-average air temperature near Earth's surface, but they are not limited to that. The changes

[6] National Oceanic and Atmospheric Administration (NOAA) State of the Climate reports, accessible at: http://www.ncdc.noaa.gov/sotc/
[7] http://www.globalchange.gov/browse/reports
[8] Department of Energy (DOE) 2011 Quadrennial Technology Review: http://energy.gov/sites/prod/files/QTR_report.pdf
[9] PCAST March 2013 letter report to the President on Energy and Climate: http://www.whitehouse.gov/sites/default/files/microsites/ostp/PCAST/pcast_energy_and_climate_3-22-13_final.pdf

also include increased temperatures in the ocean; increased moisture in the atmosphere; increased numbers of extremely hot days; changed patterns of rainfall and snowfall; and, in some regions, increases in droughts, wildfires, and unusually powerful storms.

In consequence of the temperature increase, moreover, glaciers are melting, the Greenland and Antarctic ice sheets are losing mass, and sea-level is rising. While the pace of sea-level rise is relatively slow—the current rate would produce an increase of about a foot over a century—there are three main reasons that the problem should not be underestimated:

(1) The rate appears to be increasing and is now about twice the average for the 20th century; increases as high as 1 to 2 meters (3.3 to 6.6 feet) by 2100 cannot be ruled out.[10]
(2) Even modest amounts of sea-level increase constitute a significant threat to ecosystems and infrastructure in low-lying coastal areas, not least because of the amplification of storm surges and increased intrusion of salt water into coastal aquifers.
(3) The momentum in the processes driving sea-level rise is such that it is expected to continue for centuries even under the most optimistic scenarios for climate-change mitigation; it can be slowed, but it cannot be stopped on any time scale of practical interest.

The "fingerprint" of human responsibility for most of the climate change observed over the past few decades is unmistakable: science has established persuasively that the atmospheric build-up of the key greenhouse gases has resulted from human activities; and the spatial and temporal patterns as well as the magnitudes of the observed changes in temperature are consistent with what theory and models predict would result from that build-up, after allowance is made for the partially offsetting effect of increased atmospheric concentrations of reflective and cloud-forming particulate matter (also of human origin).

Civilization's emissions of carbon dioxide, in particular, have led not only to a build-up of the stock of this important heat-trapping gas in the atmosphere (where it's responsible for about half of the total warming influence of all the heat-trapping substances humans have added over time); those emissions have also led to an increase in the dissolution of carbon dioxide into the surface layer of the ocean. There the dissolved $CO_2$ forms carbonic acid ($H_2CO_3$) and thus lowers the pH (increases the acidity) of ocean waters. This ongoing acidification increasingly puts at risk coral reefs and other marine organisms that build their shells or skeletons from calcium carbonate (including clams, oysters, and some plankton).

The foregoing conclusions are based on an immense number of observations and measurements made by thousands of scientists at both governmental and nongovernmental institutions around the world, as well as on fundamental understandings about atmospheric physics and increasingly sophisticated computer models of ocean-atmosphere-ecosystem interactions, all recorded in tens of thousands of peer-reviewed scientific publications. These key findings about climate change have been endorsed by every major national academy of sciences in the world, including those of China, India, Russia, and Brazil as well as that of the United States, and by nearly every U.S. scientific professional society, by the World Meteorological Organization and the UN's Inter-governmental Panel on Climate Change (IPCC), and by the recently released Third U.S. National

[10] Note: The highest value cited by the IPCC's 2013 climate-science synthesis is 1 meter, but a December 2012 NOAA report put the upper limit at 2 meters (see Parris, A., P. Bromirski, V. Burkett, D. Cayan, M. Culver, J. Hall, R. Horton, K. Knuuti, R. Moss, J. Obeysekera, A. Sallenger, and J. Weiss. 2012. *Global Sea Level Rise Scenarios for the US National Climate Assessment*. NOAA Tech Memo OAR CPO-1: http://cpo.noaa.gov/sites/cpo/Reports/2012/NOAA_SLR_r3.pdf)

Climate Assessment. (Some illustrative quotations from a number of the key documents are assembled in Attachment A, submitted with this testimony.)

Elaboration on the human drivers of global climate change

Scientists have developed good estimates of the magnitudes of both human-caused and natural influences on the global climate (called "forcings" in climate science) since the start of the Industrial Revolution around 1750. The results show that the human influences in this period have far outweighed the natural forcings, as well as internal variability of the climate system. The 2013 IPCC report found, specifically, that the positive forcing (warming influence) attributable to human-caused emissions over the period 1750-2011 was about 80 times as large as the positive forcing from changes in solar irradiance (the largest natural influence) over that period. Studies going back 20 years and more show that increases in globally-averaged temperatures over the last several decades have been too rapid and too sustained to be a result of internal climate variability.

Carbon dioxide ($CO_2$) is the most important greenhouse gas emitted by humans. Emissions of $CO_2$ between 1750 and 2011 accounted for 42 percent of the total positive forcings resulting from all human emissions over this period; and current $CO_2$ emissions are responsible for around 75 percent of the century-scale Global Warming Potential (GWP) of all current human emissions of heat-trapping substances.[11]

In 2012, about 90 percent of global anthropogenic $CO_2$ emissions came from fossil-fuel combustion and cement production (40% coal, 30% oil, 16% natural gas, 4% cement) and 10 percent from deforestation and other land-use change. Of the "industrial" (fossil fuel and cement) emissions in that year, China accounted for about 29%, the United States for about 15%, the 27 countries of the European Union for about 11%, India for about 6 percent, Russia for about 5 percent, and Japan for about 4 percent. These relatively few countries alone, then, accounted for about 70 percent of global industrial $CO_2$ emissions in 2012.

The second most important greenhouse gas emitted by humans is methane ($CH_4$). It has a far shorter atmospheric lifetime than that of carbon dioxide, but methane emissions between 1750 and 2011 nonetheless accounted for about 24 percent of the total positive forcings resulting from all human emissions over this period. Part of this contribution is because chemical reactions involving $CH_4$ lead to increases in tropospheric ozone and stratospheric water vapor. The activities responsible for civilization's methane emissions are, approximately: fossil-fuel

[11] Note: The GWP of an initial emissions pulse of a greenhouse gas is calculated by summing its warming effects over a specified number of years into the future. Because different greenhouse gases have different lifetimes in the atmosphere, the relative importance of their respective emissions at a given time—as measured by GWP—depends on the length of time chosen for those sums. One hundred years is a common choice. Note also that the IPCC's new approach to allocating the responsibility for forcing (as of the 2013-14 assessment) is based on the contribution of emissions of the heat-trapping substances and their precursors between 1750 and 2011, not on the changes in concentrations of the heat-trapping substances as was the approach in the IPCC's previous assessments. The two approaches to allocation give somewhat different numbers because emissions of some substances affect not only their own concentrations but also the concentrations of others.

production, processing and transport, 30%; animal husbandry, 27%; waste management, 23%; rice cultivation, 10%; and biomass burning, 10%.[12]

Emissions of halogen gases (leaked from a variety of commercial products and industrial uses) accounted for another 9% of the total positive forcing as of 2011, compared to 1750, but about 40 percent of the positive forcing from the halogen gases was cancelled out by the reduction in the stratospheric concentration of ozone caused by their emissions. Emissions of nitrous oxide (from combustion and fertilizer use) contributed about 4% of the total positive forcing up to 2011.

The other major contributor to positive forcing since the beginning of the Industrial Revolution is not a greenhouse gas at all but "black carbon"—heat-absorbing particles emitted primarily by biomass burning and by many two-stroke and diesel engines. Although the atmospheric lifetime of these particles is only days to weeks, their emissions had contributed about 16% of all positive forcing as of 2011, compared to 1750.

The positive forcings from the sources just mentioned are currently being partially offset by negative forcing that comes from reflective and cloud-forming particles that also have increased in concentration in the industrial era. The main sources of these particles are certain oxides of sulfur and nitrogen emitted by fuel combustion. There are strong incentives to reduce those emissions for reasons of public health and the protection of ecosystems from acid precipitation, however, and when this happen the resulting reduction of negative forcing by the associated reflective and cloud-forming particles will "unmask" some of the warming that currently is being offset.

Elaboration on the link between climate change and extreme weather

Weather is what is happening in the atmosphere (temperature, pressure, humidity, wind, precipitation) at a particular time and a particular place. Climate is the pattern exhibited by the weather at a particular place (or region, or the world as a whole) over a period of decades, expressed in terms of average values of weather variables day and night at different times of the year, as well as the statistics of deviations (magnitude and frequency) from these averages.

In general, one cannot say with confidence that an individual extreme weather event (or weather-related event)—for example, a heat wave, drought, flood, powerful storm, or large wildfire—was caused by global climate change. Such events usually result from the convergence of multiple factors, and these kinds of events occurred with some frequency before the onset of the discernible, largely human-caused changes in global climate in the late 20th and early 21st centuries. But there is much evidence demonstrating that extreme weather events of many kinds are beginning to be influenced— in magnitude or frequency—by changes in climate.[13]

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[12] Note: There are large natural sources that add carbon dioxide and methane to the atmosphere and large natural sinks that remove these gases. It is the human sources that have led to an imbalance in sources and sinks overall, however, leading to the build-ups of the atmospheric concentrations of these two gases. The same is true of nitrous oxide. There are no large natural sources of halogen gases, however, and the limited natural sinks for many of these lead to very long atmospheric lifetimes for many of those emitted by human activities.

[13] Note: Increases in magnitude or frequency of extremes that range far beyond historical experience can be attributed to climate change with very high confidence. For example, an analysis provided by the UN's World Meteorological Organization with its 2014 assessment of global climate in the preceding year showed that the

The manifestations of these changes in climate are observable almost everywhere:

- The atmosphere has become warmer, averaged over the year, for the world as a whole and in all but a few individual locations, and it has become wetter (the absolute humidity has increased), averaged over the year, for the world as a whole and in many regions.
- Ocean surface temperatures have risen, averaged over the year, for the world as a whole and in most places, and the depth of the ocean's warm surface layer has increased in some regions.
- The geographic unevenness of the warming[14] is affecting atmospheric and oceanic circulation patterns, although exactly how cannot always be sorted out, currently, from the natural variability in these patterns.

This being so, it is reasonable to say that most weather in most places is being influenced in ways modest to significant by the changes in climate that have occurred as a result of human activities.

A number of changes in extremes of weather and of weather-related events have become evident over the past few decades:

- Extremes of high temperature—both individual hot days and heat waves (periods of unusually high temperature that last for more than five consecutive days)—have become both more frequent and hotter in many regions.
- A larger fraction of total precipitation is occurring in extreme downpours in the United States and many other parts of the world. This is plausibly contributing to an increased risk of flooding in at least some regions.
- Drought has become more frequent and more severe in the American West and in some other historically drought-prone parts of the world.[15]
- Hotter and drier weather in wildfire-prone regions, coupled with earlier snowmelt, mean that the fire season starts earlier in the spring, lasts longer in the fall, and burns more acreage (although there is considerable year-to-year variability in the area burned).
- The intensity of tropical storms is up in some regions (most notably the North Atlantic) but not in others. There is reason to believe, though, that the most powerful of these storms—called hurricanes in the Atlantic and Eastern Pacific and typhoons in the Western Pacific—are becoming more powerful than they otherwise would be because of warmer sea-surface temperature, greater depth of the warm ocean surface layer, and higher atmospheric moisture, and that they also are becoming more devastating than they otherwise would be when they make landfall, because their storm surges occur on top of a mean sea level made higher by global warming.
- There is evidence that conditions conducive to severe thunderstorms are becoming more prevalent in the Eastern United States. Because of high year-to-year variability, however, one cannot say at this point whether recent observed increases in thunder-storm activity are

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Australian country-wide temperature record set in 2013 would have been "virtually impossible" as a result of natural variability alone.

[14] Note: For well understood reasons, the warming produced by the build-up of greenhouse gases is greater over land than over the oceans, and greater in the far North than in the mid-latitudes and tropics.

[15] Note: That drought can increase in some parts of a world that is getting more precipitation on the average is not a paradox. Global climate change is nonuniform. Precipitation is down in some places while up in others, and earlier melting of snowpack and higher losses of moisture to evaporation from soil and reservoirs contribute to low stream flows and soil drying in summer in many regions.

attributable to climate change. There is as yet not any evidence that tornadoes have increased in frequency or intensity as a result of global climate change.

There are good scientific explanations, moreover, supported by measurements, of the mechanisms by which the overall changes in climate resulting from the human-caused build-up of heat-trapping substances are leading to the observed changes in weather-related extremes. Accordingly, it is expected that the kinds of extremes already observed to be increasing will continue to increase in magnitude and/or frequency going forward, unless and until the build-up of heat-trapping substances driven by emissions from human activities is brought to a halt.

Elaboration on the "hiatus" in global warming

A number of climate-change contrarians have been propagating the claim that there has been no global warming since 1998. This is not correct.

Although the rate of increase in the globally and annually averaged temperature of the atmosphere near the surface has slowed since around 2000 compared to the rate of increase over the preceding three decades, near-surface warming of the atmosphere has indeed continued. The 2000s were warmer than the 1990s, and the 2010s so far have been warmer than the 2000s.

Thirteen of the 14 warmest years since decent thermometer records became available (around 1880) have occurred since 2000.[16] During the recent period in which the rate of increase of the average surface air temperature has slowed, moreover, other indicators of a warming planet—shrinkage of Arctic sea ice and mountain glaciers, increased discharges from the Greenland and Antarctic ice sheets, increased ocean temperatures, and sea-level rise—have been proceeding at or above the rates that characterized the preceding decades.

The long-term warming trend resulting from the build-up of heat-trapping gases and particles in the atmosphere is superimposed on a considerable amount of variability—year-to-year and decade-to-decade ups and downs in the global-average atmospheric temperature resulting from variations in solar output, in volcanic activity that injects reflecting particles into the stratosphere, and in ocean circulation patterns that govern how much of the trapped heat goes into the oceans as opposed to staying in the atmosphere. Scientists therefore do not expect the rate of atmospheric warming, which results from the combination of human and natural influences, to be uniform from year to year and decade to decade. Climate models show short periods of slow warming and even cooling within long-term warming epochs, much as we see recently in observations.

The reduced rate of warming since around 2000 is thought to be the result of a partial offsetting, by a combination of natural factors that tended to cool the atmosphere in this period, of the warming influence of the continuing greenhouse-gas build-up. An increase in emissions of sunlight-reflecting particles from an increase in global coal use may also have contributed. Among the natural factors thought to be involved, oceans are likely to have played a major role

[16] Note: The one year in the top 14 that occurred prior to 2000 was 1998. It was the third or fourth warmest year since 1880 as a result of an unusually powerful El Niño, which boosted the global-average surface temperature well above the trend line. The recent rate of temperature increase can be made to look smaller by "cherry-picking" the 1998 spike as the new start date for one's trend line, as a number of contrarians have done to bolster their claim that global warming has stopped.

in slowing atmospheric warming in this period. The oceans normally take up more than 90 percent of the excess heat trapped by anthropogenic greenhouse gases; thus, a small percentage increase in what goes into the ocean can take a large share away from what otherwise would have gone into the atmosphere.

When the variability that has lately slowed surface-atmosphere temperature trends next shifts to contributing warming, of course, it will then reinforce rather than offset the warming influence of the build-up of greenhouse gases. The rate of increase of the global-average surface temperature will then rebound, becoming more rapid, rather than less rapid, than the long-term average.

It is not clear, finally, that all of what has long been called "natural variability" is completely free of human influences. It's known that the geographic unevenness of anthropogenic global warming (amplified in the Northern Hemisphere by the shrinkage of Arctic sea ice, among other factors), affects atmospheric and oceanic circulation patterns. There is considerable evidence that the El Niño / La Niña cycle, as well as other patterns that affect how much trapped heat ends up in the oceans rather than in the atmosphere, are being influenced to some extent by anthropogenic global warming.

It has been suggested that the slow rate of recent warming calls into question our understanding of the importance of $CO_2$ in determining Earth's climate. There is no reason to believe this. Short periods of slow warming and even cooling amidst longer warming epochs are expected and are seen in instrumental records, geologic temperature reconstructions, and in climate-model output. Internal redistributions of energy (as is suspected to be responsible for most of the recent slowdown in atmospheric warming) in no way conflict with our understanding of $CO_2$ as a dominant driver of long-term changes in Earth's climate.

Quantitative measurements and projections

Two important questions germane to assessing how much action is warranted to address climate change are these: (1) Just how big are the changes in climate that have already occurred, measured against the yardstick of pre-industrial conditions? (2) How much bigger are the changes likely to become in the decades ahead under a range of assumptions about actions taken going forward (or the lack of them)?

Those questions are briefly addressed in what follows by reference to recent measured values of some key indicators and projections of the values those indicators are expected to reach by 2050 and 2100 under scenarios developed by the IPCC to explore the consequences of minimal versus maximal global mitigation actions going forward. The range of possibilities assessed by the IPCC is spanned by scenarios labelled RCP2.6 on the maximal-action side and RCP8.5 on the minimal-action side,[17] and these two scenarios as analyzed in the IPCC's 2013 and 2014 reports are the source of the projections provided below.

Increase in atmospheric carbon dioxide. As noted above, $CO_2$ is the most important of all the heat-trapping gases added directly to the atmosphere by human activities.

[17] In the IPCC's terminology, RCP stands for Representative Concentration Pathway, and the numbers represent the approximate total net forcing from anthropogenic influences in 2100 (accounting for negative as well as positive contributions) under the indicated scenario, i.e., 2.6 watts per square meter of Earth's surface in RCP2.6 and 8.5 watts per square meter in RCP8.5.

- *Measurements.* The average concentration of $CO_2$ in the atmosphere in 1750 was about 278 parts per million by volume (ppmv). In 2013, the corresponding figure was 396 ppmv. That's an increase of 42 percent. Ice-core studies show that the 2013 value is the highest concentration of atmospheric $CO_2$ experienced on Earth in the last 800,000 years.
- *Projections.* In the IPCC's minimal-action/high-emissions scenario (RCP8.5) the $CO_2$ concentration reaches 540 ppmv by 2050 and 936 ppmv by 2100. In the maximal-action/low-emissions scenario (RCP2.6), the figure is 421 ppmv in 2100.

Temperature. The single most informative index of the state of the global climate is the annually and globally averaged temperature of the atmosphere near Earth's surface. This average has been directly computable from thermometer measurements around the world since the late 19th century.[18]

- *Measurements.* According to the IPCC's 2013 report, the global average surface temperature for 2000-2009 was 0.78±0.06 °C (1.40±0.11°F) warmer than the average for 1850-1900.[19] The 2014 National Climate Assessment gives the increase in average surface temperature for the contiguous United States between 1895 and 2012 as 0.89±0.17 °C (1.6±0.3 °F).
- *Projections.* In the IPCC's 2013 RCP8.5 scenario, the global average surface temperature for 2046-2055 is 2.6±0.6 °C above the 1880-1899 average and for 2086-2095 it is 4.3±1.0 °C 7.6±1.8 °F) above the 1880-1899 average. For RCP2.6, the values are 1.6±0.6 °C for 2046-2065 and 1.6±0.7 °C in 2081-2100.

Sea level. Changes are not uniform across the globe, due to nonuniform heating and effects of Earth's rotation, winds and ocean currents, gravitational anomalies, and continental subsidence and uplift. The average change is informative about overall trends, however.

- *Measurements.* According to the IPCC (2013), global mean sea level in 2010 was about 0.2 meters (8 inches) higher in 2010 than in 1900, and about 0.3 meters higher than its 1750 value. The rate of increase since 1990 has been double the average for the 20th century.[20]
- *Projections.* In the IPCC's RCP8.5 scenario, the additional increase by 2100 is projected at 0.7±0.3 meters (28±13 inches), with further large increases following inevitably. For RCP2.6, the additional increase by 2100 is projected at 0.4±0.15 meters (16±6 inches). As noted above, NOAA's range of possibilities for 2100 extends even higher.

Increase in ocean acidity: Part of the excess $CO_2$ added to the atmosphere by human activities is absorbed by the ocean, where it combines with $H_2O$ to make carbonic acid ($H_2CO_3$). The resulting increase in the acidity of sea water (decline in its pH) imperils many of the organisms that make their shells or skeletons from calcium carbonate (corals, oysters, zooplankton).

- *Measurements.* The global-average pH of ocean surface water has declined by about 0.1 pH unit since 1750, which corresponds to a 26 percent increase in hydrogen-ion concentration. (Because of regional variations in ocean chemistry, the range is 20-35 percent.)
- *Projections.* In the IPCC's RCP8.5 scenario, ocean-surface pH falls another 0.35 pH unit by 2100, corresponding to a further 2.2-fold increase in hydrogen-ion concentration. Under RCP2.6, pH in 2100 is only 0.05 units below the current value, representing a 12 percent increase in hydrogen-ion concentration compared to today.

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[18] Note that small changes in the globally averaged atmospheric temperature near the surface are associated with large changes in the spatial and temporal patterns of temperature, precipitation, etc., that constitute climate. This is clear from the substantial changes in these patterns already being observed after an increase of only 0.8°C.

[19] IPCC, *Climate Change 2013: The Physical Science Basis*, p 37.

[20] Ibid, p 49

The numbers presented above underscore a key point made by the authors of the Third U.S. National Climate Assessment:

> *As the impacts of climate change are becoming more prevalent, Americans face choices. Especially because of past emissions of long-lived heat-trapping gases, some additional climate change and related impacts are now unavoidable. This is due to the long-lived nature of many of these gases, as well as the amount of heat absorbed and retained by the oceans and other responses within the climate system. The amount of future climate change, however, will still largely be determined by choices society makes about emissions. Lower emissions of heat-trapping gases and particles mean less future warming and less-severe impacts; higher emissions mean more warming and more severe impacts.*[21]

**Technological Analysis of the Possibilities for Remedial Action**

Mitigation

The importance of a technology strategy to address the challenges of climate change has been recognized since the 1990s. One early and seminal study, published in 1992 by the Committee on Science, Engineering, and Public Policy (COSEPUP) of the National Academy of Sciences and National Academy of Engineering,[22] explicitly addressed technological options for reducing emissions of greenhouse gases, including $CO_2$, and the need for further mitigation research and development (R&D) in several categories, including energy management in residential and commercial buildings, industrial energy management, transportation energy management, and energy supply systems. These basic energy-consuming sectors of the economy have continued to form the analytical framework for proposals to mitigate the human causes of global climate change.

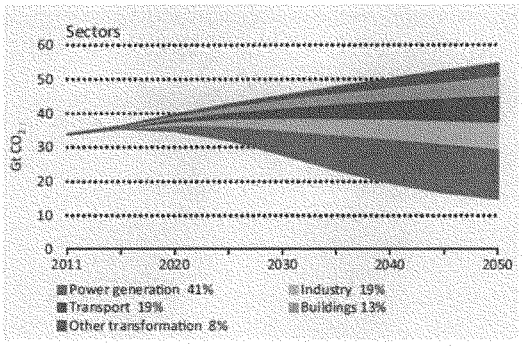
As the understanding of the potential for anthropogenic greenhouse gas emissions to cause dangerous interference with the global climate system has matured, numerous scenarios have been developed (by the IPCC, as mentioned above, and many other groups) to relate combinations of potential mitigation actions, and their effects on future emission trajectories, to the resulting changes in the projected increase in global average temperatures. One much-analyzed "business as usual" scenario, involving a continuation of current greenhouse gas emission trends, is known as the 6-Degree Scenario, because these extended current trends would result in at least a 6-degree Celsius rise in long-term global average temperatures. (Warming at 2100 would be about 4 degrees C. This scenario is similar to the IPCC's RCP8.5 scenario, described above.) This amount of global warming is widely believed to be associated with severe and irreversible impacts, such as large-scale extinctions and, over time, catastrophic sea-level rise. A second scenario, known as the 2-Degree Scenario, describes an emission trajectory that recent climate science research indicates would give at least a 50 percent chance of limiting average global temperature increases to 2 degrees Celsius, the target agreed at the 2009 Conference of the

[21] *Climate Change Impacts in the United States*, 2014 [Third U.S. National Climate Assessment], p. 13.

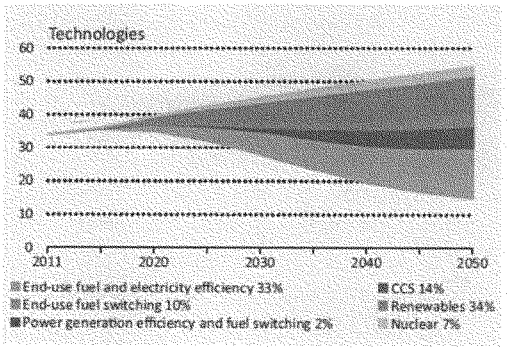
[22] Committee on Science, Engineering, and Public Policy of the National Academy of Sciences and National Academy of Engineering, *Policy Implications of Greenhouse Warming: Mitigation, Adaptation, and the Science Base*. 1992. Washington, D.C.: National Academy Press.

Parties to the UN Framework Convention on Climate Change. (This scenario resembles the IPCC's RCP2.6.)

The following figure shows the difference between emissions of greenhouse gases under the two such scenarios, as estimated by the most recent *Energy Technology Perspectives* report of the International Energy Agency (IEA). The top of the colored bands describes the likely growth of emissions out to 2050 in the 6-Degree Scenario. The bottom line represents the level of emissions needed to achieve the 2-Degree Scenario. The colored bands represent the contributions of improvements in various energy-consuming sectors to avoid the 6-Degree Scenario and achieve the 2-Degree Scenario. Like the earlier COSEPUP report, this figure shows that technological changes to avoid dangerous interference in the global climate system will require contributions from the four key energy sectors of buildings, industry, transport, and power generation.[23]




The classes of technologies that could be deployed in these sectors to achieve the 2-Degree Scenario have also been modeled by the IEA, and are depicted in the next figure.[24]




While IEA reports are not official documents of the U.S. government, they are the result of strong international technical collaboration and analysis by leading scientific and engineering

[23] International Energy Agency, *Energy Technology Perspectives 2014*, 30.
[24] *Ibid.*

experts from developed countries, including the United States. The *Energy Technology Perspective* reports and their technology roadmaps show that it is possible to construct energy pathways that are likely to avoid exceeding the 2-degree Celsius threshold for global temperature increase, while maintaining a secure and affordable energy system in the long run. The IEA even projects that its particular 2-Degree Scenario retains an important role for fossil energy in an increasingly sustainable global energy system. A variety of other authoritative analyses, including those in the IPCC's 2007 and 2013-14 reports, echo these general findings: namely, that economically and environmentally sustainable energy systems for the future can be constructed based on substantial improvements in energy efficiency and greater shares of renewable and nuclear energy, along with advanced fossil-fueled power plants with carbon capture and storage.[25]

The energy R&D programs of the U.S. Department of Energy (DOE) have long included major attention to these areas, and all of them are well represented in recent DOE budgets. In November 2011, DOE released its first-ever Quadrennial Technology Review (QTR), advocated by PCAST a year earlier[26] as a way to ensure that relevant options were all being appropriately tracked and supported to ensure their timely development to their full potential. In that review, six thrusts were deemed essential to an energy future that both strengthens U.S. competitiveness and protects the climate:

- Increase vehicle efficiency;
- Electrify the vehicle fleet;
- Deploy alternative liquid fuels;
- Increase building and industrial efficiency;
- Modernize the national electrical grid; and
- Deploy cleaner electricity sources.[27]

The Administration has strong efforts underway in each of these domains.

There is, then, a strong analytical base pointing to an array of improved and new energy technologies that can be brought to bear to reduce greenhouse-gas and black-carbon emissions in a manner that supports both energy security and economic competitiveness. That is not to say, however, that these technologies will materialize automatically in the quantities and on the time scale required. The Third National Climate Assessment highlighted the need for careful attention to the policy mechanisms that could be used to foster the development and implementation of such technologies; and analyses of the costs, benefits, tradeoffs, and synergies associated with different actions and combinations of actions to deploy them.[28] The CAP has taken those insights, too, on board and its implementation will benefit from them. It is clear, though, that technology offers possibilities for reducing emissions of heat-trapping substances even beyond what the CAP will achieve, and the science makes it clear that such further reductions will be essential. The help of Congress ultimately will be required if the full potential of technology in this domain is to be realized.

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[25] See the references cited in Footnotes 2 and 3, as well as Johansson, T.B., A. Patwardhan, N. Nakicenovic, and L. Gomez-Echeverri, *Global Energy Assessment – Toward a Sustainable Energy Future*. 2012. Cambridge University Press and the International Institute for Applied Systems Analysis.

[26] President's Council of Advisors on Science and Technology, 2010. *Report to the President on Accelerating the Pace of Change in Energy Technologies through an Integrated Federal Energy Policy*, pp 10-11.

[27] U.S. Department of Energy, 2011. *Report on the First Quadrennial Technology Review*, ii.

[28] *Climate Change Impacts in the United States*, 2014 [Third U.S. National Climate Assessment], p711.

Preparedness and resilience

Although the importance of a technology strategy for climate-change mitigation has been apparent since the 1990s, the importance of a companion technology strategy to support climate-change adaptation, preparedness, and resilience has come into view only in the last few years. The first major international study to give equal weight to mitigation and adaptation—the report of the UN Special Experts Group on Climate Change and Development[29]—came out only in 2007. The U.S. National Academies' report on *America's Climate Choices* noted in 2010 that:

> *While options available to the nation for adapting to the impacts of climate change have in many cases been identified, the scientific understanding of the effectiveness of these options is lacking, given that climate change is likely to pose challenges beyond those that have been addressed in the past as adaptations to climate variability. Thus, the need for scientific and technological advances is pervasive across the field of climate change adaptation research. ... Recently, examination of the Climate Change Science Program has shown that investment in "human dimensions research," including but not mainly oriented toward adaptation, and non-research expenditures on decision support represent about 2 percent of the total climate change research effort (NRC, 2009c). Investment in adaptation research is only a fraction of that 2 percent.*[30]

This situation has since substantially changed, as can be seen in the current 10-year strategic plan for the USGCRP, which was approved and published in 2012. Each of its four key strategic goals (i.e., advance science, inform decisions, conduct sustained assessments, and communicate and educate) focus on the needs to build and properly utilize a broad base of scientific and technological information to support adaptation actions and strategies.[31]

The technological possibilities for contributing to this goal extend across the spectrum of societal infrastructures that will be affected by a changing climate, as is described in more detail below. In these areas, as the National Research Council observed, the first technological steps towards addressing adaptation needs may be extensions of existing options for dealing with climate variability or extreme events, differing mainly in the scope of implementation, frequency of application, and the intensity of effort. It is also possible, though, that since future climate change "may well exceed the range of current climate variability and extreme events; thus, novel adaptations are very likely to be needed, especially in the event of tipping points and/or abrupt changes."[32]

A primary and general technological need associated with adapting to climate change is in the area of technologies for collecting, analyzing, and disseminating information. Enhancements to monitoring systems will be needed for adequate detection of stresses and changes in both natural systems and societal infrastructure in order to identify, at an early stage, potential needs for adaptation. For built systems, this would include an analysis of engineering thresholds of current infrastructures, so that there is a better understanding of their current resilience to climate-change

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[29] UN Special Experts Group (UNSEG), *Confronting Climate Change: Avoiding the Unmanageable and Managing the Unavoidable*, United Nations Foundation, 2007.

[30] National Research Council, 2010. *America's Climate Choices: Adapting to the Impacts of Climate Change*, p. 203.

[31] National Science and Technology Council. *The National Global Change Research Plan 2012-2021*, p. xvi.

[32] National Research Council, 2010. *America's Climate Choices: Adapting to the Impacts of Climate Change*, p. 213.

impacts.[33] There is a related need to improve understanding of the engineering interdependencies across the infrastructures and services fundamental to a vibrant economy and the degree to which these infrastructures and these services will be altered by climate change.[34] Once this information is gathered and analyzed, there are technological challenges in ensuring that the information is synthesized and disseminated in formats that can be readily used by decision-makers in both governmental and nongovernmental settings.

With respect to specific key sectors of the U.S. economy, there is a variety of technological opportunities that could boost their resilience and meet needs created by climate changes that can no longer be avoided. The following sectoral examples illustrate some of these possibilities.

Water. As climate change increases stress on water supplies, there may be significant opportunities for new technologies that give greater insight into the real-time status of ground and surface waters,[35] as well as for technologies that would improve the efficiency of water use in applications such as energy production.[36] In some places in the world, groundwater withdrawals are leading to significant subsidence that is exposing major cities to greater flooding from rivers or the ocean. Water supply technologies that can serve as an alternative to such "groundwater mining" may help reduce the potential for flooding associated with heavy downpours or sea-level rise.[37] Opportunities also exist to utilize technology to better manage surface-water resources. For example, some water agencies are developing approaches that inform flood-control operations using improved weather forecasts and soil-moisture monitoring, in turn preserving more water for consumers to use.

Agriculture. Climate change poses a major challenge to U.S. agriculture and has already led to steps farmers have taken to adapt to changes in temperature and precipitation. The Third National Climate Assessment found that "In the longer term, however, existing adaptive technologies will likely not be sufficient to buffer the impacts of climate change without significant impacts to domestic producers, consumers, or both. New strategies for building long-term resilience include both new technologies and new institutions to facilitate appropriate, informed producer response to a changing climate."[38] Such technologies may include new forms of sustainable irrigation in agriculture;[39] developing/breeding crops that can thrive in changed ecosystems and places,[40] including salt-tolerant crops;[41] and focusing on technologies that can help marine aquaculture to adapt to increasing ocean acidification.[42]

Natural Ecosystems. Beyond the benefits of agricultural and intensely managed forest ecosystems, less intensely exploited ecosystems also provide many benefits to society, including clean water, habitat that supports valuable biodiversity, food from wild fish stocks and

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[33] National Research Council, 2010. *America's Climate Choices: Adapting to the Impacts of Climate Change*, p. 205.
[34] Water Utility Climate Alliance, 2013. "National Climate Resiliency Initiative 2013."
[35] *Climate Change Impacts in the United States*, 2014 [Third U.S. National Climate Assessment], p. 89.
[36] *Climate Change Impacts in the United States*, 2014 [Third U.S. National Climate Assessment], p. 265, 267.
[37] Brown, S., et al., 2014. "Shifting Perspectives on Coastal Impacts and Adaptation," *Nature Climate Change* 4: 752-753.
[38] *Climate Change Impacts in the United States*, 2014 [Third U.S. National Climate Assessment], p. 161.
[39] National Research Council, 2010. *America's Climate Choices: Adapting to the Impacts of Climate Change*, p. 68.
[40] *Ibid.*
[41] National Research Council, 2010. *America's Climate Choices: Adapting to the Impacts of Climate Change*, p. 210.
[42] *Climate Change Impacts in the United States*, 2014 [Third U.S. National Climate Assessment], p. 562.

aquaculture, and opportunities for tourism and recreation.[43] Such ecosystems also have the ability to enhance the resilience of communities to climate change and extreme weather. For example, salt marshes, sand dunes, and barrier islands can serve as "nature's defenses", helping to shield homes and businesses from storm surge and coastal flooding.[44] Technological approaches are being developed to enhance integration of these nature-based ("green") approaches with built ("gray") infrastructure to enhance community resilience. Technological approaches are also being developed to better observe and forecast changing ocean conditions to help resource managers and ocean industries reduce impacts and increase resilience.[45]

Transportation. The Department of Transportation (DOT), in partnership with states and communities, is already advancing integration of climate information to minimize the effects of extreme weather and climate change on critical transportation infrastructure. In 2010 and 2011, DOT's Federal Highway Administration (FHWA) supported state Departments of Transportation and Metropolitan Planning Organizations' efforts to pilot approaches for conducting climate change vulnerability and risk assessments. FHWA helped to support projects in San Francisco Bay, coastal and central New Jersey, Hampton Roads, Virginia, the State of Washington, and the Island of Oahu, Hawaii. Informed by these pilot efforts, DOT is now supporting 19 Climate Resilience Pilots across the country. In addition, DOT is working with its partners in Mobile, Alabama, to conduct a vulnerability assessment of transportation infrastructure. Results of the work, including project level engineering analyses, as well as transferable climate risk management tools for use in other locations, should be available later this year. Going forward, there may be opportunities for new materials and technologies to make transportation systems less vulnerable to damage from temperature increases and water submergence. New technologies may also help in improving the function of transportation systems for emergency response and evacuation.[46]

Built Environment. A variety of technological efforts are underway around the world to address vulnerabilities of coastal communities to sea-level rise. They include projects to erect barriers; increase land elevation; stabilize erodible shores; harden facilities; and to develop rigorous methodologies for assessing the costs, benefits, and broader implications of these engineered solutions. Notable examples include the Thames Estuary 2100 Project--which is looking for the best ways of protecting London from tidal flooding over the next century and beyond--and efforts in the Netherlands, Maldives, and Singapore for claiming or building up new land.[47] In the United States, under the CAP, Federal agencies are integrating climate and sea-level rise considerations into rebuilding and recovery efforts such as those being undertaken in the aftermath of Hurricane Sandy. In addition, cities like New York City are upgrading existing buildings to be resilient against storm surges, as part of comprehensive planning for adapting these key urban centers to expected climate change.[48]

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[43] Millennium Ecosystem Assessment. 2005. *Ecosystems and Human Well-Being: Synthesis*. World Resources Institute, Washington, DC.

[44] Arkema et al. 2013. Coastal habitats shield people and property from sea-level rise and storms. *Nature Climate Change* 3: 913-918.

[45] *Climate Change Impacts in the United States*, 2014 [Third U.S. National Climate Assessment], p. 89.

[46] National Research Council, 2010. *America's Climate Choices: Adapting to the Impacts of Climate Change*, p. 209.

[47] Brown, S., et al., 2014. "Shifting Perspectives on Coastal Impacts and Adaptation," *Nature Climate Change* 4, 753-754.

[48] City of New York, 2013. PlaNYC: A Stronger, More Resilient New York, Chapter 4: Buildings.

Energy. The resilience of the electrical grid to weather and climate impacts may be increased by developing and implementing better grid sensors and equipment that enable adaptive switching of loads in cases of severe weather.[49] The adaptation of the electrical grid to climate change may also be improved by technologies that facilitate the deployment of "microgrids" to increase the resilience of the grid in specific areas.[50]

**The Economics of Action and Inaction**

The President's Climate Action Plan highlighted the sobering finding that changes in global climate that have been connected by science with increased emissions of greenhouse gases "come with far-reaching consequences and real economic costs." This June 2013 statement was based on the then-available subset of the peer-reviewed syntheses of the natural science of climate change and its impacts referenced in the first section of this testimony. The key question for economic analysis, bearing on decisions that are taken with respect to investments in climate-change mitigation and adaptation, is how the costs of these remedial actions compare to the costs of failing to take them (imposed by climate-change impacts that are not avoided by mitigation or ameliorated by improved preparedness and resilience).

Serious attempts to answer that question have been underway for some two decades. It is made particularly difficult by a number of factors, most notably: the uncertainties surrounding the exact character and magnitude of the climate-change impacts to be expected at global-average surface temperatures much higher than today's; the difficulty of monetizing many kinds of potential climate-change impacts—sea-level rise, ocean acidification, ecosystem disruptions, forced migration—even if they are reasonably well characterized; the uncertainties surrounding the future costs of many of the most promising technologies for reducing emissions from the global energy system; a baseline for energy-cost comparisons that is distorted by fossil-fuel subsidies and the free ride these fuels have enjoyed by being able to use the atmosphere as a waste dump for their green-house-gas emissions; and disagreements about the appropriate discount rates for reducing, to comparable present values, the costs of future remedial action and future climate-change impacts.

In the 1990s, attempts to compare the costs of action and inaction on climate change fell largely into two categories: studies arguing that, since the costs of taking action are relatively well defined and, at least initially, close in time, while the costs of inaction are highly uncertain and largely distant in time, it is reasonable to delay action; and studies arguing that the potentially catastrophic "downside" risks of extreme climate change were so terrible, even if decades or centuries away, that any prudent society would invest the relatively modest sums needed to significantly reduce those risks, as a form of "insurance".[51]

Since then, analyses attempting to quantify the costs of action and inaction have become more widespread and sophisticated, with the values obtained for both (under a variety of assumptions)

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[49] Hoffman, P.A. 2014. "How Synchrophasors are Bringing the Grid into the 21st Century." http://energy.gov/articles/how-synchrophasors-are-bringing-grid-21st-century

[50] National Research Council, 2010. *America's Climate Choices: Adapting to the Impacts of Climate Change*, p. 74.

[51] See, e.g., W. D. Nordhaus, *Economic Journal*, vol 101, pp 920 ff, 1991; W. D. Nordhaus, *Managing the Global Commons: The Economics of the Greenhouse Effect*, MIT Press, 1994; G. Yohe, *Global Environmental Change*, vol 6, pp 87 ff, 1996.

tending to cluster in the range of 0.5 to 5 percent of global GDP in 2030, 2050, and 2100.[52] Despite this apparent symmetry, a growing consensus has emerged in recent years, among economists and others studying this matter, that the case for making substantial investments in climate-change mitigation and preparedness/resilience—and sooner rather than later—is compelling.[53]

There are several reasons for this:

1. The scientific evidence has been building that, as the global-average surface temperature gets to two degrees Celsius and more above the 1850-1900 level, the chances of truly unmanageable types and magnitudes of climate-change impacts becomes unacceptably high. (It is instructive that, the last time the Earth's temperature was that high was 130,000 years ago, and the height of sea that came to equilibrium with that temperature was between 5 and 10 meters higher than today.[54]) The possibility of these kinds of impacts has not been adequately taken into account in existing cost-of-inaction estimates, because nobody knows how to do it in a rigorous way, and the result is that the costs of inaction have been underestimated.
2. Even a few more years' delay in taking aggressive action to reduce the greenhouse-gas emissions of the major emitting nations will make it impossible to avoid exceeding the 2°C mark and extremely costly even to avoid exceeding 3°C. (Studies by the IPCC, the World Energy Conference, the U.S. National Academies, and others have shown that, from this point, delay in taking action makes any target in the 2-3°C range much more expensive to reach.[55])
3. Most past attempts to project future costs of environmental-control technologies have yielded numbers that turned out, in the course of time, to be overestimates because the use of market mechanisms allows for technology paths that minimize costs (e.g., acid rain program). There is a wide-spread suspicion that to the extent that market mechanisms are used, the same maybe true in the case of technologies to reduce emissions of greenhouse gases and black carbon.
4. Many of the most attractive measures for reducing emissions, as well as many of the measures being contemplated to increase preparedness for and resilience against the changes in climate that are not avoided, can carry very substantial co-benefits for public health (e.g.,

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[52] See, e.g., McKinsey and Company, *Pathways to a Low-Carbon Economy: Version 2 of the Global Greenhouse Gas Abate Cost Curve*, 2009; Intergovernmental Panel on Climate Change (IPCC) 2007; Edenhofer et al., *The Economics of Decarbonization*, Potsdam Institute for Climate Impact Research, 2009; and 2013-2014 IPCC Fourth and Fifth Assessments, reports of Working Group III, accessible at:
http://www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml#1

[53] See, e.g., Nicholas Stern (ed.), *The Economics of Climate Change: The Stern Review*, Cambridge University Press, 2007; Martin Weitzman, "On modeling and interpreting the economics of catastrophic climate change", *The Review of Economics and Statistics*, vol 91, no 1, pp 1-19; F. Ackerman et al., "The need for a fresh approach to climate-change economics", in *Assessing the Benefits of Avoided Climate Change: Cost-Benefit Analysis and Beyond*, 2010; Benjamin Crost and Christian Trager, "Optimal $CO_2$ mitigation under damage risk evaluation", *Nature Climate Change*, vol. 4, pp 631-636, 2014; Council of Economic Advisors, *The Cost of Delaying Action to Stem Climate Change*, Executive Office of the President of the United States, July 2014; M. R. Bloomberg, H. M. Paulson Jr., T. F. Steyer, *et al.*, *Risky Business: The Economic Risks of Climate Change in the United States*, June 2014, http://riskybusiness.org/uploads/files/RiskyBusiness_Report_WEB_09_08_14.pdf

[54] IPCC, *Climate Change 2013: The Physical Science Basis*, p. 46. No one is suggesting that sea levels in these ranges could be reached in this century, but Earth's history suggests that's where we're headed in the long run if we can't avoid going beyond 2°C and staying there.

[55] See for example IPCC AR5 Working Group 3 Summary for Policymakers Table SPM.2. See also IEA 2014, *op. cit.*, and Council of Economic Advisors, July 2014, *op cit.*

by reducing conventional air pollution) and for other societal values. These co-benefits have often not been included in the comparisons of the cost of action and cost of inaction that have been done, leading to an underestimate of the benefits of action.

**Reflection of the foregoing in the CAP**

President Obama has been committed, from the beginning of his Administration, to the rigorous use of the best available scientific and technical information in formulating policy, including, of course, policy to address the threats from climate change. It should not be surprising, then, that the bodies of scientific and technical knowledge and judgment summarized in the foregoing are robustly and appropriately reflected across all elements of the CAP and continue to underpin the CAP's implementation. Specifically:

- An up-to-date understanding of the natural science of anthropogenic climate change and its impacts on human well-being provides (a) the motivation for seeking to develop a cost-effective plan to reduce those impacts; (b) the sense of urgency for doing so at once rather than waiting; (c) the understanding that such a plan must include not only measures to reduce the emissions that are driving global climate change but also measures to increase preparedness for and resilience against the changes in climate that can no longer be avoided; (d) the detailed knowledge of the sources of the offending emissions and the character of society's vulnerabilities that allows appropriate specificity in designing a plan; and (e) the recognition that any U.S. plan must include a component designed to bring other countries along. These are the most basic underpinnings of the CAP.

- An up-to-date understanding of technological possibilities for mitigation and preparedness/ resilience reveals that there indeed exists a wide range of existing and developable options for cutting the carbon pollution that is driving climate change and for better preparing society to deal with the changes that materialize. The available technical insights about these options have enabled the CAP to focus specifically on enabling and incentivizing progress on the development and implementation of the most promising ones, both for emissions reductions and for building preparedness and resilience

- An up-to-date understanding of the results of economic assessments of the costs of taking actions of these sorts versus the costs of inaction provides the confidence that moving ahead now is the right thing to do and, more specifically, has provided the basis for the CAP's focus on those options that are most clearly cost-effective and that bring significant co-benefits. Because the CAP focuses only on the "low-hanging fruit" that is within reach without action by Congress, the costs of implementing it will be relatively low and, indeed, could well be completely repaid by the co-benefits (see below).

Some specifics of application of these insights in the CAP

With respect to actions that will lower emissions of heat-trapping carbon pollution, the CAP contains initiatives to make new energy technologies more economic by reducing barriers to their implementation (for example, through accelerated permitting of clean energy projects and streamlining for other Federal programs) and through regulatory actions for which there is an important role for the calculation of economic costs and benefits, especially with regard to implementation of specific parts of the CAP. For example, in the case of EPA's proposed rules to reduce carbon emissions from existing power plants, EPA's estimate of monetized benefits

and compliance costs shows that, in 2030, the combination of climate benefits and air-pollution health co-benefits from the proposed rule will total as much as $93 billion in constant dollars in 2030, while the annual compliance costs net of electricity consumption reduction is estimated to total $8.8 billion.

Other elements of the CAP are also being crafted in ways that generate monetized benefits that exceed any compliance costs. For example, the CAP calls for higher fuel economy standards for heavy-duty vehicles manufactured after model year 2018. This proposal is intended to follow on to a similar set of standards for heavy-duty vehicles for model years 2014 through 2018 that will result, by model year 2018, in a new semi-truck that will save its operator enough to pay for the technology upgrades in under a year and then realize net savings of $73,000 through reduced fuel costs over the truck's useful life.

The energy efficiency standards that are being encouraged under a new goal outlined in the CAP provide another example of how economic analysis is shaping the CAP's implementation. The underlying law governing these energy efficiency standards, the Energy Policy and Conservation Act of 1974, provides that any new or revised efficiency standard must be designed to achieve the maximum improvement in energy efficiency that is determined to be technologically feasible and economically justified. In order to be found to be economically justified, the benefits of the rule must outweigh its burdens. In carrying out this analysis, the DOE examines impacts on manufacturers; impacts on consumers; impacts on competition; impacts on utilities; national energy, economic and employment impacts; and impacts on the environment and energy security.

Regarding activities to prepare the United States for the impacts of climate change, the CAP outlines a series of measures that also have common-sense utility as well as significant economic benefits. They include efforts to encourage and support smarter, more resilient investments, including through agency grants, technical assistance, and other programs, in sectors from transportation and water management to conservation and disaster relief. In a year in which moderate to severe drought has covered a large area of the United States[56] continuously from the West Coast[57] to the Great[58] Plains[59], with two areas of extreme to exceptional drought in the California-Nevada[60] region and in the Southern Plains[61] centered in northern Texas, there are real economic benefits to helping communities to prepare for droughts and reduce drought impacts, as the Climate Action Plan does through its launch of a National Drought Resilience Partnership. In addition, Executive Order 13653 (issued under the CAP) has charged the Department of the Interior (DOI), the U.S. Department of Agriculture (USDA), NOAA, the EPA, the Federal Emergency Management Agency (FEMA), and the U.S. Army Corps of Engineers (USACE), among others, to identify additional opportunities for enhancing the resilience of the Nation's watersheds, natural resources, and ecosystems in the face of climate change through potential changes to their land- and water-related policies and programs. Agencies are building on efforts already completed or underway, as outlined in agencies' climate change adaptation plans, as well as recent interagency climate adaptation strategies, such as the National Action Plan: Priorities

[56] Source: NOAA: http://www1.ncdc.noaa.gov/pub/data/cmb/sotc/drought/2014/07/20140729_usdm.png
[57] Source: NOAA: http://www1.ncdc.noaa.gov/pub/data/cmb/sotc/drought/2014/07/20140729_west_trd.png
[58] Source: NOAA:
http://www1.ncdc.noaa.gov/pub/data/cmb/sotc/drought/2014/07/20140729_high_plains_trd.png
[59] Source: NOAA: http://www1.ncdc.noaa.gov/pub/data/cmb/sotc/drought/2014/07/20140729_south_trd.png
[60] Source: NOAA: http://www1.ncdc.noaa.gov/pub/data/cmb/sotc/drought/2014/07/20140729_west_trd.png
[61] Source: NOAA: http://www1.ncdc.noaa.gov/pub/data/cmb/sotc/drought/2014/07/20140729_south_trd.png

for Managing Freshwater Resources in a Changing Climate; the National Fish, Wildlife, and Plants Climate Adaptation Strategy; and the resilience efforts outlined in the National Ocean Policy Implementation Plan. Collectively, these efforts will help to safeguard the nation's valuable natural resources in a changing climate.

**Conclusion**

In summary, the scientific and technological literature and analyses described herein make clear the case for urgent action against climate change and are clearly and pervasively reflected in the President's Climate Action Plan. Of course there is still more that could and should be done that would require the support of the Congress. I hope that this will be forthcoming.

I thank the Committee for its interest in this critically important issue. I will be pleased to take any questions Members may have at this time.

**Attachment A**

**Recent Relevant Quotes from Authoritative Sources** (inverse chronological order)

U.S. Global Change Research Program, Third U.S. National Climate Assessment, *Climate Change Impacts in the United States*, May 2014 http://nca2014.globalchange.gov

> *Long-term, independent records from weather stations, satellites, ocean buoys, tide gauges, and many other data sources all confirm that our nation, like the rest of the world, is warming. Precipitation patterns are changing, sea level is rising, the oceans are becoming more acidic, and the frequency and intensity of some extreme weather events are increasing. Many lines of independent evidence demonstrate that the rapid warming of the past half-century is due primarily to human activities.*
>
> *Human-induced climate change means much more than just hotter weather. Increases in ocean and freshwater temperatures, frost-free days, and heavy downpours have all been documented. Global sea level has risen, and there have been large reductions in snow-cover extent, glaciers, and sea ice. These changes and other climatic changes have affected and will continue to affect human health, water supply, agriculture, transportation, energy, coastal areas, and many other sectors of society, with increasingly adverse impacts on the American economy and quality of life.*

Intergovernmental Panel on Climate Change, Contribution of Working Group III to the IPCC Fifth Assessment: *Climate Change 2014: Mitigation: Summary for Policy Makers*, April 2014, http://www.ipcc.ch/

> *Without additional efforts to reduce GHG emissions beyond those in place today, emissions growth is expected to persist driven by growth in global population and economic activities. Baseline scenarios, those without additional mitigation, result in global mean surface temperature increases in 2100 from 3.7 to 4.8°C compared to pre-industrial levels (median values; the range is 2.5°C to 7.8°C when including climate uncertainty, see Table SPM.1).*

American Association for the Advancement of Science (the largest general scientific society in the world and the publisher of the prestigious journal, SCIENCE), *What We Know: The Reality, Risks, and Response to Climate Change*, March 2014
http://whatweknow.aaas.org/wp-content/uploads/2014/03/AAAS-What-We-Know.pdf

> *The overwhelming evidence of human-caused climate change documents both current impacts with significant costs and extraordinary future risks to society and natural systems. The scientific community has convened conferences, published reports, spoken out at forums and proclaimed, through statements by virtually every national scientific academy and relevant major scientific organization — including the AAAS—that climate change puts the well-being of people of all nations at risk.*

U.N. World Meteorological Organization, *WMO Statement on the Status of the Global Climate in 2013*, WMO, March 2014
https://docs.google.com/file/d/0BwdyoC9AeWjUeEV1cnZ6QURVaEE/edit?usp=sharing&pli=1

> *The year 2013 tied with 2007 as the sixth warmest since global records began in 1850. ... Thirteen of the fourteen warmest years on record, including 2013, have all occurred in the twenty-first century. ... While the rate at which surface air temperatures are rising has slowed in recent years, heat continues to be trapped in the Earth system, mostly as increased ocean heat content. About 93 per cent of the excess heat trapped in the Earth system between 1971 and 2010 was taken up by the ocean. From around 1980 to 2000, the ocean gained about 50 zettajoules ($10^{21}$ joules) of heat. Between 2000 and 2013, it added about three times that amount.*

Intergovernmental Panel on Climate Change, Contribution of Working Group II to the IPCC Fifth Assessment: *Climate Change 2014: Impacts, Adaptation, and Vulnerability: Summary for Policy Makers*, March 2014, http://www.ipcc.ch/

> *Observed impacts of climate change are widespread and consequential. Recent changes in climate have caused impacts on natural and human systems on all continents and across the oceans.*

U.K. Royal Society and U.S. National Academy of Sciences (the two most prestigious science academies in the world), *Climate Change: Evidence and Causes*, February 27, 2014, http://dels.nas.edu/resources/static-assets/exec-office-other/climate-change-full.pdf

> *Earth's lower atmosphere is becoming warmer and moister as a result of human-emitted greenhouse gases. This gives the potential for more energy for storms and certain severe weather events. Consistent with theoretical expectations, heavy rainfall and snowfall events (which increase the risk of flooding) and heat waves are generally becoming more frequent. ... While changes in hurricane frequency remain uncertain, basic physical understanding and model results suggest that the strongest hurricanes (when they occur) are likely to become more intense and possibly larger in a warmer, moister atmosphere over the oceans. This is supported by available observational evidence in the North Atlantic.*

Intergovernmental Panel on Climate Change, Contribution of Working Group I to the IPCC Fifth Assessment: *Climate Science 2013: The Physical Science Basis: Summary for Policy Makers*, September 2013, http://www.ipcc.ch/

> *Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased. ...It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century.* [Emphasis in original. In IPCC terminology, "extremely likely" means the statement's probability of being correct is between 95 and 99 percent.]

Dr. Lonnie G. Thompson (Distinguished University Professor in the School of Earth Science at Ohio State University, winner of the National Medal of Science, member of the U.S. National Academy of Sciences, arguably the most distinguished glaciologist/paleoclimatologist in the

world), "Climate Change: The Evidence and Our Options", Byrd Polar Research Center Publication 1402, 2010 http://researchnews.osu.edu/archive/TBA--LTonly.pdf

> *Climatologists, like other scientists, tend to be a stolid group. We are not given to theatrical rantings about falling skies. Most of us are far more comfortable in our laboratories or gathering data in the field than we are giving interviews to journalists or speaking before Congressional committees. Why then are climatologists speaking out about the dangers of global warming? The answer is that virtually all of us are now convinced that global warming poses a clear and present danger to civilization.*

Dr. Robert McCormick Adams (former Secretary of the Smithsonian Institution) and 254 other members of the U.S. National Academy of Sciences, "Climate Change and the Integrity of Science", Letters to the Editor, SCIENCE, May 10, 2010
http://www.pacinst.org/wp-content/uploads/sites/21/2013/02/climate_statement3.pdf

> *There is compelling, comprehensive, and consistent objective evidence that humans are changing the climate in ways that threaten our societies and the ecosystems on which we depend. ... Natural causes always play a role in changing Earth's climate, but are now being overwhelmed by human-induced changes.*

Dr. Alan Leshner (Executive Director of the American Association for the Advancement of Science) and the Presidents or Executive Directors of 17 other U.S. scientific societies (including the American Chemical Society, the American Geophysical Union, the American Meteorological Society, the American Statistical Association, and the Ecological Society of America), Open Letter to Members of the U.S. Senate, October 21, 2009
http://www.aaas.org/sites/default/files/migrate/uploads/1021climate_letter.pdf

> *Observations throughout the world make it clear that climate change is occurring, and rigorous scientific research demonstrates that the greenhouse gases emitted by human activities are the primary driver. These conclusions are based on multiple independent lines of evidence, and contrary assertions are inconsistent with an objective assessment of the vast body of peer-reviewed science. Moreover, there is strong evidence that ongoing climate change will have broad impacts on society, including the global economy, and on the environment. For the United States, climate change impacts include sea level rise for coastal states, greater threats of extreme weather events, and increased risk of regional water scarcity, urban heat waves, western wildfires, and the disturbance of biological systems throughout the country.*

Dr. Bruce Alberts (President of the U.S. National Academy of Sciences) and the presidents of all of the other national academies of science of the G8+5 countries (which include Russia, China, India, and Brazil), *G8+5 Academies Statement: Climate Change and the Transformation of Energy Technologies for a Low-Carbon Future*, May 2009
http://www.nasonline.org/about-nas/leadership/president/statement-climate-change.pdf

> *Climate change is happening even faster than previously estimated; global $CO_2$ emissions since 2000 have been higher than even the highest predictions, Arctic sea ice has been melting at rates much faster than predicted, and the rise in the sea level has become more rapid. Feedbacks in the climate system might lead to much more rapid climate changes. The need for urgent action to address climate change is now indisputable.*

# Director John P. Holdren

**Dr. John P. Holdren** is Assistant to the President for Science and Technology, Director of the White House Office of Science and Technology Policy, and Co-Chair of the President's Council of Advisors on Science and Technology (PCAST). Prior to joining the Obama administration Dr. Holdren was Teresa and John Heinz Professor of Environmental Policy and Director of the Program on Science, Technology, and Public Policy at Harvard University's Kennedy School of Government, as well as professor in Harvard's Department of Earth and Planetary Sciences and Director of the independent, nonprofit Woods Hole Research Center. Previously he was on the faculty of the University of California, Berkeley, where he co-founded in 1973 and co-led until 1996 the interdisciplinary graduate-degree program in energy and resources. During the Clinton administration Dr. Holdren served as a member of PCAST through both terms and in that capacity chaired studies requested by President Clinton on preventing theft of nuclear materials, disposition of surplus weapon plutonium, the prospects of fusion energy, U.S. energy R&D strategy, and international cooperation on energy-technology innovation.

Dr. Holdren holds advanced degrees in aerospace engineering and theoretical plasma physics from MIT and Stanford. He is a member of the National Academy of Sciences, the National Academy of Engineering, and the American Academy of Arts and Sciences, as well as a foreign member of the Royal Society of London and former president of the American Association for the Advancement of Science. He served as a member of the MacArthur Foundation's Board of Trustees from 1991 to 2005, as Chair of the National Academy of Sciences Committee on International Security and Arms Control from 1994 to 2005, and as Co-Chair of the independent, bipartisan National Commission on Energy Policy from 2002 to 2009. His awards include a MacArthur Foundation Prize Fellowship, the John Heinz Prize in Public Policy, the Tyler Prize for Environmental Achievement, and the Volvo Environment Prize. In December 1995 he gave the acceptance lecture for the Nobel Peace Prize on behalf of the Pugwash Conferences on Science and World Affairs, an international organization of scientists and public figures in which he held leadership positions from 1982 to 1997.

Chairman SMITH. Thank you, Dr. Holdren.
Ms. McCabe.

**TESTIMONY OF MS. JANET MCCABE,
ACTING ASSISTANT ADMINISTRATOR,
OFFICE OF AIR AND RADIATION,
U.S. ENVIRONMENTAL PROTECTION AGENCY**

Ms. MCCABE. Thank you, Chairman Smith, good morning, and Ranking Member Johnson and Members of the Committee. Thank you for the opportunity to testify today. I am very pleased to be here with Dr. Holdren.

The science is clear, the risks are clear, and the high costs of climate inaction are clear. We must act. That is why President Obama laid out a Climate Action Plan and why on June 2nd of this year, Administrator McCarthy signed the proposed Clean Power Plan to cut carbon pollution, build a more resilient Nation, and lead the world in our global climate fight.

Power plants are the largest source of carbon dioxide emission in the United States. While the United States has limits in place for the level of arsenic, mercury, sulfur dioxide, nitrogen oxide and particle pollution that power plants can emit, there are currently——

Chairman SMITH. There we go. Well, we are getting there. There we go.

Ms. McCabe, if you will proceed? I hope that this is fixed permanently. Thank you.

Ms. MCCABE. American know-how at work.

As I was saying, while the United States currently has standards in place for a range of harmful pollutants that are emitted by power plants, there are currently no national limits on carbon pollution from these sources.

The Power Plan aims to cut energy waste and leverage cleaner energy sources by doing two things. First, it uses a national framework to set achievable state-specific goals to cut carbon pollution per megawatt-hour of electricity generated. Second, it empowers the states to chart their own customized path to meeting their goals.

We know that coal and natural gas play a significant role in a diverse national energy mix. This plan does not change that. It builds on actions already underway to modernize aging plants, increase efficiency and lower pollution, and it paves a more certain path for conventional fuels in a clean energy economy.

The EPA stakeholder outreach and public engagement in preparation for this rulemaking was and continues to be unprecedented. Starting last summer, we held 11 public listening sessions around the country. We participated in hundreds of meetings with a broad range of stakeholders across the country and talked with every state. Now the second phase of our public engagement is underway. We have already held four public hearings in Atlanta, Denver, Pittsburgh and Washington, D.C., at which over 1,300 people testified. We have had hundreds of calls and meetings with states and other stakeholders, and we have already received more than three-quarters of a million comments. Through meetings, phone calls and other outreach, we are proactively seeking input, and many states,

utilities and other stakeholders are bringing us suggestions that reflect the significant and thoughtful work they are putting into responding to this proposal. Because of this strong interest, in fact, we announced yesterday that we are extending the comment period for an additional 45 days to December 1st.

These are just the sort of discussions we need to have, and these are not mere words: this is a proposal we want and need input from the public.

To craft the proposed state goals, we looked at where states are today, and we followed where they are going. Each state is different, so each goal, and each path, can be different. The goals spring from smart and sensible opportunities that states and businesses are taking advantage of right now.

Under the proposal, the states have a flexible compliance path that allows them to design plans sensitive to their needs, including considering jobs and communities in a transitioning energy world. It allows them enough time—15 years from when the rule is final until compliance with the final target—to consider and make the right investments, ensure reliability, and avoid stranded assets.

All told, in 2030 when states meet their goals, our proposal will result in about 30 percent less carbon pollution from the power sector across the United States when compared with 2005 levels. In addition, we will cut pollution that causes smog and soot by more than 25 percent. Together, these reductions will provide important health benefits to our most vulnerable citizens including our children.

In 2030, the Clean Power Plan will deliver climate and health benefits of up to $90 billion, and because energy efficiency is a cost-effective strategy, we predict that in 2030, average electricity bills for American families will be eight percent cheaper.

This proposal has started an active conversation about the steps that states, cities, utilities and others are already taking to reduce carbon pollution and how about the EPA can set targets and a reasonable schedule that can be achieved by every state, using measures they choose themselves to suit their own needs.

The EPA looks forward to discussion of the proposal over the next several months, and I look forward to your questions. Thank you.

[The prepared statement of Ms. McCabe follows:]

**Opening Statement of Janet McCabe**
**Acting Assistant Administrator**
**Office of Air and Radiation**
**U.S. Environmental Protection Agency**

**Hearing on EPA's Proposed Clean Power Plan**

**Committee on Science, Space, and Technology**
**U.S. House of Representatives**
**September 17, 2014**

Chairman Smith, Ranking Member Johnson, members of the Committee: Thank you for the opportunity to testify today.

Climate change is one of the greatest challenges of our time. It already threatens human health and welfare and economic well-being, and if left unchecked, it will have devastating impacts on the United States and the planet.

The science is clear. The risks are clear. And the high costs of climate inaction are clear. We must act. That's why President Obama laid out a Climate Action Plan and why on June 2 the Administrator signed the proposed Clean Power Plan—to cut carbon pollution, build a more resilient nation, and lead the world in our global climate fight.

Power plants are the largest source of carbon dioxide emissions in the United States, accounting for roughly one-third of all domestic greenhouse gas emissions.[1] While the United States has limits in place for the level of arsenic, mercury, sulfur dioxide, nitrogen oxides, and particle pollution that power plants can emit, there are currently no national limits on carbon pollution levels.

EPA's proposed Clean Power plan will cut hundreds of millions of tons of carbon pollution and hundreds of thousands of tons of other harmful air pollutants from existing power plants. Together these reductions will provide important health benefits to our most vulnerable citizens, including our children.

The proposed Clean Power Plan is a critical step forward. It is built on advice and information from states, cities, businesses, utilities, and thousands of people about the actions they are already taking to reduce carbon dioxide emissions.

The Plan aims to cut energy waste and leverage cleaner energy sources by doing two things: First, it uses a national framework to set achievable state-specific goals to cut carbon pollution per

[1] Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012.

megawatt hour of electricity generated. And second, it empowers the states to chart their own, customized path to meet their goals.

We know that coal and natural gas play a significant role in a diverse national energy mix. This Plan does not change that—it builds on action already underway to modernize aging plants, increase efficiency, and lower pollution, and paves a more certain path for conventional fuels in a clean energy economy.

The EPA's stakeholder outreach and public engagement in preparation for this rulemaking was unprecedented. Starting last summer, we held eleven public listening sessions around the country. We participated in hundreds of meetings with a broad range of stakeholders across the country, and talked with every state.

Now, the second phase of our public engagement is underway. We've already held four public hearings in Atlanta, Denver, Pittsburgh, and Washington, DC, at which over 1300 people testified, we've had dozens of calls and meetings with states and other stakeholders, and we have already received hundreds of thousands of comments during our comment period that runs through October 16, 2014. Through meetings, phone calls, and other outreach, we are proactively seeking input, and many

states, utilities, and other stakeholders are bringing us suggestions that reflect the significant and thoughtful work they are putting into responding to this proposal.

These are just the sort of discussions we need to have. These are not mere words: this is a proposal, and we want and need input from the public.

To craft the proposed state goals, we looked at where states are today, and we followed where they're going. Each state is different, so each goal, and each path, can be different. The goals spring from smart and sensible opportunities that states and businesses are taking advantage of right now.

Under the proposal, the states have a flexible compliance path that allows them to design plans sensitive to *their* needs, including considering jobs and communities in a transitioning energy world. It also allows them enough time – fifteen years from when the rule is final until compliance with the final target – to consider and make the right investments, ensure reliability, and avoid "stranded assets."

Our plan doesn't just give states more options—it gives entrepreneurs and investors more options, too, by unleashing the market forces that drive innovation and investment in cleaner power and low-carbon technologies.

All told, in 2030 when states meet their goals, our proposal will result in about 30 percent less carbon pollution from the power sector across the U.S. when compared with 2005 levels – 730 million metric tons of carbon dioxide out of the air. In addition, we will cut pollution that causes smog and soot by more than 25 percent. The first year that these standards go into effect, we'll avoid up to 100,000 asthma attacks and 2,100 heart attacks—and those numbers increase over time.

In 2030, the Clean Power Plan will deliver climate and health benefits of up to $90 billion dollars. And for soot and smog reductions alone, that means for every dollar we invest in the plan, families will see $7 dollars in health benefits. And because energy efficiency is such a smart, cost-effective strategy, we predict that, in 2030, average electricity bills for American families will be 8 percent cheaper.

President Obama's Climate Action Plan provides a roadmap for federal action to meet the pressing challenge of a changing climate – promoting clean energy solutions that capitalize on American innovation and drive economic growth and providing a role for the full range of fuels, including coal and natural gas.

This proposal has started an active conversation about the steps that states, cities, utilities, and others are already taking to reduce their carbon pollution and about how the EPA can set targets and a reasonable schedule that can be achieved by every state, using measures they choose themselves to suit their own needs. The EPA looks forward to discussion of the proposal over the next several months, and I look forward to your questions. Thank you.

Janet McCabe, Acting Assistant Administrator for the Office of Air and Radiation

Janet McCabe is the Acting Assistant Administrator for the Office of Air and Radiation, having previously served as OAR's Principal Deputy to the Assistant Administrator.

Prior to joining EPA in November 2009, McCabe was Executive Director of Improving Kids' Environment, Inc., a children's environmental health advocacy organization based in Indianapolis, Indiana and was an adjunct faculty member at the Indiana University School of Medicine, Department of Public Health.
From 1993 to 2005, Ms. McCabe held several leadership positions in the Indiana Department of Environmental Management's Office of Air Quality and was the office's Assistant Commissioner from 1998 to 2005. Before coming to Indiana in 1993, Ms. McCabe served as Assistant Attorney General for environmental protection for the Commonwealth of Massachusetts and Assistant Secretary for Environmental Impact Review.

Ms. McCabe grew up in Washington, D.C. and graduated from Harvard College in 1980 and Harvard Law School in 1983.

Chairman SMITH. Thank you, Ms. McCabe.

The gentleman from Indiana, the chairman of the Research and Technology Subcommittee, has a markup in another Committee and has to leave immediately, so I am going to recognize himself for questions and then I will take his place when it is time for him to ask questions.

Mr. Bucshon.

Mr. BUCSHON. Thank you, Mr. Chairman.

Over the last few years we have gone from global warming to now climate change since the temperature of the Earth hasn't changed in many, many years. The temperature of the Earth has been changing for centuries. I fully believe that the temperature of the Earth is changing. But of course, now supporters of this new regulation are saying well, it is changing now at an unusual pace compared to the past because now the American public is getting it that the temperature of the Earth has been changing for centuries.

Ms. McCabe, first of all, welcome from Indiana. This plan places a heavy burden on the states. Many state legislatures will need to approve enabling statutes to implement the rule. For example, we have heard from previous witnesses that have come before this Committee that states will need to devise institutional arrangements between state public utility commissions and state environmental regulators to implement carbon-driven resource planning. Further, states will need to consider legislation to implement energy efficiency measures to meet the goals under the plan and to grant additional authorities to state public utility commissions on such matters as stranded investment and cost allocation.

It is quite possible that certain states, for whatever reason, will be unable to make these steps in which case the state plans will be inadequate under the proposal, thus mandating the EPA-issued Federal Implementation Plan, or FIP.

Can you describe for me what an FIP would look like where a state has failed to enact the necessary laws to carryout EPA's plan for them? For example, what would an EPA-imposed energy efficiency mandate look like and how would EPA allocate costs under such a mandate?

Ms. MCCABE. Congressman, thank you for your question. Let me first emphasize that in the plan, the proposal, we certainly recognize that there are steps that states will need to take in order to put authorities in place and design their plans, and we provided several years for that work to take place, assuming that states will be going forward with that. Many states already have programs in place that they will be able to use or build upon, and we are confident that working with the states, as EPA always has in implementing Clean Air Act programs, that we will be/able to find time and work with each other to make sure that states have the time they need to put authorities in place, and that is what we are focused on at the moment is making sure that we understand one another, that we hear from the states about the timing challenges that they expect to have and the things that they need to do, and we are confident that we will be able to move forward with states in a productive way so that they can be successful in developing and implementing their own plans.

Mr. BUCSHON. Thank you. Is it true that this rule has no effect on the global temperature change?

Ms. MCCABE. This rule is about cutting carbon pollution, and cutting carbon pollution will help address the contributions to the effects that we are seeing——

Mr. BUCSHON. Because we have heard previous Administrators from the EPA say that it won't. It is not about affecting the global temperature and climate change.

Ms. MCCABE. Well, I can——

Dr. HOLDREN. Can I take that?

Ms. MCCABE. Sure.

Dr. HOLDREN. Yeah, I would like to respond to that if I may.

Mr. BUCSHON. Yeah. I mean, there are public comments out there that that question has been asked and answered saying no.

Dr. HOLDREN. You should look at the scientific literature rather than the public comments. The fact is——

Mr. BUCSHON. Of all the climatologists whose career depends on the climate changing to keep themselves publishing articles, yes, I could read that but I don't believe it.

Dr. HOLDREN. If you would allow me to finish, the point is that the limitation on carbon emissions in the United States is a very important first step for us to take on a longer trajectory to meet the President's goals of a 17 percent reduction from 2005 by 2020, and ultimately an 80-plus percent reduction by 2050. If the United States does not take that sort of action, it is unlikely that other major emitters in the world—China, India, Russia, Europe, Japan—will do so either, and the fact is, all of us need to reduce our carbon emissions if we are to avoid unmanageable degrees of climate change.

Mr. BUCSHON. Okay. Fair enough.

Ms. McCabe, there are some comments out there saying asthma attacks decrease, heart attacks decrease. Where do you get that information? Because I was a medical doctor before, and it says in the first year the plan will avoid 100,000 asthma attacks and 2,100 heart attacks. I can tell you, as a medical doctor, you cannot say that.

Ms. MCCABE. Well——

Mr. BUCSHON. That is just scare tactics. That is not factual.

Ms. MCCABE. Well, all of our information is based on factual information that is developed and in the record and available for people to comment on.

Mr. BUCSHON. And let me say I reviewed that from the American Lung Association. In fact, their medical director came down last year from New York and spoke to me about this. And is it true or not that it is based on actually modeling and not actually factual patient data?

Ms. MCCABE. There is a large body of evidence that——

Mr. BUCSHON. Is it based on computer modeling or is it based on factual medical data? That is the question. Yes or no.

Ms. MCCABE. EPA uses both modeling and——

Mr. BUCSHON. And is it true that the model that was created to do this, the EPA paid tens of thousands of dollars to the person to create the model to, in my view, after I have looked at all the science including people who funded the research—the funders of

this research that was done are all pretty far left global warming foundations and others that want this data to come out? I mean, I am just saying, it all depends. If you are a medical person and you look at who funds a study and the result of the study, I mean, I look at the first, who funded it, and if people that believe the result funded it, do you see where I am getting at?

Ms. MCCABE. Yes, Congressman——

Mr. BUCSHON. And it is all based on modeling, not on factual information, so I would—I just——

Dr. HOLDREN. Can I take a piece of this as well?

Mr. BUCSHON. No, I am over my time so I will just say this and I yield back to the chairman, that scare tactics like that is really appalling to me to use medical information to scare parents that their children about asthma attacks and scare people saying they are going to have heart attacks and you are going to prevent that with this rule in the first year. That is just not factual. And I would argue that we should all on both sides of this discussion avoid scare tactics.

I yield back, Mr. Chairman.

Chairman SMITH. Thank you, Dr. Bucshon. The gentlewoman from Oregon, Ms. Bonamici, is recognized.

Ms. BONAMICI. Thank you very much, Mr. Chairman. Thank you to both of our witnesses for appearing before us again to discuss this very important topic, and I am glad that my colleague, Mr. Bucshon, mentioned scare tactics because, Mr. Chairman, I have an article that I would like to submit for the record because we are likely to hear some arguments that the coal industry has used over the years to sway people against regulation designed to protect the environment, and so I would like to introduce this article, which chronicles the coal industry's overreactions and some exaggerated claims over the last 40 years.

Chairman SMITH. Without objection, the article will be a part of the record.

[The information appears in Appendix II]

Ms. BONAMICI. Thank you. I hope the Committee Members read this article as well.

Thank you again. I am going to begin my question in this hearing much the same way as I began when we held a similar hearing just over a month ago by briefly discussing the economic costs of failing to act to combat climate change for communities. For example, in my district in Oregon, the threat of climate change brings serious economic consequences to coastal communities with the fishing and seafood industries, for example, rely on a healthy ocean to support their livelihood. The agriculture sectors need freedom from concerns about drought. Changes in our climate brought on by record-high carbon emission causes economic concern. Many Fortune 500 companies are now building the economic realities of climate change into their long-term business plans. Insurance companies are starting to account for the increased frequency of severe weather events. These things are happening, and it is up to us as policymakers to act now to mitigate the damage.

So Dr. Holdren, first of all, thank you for your very thorough testimony. I do encourage Members of the Committee to read your entire written testimony, which is very thorough and detailed. We are

here today to ostensibly discuss the science behind the EPA regulations, and because some people question whether the EPA is considering the economic impact of its regulations, can you please expand on the potential economic benefits of reducing greenhouse gas emissions through rules like the recently proposed rule limiting emissions from existing power plants?

Dr. HOLDREN. Thank you. I am happy to do that. There is some considerable discussion of that in my rather lengthy written statement, but the fact is that we are facing under unabated continuation of global climate change large increases in damages from a wide variety of extreme weather events including, in some regions, floods, in other regions, droughts, in many regions, more extreme heat waves, in many regions, more wildfires, pest outbreaks, pathogen spread in terms of geographic range. We are looking at impacts on many sectors of the economy on the energy sector, the forestry sector, the agriculture sector, the fishery sector. We are looking at increases in ocean acidification that have the potential to dramatically change ocean food chains and fisheries possibilities, and we are looking, as already mentioned, at human health effects, and I would mention, although Dr. Bucshon has now left, that the models that are used in this domain are all based on data. They are based on patient data. They are based on epidemiological studies, and there is a wide range of models, not a single model. They have been funded by a wide range of sources, and the findings in the National Climate Assessment, which came out in May, on the impacts of climate change on health were thoroughly vetted by experts at the National Institutes of Health——

Ms. BONAMICI. Thank you, Doctor. I do want to have time for one quick question.

Dr. HOLDREN. Sorry.

Ms. BONAMICI. But thank you for that clarification.

On a related note, I want to follow up on something that was discussed in our July hearing. Dr. Cash from the Massachusetts Department of Environmental Protection stated that EPA's latest action will "help the Nation develop an advanced energy infrastructure." So can you please both comment briefly on the importance of having the United States lead the way in the development and implementation of the next generation of energy policies and talk about whether the existence of rules will foster innovation by creating demand for new technologies.

Ms. MCCABE. I will take a start at it. This is another example of how regulations will spur innovation and development of new technologies. In particular, what we found when we looked at what the power sector and states were already doing to address carbon is that they were investing in renewable energy and moving that forward. They were investing in energy efficiency and moving that forward, and there is huge opportunities in addition to other sorts of technologies for this plan to spur even greater investment in those sorts of technologies and move them into all across the country and into the mainstream.

Ms. BONAMICI. And I trust you would both agree with me that we would prefer that the United States be the leader in developing these technologies.

Ms. BONAMICI. Absolutely.

Dr. HOLDREN. I would just add and emphasize that countries all around the world are buying renewable-energy technologies, they are buying energy-efficiency technologies, they are buying cleaner fossil-fuel technologies. They are going to be buying a lot more of them because it is recognized all around the world that climate change is real and we need to do something about it, and we will be far better off if the United States is the principal provider of those technologies in the decades ahead than if we allow other countries to take the lead in that domain.

Ms. BONAMICI. Thank you. My time is expired. I yield back. Thank you, Mr. Chairman.

Chairman SMITH. Thank you, Ms. Bonamici.

The gentleman from California, Mr. Rohrabacher, is recognized for his questions.

Mr. ROHRABACHER. Thank you very much, and thank you for being with us today.

I—let me just note about the last point, yeah, we do have countries like Spain investing in other types of technology for producing energy and it is breaking their bank. It is putting them into bankruptcy.

There is just a list of things that just—note that this is a matter of contention that I would think the public should look at, whether or not there actually has been 17 years where there has been no warming, although that was what was predicted. I keep seeing reports saying that there are no more hurricanes than there always have been or they are not more extreme than they ever were.

We have climate models obviously that have been presented us that we were going to have a huge jump in our temperature that were clearly wrong. The Arctic ice volume now is increasing rather than decreasing, as is the population of the polar bears increasing rather than decreasing, and we have seen an increase in plant growth and crop yields. Let me—so those are just matters.

Back-and-forth with those people who believe that humankind and our activities are changing the climate and those of us who don't, we need to know whether those specific issues—what the facts show on those things because I keep hearing disagreement from those who would like to pass regulations like the ones we are talking about today.

Ms. McCabe, at what point—you keep using the word carbon pollution——

Ms. MCCABE. Um-hum.

Mr. ROHRABACHER. —at what point—level of $CO_2$ does $CO_2$ become damaging to human health?

Ms. MCCABE. Well, carbon——

Mr. ROHRABACHER. Right now, we have $CO_2$ at about 400 parts per million.

Ms. MCCABE. Um-hum.

Mr. ROHRABACHER. At what point does that actually become harmful to human beings?

Ms. MCCABE. I will let Dr. Holdren amplify my answer, but it is clear that the amount of carbon that is being emitted——

Mr. ROHRABACHER. No, no, I am asking for a specific number. You guys are the experts. You are here telling us to pass what we consider to be a draconian regulation. You should know at what

point it becomes harmful to human health. If it is now at 400 parts per million—Dr. Holdren, maybe you have the answer to that—at what level does it become harmful to human beings?

Dr. HOLDREN. Vice Chairman Rohrabacher, I always enjoy my interactions with you. I have to say, with respect, that is a red herring. We are not interested in carbon dioxide concentrations because of their direct effect on human health. We are interested in them because their effect—of their affect——

Mr. ROHRABACHER. All right.

Dr. HOLDREN. —on the world's climate, and climate change has effects——

Mr. ROHRABACHER. So it is a red herring——

Dr. HOLDREN. —on human health.

Mr. ROHRABACHER. Okay. So it is a red herring to say that when people are talking about human health that there is no direct impact on human health, that this is something——

Dr. HOLDREN. Not of $CO_2$ concentration. There is a direct——

Mr. ROHRABACHER. All right. All right.

Dr. HOLDREN. —there are very strong and direct impacts——

Mr. ROHRABACHER. Okay.

Dr. HOLDREN. —and there is a strong direct effect——

Mr. ROHRABACHER. Strong indirect, okay.

Dr. HOLDREN. —and there is a strong direct effect——

Mr. ROHRABACHER. So let's go——

Dr. HOLDREN. —on the co-emitted pollutants——

Mr. ROHRABACHER. So let's go for the record——

Dr. HOLDREN. —like oxides or sulfur and black carbon——

Mr. ROHRABACHER. So let's go for the record that you have now agreed there is no direct impact on human health by $CO_2$ concentration——

Dr. HOLDREN. And a huge indirect impact.

Mr. ROHRABACHER. And at what time—I guess we will say you are not even going to go—because the next level higher is going to go to us—how long will it take us to get to the point where it does actually impact human health?

And I will just put in for the record that it seems—it is at 400 parts per million now and between 1,000 to 2,000 parts is what we pump into greenhouses and it is commonly accepted that it takes about 20,000 parts per million as differentiated from the 400 parts per million now that we have before it becomes harmful to human health, unless of course you want to say that those things that we just—that I just outlined are real, that there has actually been warming, that the models have been successful, that the Arctic ice now is not growing, and the population of the polar bears is continuing to diminish, and et cetera, et cetera. So, yeah——

Dr. HOLDREN. May I respond?

Mr. ROHRABACHER. You certainly may.

Dr. HOLDREN. First of all, there is a long section in my testimony explaining that the so-called hiatus in global warming is not what you have portrayed it to be. It is a slowdown in the rate of increase of the atmospheric surface temperature from what occurred in previous decades. The fact is, even by that index, the Earth is still warming. The 2000s were warmer than the '90s, the 2010s so far

have been warmer than the 2000s, 13 of the 14 hottest years in the instrumental record going back 150 years——

Mr. ROHRABACHER. Right.

Dr. HOLDREN. —have occurred since 2000.

Mr. ROHRABACHER. Okay. And let's——

Dr. HOLDREN. And it is also true——

Mr. ROHRABACHER. Okay.

Dr. HOLDREN. —that in terms of the Arctic ice in volume and in area at any given time of year it continues to be on a shrinking trajectory, although of course there is natural variability that bounces it up and down a bit——

Mr. ROHRABACHER. But you——

Dr. HOLDREN. —but the trend is unmistakable.

Mr. ROHRABACHER. But you will acknowledge that there are many scientists—and by the way, I want to congratulate both of you because last time you were both here independently when we tried to pin down this fraud of 97 percent of all the scientists agree that manmade global warming is now upon us, you both refused to back up that fraudulent claim and I applaud you for that.

Let me just note that when we are talking about these issues—the very issues that we brought up, there are legitimate scientists—this isn't just a claim here at the hearing—there are legitimate scientists on both of these issues, on both sides of the various issues that you and I just brought up, and I think that it behooves us not to just suggest that, well, this is what the fact is.

I think that what we should all do is compare the various scientific facts that are coming in and not just dismiss all of the scientists who are claiming that no, the polar bears are not disappearing and no, there are not more hurricanes, there are not more tornadoes, there are not more, say, critical weather situations going on. I think those issues need to be looked at with an open mind and that both sides can look at it scientifically.

Thank you very much.

Chairman SMITH. Thank you, Mr. Rohrabacher.

The gentlewoman from Illinois, Ms. Kelly, is recognized for her questions.

Ms. KELLY. Thank you, Mr. Chair.

Ms. McCabe, as you likely are aware, critics of this and virtually any other EPA proposed rule often claim that the economy and the American consumer will suffer as a result of efforts to make our environment cleaner and safer. More "the sky is falling" attitude toward actions that will protect the health of Americans is contradicted by the fact that the U.S. economy has tripled in size since the adoption of the Clean Air Act in 1970, which you know. One of the concerns often raised is that the Clean Power Plan will cause residential electricity prices to increase dramatically. Can you comment on that? Is that the case? And can you please describe the estimated impact that the proposed rule will have on Americans' electricity bills?

Ms. MCCABE. Absolutely. Thank you for the question.

Ms. KELLY. Coming from Illinois, it is very important.

Ms. MCCABE. Yes, yes, for me, too. Yes, this is an issue that we look at in our regulatory impact assessment, which was put out with the proposed rule. We did take a look at the anticipated im-

pacts on electricity bills, and because of the strong emphasis that we expect from states in looking at energy efficiency as a very clear and obvious and cost-effective approach, our analysis predicts that electricity bills for American families will go down by 2030 by about eight percent, and that is a good thing for all of us because you get the improved environment, you get the pollution reduction of other pollutants that come along with the carbon that will have immediate impacts on people in their neighborhoods and improve their health, and you also, through the increased use of energy efficiency, will get lower electric bills.

Ms. KELLY. Where do you feel that your doubters or critics are getting their information from?

Ms. MCCABE. I don't know that I can speak to that, Congresswoman. People do the analyses that they choose to do. What we appreciate is the transparent and public process that we have during this proposal so that people can bring whatever analyses they have to us and everybody can take a look at that and we can work through it.

Ms. KELLY. Okay. Thank you very much. I yield back.

Chairman SMITH. Thank you, Ms. Kelly.

I now recognize myself for questions next.

And, Dr. Holdren, let me direct my first question to you. The EPA says that its regulations will reduce carbon dioxide emissions by about 555 million tons per year in 2030. That same year, Department of Energy is projecting that China alone will emit about 14 billion tons of carbon dioxide every year. That means that after this costly and in my view burdensome rule is implemented, it will offset only 13 days of Chinese carbon dioxide emissions and of course much less of the total world's emissions. And I want to focus on the impact of the rule. We will get to the impact on other countries in a second. But would you agree that the impact of the rule when and if implemented would have a negligible impact on climate change?

Dr. HOLDREN. As I have already said, this rule is a start. The Climate Action Plan is a start. If we do not make a start, we will never get to the kinds of reductions——

Chairman SMITH. Right.

Dr. HOLDREN. —that we need. But by the way, we will never get there without the Congress' help.

Chairman SMITH. Right.

Dr. HOLDREN. It is one of the reasons I feel happy to be here.

Chairman SMITH. What impact would this rule have on global temperatures, for example?

Dr. HOLDREN. A small impact if we neglect the leadership role that the United States plays in the world.

Chairman SMITH. And——

Dr. HOLDREN. I have just been traveling around the world talking to leaders——

Chairman SMITH. I am going to get to the——

Dr. HOLDREN. —of other countries——

Chairman SMITH. I am going to get to the leadership question——

Dr. HOLDREN. —and they are appreciative——

Chairman SMITH. —in just——

Dr. HOLDREN. —of what we are doing.

Chairman SMITH. Dr. Holdren, let me finish. I am going to get the leadership question in a minute but I want to get to the impact of this rule on climate change. You said it would have a very small impact on global temperatures. What about its impact on the rise in sea levels?

Dr. HOLDREN. That impact will also be small. And again, it is necessary to start or we will be cooked and flooded.

Chairman SMITH. I understand. I just want to make sure that everybody understands the impact of the rule on climate change is going to be small, I would say negligible given what I have said.

And as far as our leadership role goes, to me that is totally hypothetical and speculative. You have got China today building on the average I think of one new coal-fed power plant every week and I don't think these other countries are going to have much of an incentive to follow anybody's lead if it is going to cost them more money and damage their economy. But I am glad to have your answers on the small impact on climate change.

Dr. HOLDREN. Can I answer the other point about our leadership——

Chairman SMITH. Well——

Dr. HOLDREN. —and about China——

Chairman SMITH. I think——

Dr. HOLDREN. —and about India?

Chairman SMITH. I think you already have today a couple of times, but I would like to go to Ms. McCabe, and then if we have time come back to that. The question—as I say, to me the impact on other countries is hypothetical.

Ms. McCabe, let me ask you some of these same questions, but on the way there you said a minute ago that the rule is about cutting out carbon pollution. The EPA Administrator, your boss, said when she testified before the Senate that this is not about pollution control. Why the contradiction in your statement and the Administrator's statement?

Ms. MCCABE. Well, I am not familiar with exactly what statement you are referring to. She may have been talking about the fact that there are technologies that would not be considered the traditional pollution control——

Chairman SMITH. Right.

Ms. MCCABE. —types of technologies that——

Chairman SMITH. Okay.

Ms. MCCABE. —are available to reduce——

Chairman SMITH. If——

Ms. MCCABE. —carbon——

Chairman SMITH. On the surface it looks like they are contradictory statements but we will look for another explanation.

Let me go back and ask you some of the same questions I just asked Dr. Holdren. What impact will this rule have on global temperatures? Is it going to be small, is it going to be great, is it going to be—what?

Ms. MCCABE. Well, I certainly would defer to Dr. Holdren on the science questions. I would agree with him that the impacts of any single action will be small, but it takes many small actions to make a difference on this global problem.

Chairman SMITH. Right. And the impact would be small on global temperatures and the impact would be small on any sea level rise as well, would it not?

Ms. MCCABE. Again, it takes many, many actions——

Chairman SMITH. I know but the answer——

Ms. MCCABE. —to make the difference.

Chairman SMITH. —to my question is that it would be a small impact and you would agree with Dr. Holdren?

Ms. MCCABE. I would agree.

Chairman SMITH. Okay. Thank you both very much. You have answered my questions.

And we will now go to the gentleman from California, Mr. Swalwell, for his questions.

Mr. SWALWELL. Thank you, Mr. Chairman.

And first, I just want to start with Dr. Holdren. Dr. Holdren, we heard a little bit about scare tactics earlier, but I wasn't around in 1970 when the Clean Air Act was passed. I came on the scene about ten years later. But when the Clean Air Act was passed, everything I have read was that there were a number of scare tactics from industry around what it would do to our economy. Do you remember that?

Dr. HOLDREN. I do.

Mr. SWALWELL. And——

Dr. HOLDREN. I do.

Mr. SWALWELL. And one of the scare tactics was that we would see our economy, rather than move forward, that the economy would move backwards. Do you remember that?

Dr. HOLDREN. I do.

Mr. SWALWELL. And isn't it true that in fact our economy has tripled in size since the Clean Air Act was passed in 1970?

Dr. HOLDREN. I think that is roughly right. I would have to double-check the figure.

Mr. SWALWELL. And isn't it true that pollutants have been reduced by 70 percent since the Clean Air Act was passed in 1970?

Dr. HOLDREN. At least many of the important ones have.

Mr. SWALWELL. Okay. Did you read the New York Times story over the weekend on Germany's solar and wind investments?

Dr. HOLDREN. I did.

Mr. SWALWELL. Do you believe that the United States is any less capable than Germany in making investments in solar and wind? And what would it mean for reducing carbon emissions if we made investments that would have us have 30 percent of our energy supplied by renewables, as Germany is on track to do by the end of the year?

Dr. HOLDREN. We are not technically less capable. We may be politically less capable of taking the necessary decisions.

Mr. SWALWELL. And what would it do for our Climate Action Plan if, over the next 15 years, we achieved what Germany is going to achieve by the end of this year, which is having 30 percent of its energy provided by renewables?

Dr. HOLDREN. It would obviously be a great help.

Mr. SWALWELL. Okay. And, Ms. McCabe, do you have any thoughts on that?

Ms. MCCABE. No, I would just confirm that we think increased use of renewable energy is going to be a key portion of states' plans that they can choose to develop. So I would agree.

Mr. SWALWELL. Also, Dr. Holdren, many have mentioned that even if we do something, that other countries—some of the bigger countries, China and India, if they do nothing, that our efforts could be negligible. However, don't we have some recourse to enforce or require other countries to take action? For example, can't nations that are being responsible—that are not being responsible in addressing this global threat be slapped with a WTO complaint tariff?

Dr. HOLDREN. Let me say that at this point I don't——

Mr. SWALWELL. Sorry, WTO compliant tariff.

Dr. HOLDREN. I think at this point we don't need to talk about recourse because the fact is that both China and India, the second and third biggest emitters in the world, are both taking far more action than most Americans realize. The Chinese in their 12th five-year plan put a target for reducing the percentage—a target for increasing the percentage of non-fossil fuel in primary energy consumption. We, by the way, have not done that. We don't have any non-carbon or low carbon energy standard. China has set specific national targets for the expansion of nuclear, wind, solar, and natural gas. They have a carbon intensity target, which they are on track to meet. They have minimum energy efficiency standards across a wide range of appliances and vehicles.

Mr. SWALWELL. And, Dr. Holdren——

Dr. HOLDREN. And they have been shutting down their old coal-burning power plants——

Mr. SWALWELL. I appreciate you bringing that up because——

Dr. HOLDREN. —and replacing them with more efficient ones.

Mr. SWALWELL. —I want to put into the record if it is okay with the Chair two stories that backup what Dr. Holdren is saying, one, a September 12, 2014, story, "China Aims High for Carbon Market by 2020," and also a May 7, 2014, story, "India Goes Green, Drafts Policy to Lower Carbon Emissions."

Chairman SMITH. Without objection, those two articles will be made part of the record.

[The information appears in Appendix II]

Mr. SWALWELL. Thank you, Mr. Chair.

So I think the question that we are tasked with today is do something or do nothing, and as far as I am concerned, plan always beats no plan, especially when the stakes are so high. And so I guess I would challenge my colleagues on the other side if they want to do nothing, why don't we go ahead and build a do-nothing climate wall. We can put it somewhere out on the Washington Mall and we can put all the names of the people who think that we should do nothing, and then in 100 years we can let our children and grandchildren go to that wall and see who wanted to do nothing and who wanted to do something. And I hope we did something and we will let history be the judge of what happens next.

Mr. ROHRABACHER. Will the gentleman yield for a question?

Mr. SWALWELL. And I yield back the balance of my time.

Mr. ROHRABACHER. Would the gentleman yield for a question?

Mr. SWALWELL. I yield back.

Chairman SMITH. The gentleman has yielded back.

Thank you, Mr. Swalwell, and we will now go to the gentleman from Ohio, Mr. Johnson, for his questions.

Mr. JOHNSON. Thank you, Mr. Chairman. Thank you, folks, for joining us today.

Ms. McCabe, I would like to start out, you acknowledged in agreement with Dr. Holdren that the rule would have a small impact in the climate spectrum. Do you also view the thousands of jobs and the economic impacts of these rules on the American people as small impacts?

Ms. MCCABE. We—Congressman, we take very seriously any expected impacts on the economy when we consider our rules——

Mr. JOHNSON. Well, you know, the experts are saying, Ms. McCabe—you know, I represent a district in Ohio that has six coal-fired power plants; I have got roughly 15,000 or so coal industry-related jobs. If these rules go forward, those jobs are going to be forfeited. So my question to you is do you view those as small impacts?

Ms. MCCABE. I think that any job concerns to a community are significant and need to be paid attention to. This rule is——

Mr. JOHNSON. Are they acceptable to you?

Ms. MCCABE. This rule is being written in the context of a transitioning energy system, and——

Mr. JOHNSON. Let's talk about that for a second. Transitioning energy position, you know, during this past winter the polar vortex, the cold snap, many coal-fired power plants that are slated to retire were running at over 90 percent capacity. In Ohio I have heard the experts say that we were one coal-fired power plant away from rolling brownouts and blackouts. And I am already getting manufacturers today that are being asked to idle their manufacturing plants because there is not enough energy on the grid.

So how would the grid have performed this past winter and how high would have wholesale prices risen if the coal-base-load of power plants scheduled to close over the next two years, if they were not available this past winter? What does your analysis reveal about that? You take all that power off the grid, how would that have affected the price for energy this past winter?

Ms. MCCABE. The Clean Power Plan envisions that in 2030, 30 percent of——

Mr. JOHNSON. I am not talking about 2030; I am talking about last winter. How would it have affected the wholesale prices if that energy had not—that you are planning to take off the grid, if it had not been available? How would it have affected wholesale prices?

Ms. MCCABE. EPA is not planning to take any power off the grid. This plan would allow states to develop plans and we see that energy reliability would not be compromised under the plan as we have devised it.

Mr. JOHNSON. Okay. Well, the states have a different view of that I think. Let me ask you this, then, talking about the states. You know, explain it to me then how you intend to approve or disapprove of a state plan if the state submits a plan that has a different baseline than those that are set out in the proposed rule because the EPA's generation mix for 2012 doesn't include all the

utilities that usually operate, for example, they were shut down that year or they did not operate?

Ms. MCCABE. Um-hum.

Mr. JOHNSON. Will the EPA disapprove a state plan that sets a different reduction target than what the Agency requires in the proposed rule because it failed to include a utility that did not operate in 2012?

Ms. MCCABE. This is why our rulemaking has a public process with opportunities for people to give us information. We want to make sure that the targets that we ultimately finalize are accurate and correct and based on correct information, and we are in those discussions with states every day now to make sure that we have that right information.

Mr. JOHNSON. Okay. Dr. Holdren, and—during—you talked about success through science in your opening statement this morning. Last July, Steve McConnell, the former Assistant Secretary for Energy until last year, now at Rice University, testified before this committee that the relationship between the DOE and the EPA was really disingenuous interagency collaboration and simply a box-checking exercise. Further, it was an awkward—he said it was an awkward dance because very often the inconvenient truths of technical evaluations didn't fit the political agenda and that made it very difficult to actually have any collaboration, and in fact, as time went, on the communication became almost zero.

Mr. McConnell gave an insightful example of where EPA's idea of checking the box on a 650-page technical document to the Department of Energy at 3:00 p.m. on a Friday afternoon that EPA told him they had to respond back by 10:00 a.m. on Monday.

So you are in charge of scientific and technical cooperation between departments and agencies. Is this how the Obama Administration makes technical decisions that will cost the American taxpayers billions of dollars? Is this what you call success through science? Or is it simply a political agenda to shut down coal-fired power plants across the country?

Dr. HOLDREN. It is certainly not a political agenda to shut down coal-fired power plants, and as you know—as I believe you know, under the Climate Action Plan, coal would still be providing 30 percent of U.S. electricity at the end of—at the period in 2030.

But in terms of interagency cooperation, of course we want and we encourage interagency cooperation. I am responsible for the oversight of activities and initiatives that involve the cooperation of multiple agencies. We work hard at getting that to happen. I think it is happening. I think both EPA and DOE currently have not only very capable but very collaborative leaders in Secretary Moniz and Administrator McCarthy. I have seen them working closely together. I have seen the process of collaboration. I am not sure what happened when——

Mr. JOHNSON. All right. Well, let me—my time is almost expired so let me ask Ms. McCabe then.

Mr. ROHRABACHER. [Presiding] There is——

Mr. JOHNSON. Will you——

Mr. ROHRABACHER. Your time has expired—more than expired. Thank you.

And——

Mr. JOHNSON. I yield back.

Mr. ROHRABACHER. —now, Ms. Edwards.

Ms. EDWARDS. Thank you very much, Mr. Chairman.

And, Dr. Holdren, and to both of our witnesses, thank you very much for being here.

I think that we could not be dealing with any more important issue than this discussion right here and we need to get off the dime on the politics because we are losing ground every single day.

And I would like to ask the Chairman, I have an article from the Washington Post that just appeared a couple of days ago that highlights the impact—the potential impact to flooding from storm surge that would threaten D.C.—the District of Columbia infrastructure. And I would note it is a shame that Mr. Swalwell is no longer here and he has left because I would tell him that if he were going to build that wall on the Mall, he should choose a different place because it will be underwater.

And so with that, Mr. Chairman, I would like to enter this article from the Washington Post appearing September 16 into the record.

Mr. ROHRABACHER. Without objection.

[The information appears in Appendix II]

Ms. EDWARDS. Thank you.

Dr. Holdren, as we have just indicated, you know that our coastal communities are a major contributor to the U.S. economy that supports maritime commerce and shipping ports, fishing, tourism. I know Maryland has a great benefit to our economy because of our coast and our Chesapeake Bay. And all of these areas are highly vulnerable to the threat of sea level rise.

In addition, in the Maryland Chesapeake Bay, the five states that comprise the watershed, that there is a lot of farmland there, too, and so in addition to the economy that takes place on the water, there is the economy just bordering the water that really threatens us. The third National Climate Assessment asserts that more than a trillion dollars of coastal property and infrastructure is at risk of inundation from a sea level rise of 2 feet above the current level. Can you outline the potential impact a 2 foot rise in sea level would have on the American economy?

Dr. HOLDREN. Well, let me say a couple of things about that. One is that is quite extensively analyzed in the National Climate Assessment that came out in May. The second point is that the first phase of the Climate Data Initiative, which is part of the President's Climate Action Plan, and the first phase of the Climate Resilient Toolkit, which will be rolled out shortly, are both focused on providing more detailed data on the consequences of sea level rise of various levels on infrastructure and on the economy.

And so while we already have rough accounts of how devastating sea level rise in that magnitude would be, we will soon have better ones and we will have tools that will enable people on the coast all around the country to understand, anticipate, prepare for, and plan for the amounts of sea level rise that are likely to occur in their areas.

Ms. EDWARDS. Dr. Holdren, just to follow that up, I recall that just a couple of months ago there was another article—I think it was either in the New York Times or Washington Post—that talked about particular impacts in the Virginia Beach and Norfolk

area to our military facilities. And in fact, as part of our military readiness and planning, they have tried to accommodate for that kind of rise. We put billions of dollars into structuring and restructuring, rebuilding our ports to accommodate our military bases and facilities because our Department of Defense actually does believe that there is a tremendous impact of climate change contributing to sea level rise.

Has there been an assessment of the threat to our defense—our national defense and military readiness?

Dr. HOLDREN. There have been a number of reports by the Pentagon and by consultants to the Pentagon on the impacts of climate change on national security, and I would refer you to those. You are absolutely right, Congresswoman Edwards, that the Pentagon recognizes very clearly that climate change is a big challenge for our military and for our national security.

Ms. EDWARDS. Thank you very much. And just to be clear, though, when we are thinking about the impact to the economy on our coastal communities, do we have a rough estimate—is there a rough estimate of how much of the population just on the two coasts, the Atlantic and the Pacific, that is attributed to—that would be impacted by sea level rises?

Dr. HOLDREN. I am just in the process of looking up a number—excuse me. I am just in the process of looking up the number in the National Climate Assessment. There is an estimate in there of what fraction of the U.S. population lives at various heights above current sea level. I don't recall it off the top of my head.

Ms. EDWARDS. Let's just say it is a boatload of people, right?

Dr. HOLDREN. I would be happy to get back to you with a quantitative answer on that.

Ms. EDWARDS. Great. Thank you very much for your testimony.

Mr. ROHRABACHER. Thank you very much.

Mr. Bridenstine.

Mr. BRIDENSTINE. Thank you, Mr. Chairman.

When the President was campaigning in 2008 he was interviewing with the San Francisco Chronicle and they asked him—quite infamously they asked him, you know, are you going to shut down coal-fired power plants? And his response was, well, no, I am not going to shut them down; we will increase regulations to the point where it is so expensive, they won't be able to stay in business. I would like to ask each of you, do you agree with the President's philosophy on that?

Dr. HOLDREN. Well, first of all, I am sure the Resident no longer agrees with it. Whatever he said in 2008, he——

Mr. BRIDENSTINE. So that is not the President's philosophy?

Dr. HOLDREN. It is not the President's philosophy.

Mr. BRIDENSTINE. Okay. That is good.

Dr. HOLDREN. The President is not trying to——

Mr. BRIDENSTINE. So you don't agree with it? Yes or no, you don't agree with it?

Dr. HOLDREN. I don't agree with the statement as you just presented it——

Mr. BRIDENSTINE. Okay.

Dr. HOLDREN. —that the President——

Mr. BRIDENSTINE. Ms. McCabe?

Dr. HOLDREN. —apparently said in 2008, and he doesn't either.

Ms. MCCABE. Absolutely, we don't agree.

Mr. BRIDENSTINE. Okay. So has he recanted that or retracted it or apologized for suggesting that?

Dr. HOLDREN. The National Climate Plan makes very clear—Climate Action Plan makes very clear that we do not intend to shut down coal-fired power plants, and it is the President's plan. So I say he is absolutely clear on the record on that and he has said it in a number of recent speeches as well.

Mr. BRIDENSTINE. Okay. Chuck McConnell is the Executive Director of the Energy and Environment Initiative at my alma mater, Rice University. He is a former Assistant Secretary of Energy and this Administration, and he testified before this committee about the environmental impacts of the Administration's carbon plan that you have just mentioned, or rather the lack of the impact of the environmental plan. He says that the reductions in emissions resulting from these rules will account for less than 1/100th of 1 degree Celsius drop in temperatures. Do you guys agree with that?

Dr. HOLDREN. I don't agree with it for the reasons I have already stated, namely, we are beginning a process that is going to lead to further reductions.

Mr. BRIDENSTINE. No, no, no, no, this rule—no, no——

Dr. HOLDREN. This rule alone——

Mr. BRIDENSTINE. Do you agree with that statement, 1/100th of 1 degree Celsius?

Dr. HOLDREN. I would have to look—have to review the number before I——

Mr. BRIDENSTINE. These are your models.

Dr. HOLDREN. —before I subscribe to a particular——

Mr. BRIDENSTINE. These aren't my models; these are your models and—now, he also suggested——

Dr. HOLDREN. I will be happy to review the number and get back to you——

Mr. BRIDENSTINE. Sir, this is my time——

Dr. HOLDREN. —but the point is this is a start.

Mr. BRIDENSTINE. Sir, I am asking the questions here. He also suggested that it would increase sea levels by 1/3 of the width of a dime over 30 years. Do you agree with that assessment?

Dr. HOLDREN. Again, I will get back to on the specific numbers but the assessment is irrelevant. We are starting a process which is going to require larger emissions reductions going forward——

Mr. BRIDENSTINE. By China? We need larger——

Dr. HOLDREN. Oh, absolutely we do and China is already on that pathway as well.

Mr. BRIDENSTINE. Oh, I——

Dr. HOLDREN. And in some respects they are ahead of us.

Mr. BRIDENSTINE. I am glad to hear that China is on board with our plan because they weren't on board with our plan when we wanted to protect international waters in the South China Sea, were they?

Dr. HOLDREN. We are not talking about the South China Sea; we are——

Mr. BRIDENSTINE. No, we are because the South——

Dr. HOLDREN. —talking about climate change.

Mr. BRIDENSTINE. —China Sea is their next move and they are doing it for energy purposes. And guess what? They didn't consult the Philippines, they didn't consult Vietnam, they didn't consult Malaysia or Indonesia, they didn't consult Taiwan. They just went ahead and said we now control the South China Sea. Now was that in the plan?

Dr. HOLDREN. I am not defending what China has done in the South China Sea.

Mr. BRIDENSTINE. Well, let me ask you——

Dr. HOLDREN. What I am saying is China finds it——

Mr. BRIDENSTINE. —I am going to ask you a very important question——

Dr. HOLDREN. —in its own interest——

Mr. BRIDENSTINE. Does China——

Dr. HOLDREN. —to reduce greenhouse gas emissions——

Mr. BRIDENSTINE. Does China do what is in our interest or do they do what is in their interest? Because what we have seen is they do what is in their interest and encourage us to do what is against our own interest. Do you agree with that?

Dr. HOLDREN. No, I do not. In the case of climate change it is in both our countries' interest to reduce both of our greenhouse gas——

Mr. BRIDENSTINE. Then why are they continuing to——

Dr. HOLDREN. —and that is why we are cooperating——

Mr. BRIDENSTINE. —increase their emissions?

Dr. HOLDREN. —in that domain.

Mr. BRIDENSTINE. You recognize that they are continuing to increase their emissions, and the more we reduce ours, we hinder our economy while their economy is growing more rapidly, is that correct?

Dr. HOLDREN. They are continuing to increase their emissions but at a declining rates, and they are aiming to peak and then decline at—currently, we expect that China will be announcing an intention to peak by 2030 and we——

Mr. BRIDENSTINE. Well, I am glad they are going to——

Dr. HOLDREN. —hope——

Mr. BRIDENSTINE. —peak in 2030.

Dr. HOLDREN. And we hope that they will move that forward as the technological capabilities to do it become available.

Mr. BRIDENSTINE. I have got 30 seconds left. The Mayor of Tulsa was here today, Dewey Bartlett. He is a good friend of mine. He would like me to ask you guys if you are aware that 50 percent of the total electricity output for Oklahoma comes from coal. Are either of you aware of that, 57 percent of our electricity output comes from coal in the State of Oklahoma?

Ms. MCCABE. There are a number of states where a significant portion comes from coal and we expect that to continue.

Mr. BRIDENSTINE. In Oklahoma we have a 20 percent lower cost of electricity than the national average. Are you aware of that?

Ms. MCCABE. Not specifically but I—it doesn't surprise me.

Mr. BRIDENSTINE. So when these rules go into effect, do you know what happens? Manufacturing jobs that have a high cost of energy, manufacturing jobs leave Oklahoma. And guess what? It is a lot more difficult to attract jobs to Oklahoma. Are you guys

aware of that? So even though you suggest that this may grow the economy, right now, that is not how it is working in my State of Oklahoma.

I am out of time but this is something you need to think about. Thank you so much.

Mr. ROHRABACHER. Thank you.

Mr. Posey from Florida.

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

Thank you, Dr. Holdren and Ms. McCabe for coming here today. I know sometimes it is really not fun here and I hope it is not intended as a bunch of grouches. I mean I hope everybody is really trying to find common denominators and trying to make common sense meets science and get a good handle on this and I think that if there is enough debate, someday it will probably level out and most people will share the same opinion, but there is just a lot of digging to get there.

And, for the hundredth time, I believe in climate change, never said I didn't believe in climate change. Some people have claimed that I said I did—I never—I defy anybody to say I don't believe in climate change. I think the last time Dr. Holdren was here we discussed climate change. I talked about the temperature of the Earth 65 million years ago being significantly hotter than it is now and some lame-brained blogger willfully and wantonly distorted the fact to say I said it didn't bother the dinosaurs, why should it bother us? So there is a lot of venom flowing on both sides of this issue, which I am afraid hinders more direct discussion of the fact, and that is real unfortunate.

You know, I think from my perspective the overarching interest in the issue and the common ground that I think everybody has is it is important that we have clean air and clean water for everybody. I mean every generation—everybody is healthier if we have clean air and clean water, and I think that is kind of where you are trying to go and I think that is where the so-called other side is trying to go, too, but there are just some things they want to quantify. And, you know, science should be questioned. Everybody's opinions should be questioned. Mine should be questioned, yours should be—everybody's should be—and that is what we do here.

Sadly, like I say, sometimes it gets a little more acrimonious than it needs to be. Sometimes the people that come in here and say politics shouldn't be involved in this are the most political people and politicize it the most, but that is unfortunate.

But my interests, getting to the crux of it, is still trying to have some kind of quantification rather than just platitudes. They say, well, we do a bunch of little things and add up to a big thing. You know, I understand that and I think everybody understands how that might work, but it is still just trying to quantify it. And somebody talks about a dime-thin worth of coastal rise but what I am still kind of searching for is to quantify what man's contribution in the United States of America is to climate change. I mean I know we are having it, you know, and everybody knows. I mean you learned as a young child the longer you stand in front of the fireplace, the warmer you get generally speaking unless there is extenuating circumstances.

But I just—and you don't want—you don't have to do it now. I am not trying to do a gotcha, but that is really what I am looking for, and if you can drop me a note on that, that is okay. I mean, you know, it doesn't have to be a big arena question, just trying to quantify if we go—if we take these steps at the end of the day, you know, what really difference is it going to make? And I am not saying it is worth it or shouldn't be worth it or whatever we do for clean air and clean water isn't important. I think everything that we do is. But just to kind of start working on the equation, it would be good to know what we attribute to the natural heating of our planet and do we expect that to continually increase, and then to what extent mankind directly affects it, and then more particularly to what extent the United States of America directly affects it. And I think that will put a lot of questions of a lot of other people in perspective, too, if we ever reach that—if we ever get that point. And either one of you can respond. You know, I am not trying to be argumentative but——

Dr. HOLDREN. Well, Congressman Posey, first of all, I appreciate your opening comment about the need for continuing discussion and the hope for ultimate convergence. That is an appropriate sentiment.

I would note, first of all, that in my long statement there is a lot of quantitative information and there is reference to much more, and the facts as we understand them are that natural climate change, if it was the only thing that was happening, the world would be in a long-term cooling trend. So the fact that is embraced by the vast majority of the scientific community who study these matters is that virtually all of the warming trend we have seen in the last several decades has been caused by human activities and most specifically by emissions from fossil fuel combustion, secondarily from deforestation and land-use change.

The second point I would make is although you are absolutely right that climate has been changing for the whole history of the Earth for a whole variety of reasons, it is changing many times faster now than it changed before. And the problem that poses is that the ability of society to adapt and ecosystems to adapt is stressed and potentially ultimately swamped.

Sixty-five million years ago when it was 13 or 14 degrees centigrade above the current temperature, the sea level was probably about 70 meters above the current sea level. We believe that the polar caps were free of ice at that time. All that ice was in the ocean and that makes sea level 70 meters higher. Also, 65 million years ago we didn't have 7 plus billion people to feed, house, and try to make prosperous.

So while you are absolutely right the temperature has varied enormously over the millions of years, that should be no consolation in the current situation where we are driving the temperature up at an unprecedented pace.

Mr. ROHRABACHER. Your time is up and the Chair will now be switching to Mr. Schweikert from Arizona.

Let me just add as I leave for my next assignment that I personally thank the witnesses and where we have some fundamental differences or disagreements, we certainly should keep our minds

open and try to be—try to get to what really is the science. And let me say in other areas we agree.

And, Mr. Holdren, I want to congratulate the White House on your recent decision to assign commercial contracts for space transportation and resupply of the space station, Debian, and Space Acts.

Dr. HOLDREN. Let me just say that was NASA's decision, but thank you for your approval.

Mr. ROHRABACHER. You might have had something to do with it. If you did, thanks.

Dr. HOLDREN. Okay.

Mr. ROHRABACHER. And with that, Mr. Schweikert.

And Mr. Stockman will be taking Mr. Schweikert's position in line. Thank you.

Mr. STOCKMAN. Thank you. I have some of the statements that were passed around today was the investments in Europe and—in climate change, and I think what was left out of the record was that Spain sold climate change bonds to its populace and guaranteed by the government and the government now has rescinded that guarantee and they lost a tremendous amount of money.

And so for the argument only point to Germany without pointing to Spain's failure, we would be remiss in the record to leave that out. Many Spaniards lost their entire savings investing in climate change technology.

Also, too, I hear repeatedly, you know, well, Obama is not going to close plants. I don't think anybody suggested that Obama is going to close plants. I think what we are suggesting is the policies will close plants, and that seems to bear out with the predictions are coming true across the country and what plants have to be closed.

In reference to China, I was just there. The embassy said that their level of measuring of pollution was so high that their equipment could not measure it and there is now a key factor in moving to Beijing that you are given compensation because you can't even breathe the air there, and many people working there, including some of the embassy staff, are not willing to work in Beijing it is so bad. And I actually asked some of the Chinese officials if they thought they could meet their climate projections and they laughed. They don't believe it and I don't think we should either.

And my colleague over here who said we are in a do-nothing caucus, may I remind the colleague by his own testimony that the EPA was created by a Republican and he, by his own admission, says that the pollution has gotten 70 percent better. So I would argue that that is not do-nothing; that is actually has done something.

And I went to Maryland and asked repeatedly two things which I have never been able to get answers on. One was I said what ended the Ice Age? And the lead scientist at NASA said this: He said that what ended the Ice Age was global wobbling. That is what I was told. This is a lead scientist down in Maryland. You are welcome to go down there and ask him the same thing.

So on my second question, which I thought was an intuitive question that should be followed up, is the wobbling of the Earth included in any of your modeling? And the answer was no. So how can you have wobbling of the Earth cooling the Earth and not be

included in any projections? That is one for the books that I am a little bit confused about. How can you take an element which you give to the credit for the collapse of global freezing and then to global warming but leave it out of your models? I am a little bit puzzled because we still don't have any metrics I understand of how to determine global wobbling, which I didn't know was part of the reason for the end of the Ice Age.

The last thing I asked him which I can't get answers to how long will it take for the sea level to rise 2 feet? I mean think about it, if your ice cube melts in your glass, it doesn't overflow. It is displacement. I mean this is the thing, some of the things that they are talking about that mathematically and scientifically don't make sense.

But I just—I am wondering overall when you have a model and you say we are going to leave out the most important impact of that model out of our theory and not talk about global wobbling, how can you make projections?

So I am concerned that while again you are saying Obama is not closing plants, you are correct on that note, which we here in Congress and other places take these words very seriously, but the policies will do exactly that. It will close plants and it has in Texas and it will around the country. And unfortunately, China I know firsthand is laughing at their own predictions. And with that, I will let you respond, but if you have a model with global wobbling, please let me know and let me know how long it takes the seas to rise 2 feet.

Dr. HOLDREN. Congressman Stockman, I am not going to talk about the economy of Spain; that is not my expertise, but I am going to talk about the science and help you a little bit with global wobbling to start with. Global wobbling, which refers to changes in the Earth's tilt and orbit, takes place on characteristic timescales of 22,000 years, 44,000 years, and 100,000 years. It is very slow. It brought us into ice ages; it brought us out of ice ages. When you take global wobbling into account, as I have already suggested, we would be in a cooling period now, but the warming inflicted by human activities has overwhelmed the effect of global wobbling.

Mr. STOCKMAN. But I was told——

Dr. HOLDREN. You don't have——

Mr. STOCKMAN. Wait a minute. None of the models have global wobbling in them. Is that true?

Dr. HOLDREN. And I am about to explain why. The reason why is that global wobbling is a tiny effect on the timescale of 100 years in which we try to run these models to understand what is going on now and going on soon. It is so small——

Mr. STOCKMAN. No, with all due respect——

Dr. HOLDREN. —and it is so small that you don't——

Mr. STOCKMAN. No.

Dr. HOLDREN. —need to put it in.

Mr. STOCKMAN. No, you can't say it had a global impact and then is small both. Those are the kind of statements——

Dr. HOLDREN. It had a global impact over periods of tens of thousands and hundreds of thousands——

Mr. STOCKMAN. So you are saying the Ice Age——

Dr. HOLDREN. —of years. We are talking about decades——

Mr. STOCKMAN. —took hundreds of thousands of years to end?

Dr. HOLDREN. Ice ages——

Mr. STOCKMAN. How long did the Ice Age take to end?

Dr. HOLDREN. Ice ages went on for hundreds of thousands of years——

Mr. STOCKMAN. That is not what I am asking you——

Dr. HOLDREN. —in some cases for millions——

Mr. SCHWEIKERT. [Presiding] Mr. Stockman——

Dr. HOLDREN. —and they ended over long periods of time as well as a general matter.

Mr. STOCKMAN. Doctor, I would just ask you if you could give me your model——

Mr. SCHWEIKERT. And sorry, I don't mean to step on anyone. It is just as the chaos of today, everyone is going to be running on to other hearings.

Mr. Weber.

Mr. WEBER. Thank you. Appreciate you all being here. Mr. Holdren, you just, in your exchange with Congressman Stockman, said that the economy of Spain is not your expertise, and I would probably venture to add that the economy of the United States is probably not your expertise either. Is that fair to say?

Dr. HOLDREN. That is correct. In respect to the economy of the United States, I rely on folks like the Council of Economic Advisors and the National Economic Council——

Mr. WEBER. The reason I bring that up is because the last thing we want is an unintended consequence, which Congress seems to be good at I might add, whereby the policies coming out of the Administration, the EPA, or any of the other agencies have that unintended consequence of actually harming our economy. And so I try to be keenly in tune with that. I just want to make that point.

Very quickly, in January of this year, a very cold January I might add, you filmed a short video for the White House website entitled "The Polar Vortex." In that video you said, "a growing body of evidence suggests that the kind of extreme cold being experienced by much of the United States as we speak is a pattern that we can expect to see with increasing frequency as global warming continues." And scientists on both sides of that issue quickly took issue with that. A complaint was filed with the agency seeking to correct it under the Federal Information Quality Act, yet your office claimed this was an expression of your personal opinion. Is that accurate?

Dr. HOLDREN. It is accurate, and as the President's Science Advisor, I express my personal opinion on the balance of science all the time.

Mr. WEBER. Okay. And if that was nothing more than a personal opinion, were White House resources spent on producing that video?

Dr. HOLDREN. I stated in the video that it was my judgment that we would see more of this. I believe that to be true.

Mr. WEBER. But my question was about the money. Who paid for the video?

Dr. HOLDREN. I assume that the——

Mr. WEBER. Okay.

Dr. HOLDREN. —White House Digital Services paid for the video.

Mr. WEBER. You are contributing to the economy then, so maybe the economy is part of your forte because some production company made out on that deal.

Let me go to the regulation that you are proposing here and let me—I want to jump over the ozone rule for just a minute and the EPA has a track record. I am from Texas. Texas has about 1,200 people a day moving there. We have dropped our carbon emission four percent in the last almost ten years while we have gained 4 million people to a population of 25 million, so that is a pretty hefty sum, a little over 20 percent I guess or about—not quite 1/5.

So the ozone proposal that you all put forward would cost $90 billion, with a B, lowering the ozone standard, and yet earlier you said to Jim Bridenstine that the assessment was irrelevant that he was trying to make the connection on. So if $90 billion annually it is going to cost to business, are you still prepared to say here today that won't cost any more for electricity, that the cost of energy that is going to go up because of these kind of regulations really—I realize we are not economy experts here, but do you really sit there and think that industry pays $90 billion a year or more to effect just that one ozone rule and nothing is going to go up?

Ms. MCCABE. Well, Congressman, if your question is about the Clean Power Plan, the economic analysis does show that electricity bills will go down in 2030 because of the effects of energy efficiency.

Mr. WEBER. Well, listen, I applaud you for believing that. I have got some oceanfront property in Oklahoma I would like to sell, too, so I just—I can't buy that. I mean I do—I own a business so I know how the economy works.

Let me go to carbon for just a second. Texas, as I said, has done a great job, people moving there every day by the thousands, 1,200 a day. And your carbon rule that you are proposing, with Texas cleaning up its air—and I will—and I believe that the EPA will admit that most of the ozone emissions, all right, noxious gas emissions, from non-stationary point sources, i.e., vehicles. Is that true?

Ms. MCCABE. Point sources is a term that refers to stationary sources——

Mr. WEBER. Got that.

Ms. MCCABE. —the emissions that contribute to ozone——

Mr. WEBER. They are coming—let me just short-circuit you. They are coming from cars.

Ms. MCCABE. No—not—no, not predominately. Cars——

Mr. WEBER. Non-stationary point sources, how would you describe that?

Ms. MCCABE. Cars make up about 1/3 of the emissions—

Mr. WEBER. Okay.

Ms. MCCABE. —and utilities, power plants, make up another 1/3.

Mr. WEBER. Those plants seem to be pretty stationary to me but that is just me thinking.

Ms. MCCABE. Right, but they are a significant——

Mr. WEBER. The——

Ms. MCCABE. —contributor to pollution——

Mr. WEBER. I am almost out of time. The point is that Texas has been really increasing their—I want clean air and clean water for

my kids and grandkids and for me and for you. Texas has been improving their air and water quality without the EPA's oversight. We have got states that are doing a good job, and unfortunately, the rules that the EPA is proposing are going to put a lot of the country in non-attainment on ozone, going to cost a lot of jobs, so even though we are not economy experts, before we have that unintended consequence, we are going to have to really think long and hard about the data and the scientists—the science used behind this.

And I am way out of time. I apologize but I just want to make that point.

Mr. Chairman, I yield back.

Mr. SCHWEIKERT. Sorry about that. We were working on some of our calendar.

Mr. Bucshon—or, excuse me, Mr. Cramer.

Mr. CRAMER. Thank you, Mr. Chairman.

Thank you, Ms. McCabe and Dr. Holdren, for being here. Good to see both of you again.

I am a little conflicted because I want to focus on the one hand on the reliability issues that Mr. Johnson brought up earlier but I think I am going to start with the flexibility issues because both the Agency and the Administration—you are quite adamant about the flexibility that the rule provides states, and I am wondering how much flexibility was considered for states with regard to the rate of emissions themselves? I mean did states have much flexibility in determining the emission rates?

Ms. MCCABE. Well, under the Clean Air Act, it is EPA's responsibility to determine the level of reductions to be achieved or the ultimate performance level, but then equally under the Clean Air Act the states have a responsibility but the opportunity to design a plan that achieves those goals using the best system that makes sense for them.

Mr. CRAMER. Okay. So going to another area of flexibility, and this was a question that was raised by a constituent of mine who is in the room, Perry Schafer, who has a small business—a couple of small businesses in North Dakota called Environmental Services. He provides service and sells products to power plants largely. And how much analysis under the Regulatory Flexibility Act was put into this rule? First of all, I guess are you familiar with the Regulatory Flexibility Act and what it does?

Ms. MCCABE. I am.

Mr. CRAMER. Okay. So how much—well, how much analysis was put in to consideration of that act and can you perhaps elaborate a bit on what the findings were and how it is applied in the proposed rule?

Ms. MCCABE. So the industrial sector that is addressed by the rule is the power plant sector and those are primarily large businesses. And so the economic analysis that we do look at the impact that we expect from the types of choices that people will be making in order to comply with the rule given what we see happening in the economy right now.

Mr. CRAMER. So when you are applying the analysis for the Regulatory Flexibility Act, you are considering the flexibility of the power plant but not all these small businesses that are affected by

the rule as they impact the power plant. Is that what I just heard you say?

Ms. MCCABE. Well, we look at the approaches that we see being used by states and companies around the country and the types of things that they are doing and look at the expected impacts of those on costs and—on the economy.

Mr. CRAMER. So besides the precedent-setting piece of this, which we haven't even begun to address what the impact will be if this rule goes forward, if it is accepted and becomes the tradition and culture of the land, what impact it is going to have on manufacturing and the rest of the industrial sector, is it not true that the industrial sector depends tremendously on electricity and that it fact whether small business, medium-sized business, or large business, there is a very direct—not just an indirect—but a very direct economic impact and did the—is the flexibility there to address small business?

Ms. MCCABE. Well, the analysis that we have done shows that the effect actually will be positive by reducing electric bills in 2030 as a result of the energy efficiency, and the rule will lead to significant investment in the kinds of activities that support small businesses across our community and energy efficiency and renewable energy and other technologies.

Mr. CRAMER. Since you brought up this lowering of rates or the lowering of the bills in 2030 due to efficiency, being a former regulator—economic regulator, utility regulator, I know full well that efficiency is not free. It is not even cheap. It may not even be the cheapest alternative, although I know that is commonly thought. But in a state where our retail rates today average about between eight and nine cents a kilowatt hour, the cost of compliance with efficiency standards is oftentimes greater than the cost of the electricity itself.

And the other thing I would raise is the plants have to be paid for and they have to be paid for over the lifespan of the plant, and if you impose efficiency which costs people—and frankly I think is a greater burden on the poor than it is on the people that can afford the efficiency methods, doesn't the cost of that plant—the stranded cost still have to be covered one way or another, and whether it is at 8 cents or 9 cents or 10 cents or 30 cents a kilowatt hour, I mean is that all factored in or is this a very static analysis, which I am afraid it is?

Ms. MCCABE. Well, there is a lot in your question, Congressman.

Mr. CRAMER. Yes.

Ms. MCCABE. But on the question of stranded assets, one of the advantages to the long trajectory that the proposal has in it, which is compliance by 2030——

Mr. CRAMER. Um-hum.

Ms. MCCABE. —was exactly to address those sorts of issues. We recognize that that is a reality and we wanted have a plan that would allow states to make choices that would avoid stranded assets.

Mr. CRAMER. And I think the other advantage is that when you go that far out, nobody is going to remember that we have promised that rates were going to come down in 2030.

My time is expired.

Mr. SCHWEIKERT. Thank you.
Mr. CRAMER. Thank you for your testimony.
Mr. SCHWEIKERT. Thank you, Mr. Cramer.
Mr. Neugebauer.
Mr. NEUGEBAUER. Thank you, Mr. Chairman. Thank you for holding this hearing.

This is a question to both of you. The EPA I think calculates that this rule will cost between $7.3 and $8.8 billion, but the U.S. Chamber of Commerce recently published a study that said they think it will cost the economy $50 billion per year through 2030. The question we have heard a lot about how high energy costs can impact businesses and that causes unemployment, but the thing that I think sometimes goes unsaid is what does it do to American families? So does the Administration acknowledge that if, for example, you increase the cost to a family for energy of $500 a year, that what that does to low-income and senior citizens and how they are going to be able to cope with that?

Ms. MCCABE. We recognize these are real impacts. That is why the rulemaking process requires the agencies to put forward an economic analysis so everybody can take a look at those things. I will note that we need to be careful when we compare different studies to make sure that people are looking at the same thing, and so the analysis that we have in our—that is in our proposed rule now is out for public comment and people can give us their views on what the EPA is actually proposing as opposed to perhaps other ideas that people might have.

Mr. NEUGEBAUER. But you are making some assumptions here and you have a study, they have a study, there are a lot of numbers out there. Some of those numbers that I hear are even bigger numbers than that. But the real issue is is you say by 2030 that this will be cost neutral because of energy efficiency. Well, number one, we don't know whether that efficiency will occur, but in the meantime, that senior citizen or that low-income family is going to be paying more for their utilities.

Ms. MCCABE. If I may, Congressman, then I will defer to you—yes, certainly. One of the things that we did in developing this proposal was to look at the programs that are already out there and many states are very far along with very good and aggressive energy efficiency programs in which they are finding that it is good for their local economies. Utilities and utility regulatory systems are very aware of the impacts on low-income ratepayers and there are lots of programs that make sure that those impacts are mitigated or adjusted so that the benefits can be achieved without opposing those sorts of costs on people.

In this rule, which puts states in the driver's seat for deciding how they are going to implement these plans, allows them all the flexibility to make sure that they are making those kinds of sensible decisions that are sensitive to the needs of their citizens.

Dr. HOLDREN. I would like to just add two very quick points. First of all, the Chamber of Commerce study was of what they thought the EPA plan was going to be. It was developed before the EPA plan came out and the EPA came out with a different plan than the Chamber of Commerce analyzed, so no wonder the numbers are different.

Secondly, the biggest factor in reducing coal use for electricity generation in this country has been the expansion of natural gas, and the reason that has happened, although natural gas does bring a greenhouse gas benefit, the reason it happened is that natural gas has been cheaper, not more expensive than coal.

Mr. NEUGEBAUER. Yeah. Well, again, I am not sure exactly what the Chamber's study would be adjusted based on the new rule, but what I have—know that we have had a number of witnesses, and sit where you are, and nobody has said that they think that this rule will make the cost of electricity go down. I mean we—and it is not just one or two people; we have had a number of people. And so I think the question that I have is that you have basically created a tax and this tax is going to be—you know, for upper income people this may not be an issue but it is going to cost jobs. But more importantly, you know, it is going to put a real strain on our families.

Speaking of jobs, what—how many—if you did an analysis and you talked about putting this rule into effect, how many jobs do you think would be decreased by the fact that you would put this in place? Or do you think it is going to increase jobs or decrease jobs? What is your study?

Ms. MCCABE. Yeah, all of that is laid out in our Regulatory Impact Analysis and looks at the impacts in various parts of the economy on job increases and decreases. And our information shows that there will be increases in some areas and decreases in other areas. There are already those sorts of shifts going on in the energy sector, and so our analysis reflects that. So I would commend folks to take a look at that and give us their thoughts on how we have looked at those numbers.

Mr. NEUGEBAUER. What was the net?

Ms. MCCABE. If you give me a minute, I will find that for you, Congressman.

Mr. SCHWEIKERT. Ms. McCabe, can I beg of you to look that up——

Ms. MCCABE. We can get it——

Mr. SCHWEIKERT. —when it comes up, we will——

Ms. MCCABE. We will get it back to you.

Mr. SCHWEIKERT. All right.

Ms. MCCABE. We can get it back to you.

Mr. SCHWEIKERT. Thank you, Mr. Neugebauer.

Mr. Broun.

Mr. BROUN. Thank you, Mr. Chairman.

President Obama, in a nationally televised address, said his energy policies would "necessarily skyrocket the cost of energy." And I think your proposed rule—and he is utilizing the EPA to do that. And I just want to make a public comment. I think this is blatantly unfair to poor people and senior citizens on limited income. That is what you guys at the OSTP in the EPA have been doing is driving up the cost of energy and it is absolutely unfair to poor people and to senior citizens on limited income, as well as the middle class. Only the rich people can afford to pay for the energy that you all's rules that you have already put in place and that you are proposing will go forward.

But why does the proposed rule that will penalize states whose utilities have decided to invest in new nuclear generation by factoring those facilities into the state targets? Shouldn't those utilities that made the decision to invest in non-emitting baseload generation get full credit for their investments? Administrator?

Ms. MCCABE. Yes. So this is an issue that we are getting a lot of input on and a lot of good discussion, and as you acknowledge, there are states and utilities that have been more forward-looking in the types of investments that they have made and we believe that the rule actually recognizes those advances and——

Mr. BROUN. Well, I don't think so and the states should get full credit for those and the utilities that are doing so.

Also, can you discuss the treatment of the Nation's nuclear energy fleet? In your analysis you simply assume that states can keep on the nuclear power generation that they now have. How might the expected accelerated retirement of nuclear plants affect the cost of the rule?

Ms. MCCABE. Yeah, we recognize that states' choices about nuclear energy are important considerations for them. The rule itself focuses on the fossil generating fleet. That is our obligation under the Clean Air Act. We—in—we built into the rule some elements that we hope will provide some incentive to keep clean nuclear generation in operation, to help the states with their carbon intensity, and we will—we have been talking with states with significant nuclear resources to make sure that we fully understand what they see as the possible implications.

Mr. BROUN. Well, Georgia is trying to put in the first two nuclear power plants that have been authorized in several decades——

Ms. MCCABE. Right.

Mr. BROUN. —and it has run into problem after problem, Georgia Power Company has and Southern Company has because of this Administration particularly. We need to make nuclear power easier to put in place. We need to have some policy to—NRC as well as EPA and other entities that affect these, to make it so that utilities can put in power plants and not so expensive because that is going to make electricity much cheaper and it is non-emitting.

Dr. Holdren, emails have emerged in the Richard Windsor lawsuit where former EPA Administrator Lisa Jackson violated the law by using false email identity that also revealed that you used a private email account for work-related emails, all this while you were at the White House. According to records from that lawsuit, you were sending such work-related emails to your duties at the White House even after you sent a memo admonishing other OSTP employees to stop using private email account. And in fact you even pledged that you were going to cut ties with previous groups and you used private emails, I understand, with the Woods Hole Oceanographic Institute in spite of your pledge and against the law. Have you decided to heed your own advice and stop using your private email account when you are clearly discussing your work-related duties of the White House?

Dr. HOLDREN. I am not sure what that has to do with the topic of this hearing but I will answer. The——

Mr. BROUN. You were here before me and last time I saw you we were in the office talking about another issue and hopefully we can settle that in the future.

Dr. HOLDREN. So——

Mr. BROUN. But——

Dr. HOLDREN. —the answer is I copied——

Mr. BROUN. —I think it is very important——

Dr. HOLDREN. —as the regulations require in the White House, I copied all work-related emails that originated on my home computer to the White House so that there would be a record so there would be no violation of the Federal Records Act. The reason I did some of those emails initially at home was that I didn't have the technological capability to get at my White House computer from home. We now have that capability and I am no longer using my home computer when I am not at the White House. But then I complied——

Mr. BROUN. So you utilized——

Dr. HOLDREN. I complied with regulations by copying those emails to my White House computer so that there would be no violation of the Federal Records Act.

Mr. BROUN. And so all of your private emails were put into public records so that the——

Dr. HOLDREN. As far as I know, all those related to work——

Mr. BROUN. —Federal Records Act and Freedom of Information Act, there is no violation?

Dr. HOLDREN. As far as I know, there is no violation. As far as I know, I succeeded in my intention to copy all of my work-related emails to the White House computer.

Mr. BROUN. Well, I certainly hope so. Lisa Jackson broke the law——

Mr. SCHWEIKERT. Okay.

Mr. BROUN. —and I think that you are doing the same thing when you do that.

Mr. SCHWEIKERT. Thank you, Mr. Broun.

Mr. BROUN. My time is expired. Thank you, Mr. Chairman.

Mr. SCHWEIKERT. Mr. Hultgren.

Mr. HULTGREN. Thank you both for being here. We as policymakers certainly need to know how science is being used by the Administration to justify new rules. Too many of my constituents are just struggling to keep the lights on, just as we were struggling earlier in this hearing, on home or work, so they really do need to know the effects the rules will actually have. To many of my constituents, many of this Administration's new regulations seem to benefit lawyers in Washington, D.C., more than the environment back in McHenry County, Illinois.

Administrator McCabe, we have had former Administration witnesses testify to EPA's interagency collaboration as being merely a box-checking exercise rather than a true collaboration. This echoed back to your response to me in a previous hearing where you would not say that EPA actually utilized DOE's Technology Readiness Assessment for the technologies you needed to justify your own rules.

This seems to be an ongoing problem throughout your agency and with environmental regulations in general, so I want to ask a more specific question about how EPA plans to react during the po-

tential grid reliability emergencies that I am afraid these rules might bring about. It is my understanding that there have been two instances where plants were shut down due to EPA regulations but DOE required them under Section 202(c) of the Federal Power Act to resume operations in order to avoid a reliability emergency. If these plants did not resume operation, they would face unlimited liability from lawsuits under the Clean Air Act. One of the plants did resume operation and was slapped with National Ambient Air Quality Standard violation. The other was forced to settle significant lawsuits out of court.

This should be a yes or a no. If you are receiving two conflicting orders from a regulatory agency, is it proper use of regulatory authority to just make a citizen choose which fines they pay and which mandates they ignore? This certainly seems to be a case where the EPA rules say that the lights being off is a greater benefit to society than people working. When or could the Administration's new plan be used in this way?

Ms. MCCABE. EPA works closely with DOE and with FERC and we have been for a number of years to make sure that we are keeping on top of any potential reliability issues. The—our system of laws in this country has provisions for emergency situations that, as you note, have been activated not very often, and so we work within those system of laws.

There are a number of things about the Clean Power Plan that we think will make those sorts of situations very unlikely to happen. One of them, for example, is the fact that the compliance period, the averaging times for utilities under these rules are lengthy, and so they are—they will accommodate emergency situations of short duration because they will be able to average their operations over a long period of——

Mr. HULTGREN. But the point of my question was, you know, really of forcing citizens and private entities to choose between which fines they will pay, which mandates they ignore. Again, I feel like this is an unfair situation to put them in.

Let me address a second question to both of you. Factoring out supposedly co-benefits from other emissions, how do carbon reductions equate to reductions in heart attacks and asthma?

Dr. HOLDREN. That all has to do with the effects of climate change itself as carbon dioxide does not cause asthma by itself; it does not cause heart attacks. If, however, you change the climate so that there are more extreme instances of heat stress, you contribute to heart attacks. If you change the climate in a manner that increases pollens or increases conventional air pollutants of a number of kinds, then you affect asthma.

Mr. HULTGREN. Administrator McCabe, is EPA considering any additional requirements for reductions in ozone?

Ms. MCCABE. They are—we have a process underway now as the Clean Air Act requires——

Mr. HULTGREN. So yes?

Ms. MCCABE. —to review the 2008 ozone standard.

Mr. HULTGREN. And what is that lowering amount that is being considered?

Ms. MCCABE. EPA has not proposed a rule yet. We will propose one later this year. There has been a science inquiry going on for the last couple of years, as is required by the Clean Air Act.

Mr. HULTGREN. Was it an agency decision to create new rules or was this a result of a lawsuit?

Ms. MCCABE. We are required under the Clean Air Act to review the National ambient air quality standards on a regular basis, every 5 years.

Mr. HULTGREN. Do you believe the EPA should have their hands tied on this if they know a rule cannot be complied with?

Ms. MCCABE. There is a premise of that sentence that I don't agree with. The EPA, ever since the beginning of the Clean Air Act, has successfully promulgated health standards for air quality that have led to tremendous improvements in public health across the country.

Mr. HULTGREN. My time is expired. I yield back the balance of my time.

Mr. SCHWEIKERT. Thank you, Mr. Hultgren.

Mr. HULTGREN. Thank you.

Mr. SCHWEIKERT. Mr. Kennedy.

Mr. KENNEDY. Thank you, Chairman.

To Ms. McCabe—thank you both, first of all. It is great to see you again. Thank you both for coming to testify today. Thank you for your service to your country.

Ms. McCabe, at a hearing on the Clean Power Plan back in July, Dr. Cash, who is the Commissioner of Massachusetts Department of Environmental Protection, highlighted the successes of RGGI, the Regional Greenhouse Gas Initiative in New England. For example, he indicated that through RGGI, the participating states have been able to reduce carbon emissions by 40 percent while simultaneously expanding the regional economy by seven percent. It is my understanding that EPA recognizes the effectiveness of the state partnerships like RGGI and has explicitly drafted a proposed rule to allow partnerships like these to continue. I was hoping, Ms. McCabe, that you might be able to discuss some of the advantages of using a regional approach like this to reduce carbon emissions and its impact on innovation.

Ms. MCCABE. Yeah, that is a very, very good question, and Dr. Cash is very eloquent on the benefits of the program to Massachusetts. I have had that conversation with him.

There are a number of benefits and I will just emphasize that in our proposal we are agnostic about whether states might want to join with other states but there are definitely are some advantages. One advantage is that, as you make the pool of participants larger, you increase the opportunities and that will generally lead to more opportunity for more cost-effective reductions; the bigger the pool, the more opportunity. So that is one.

There are advantages that some states may perceive because of the way the energy production system works. That is some companies operate—many companies operate in more than one state and so it can reduce complexity for there to be a regional plan that states can work within, and so that is another definite benefit.

It can simplify—the RGGI system has some very straightforward compliance mechanisms in place that simplify the operation of the

program, and again, that brings cost down, brings more certainty to the process.

Mr. KENNEDY. Great, thank you. And now a question for you both, and, Dr. Holdren, maybe you can start. It has often been said or at least reported in the press—some aspects of the press that the Administration is waging a "war on coal." However, I think it is important to note that thus far the Administration has invested about $6 billion in support of developing carbon capture and other technologies to try to make coal more efficient and to reduce its environmental impacts. I believe in December of last year DOE issued a solicitation making up to $1 billion in loan guarantees available to fossil fuel projects.

Dr. Holdren, I was wondering if you could just respond to the assertion about war on coal and discuss some of the Administration's efforts?

Dr. HOLDREN. Thank you, Congressman Kennedy.

We have actually addressed that a number of times. I know you had to be out of the room but the——

Mr. KENNEDY. Apologies.

Dr. HOLDREN. —President and the Administration are certainly not waging a war on coal, far from it as you point out. We are investing billions and billions of dollars in improving coal technologies with the understanding and the expectation that coal will continue for many decades to come to play a significant role in our electricity generating system.

One of the things we noted was that under the proposed rules coal would still be generating 30 percent of U.S. electricity in 2030. That is a lot of electricity, it is a lot of coal, but we hope to do it much more cleanly.

Mr. KENNEDY. Ms. McCabe, anything to add?

Ms. MCCABE. No, I second it.

Mr. KENNEDY. Okay. I apologize for making you repeat yourself but I appreciate the fact that you did. Thanks very much and I yield back.

Mr. SCHWEIKERT. Thank you, Mr. Kennedy.

And I am going to recognize myself.

And I would actually like to hand a couple minutes over to the good doctor, Dr. Bucshon.

Mr. BUCSHON. Thank you. I had another committee markup. We just reauthorized Amtrak over in Transportation, so my apologies for not being at the entire hearing.

But I want a couple follow-ups. First of all, Ms. McCabe, I would like to invite you to my district for a public hearing on the new—or in fact any coal-producing state, if EPA could come into a—and listen to what the people in my district or other coal-producing states have to say, I am inviting you to my district to do that.

Dr. Holdren, I am going to request from you that the White House and the EPA release all of the scientific information, including all of the data justifying the premise that is being promoted—that this regulation, the new power plant regulations will decrease the incidence of asthma and heart attacks, including all the medical background information. I have requested this before from Health and Human Services and others and they have hidden be-

hind HIPAA regulations, but I would request that we get all that information to back up these claims.

And also, as you admitted, there is a difference between particulate emission and $CO_2$ emission, and this hearing is primarily about $CO_2$ emission, and I will give you that there is a significant difference. And the comments I made earlier are primarily based on particulate information but also then you can't use that and say it is justifying $CO_2$ emission requirements.

My final comment will be carbon capture and sequestration is not economically feasible and not commercially available for my state. Therefore, putting in place a regulation that requires it to comply also isn't economically feasible for my state. I understand the science behind it. I agree that industry and all of us should always be looking for better ways to burn coal, but the time frame and the assumptions that are made for this rule are off base for my state and 85 percent of—80 to 85 percent of our power is from coal. We are a huge manufacturing state. We are going to lose jobs. My district has every coalmine in the state. We have already—we are closing to power plants, we have closed one coal—two coalmines now, and I would implore you to look at that economic information.

I yield back to the Chairman.

Mr. SCHWEIKERT. Thank you, Doctor.

And forgive also the comings and goings today. This is just a chaotic moment as we are trying to finish off this week and so all the running back and forth.

I had two minutes left in my—and I will ask you to put that on the clock so we are studious in splitting the time.

It is a conversation I would like to do in much greater depth and my point of reference is actually sort of the discussion of allocation of resources, so in some ways it is less about $ACO_2$, the PM10, some of the NOX, some of the other—it is the allocation of resources and where we maximize benefits.

Sitting in the same chairs about two months ago we had four researchers, all absolutely believed in the difficulties with $ACO_2$ and the environment, but when asked the question of what you would do for the next five, ten years, the allocation question was—and I was surprised at the responses. I would deal with invasive species. I would deal with the fish population and some others.

So there was a real interesting allocation question, and I have great fear that much of sort of the discussion we are having around today may be driven by those who have invested in certain technologies and, as my father used to say, it is always about the money. Am I being—let me ask, at a high-level policy level, how much sort of moves into the discussion of are we driving the allocation of resources where we maximize benefit to our society and the environment?

And that is actually I think more of a Ms. McCabe type question.

Dr. HOLDREN. Actually, I am going to start and then I will——

Mr. SCHWEIKERT. Should I flip it because——

Dr. HOLDREN. —turn it over to Ms. McCabe. Yeah. I will flip it very quickly but allocation of course is always a big challenge. In the climate change domain the problem is that if we focus constantly on shorter-term priorities and push off the climate change

steps that we need to take, it is going to be impossible to meet the 2 degree C target or even the——

Mr. SCHWEIKERT. Doctor——

Dr. HOLDREN. —3 degree C target——

Mr. SCHWEIKERT. —there is actually a problem in that. If you and I go back to literature that I think even you were a participant in a decade ago, none of us expected the revolution that has happened in natural gas. Who would have ever thought we would have that and exceeded the Kyoto accords because of the long-term futures prices of natural gas? So sometimes that arrogance of knowing what tomorrow is were wrong. And I am—this is rude to do; I would love to carry this conversation on in the future——

Dr. HOLDREN. We should.

Mr. SCHWEIKERT. I am now beyond——

Dr. HOLDREN. We should.

Mr. SCHWEIKERT. —my time and I have to run to another committee, so thank you. And I am going to actually hand over Chair so our Ranking Member can do her 5 minutes. Madam Ranking Member.

Ms. JOHNSON. Thank you very much. And I have to apologize. I was one of those that had to go to another committee for a markup.

But, Dr. Holden, as you are aware, the Administration's Council of Economic Advisors released a report in July which makes the economic case for addressing climate change. The main conclusion is that delaying action is costly. In fact, the report indicates that if the lack of action results in warming of 3 degrees Celsius above the preindustrial levels rather than 2 degrees Celsius, then the increased economic damages to the United States could be as high as $150 billion annually.

Now, I am a nurse and we have talked all about how much it costs and how many jobs, but I am not sure how much we have talked about how many lives that are affected if we don't clean this environment. In your testimony you mentioned a growing consensus among economists and others that there is a compelling case for making substantial investments to address climate change. Can you please describe the current state of the economic literature—excuse me—comparing the cost of action and inaction on climate change? Thank you.

Dr. HOLDREN. Yes, thank you very much. I do expand on that at some length in my testimony. What has been happening in the economic literature of the past two decades is an increasing trend toward a strong consensus that we need to take action and we need to take action sooner rather than later precisely because of the kinds of finding that you cited. And by the way, there are other findings out there that point to even more alarming possibilities if we allow the temperature—the global average surface temperature of the atmosphere to go to three degrees Celsius or higher. The likelihood of tipping points leading to truly unmanageable change, that goes up as one goes into those domains and nobody really has a handle on what the upper limit of damages might be.

Just from the standpoint of investment in prudent insurance, it makes sense to take steps now to reduce the likelihood of getting anywhere near those temperature regimes, and economists as well

as natural scientists have really largely come to agreement about that.

Ms. JOHNSON. Thank you very much. Lete me thank both of you for coming and simply say that while we might sit here with our heads in the dust or whatever, the damage goes on, and it is time for us to address the issue. And I appreciate you coming, I appreciate your steadfastness, and I certainly appreciate the work of EPA. Thank you. I yield back.

Mr. BRIDENSTINE. [Presiding] The gentlelady yields back.

I am evidence that if you stay here long enough, they eventually give you the gavel.

And I would like to thank the witnesses for being here and for your testimony and for all the Members who are left, which is one, for your questions. The Members of the Committee may have additional questions for you and we will ask you to respond to those questions in writing. The record will remain open for two weeks for additional comments and written questions from the Members.

The witnesses are excused and the hearing is adjourned.

[Whereupon, at 12:09 p.m., the Committee was adjourned.]

# Appendix I

## Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

*Responses by the Honorable John Holdren*

**QUESTIONS FOR THE RECORD**
**The Honorable Lamar Smith (R-TX)**
**U.S. House Committee on Science, Space, and Technology**

*The Administration's Climate Plan: Failure by Design*

Wednesday September 17, 2014

**Questions for the Honorable John Holdren**

1. The U.S. Global Change Research Program's (USGCRP) mission promotes meeting the challenges of climate and global change through the engagement and guidance of science. USGCRP's budget is comprised of funding from many federal agencies, which also conduct research in different disciplines of climate change. With a budget of over $2 billion, USGCRP conducts extensive global research.

a. What role does the USGCRP play in developing the President's Climate Action Plan?

**USGCRP leadership, including the Executive Director, Deputy Director, and related staff, representing the USGCRP, have participated extensively in the development of the Plan, as have affiliated members of many of the USGCRP agencies.**

b. What role does the USGCRP play in the U.N. International Panel on Climate Change or other international efforts?

**USGCRP is the mechanism that supports and enables the U.S. Government's review processes for the Intergovernmental Panel on Climate Change (IPCC) assessments and other international assessments. For the recent IPCC 5th Assessment, USGCRP supported each of the three Working Group reports, the Synthesis Report, and many of the related IPCC Special Report publications. In addition, USGCRP supports the cost and staffing of a significant part of the IPCC Working Group Two Technical Support Unit. USGCRP staff and member agency representatives have also been members of the United States' delegations for all of the Assessment Report 5 Working Group negotiations and the negotiations for approval of the Synthesis Report.**

c. Did USGCRP consult with OSTP or EPA regarding the proposed regulations for power plants?

**No.**

2. As the international community looks toward next year's 21st Conference of the Parties on Climate Change:

a. What are you, or any other OSTP employees, currently doing in preparation?

**I and a few members of the OSTP staff have been involved in discussions in the Executive Office of the President on options for what the United States might present at or before COP21 for this country's post-2020 emissions targets.**

b. Which, if any countries, have pledged to the administration that they will take similarly drastic steps to reduce CO2 emissions?

**The European Union recently announced publicly that its members collectively would reduce their emissions by 40 percent below 1990 levels by 2030.**

c. Please explain the President's intentions to submit any future international agreements on climate to the Senate for its Advice and Consent.

**I am not in a position to comment on the President's intentions.**

3. If the Climate Action Plan were implemented:

   **a.** How many jobs will be lost because of all the new regulations?

   **It stands to reason that most of the activities called for in the President's Climate Action Plan will spur economic growth that, in turn, will afford new jobs and employment opportunities. Examples of such activities include the following:**

   - **Promoting leadership in renewable energy, through accelerating clean-energy permitting and expanding and modernizing the electric grid.**
   - **Spurring investment in advanced fossil-energy projects.**
   - **Developing and deploying advanced transportation technologies.**
   - **Reducing barriers to investment in energy efficiency.**
   - **Expanding programs to cut energy waste in buildings through the Better Buildings Challenge.**
   - **Making the Federal government a leader in consuming energy from renewable sources and pursuing greater energy efficiency.**
   - **Boosting community-based resilience to climate change by encouraging the construction of safer buildings and infrastructure.**
   - **Reducing wildfire risks.**
   - **Negotiating global free trade in environmental goods and services, thereby opening new markets to American goods and services in this area.**

   **With respect to the relatively few regulations called for in the Climate Action Plan, each relevant rule, when proposed, will be accompanied by a regulatory impact analysis (RIA) that addresses employment impacts. In EPA's recently proposed Clean Power Plan, the RIA includes an analysis of employment impacts in Chapter 6. I will note that the RIA makes the excellent point that it is difficult to quantify such impacts precisely because EPA is providing so much flexibility under the proposed rule to States to determine the contours of implementation plans.**

b. How did you reach that conclusion?

**With respect to my statement that many of the technology-focused activities in the Climate Action Plan will spur economic growth, this conclusion is based on two firmly established conclusions from the economics literature. The first is the evidence linking innovation to environmental regulation and environmental policies more broadly. The second is a substantial body of economics research, dating back to the seminal work of Robert Solow in the 1950s, showing that the rate of economic growth of output per unit of labor input depends substantially on the rate of technological progress in the broadest sense. Dr. Solow's work establishing the theory of economic growth, including the fundamental contribution made by technological progress, was recognized by his selection for the Nobel Prize in Economic Sciences in 1987.**

4. In your recent testimony before this committee, you wrote (page 7, QFRs) that "in many cases not all the benefits and costs of a rule can be quantified and/or monetized."

a. How does this factor into the policies that you recommend to the President?

**In the case of policies on which I am called to advise the President, I consider both the available qualitative and quantitative information on the effect of such policies, as well as the costs of inaction on the underlying problems that the policies are intended to address.**

b. How does this statement apply to your Climate Action Plan?

**In the case of the President's Climate Action Plan, the report *Climate Change Impacts in the United States: The Third National Climate Assessment*, which was produced pursuant to statutory requirement, presents a compelling scientific case for the broad and growing impacts of climate change on U.S. society and the U.S. economy. In addition to this key report, the Council of Economic Advisors published a report last July entitled *The Cost of Delaying Action to Stem Climate Change*, which investigated the economic research that has been undertaken on the effects of inaction on climate change. The report found that, "Based on a leading aggregate damage estimate in the climate economics literature, a delay that results in warming of 3° Celsius above preindustrial levels, instead of 2°, could increase economic damages by approximately 0.9 percent of global output. To put this percentage in perspective, 0.9 percent of estimated 2014 U.S. Gross Domestic Product (GDP) is approximately $150 billion. The incremental cost of an additional degree of warming beyond 3° Celsius would be even greater. Moreover, these costs are not one-time, but are rather incurred year after year because of the permanent damage caused by increased climate change resulting from the delay." The report also found that "An analysis of research on the cost of delay for hitting a specified climate target (typically, a given concentration of greenhouse gases) suggests that net mitigation costs increase, on average, by approximately 40 percent for each**

**decade of delay. These costs of delay are higher for more aggressive climate goals: each year of delay means more CO2 emissions, so it becomes increasingly difficult, or even infeasible, to hit a climate target that is likely to yield only moderate temperature increases." These are important considerations to any discussion of public policy surrounding potential responses to climate change.**

5. The Like Minded Group of Developing Countries, which represents China, India, and other major developing nations, submitted a position statement to the UN Framework Convention Secretariat last fall on the negotiations for a global climate change agreement in Paris in 2015.

   The statement emphasized that the distinctions established in the 1992 Rio Convention between developing and developed countries should remain in any new agreement, and that developed countries should take the lead on reducing emissions, while any actions by developing countries would be conditioned on receiving "support from developed countries."

   In 1992, China could fairly be classified as a developing country. But today, China is a huge industrial power, one of the world's largest manufacturing nations, and the largest emitter of greenhouse gasses.

a. Does the Obama administration believe that all Paris agreements will maintain the distinctions made in 1992, and continue to treat China as a developing country, with vastly different responsibilities under the UN Framework Convention?

   **When the Obama Administration took office, one of its major objectives in international climate talks was to shift away from the Kyoto paradigm, *i.e.*, to move away from the notion that climate commitments should be based on a bifurcated system of categories from 1992, especially given that the economic and emissions profiles of major developing countries had evolved substantially. Building on the outcome of COP-15 at Copenhagen in 2009, where we secured agreement from both developed and developing countries to take on mitigation commitments, United Nations Framework Convention on Climate Change (UNFCCC) Parties agreed in 2011 to negotiate a new agreement by 2015 that would be "applicable to all."**

   **In terms of the agreement to be concluded in 2015, the United States has been very clear that a bifurcated agreement, particularly one based on antiquated categories, is a non-starter. The approach the Administration has put forward and that is now under discussion at the UNFCCC regarding mitigation commitments allows countries, in effect, to self-differentiate. Nationally-determined contributions take account of Parties' varying national circumstances and capabilities. We have also been clear that these commitments should not be contingent upon the provision of international finance.**

b. What is the nature of the "support" provided for emission reductions by developing

nations? The statement references the provision of "public finance" from developed nations to developing countries - will the President make any commitments on "public finance"? Will Congress be consulted on these commitments?

**Developed countries provide support to developing countries through three areas: technology, finance, and capacity building. In terms of finance, developed countries are collectively working to "mobilize" $100 billion in climate assistance annually by 2020 from all sources, including public and private, in the context of meaningful and transparent mitigation actions by developing countries. While it is expected that the majority of this will come from private sources, public finance represents an important lever for catalyzing private investment. In terms of the Paris agreement, the United States has opposed a collective public-finance target as well as legally-binding individual Party public-finance commitments.**

**Going forward, I cannot comment on what the President may do. But as with other Federal funding, any commitments or requests for Federal international assistance funding would be subject to Congressional authorization and appropriation.**

c. Is it acceptable for developed nations to undertake emissions cutbacks well in advance of any reductions by developing countries? What are the international trade implications of such an approach?

**The United States is committed to leading efforts to address climate change both at home and abroad. This is a top priority as reflected in the President's Climate Action Plan. By acting now, the U.S. is demonstrating leadership and driving the agenda toward a new international climate agreement that is ambitious, effective, and inclusive of all countries, particularly the largest greenhouse-gas emitters. To accomplish this goal, we advocate an approach under which all countries – both developed and developing – put forward nationally-determined mitigation contributions well in advance of the Paris conference to provide time for countries and civil society to consult before finalizing the agreement in Paris. It is important that major economies, as well as a significant number of other countries, do the same. The Administration has taken significant steps toward that goal, including significant investments to increase renewable energy production and setting standards that will double the fuel economy of our light-duty vehicles by 2025. These actions have the added benefit of spurring economic growth based on American innovation and entrepreneurship.**

6. The Like Minded Group submission states that the "Loss and Damage" mechanism established in Doha in December 2012, which provides developing countries with compensation for damages from extreme weather events allegedly caused by climate change, must be made "operational and robust."

a. Has the United States agreed to a mechanism for compensating developing nations for the impacts of extreme weather events?

**No, the United States has not agreed to such a compensation mechanism. No such compensation mechanism has been established. Parties did, however, establish a Loss & Damage Warsaw International Mechanism in 2013. This mechanism is not a funding facility; it does not include any mention of compensation. The mechanism, however, will seek to improve knowledge and action on issues related to comprehensive risk management and other approaches to reduce and avert loss and damage.**

b. Assuming these damages could be causally linked to global greenhouse gas emissions, how should the cost of such damages be divided among developed nations?

**Parties to the UNFCCC have not agreed to a compensation mechanism. Any potential allocations would have to be the subject of future negotiations before they are operationalized.**

7. The Like Minded Group statement also references $100 billion in funding offered to developing countries in Cancun in 2010 in order to "cope with the adverse effects of global warming" post-2020, and requests increases in this amount for future efforts.

a. Does the Obama administration support the $100 billion offer referenced in the statement?

**The $100 billion commitment undertaken by the United States and other donor countries at Copenhagen in 2009 was to "mobilize" $100 billion in climate assistance annually by 2020 from all sources, including public and private, in the context of meaningful and transparent mitigation actions by developing countries. The United States has worked with other donors toward mobilizing finance from across the spectrum, with a focus on how to most effectively use our public resources to unlock private investment. Collectively, developed countries have made significant progress with public finance alone, amounting to $30-50 billion in 2013. Demonstrating progress towards the $100 billion goal is key to maintaining U.S. leadership and keeping the UNFCCC negotiations on track.**

b. Which nations would contribute to this amount? How would this amount be increased to meet the "real financing needs of developing countries"?

**The United States is now working with other developed countries to collectively mobilize $100 billion per year by 2020 from all sources, public and private, in the context of meaningful and transparent mitigation by developing countries. We are coordinating with other donor countries to**

**bring together development finance institutions, export credit agencies, and multilateral development banks on this issue.**

**We continue to hear large, and in our view excessive, demands by developing countries for new public finance commitments by developed countries in conjunction with the Paris agreement. We have pushed back against these demands. Any finance commitments made in connection with the 2015 agreement will need to reflect our fiscal realities and include an expanded pool of contributors.**

c. What role does the Obama administration see for Congress in approving this financing?

**As with other Federal funding for international assistance, future budget requests, if any, would be subject to Congressional authorization and appropriation.**

8. Our grid, from generation to consumption, was built on technologies that took more than 100 years to establish. And yet the "Clean Power Plan" seeks to fundamentally re-engineer the grid and the electricity that provides power for consumers and businesses by 2030.

   a. Former EPA Deputy Administrator Bob Perciasepe noted that the EPA views the climate plan as an opportunity for the agency to remake the nation's electric grid. Is this an appropriate role for the EPA?

   **I would refer any questions you may have about EPA's role in the Clean Power Plan to my EPA co-panelist at the hearing.**

   b. What is the legal authority for EPA to remake the nation's electric grid?

   **Again, I would refer any questions you may have about EPA's role in the Clean Power Plan to my EPA co-panelist at the hearing.**

9. In your written response to a question: "In the peer review process, are peer reviewers always provided access to the underlying and raw data behind a study?" you explain that (page 4) "peer reviewers are not always provided access to the full underlying and raw data behind a study."

   Are there any instances where limited data access may mask mistakes or biases in the analysis, or any other part of the scientific process of the study?

   **As with all human endeavor, there will be such instances, but this possibility is addressed under the broader concept of reproducibility that I explained in my previous response, namely that: "In the scientific community, [reproducibility]**

**does not necessarily imply access to the original raw data from another researcher, but rather that further experimentation either using similar methods or an alternative approach can reproduce the results of the initial study, leading to independent confirmation and weight-of-evidence support to a concept."**

10. President Obama issued a memo entitled "Transparency and Open Government" which state the following:

"My Administration is committed to creating an unprecedented level of openness in Government. We will work together to ensure the public trust and establish a system of transparency, public participation, and collaboration. Openness will strengthen our democracy and promote efficiency and effectiveness in Government."

In February of 2014, Dr. John Graham, Dean of Public and Environmental Affairs at Indiana University and former Administrator at the Office of Management and Budget, wrote in his testimony of his support that EPA should not issue regulations unless all scientific and technical information relied upon is specifically identified. He writes:

"A third party (or even another federal agency or OMB) cannot possibly evaluate the merits of a covered action if they do not know what specific scientific and technical information was relied upon by EPA."

a. Do you support the principle of scientific transparency?

**Yes.**

b. What specific recommendations would you make to the EPA so that this scientific and technical information is available to any interested party who requests this information?

**Interested researchers should have access to Federally-funded publications and research data to the greatest extent and with the fewest constraints possible, taking into consideration privacy, confidentiality, and security risks. The Executive Office of the President has issued extensive guidance on this topic, including: OMB's *Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards* (78 FR 78589) to implement the Shelby Amendment to Public Law 105-277; OMB's Government-wide *Information Quality Guidelines* and those of the EPA; OMB's Circular A-4; and more recently and expansively my December 2010 memorandum on Scientific Integrity (http://www.whitehouse.gov/sites/default/files/microsites/ostp/scientific-integrity-memo-12172010.pdf) and my February 2013 memorandum on *Increasing Access to the Results of Federally Funded Scientific Research* (http://www.whitehouse.gov/sites/default/files/microsites/ostp/ostp_public_access_memo_2013.pdf). The latter is one of the foundations of the President's Open Data Policy requirements under the May 9, 2013 Executive Order – *Making Open and Machine Readable the New Default for Government Information.* The overarching intent of these actions is to make Federally-funded publications and research data**

**openly available "to the greatest extent and with the fewest constraints possible."**

Dr. Graham goes on to state in his written testimony regarding original health data from epidemiological studies that: "If the underlying data from the key health studies were made publicly available for all researchers to analyze (rather than just a select few appointed by Health Effects Institute), I think it is quite possible that many new insights would be gleaned and some of the conventional wisdoms we now accept as fact would be dislodged or refined."

c. Is Dr. Graham correct in this statement?

**The Health Effects Institute (HEI) is a highly respected research institution jointly funded by the EPA and industry. The original studies based on the American Cancer Society and Harvard University cohorts already have been subject to reanalysis and validation by HEI. Specifically, HEI entered into confidentiality agreements with the owners of the data to have access to the data in order to conduct a reanalysis of two studies of these cohorts. That re-analysis took 30 researchers more than three years to complete, and confirmed the validity of the findings and methodology. The same methodological approaches were used in the more recent studies of these cohorts, and are therefore similarly validated by the HEI reanalysis.**

d. Why shouldn't any interested researcher have access to this data?

**Interested researchers should have access to Federally-funded publications and research data to the greatest extent and with the fewest constraints possible, taking into consideration privacy, confidentiality, and security risks.**

**QUESTIONS FOR THE RECORD**
**The Honorable Paul Broun (R-GA)**
U.S. **House Committee on Science, Space, and Technology**

*The Administration's Climate Plan: Failure by Design*

Wednesday September 17, 2014

**Questions for the Honorable John Holdren**

1. In response to this Committee's QFRs following your appearance on March 26, 2014, you were asked for a copy of Mr. Todd Park's (former US Chief Technology Officer) Form 278. You appeared to misunderstand the question and directed the Committee to a website to fill out an OGE Form 201. On behalf of the Committee, I reiterate the request for all of Mr. Park's financial disclosure forms during his tenure as US Chief Technology Officer.

   As a courtesy, and in response to a direct request from a Committee of jurisdiction over OSTP, I do not foresee any challenges in your being able to provide the documents requested.

   **The U.S. Office of Government Ethics has confirmed that--consistent with Section 105 of the Ethics in Government Act of 1978, as amended (5 U.S.C. App.), and 5 C.F.R § 2634.603--any requestor, including a Member of Congress, is required to submit the OGE Form 201 to request such records. The OGE Form 201 is available online at http://oge.gov/Forms-Library/OGE-Form-201--Request-to-Inspect-or-Receive-Copies-of-OGE-Form-278/SF-278s-or-Other-Covered-Records/. OSTP will process your request expeditiously upon receipt of this required form.**

*Responses by Ms. Janet McCabe*

QUESTIONS FOR THE RECORD

The Honorable Lamar Smith (R-TX)

U.S. House Committee on Science, Space, and Technology

The Administration's Climate Plan: Failure by Design

Wednesday September 17, 2014

Questions for Ms. McCabe

1. EPA has claimed that the "Clean Power Plan" will reduce asthma and heart attacks because it will reduce ozone and emissions of particulate matter. However, ozone and particulate matter are heavily regulated under separate environmental regulations. Factoring out those other emissions, how do carbon dioxide reductions equate to reductions in heart attacks and asthma?

**Response: We expect substantial carbon dioxide reductions from implementation of the proposed guidelines, which will reduce pollution at the point of power generation. In addition to reductions in carbon dioxide, there will be the co-benefit of reducing emissions of pollutants that contribute to particulate matter and ozone formation. The Clean Power Plan will reduce consumption of fossil fuels and the associated emissions of nitrogen oxides, particulates, and other pollutants. As estimated in the RIA, these emissions reductions cause ozone and PM reductions that are additional to reductions achieved by other regulations. Scientific experts, including the CASAC, have repeatedly shown that pollution reductions bring substantial health benefits, especially to the most vulnerable among us: children, seniors, and those with respiratory impairment. The pollution reductions we expect from the Clean Power Plan would lead to estimated reductions of up to 6,600 premature deaths, 150,000 asthma attacks in children, 3,300 heart attacks, 2,800 hospital admissions and emergency department visits, and 490,000 missed school and work days in 2030.**

2. How much flexibility do state regulators have in determining the final emission rate in each of the states?

**Response: State regulators have a great deal of flexibility in determining the final requirements for the sources in their states. Section 111(d) of the Clean Air Act lays out a two-step process: first, the EPA determines what the Best System of Emissions Reduction is and applies that consistent national framework to set achievable, state-specific goals to cut carbon pollution; and, second, the states have flexibility to chart their own, customized path to meet their goals. States will choose what measures, actions, and requirements to include in their plans, and demonstrate how these will result in the needed reductions.**

3. What particular section(s) in the Clean Air Act authorizes the EPA to eliminate or constrict the use of a particular fuel for electricity?

**Response: For decades, the Clean Air Act has specifically provided that air pollution control may be based on cleaner fuels. For example, Clean Air Act section 169(3), which was enacted in 1977, states that clean fuels may be the basis for the controls implemented by new sources. Proposed under a different provision, Section 111(d), the Clean Power Plan builds on advice and information from**

**states, cities, businesses, utilities, and thousands of people about the actions they are already taking to reduce carbon dioxide emissions. The Plan aims to cut energy waste and leverage cleaner energy sources by doing two things: First, it uses a national framework to set achievable state-specific goals to cut carbon pollution per megawatt hour of electricity generated. And second, it empowers the states to chart their own, customized path to meet their goals. In designing their compliance plans states may use lower carbon energy sources, but in our estimate of at least one scenario for states' compliance paths, coal and natural gas remain the two largest sources of electricity generation in 2030. Of course, the Clean Power Plan is a proposed rule, and EPA has broadly solicited public comment on the design of state plans and scenarios for states' compliance paths.**

4. As the international community looks toward next year's 21st Conference of the Parties on Climate Change:

a. What is EPA, any EPA regional offices, or any employees, currently doing in preparation?

**The EPA is preparing for technical discussions on areas such as monitoring, reporting and verification of greenhouse gas emissions, as well as providing information, as appropriate, on EPA's domestic programs to address climate change.**

b. Please detail any Clean Air Act authorities or other roles EPA has to play a role in these negotiations.

**EPA's role is to provide technical information in support of the Department of State which is the lead agency for the United States government in these negotiations.**

c. Which, if any countries, have pledged to the administration that they will take similarly drastic steps to reduce C02 emissions?

**As the lead agency for the negotiation of international climate change agreements, the Department of State is in the best position to describe efforts to reduce CO2 emissions in other countries.**

d. Will EPA encourage the President to submit any future international agreements or treaties on climate to the Senate for its Advice and Consent?

**The Department of State leads the negotiation of international climate change agreements, and EPA's role is to provide technical input and communicate domestic efforts to address climate change.**

5. Regardless of whether EPA will -- or will not -- release a "model FIP," please answer the following questions:

a. Does EPA have authority under section 111 (d) (or any other section of the CAA) to issue a mandatory federal plan that orders a state to dispatch low-carbon electricity? Please prove all supporting legal precedents and authorities.

b. Does EPA have authority under section 111 (d) (or any other section of the CAA) to issue a mandatory federal plan that orders a state to generate electricity from renewable sources? Please prove all supporting legal precedents and authorities.

c. Does EPA have the authority under section 111 (d) (or any other section of the CAA) to issue a mandatory federal plan that orders a state to enact consumer energy efficiency standards? Please prove all supporting legal precedents and authorities.

d. Does EPA have the authority under section lll(d) (or any other section of the CAA) to issue a mandatory federal plan that requires a nuclear power plant to remain open? Please prove all supporting legal precedents and authorities.

**Response: We think that the flexibility in the Clean Power Plan will make it very attractive for states to choose to comply. Our extensive outreach has allowed us to incorporate ideas from the states and from the power sector, so we hope that they will see those ideas reflected and choose to take advantage of the opportunity for tailoring plans to a state's unique situation and goals that the proposal allows. The CAA does provide the EPA the authority to write a federal plan if states do not put sufficient state plans in place, but we have not yet proposed what such plans would look like. The EPA recognizes that states may have additional authorities under state law to implement certain provisions that might not be included in a federal plan; this is one of the advantages of providing maximum implementation flexibility to states. If the EPA decided to issue a federal plan, the agency would be required to follow the rulemaking process, starting with a proposal that would be made available for public comment.**

6. The Clean Power Plant proposal for existing coal and natural gas fired power plants is unique in that it assumes EPA authority to regulate the structure of the electric utility system rather than pollution that comes out of a stack. There are many cases where the courts have affirmed that only the Federal Energy Regulatory Commission (FERC) may regulate the transmission and sale of electricity.

Do you believe EPA has this new-found authority? Please prove all supporting legal precedents and authorities.

**Response: The Clean Power Plan is based on EPA's authority under section 111 of the Clean Air Act to regulate the amount of carbon pollution emitted by power plants. It builds on advice and information from states, cities, businesses, utilities, and thousands of people about the actions they are already taking to reduce carbon dioxide emissions. The Plan aims to cut energy waste and leverage cleaner energy sources by doing two things: First, it uses a national framework to set achievable state-specific goals to cut carbon pollution per megawatt hour of electricity generated. And second, it empowers the states to chart their own, customized path to meet their goals.**

**Each of the measures identified as "building blocks" in the proposal would lead to a reduction in the amount of carbon pollution emitted by existing fossil fuel-fired power plants, and thus contribute to the reductions under Section 111(d). Along with the proposed rule, the EPA included in the docket a Legal Memorandum providing background for the legal issues raised by the rule. That Legal Memorandum details the EPA's understanding, at the time of proposal, of legal issues the proposal raises. That document can be found using Docket ID Number EPA-HQ-OAR-2013-0602-0419.**

7. In an August 1, 2011 letter to Senator Lisa Murkowski, FERC Commissioner Moeller explained that the ICF model used by EPA to assess the rule's impacts on reliability is insufficient and that a transmission

requirements study would be needed to develop a transmission expansion plan for the potential generation mix that may result from the ICF model.

How do you respond to the noted deficiencies in the ICF model that EPA relies on?

**Response: It is important to recognize that "the potential generation mix that may result from the ICF model" is in no way required for compliance with the proposed Clean Power Plan. Under the proposed Clean Power Plan, the EPA calculated state goals using historical data reported by generators in each state, and the EPA conducted illustrative modeling scenarios to consider the magnitude of potential costs and benefits of emission reductions expected under the rule. Given the considerable flexibility afforded to states to design state plans for implementation of the rule, EPA's modeling projections are only one approach among many that would demonstrate compliance with the state goals. As states put together state plans to achieve their goals, transmission planning authorities may conduct whatever analyses they deem appropriate to assess and manage reliability across the potential generation arrangements anticipated in state plans. In addition, the Clean Power Plan allows states enough time – fifteen years from when the rule is final until compliance with the final target – to consider and make the right investments, ensure reliability, and avoid "stranded assets."**

**EPA's use of the Integrated Planning Model is consistent with the agency's Scientific Integrity Policy. IPM has received extensive review by energy and environmental modeling experts in a variety of contexts. IPM has also been employed by states, other federal and state agencies, environmental groups, and industry, all of whom subject the model to their own review procedures.**

**RTOs have reviewed and contributed information into IPM model development so that the model respects interregional limitations on bulk power energy and capacity transfers. IPM includes a detailed representation of existing transmission capabilities between model regions. The most recent IPM release (version 5.13) refined the modeled regions to reflect more recent power market structure based on NERC, FERC, EIA, and other data and planning sources, and now includes more regions that better reflect limitations on current power system dispatch and transmission behavior.**

**At the same time, the EPA recognizes that the illustrative projections provided by this type of modeling, and the resource adequacy insights they support, are not intended as a substitute for transmission planning studies. Planning authorities are fully capable of evaluating the potential for more localized transmission impacts, which they have done successfully in other planning contexts. Furthermore, the proposed Clean Power Plan offers substantial flexibility to plan for emission reductions across multiple units and across multiple years, allowing states and reliability planners to design compliance pathways that are fully compatible with reliability requirements.**

8. Even though OMB is still in the process of reviewing public comments that were filed in February, EPA relies upon the global "Social Cost of Carbon" calculations to justify the Clean Power Plan. The SCC uses three Integrated Assessment Models that claim to be able to model global impacts for 300 years.

a. What are the estimates for US-only impacts from each of the three SCC models?

b. Did EPA compare the three SCC model predicted sea levels and temperatures with MAGICC results?

c. What is the impact of the proposed reductions in C02 emissions from US power plants on the SCC?

d. What is the impact of the increases in total non-US greenhouse gas (GHG) emissions from all sources on the SCC?

**Response: The EPA works with OMB to ensure that the EPA is following guidance in assessing the costs and benefits of their agency actions. As explained below, both the use of a global value for the SCC and the way in which the EPA applies the SCC estimates are consistent with OMB guidance.**

**The SCC estimates represent global measures because emissions of greenhouse gases contribute to damages around the world and the world's economies are now highly interconnected. This means that CO2 emissions create adverse impacts around the world regardless of whether they are emitted in the U.S. or elsewhere. In addition, climate damages experienced in other countries can create additional impacts on the U.S. economy. To reflect the global nature of the problem, the USG SCC estimates incorporate the full damages caused by CO2 emissions and we expect other governments to consider the global consequences of their greenhouse gas emissions when setting their own domestic policies. See the 2010 Technical Support Document (TSD) for more discussion. Also discussed in the 2010 TSD are the practical difficulties in estimating domestic estimates of the SCC given that available economic modeling is focused primarily on global effects.**

**The SCC is estimated on a business-as-usual baseline (i.e., a no-new climate policy trajectory) that forecasts future global $CO_2$ emissions, including expected changes in non-U.S. emissions. The CO2 reductions from the Clean Power Plan are not expected to affect estimated SCC values. That is because the SCC, which represents the monetized net damages associated with the incremental unit of CO2 emissions, is not particularly sensitive to changes, of the magnitude forecast under the CPP, in underlying CO2 emission projections.**

9. EPA has a model that has been used to estimate the impacts of proposed rules on global sea levels and global temperatures. This is a standard tool that appears on its official public website.

This is the Model for the Assessment of Greenhouse Gas Induced Climate Change (MAGICC) that uses the same IPCC climate models that used in the Social Cost of Carbon Integrated Assessment Models.

a. Did EPA run a baseline case using MAGICC through 2040 to determine the sea level rise as a result of a baseline reference forecast US and global GHG emissions? Why or why not.

b. What is the EPA MAGICC-predicted impact of the proposed REDUCTIONS in C02-only emissions from US power plants on global sea level rise?

c. What is the EPA MAGICC-predicted impact of the INCREASES in total greenhouse gas (GHG) emissions from all sources on global sea level rise?

Response: **Consistent with statute, Executive Orders 12866 and 13563, and OMB guidance, the EPA conducted a Regulatory Impact Analysis that shows benefits and costs of compliance with the Clean Power Plan. While the impact of emission changes on sea level rise are estimated within each IAM (integrated assessment model) as part of the calculation of the SCC, it is the resulting monetized damages that are relevant for conducting the benefit-cost analysis. As such, it is the final USG SCC estimates that are used in the RIA to estimate the welfare effects of quantified changes in carbon**

**dioxide emissions. The EPA recognizes that there is uncertainty in the SCC estimates and the assumptions underlying them; this uncertainty is discussed in detail in the Technical Support Document, consistent with OMB guidance and best practices for regulatory impact analysis.**

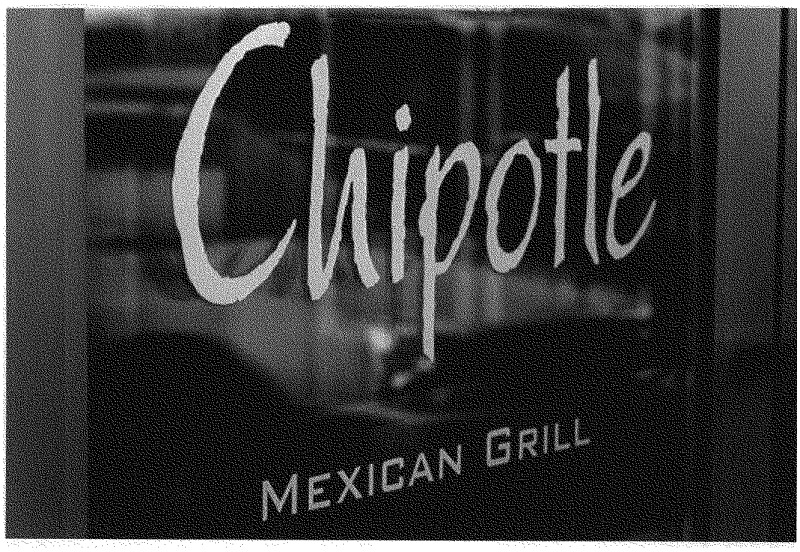
# Appendix II

## Additional Material for the Record

ARTICLE SUBMITTED BY RANKING MEMBER EDDIE BERNICE JOHNSON

# Coca Cola, Heinz And Other Major Food Companies Warn Climate Change Threatens Business

by Emily Atkin Posted on September 15, 2014 at 11:56 am Updated: September 15, 2014 at 1:17 pm




CREDIT: AP Photo/Gene J. Puskar

Back in March, popular burrito chain Chipotle made news when ThinkProgress reported that climate change could threaten its guacamole supply. That report was based on a statement Chipotle made in its annual report to its investors, filed with the Securities Exchange Commission.

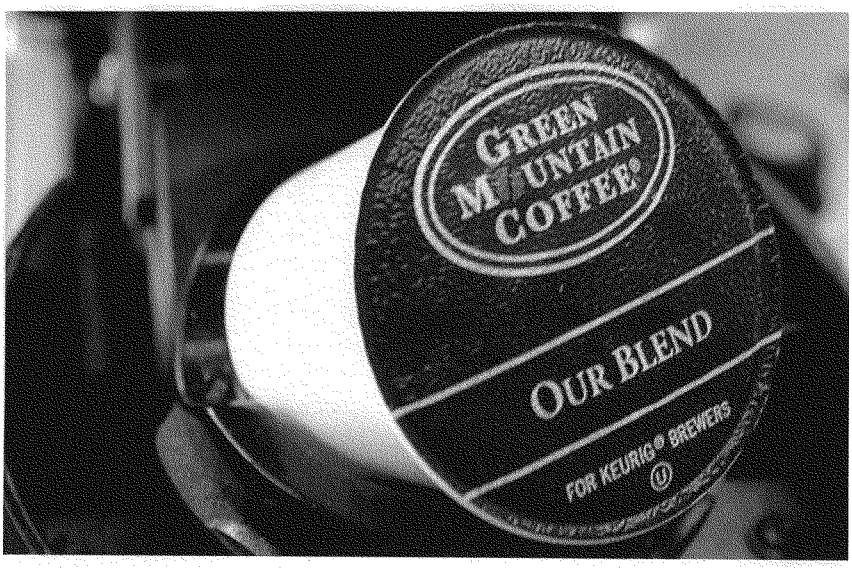
Chipotle took issue with the story, noting that its language about how climate change could affect guacamole was routine for annual reports and other SEC filings. The SEC requires companies to tell investors about any business risk they face, no matter how small. Indeed, companies mention things like freak accidents and terrorist attacks in these reports as well. In all,

Chipotle just didn't want its customers to become alarmed about a guacamole shortage (and in fact, guacamole hasn't budged from the menu).

But as ThinkProgress noted at the time, the real story was not a guacamole shortage, but the emerging reality of doing business in a warming world. While politicians continue to bicker over whether or not climate change exists, companies now have no choice in the matter — they must acknowledge the science and the risk and disclose the reality of that risk to their investors' pocketbooks. Whether that risk actually manifests itself is another matter, but the fact that companies are increasingly putting climate change on their threat lists speaks volumes to the severity of the problem.

Here are seven other big food companies that disclose to investors that climate change poses a threat to their products and bottom lines.

### Keurig Green Mountain




CREDIT: AP Photo/Toby Talbot

The company famous for making it so humans have to put basically no effort into making coffee disclosed in its most recent quarterly report to investors that climate change could impact coffee and tea crops. In a clip from the report's climate risk section, headlined "Climate change may have a long-term adverse impact on our business and results of operations," Keurig noted

increasing concern among scientists that climate change could change weather patterns across the globe.

"Decreased agricultural productivity in certain regions of the world as a result of changing weather patterns may limit availability or increase the cost of key agricultural commodities, such as coffee and tea, which are important sources of ingredients for our products, and could impact the food security of communities around the world," the report said. "Increased frequency or duration of extreme weather conditions could also impair production capabilities, disrupt our supply chain or impact demand for our products."

It's long been known that both coffee and tea crops are threatened by climate change. Severe drought has negatively impacted Brazil's coffee bean crop, and pest invasions have affected Sri Lanka's tea.

## Michael Foods Group

You probably know Michael Foods Group's products even if you don't know their parent company's name. The $2 billion company produces the AllWhites egg whites, Better'n Eggs, and Simply Potatoes brands. It also says climate change and some of the known effects of climate change pose a risk to its business.

"There is increasing concern that a gradual increase in global average temperatures due to increased concentrations of carbon dioxide and other greenhouse gases in the atmosphere will cause significant changes in weather patterns around the globe," the company said in a recent 10-K filing. "Increased frequency or duration of extreme weather conditions could also impair production capability and disrupt suppliers or impact demand for our products."

Along with extreme weather, the company cites the spread of avian influenza and pests as things that could have a negative impact on business. Peer-reviewed research from the University of Michigan states that climate change could increase the risk of avian influenza near the Delaware Bay.

"To protect against this risk, we have intensified biosecurity measures at our layer locations," the company said. "Nevertheless, weather, disease and pests could affect a substantial portion of our production facilities in any year and could have a material adverse effect on our business, prospects, results of operations and financial condition."

**Heinz**




CREDIT: AP Photo/Toby Talbot

It makes sense that Heinz's disclosure to investors about climate change would be a bit wishy-washy; the company is, after all, owned by Warren Buffett, whose personal views on climate change have been similarly lacking in strength. But a risk disclosure in one the company's latest SEC filings does list the "potential impact of climate change" along with crop shortages, pest infestations, and "other unforeseen circumstances" as things that could harm business.

"The company sources raw materials including agricultural commodities such as tomatoes, cucumbers, potatoes, onions, other fruits and vegetables, dairy products, meat, sugar and other sweeteners, including high fructose corn syrup, spices, and flour, as well as packaging materials such as glass, plastic, metal, paper, fiberboard, and other materials and inputs such as water, in order to manufacture products," the filing reads. "The availability or cost of such commodities may fluctuate widely due to government policy and regulation, crop failures or shortages due to plant disease or insect and other pest infestation, weather conditions, potential impact of climate change, increased demand for biofuels, or other unforeseen circumstances."

### Big Heart Pet Brands

If you can't get worried about climate change for humans, then at least think about the puppies and kittens. Big Heart Pet Brands is another one of those parent company names you might not know, but you probably know their brands: Milk-Bone, Meow Mix, Kibbles 'n Bits, and 9 Lives to name a few. And in that company's most recent 10-K, it acknowledged that adverse weather events "caused by climate change or otherwise" could drive up the price of its ingredients.

"The commodities and ingredients that we use in the production of our products (including grain and soybean meal) are vulnerable to adverse weather conditions and natural disasters, such as floods, droughts, frosts, earthquakes and pestilences," the filing reads. "Adverse weather conditions may be impacted by climate change and other factors. Adverse weather conditions and natural disasters can reduce crop size and crop quality, which in turn could reduce our supplies of ingredients, or increase the prices of our ingredients."

But unlike other companies, Big Heart actually has a section stating that they are working to combat climate change by working on "a variety of sustainability activities." That's in its own interest, as it notes its own customers want them to do it. "Sustainability is also an area of interest for certain of our customers and consumers and, particularly in light of concerns regarding climate change, may become an area of increased focus," the filing says.

### Omega Protein

The Omega Protein Corporation, which produces omega-3 fish oil, is probably not one you've ever heard of, but it bills itself as the country's largest manufacturer of organic fish solubles. While that might not be part of your daily diet, the unique nature of their product means that climate change could impact the company's business in a unique way.

A lot of Omega's fish oil products come from the menhaden fish, which Wikipedia notes is also known as the mossbunker, bunker, or pogy fish. Unrelated to the company, these fish are also important prey species for larger fish in the Chesapeake Bay.

Omega's filing says that the effects of climate change could negatively impact the menhaden species, which would pose great risk to the company. "It is possible that these conditions, if they occur, would impact the spawning, feeding, migration, distribution and growth of the menhaden species and hence, our fishing harvest," the filing reads. "As a result, such conditions may pose increased climate-related risks to our assets and operations."

### Coca-Cola




CREDIT: AP Photo/Jeff Chiu

Coca-Cola's risk statement about climate change is pretty basic, but it's simple enough to encapsulate the basic big picture: that the affects of climate change as scientists see them could be bad for profits.

"The growing political and scientific sentiment is that increased concentrations of carbon dioxide and other greenhouse gases in the atmosphere are influencing global weather patterns," a company 10-K filing says. "Changing weather patterns, along with the increased frequency or duration of extreme weather conditions, could impact the availability or increase the cost of key raw materials that the Company uses to produce its products. In addition, the sale of these products can be impacted by weather conditions."

In addition, the company also acknowledges that regulations to curb greenhouse gas emissions imposed by the U.S. Environmental Protection Agency could also negatively impact business. Current regulations have had a "minor" affect on business now, but the filing said that future regulations could "directly or indirectly affect the Company's production, distribution, packaging, cost of raw materials, fuel, ingredients and water."

**Marine Harvest ASA**

While Marine Harvest (formerly known as Pan Fish) is also not a household name, the $3 billion Norwegian seafood company has a share of almost 30 percent of the global salmon and trout market, according to a company Board of Director's report. In 2006, Marine Harvest was the world's largest producer of Atlantic salmon, with 9000 employees in 20 countries on five continents.

In an April filing with the SEC, the company cited rising ocean temperatures and ocean acidification as the "two main threats" faced by the company due to climate change

"Climate change poses a potential challenge to our industry," the filing reads. "Fish farming is dependent on thriving aquatic ecosystems which are particularly vulnerable to the effects of a warming planet."

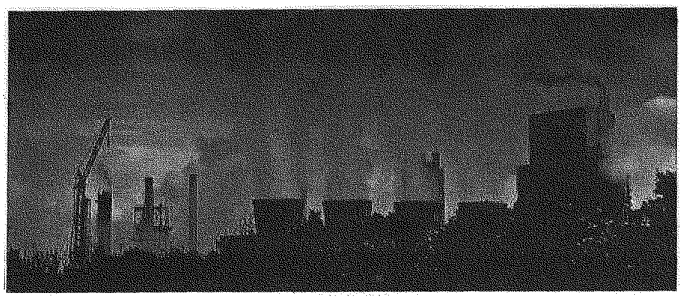
Because of this, the filing goes on to say that the company must help solve the problem by reducing its own greenhouse gas emissions, even going to far as saying it would explore a "more climate friendly protein alternative" for the business. In addition, the company said it would reduce the animal content of its fish feed — a change that would be "key to both profitability and improving our carbon footprint."

http://thinkprogress.org/climate/2014/09/15/3566246/food-companies-climate-risk-disclosure/

ARTICLE SUBMITTED BY REPRESENTATIVE SUZANNE BONAMICI



NEW REPUBLIC



ENVIRONMENT JULY 28, 2014

# The Coal Industry Has Been Fear-Mongering for 40 Years Now

## These old newspaper ads prove the industry's predictions have always been wrong

By Rebecca Leber @rebleber

Photo: Shutterstock.com

Listen to the debate about President Barack Obama's supposed "war on coal," and you'll hear arguments like these: "Electric rates are going to double between now and 2017," coal executive Bob Murray told - http://www.foxnews.com/on-air/your-world-cavuto/2014/06/27/murray-energy-ceo-president-grossly-wrong - Fox host Neil Cavuto in late June. "[Obama] is driving this country from a reliable, low-cost power grid to enormous electric power costs for absolutely no environmental benefit whatsoever." When the rule came out, the Environmental Policy Alliance, a conservative group, ran a full-page ad - https://epafacts.com/full-page-ad-highlights-epa-threat/ - accusing the Environmental Protection Agency of wanting "to shut down 25% of our electric grid." And the U.S. Chamber of Commerce has charged the EPA rule would cost the economy more than

$51 billion - https://www.uschamber.com/press-release/energy-institute-report-finds-potential-new-epa-carbon-regulations-will-damage-us - a year.

The fossil fuel industry has been promising this kind of catastrophe for decades, with a slight variation now and then. If the sky indeed fell because of the EPA's proposed climate rule like promised, it would be the first time the industry guessed it right. And you can expect these allegations to pick up again this week and last through the midterms, as the EPA kicks off a series of public hearings on its first-ever proposal to restrict carbon emissions from existing power plants, the largest source of greenhouse gas pollution in the U.S.

Back then, the fossil fuel industry was trying to fend off a different set of regulations designed to cut toxic pollutants, like nitrogen and sulfur emissions, from coal. Today, the industry and allies are fighting a different initiative: an effort by the Obama administration to reduce coal emissions from existing power plants, enough to reduce the power sector's pollution 30 percent by 2030.

But if the circumstances have changed, the rhetoric hasn't.

Like all such warnings, these contain at least a little truth. Some coal plants really will close. Some people may pay higher bills. But is not the whole story, and it helps to look at how the dire predictions of the past four decades panned out:

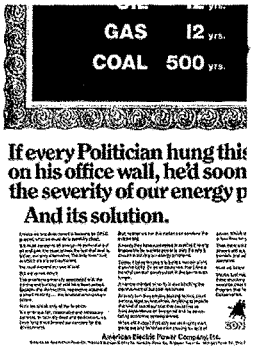
## Your electric bill will go way up.

When the Clean Air Act passed Congress in 1970 and was amended in 1990 to tackle pollutants from major sources—coal plants and cars— the coal industry, and occasionally the automakers, claimed cleaner standards would force plants to close en masse, thereby raising prices. Though the intent was to cut smog, acid rain, and health problems, lawmakers took industry opposition seriously: The original Clean Air Act grandfathered in existing coal plants so they would not have to invest in most cleaner technologies.

After all, the American Electric Power Company claimed in a New York Times ad in 1976 - http://www.documentcloud.org/documents/357223-1976-2-4-aep-nyt-fanaticalenviros.html - that "the problems generally associated with the mining



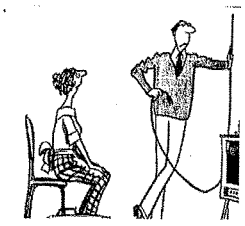
and burning of coal have already been solved" and railed against "the destructive, regressive actions of a small minority... the fanatical environmentalists." The ad—unearthed by Greenpeace - http://www.documentcloud.org/documents /357223-1976-2-4-aep-nyt-fanaticalenviros.html - back in the 2012 presidential election—predicted factories would start closing for lack of power "in parts of our country in less than ten years." Before that, Carl G. Beard II, director of the West Virginia Air Pollution Control Commission in 1972, claimed, "Consumers of power will pay for these costly errors for the next 25 to 30 years."




Predictions of huge rate hikes also preceded proposals to crack down on acid rain in 1990. The amended Clean Air Act set up a cap-and-trade program for sulfur dioxide and cleaner equipment to cut nitrogen oxides. In 1989, the utility lobbying arm Edison Electric Institute claimed regulating the roots of the problem—sulfur dioxide and nitrogen oxide—would lead to unacceptable electricity rates. The CEO of Southern Power testified to Congress that acid rain regulations "could cost electric utility rate payers $5.5 billion annually between enactment and the year 2000." This turned out to be overstated. When the Center for American Progress - http://www.americanprogress.org/issues/green/report/2014/03/19/85923 /groundhog-days/ - calculated the actual impact, the utilities' estimates of rate increases were off by 16 percent. In fact, 32 states had lower electricity rates (in 2009 dollars) than during the course of the debate.

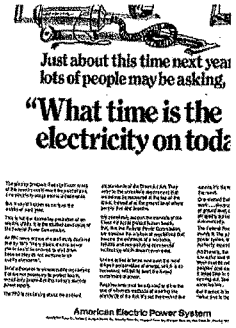
## The lights will go out.

In 1974, an American Electric Power Company ad - http://www.documentcloud.org/documents /357218-1974-7-9-aep-nyt-whattimeelectricityon.html - warned, "Just about this time next year lots of people may be asking, 'What time is the electricity on today?'" The ad ran as an objection to cracking down on how much pollution plants could spew from their



tall smokestacks, arguing that the Clean Air Act set an "unrealistic requirement that emissions be measured at the top of the stack, instead of at the ground level where people live and breathe."

Needless to say, many of coal's frequent warnings of widespread electricity shortages never came to pass. Almost 40 years later, the lights are still on, meeting higher demand than ever, with the help of efficiency measures and renewable energy.




## Coal plants will close.

When the EPA in 2011 issued a rule to cut cross-state sulfur dioxide pollution by 73 percent, - http://www.epa.gov/crossstaterule/ - the industry predicted widespread closing of plants. The owners of one plant in particular—in Homer City, Pennsylvania—said there would be painful electricity hikes and other "immediate and devastating" consequences.

Three years later, the Associated Press - http://bigstory.ap.org/article/after-decades-dirty-power-plant-get-clean - hailed the plant as a kind of success story, because it didn't close and it finally installed equipment that slashes pollution further than the rule even required. In the past, that the plant emitted more sulfur dioxide than all other plants combined, Environmental regulations do play some role in deciding whether to update or close a plant. However, the part they play is relatively small. Ultimately, the economic considerations also include how cheap natural gas impacts the attractiveness of coal is and the age of a plant determine whether the mine shuts down, research - http://www.reuters.com/article/2012/10/08/us-utilities-brattle-coal-idUSBRE8970LV20121008 - from economists at the Brattle Group pointed to both reasons as cause for plan closures.

## An entire industry will die.

Coal isn't the only industry guilty of overreaction. Rachel Maddow explained on her show a few weeks ago how auto executives in the 1970s thought the Clean Air Act's standards to cut vehicle emissions would mean the death of car production - http://www.msnbc.com/rachel-maddow-show/uninterrupted-streak-failed-predictions -

in America. Their facilities "would be forced to close," the car manufacturers trade group warned. The domestic auto industry did struggle, culminating in its near-collapse during the 2008 financial crisis. But that was a function of mismanagement and other problems, not overly onerous environmental rules. Foreign carmakers did just fine and the U.S.-based carmakers are now thriving, too.

By the way, the EPA has its own projections for the climate rule. They estimate - http://www2.epa.gov/sites/production/files/2014-05/documents /20140602fs-overview.pdf - it will reduce premature deaths by about 6,600, lead to electricity bills that are 8 percent lower, and realize climate and public health benefits worth somewhere between $55 to $93 billion by the time it's fully implemented in 2030. Meanwhile, the pollutants that the EPA has tackled would slowly improve (this map - http://www.newrepublic.com/article/118423/nasa-map-shows-air-quality-improve - shows you an example by just how much.)

The EPA is guilty of overshooting some of its predictions. But it can also actually overestimate its own projected cost of installing cleaner technology. The Rhodium Group and Natural Resources Defense Council both argue - http://www.eenews.net /stories/1060001499/print - that the cost-benefit analysis depends on a lot of factors, including how states draft their plans and whether the industry finds ways to go cleaner more efficiently. The EPA doesn't isn't accounting for technological innovation, either, when making its calculations.

While coal is indeed hurting, some red states' natural gas industries is getting a big boon in the new rules. So while the rule will make the shift to natural gas and renewables that much faster, don't believe that the sky is falling. Remember, the whole point is not a war on coal, but fighting the bigger battle—climate change.

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TAG India , Climate change , Global Warming , REDD+ , Carbon Emissions , Deforestation

# India goes green, drafts policy to lower carbon emissions

By Alexander Saharin, Tech Times | May 7, 3:08 AM SHARE(20) TWEET(24) 0 COMMENTS



India is planning to curb its carbon emissions by drafting new policies. The country plans to cut down on deforestation.
(Photo : [illegible])

India is known as one of the largest contributors to global carbon emissions in the world. However, the country may finally be taking more aggressive measures to lower its carbon emissions by drafting new policies regarding deforestation.

The Indian Government's Union Ministry of Environment and Forests (MoEF) has released the first draft of a policy that may nudge the nation into complying with the United Nation's REDD+ program. The program is a collaborative initiative comprised of numerous partner countries from around the world. REDD stands for Reducing Emissions from Deforestation and forest Degradation. The initiative was launched back in 2008 with the aim of reducing deforestation by providing monetary incentives to help communities that depend on forests for their livelihoods.

"Climate change due to accelerated Green House Gases (GHGs) emission has become one of the toughest challenges of the present," says [pdf] the MoEF's draft. "Deforestation and forest degradation is a major source of CO2 (an important Green House Gas) emission."

Instead of cutting down trees, local communities will be compensated financially for protecting nearby forests. Since forests are considered to be important carbon storage locations, preventing deforestation can help curb the effects of global warming and climate change due to increased carbon emissions.

"There is significant scope for improving quality of forest cover by addressing drivers of degradation as a significant part of the country's forest cover falls in the open to medium categories owning to various drivers of degradation. As estimated, REDD+ programme could provide for capture of around 1 billion tonnes of additional CO2 over the next 3 decades and significant financial incentives as carbon services under REDD+ including flow of positive incentives to local communities," the draft says.

India's participation in REDD+ is seen as an important milestone due to the fact that over 20 percent of the country is covered by thick forests. In total, the country has approximately 92.26 million hectares of forest cover. The country ranks 10th in the list of countries with the largest forested areas despite also being ranked high in the list of countries with the highest reported carbon emissions.

With the drafting of the new policy, India is hoping to implement the necessary REDD+ structures on both the National and regional levels. While the initiative is meant to decrease deforestation, implementation has been problematic. In Nepal, local forest communities have lamented that they were actually losing revenue due to the program. The REDD+ initiative is an environmental program and can do little to improve the lives of forest communities afflicted by poverty.

Five months before the Indian government published the first draft of its policy for joining the UN's REDD+ program, numerous developed and developing countries signed on to the REDD+ initiated when the 19th UN Conference of Parties on climate change was held in Warsaw. During the UN meeting, representative decided on 7 methods of compensating developing nations that have signed up for the REDD+ initiative. The latest move by the Indian government shows the country's willingness to take part in the program.

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# China aims high for carbon market by 2020

Published: September 12, 2014 - 8:13AM

China's national carbon market is likely to regulate 3-4 billion tonnes of carbon dioxide by 2020 and be worth up to 400 billion yuan ($72 billion), a government official said on Thursday, which would make it twice as big as the EU market, currently the world's biggest.

The National Development and Reform Commission (NDRC), China's top economic planner, and the Asian Development Bank held a conference in Tianjin on Thursday, outlining initial plans for a nationwide market to slow down the rapid growth of greenhouse gas emissions in China.

A senior climate official said last month China planned to start a national market in 2016.

Over the first five years of the scheme, the NDRC plans to bring emitters accounting for 3-4 billion tonnes of CO2 annually into the scheme, around 4per centnt of China's total emissions, according to a presentation delivered by Jiang Zhaoli, director of domestic policy and compliance in the NDRC climate change department.

The NDRC expects the emission permit futures market to be worth 60-400 billion yuan ($11-$72 billion) annually by 2020, with a smaller spot market with a value of around 1-8 billion yuan, according to the presentation seen by Reuters.

While the NDRC has been tasked with drawing up rules and regulations for the scheme, the final design would need approval by the State Council, China's cabinet.

Jiang's presentation was based on China removing a ban on futures trading in carbon permits, something experts have said is necessary to make the market work.

The scheme as outlined would regulate around twice as many tonnes of CO2 as are currently included in the European Union emissions market and could double the value of the global market.

Jiang said China would bring in even more emitting sectors after 2020 and would also seek ties to international markets in the next decade, but the presentation gave no further details.

It showed that Beijing plans to let central government decide the amount of permits that will be handed out to companies, create and operate the permit registry and set the rules for how emissions are monitored, reported and verified.

But the NDRC would allow a certain degree of regional autonomy in designing trading rules, the document said.

Since last June, China has launched seven regional pilot carbon markets in a bid to gain some experience before the national scheme begins.

China, the world's biggest emitter of greenhouse gases, has pledged to reduce its emissions per unit of GDper cent-45 percent below 2005 levels by 2020.

In the run-up to a global climate summit in Paris next year, China is now looking at options for what targets it might commit to in the longer term.

The Energy Research Institute (ERI), an NDRC-led think tank, recently submitted a study to NDRC officials recommending that China's emissions peak in 2030, an ERI researcher said at a Beijing conference in August.

The ERI report also outlined a more ambitious scenario with emissions peaking in 2025 and a laxer one with a 2035 target date for stopping emissions growth.

**Reuters**

*This story was found at: **http://www.smh.com.au/environment/climate-change/china-aims-high-for-carbon-market-by-2020-20140912-10ftdp.html***

ARTICLE SUBMITTED BY REPRESENTATIVE DONNA F. EDWARDS



Economy

# Flooding from storm surge would threaten D.C. infrastructure, report says

By Lori Montgomery September 16, 2014

By the end of this century, as sea levels rise, as much as $7 billion worth of property in the District will routinely be threatened by storm-driven floodwaters, according to a new analysis, including 1,000 homes, three military bases and a broad swath of the Mall.

With tides on the Atlantic Coast generally forecast to rise two to four feet by 2100, the nation's capital faces increasing odds that a big storm will blow up the Potomac River and raise local waters by at least eight feet, the analysis says — roughly a foot higher than the damaging floods that accompanied Hurricane Isabel in 2003.

The report, set for release Tuesday by the nonprofit Climate Central, maps the areas at risk in unprecedented detail, cataloguing vulnerable government facilities, roadways, cultural sites and private houses. At eight feet, for example, the Washington Navy Yard, Fort McNair and much of Joint Base Anacostia-Bolling would be inundated, the report says. So would the Maine Avenue waterfront, subsidized apartments along the Anacostia River and national memorials honoring Jefferson, King and Lincoln.

"In D.C., we're talking about a relatively small slice of land that's vulnerable. But it's an area of great cultural, economic and even military importance," said Ben Strauss, vice president for climate impacts at Climate Central, an organization of scientists and journalists that is assessing flood risk from sea-level rise for the entire U.S. coastline.

New maps show future storm surge

Museums and federal office buildings along a low-lying stretch of Constitution Avenue NW, which flooded after a week of heavy rains in 2006, would be protected from a tidal surge by a recently-completed levee that straddles 17th Street NW, not far from the White House and the Washington Monument.

But District officials said much of the city's waterfront could be transformed by the threat: The highest flood on record in the city was 7.9 feet in 1933. But by 2100, Climate Central estimates that the District would be facing an eight-foot flood roughly every 10 years.

"That's very routine, probably to the point that people will have to change their way of operating completely," said Brendan Shane, chief of sustainability for the District Department of the Environment. "Things will be walled off, jacked up or moved. You're looking at a very different use of the landscape in that scenario."

In addition to the District, Climate Central was set to release detailed maps and data Tuesday for Maryland, Virginia and Delaware. All told, Strauss said, more than $42 billion worth of property across the three states will be threatened by regular flooding as sea levels rise, imperiling 116,000 homes and 3,400 miles of roadway.

The most vulnerable spots are Norfolk, Va.; Ocean City, Md.; and other places hit hard by the ocean. But Baltimore's Inner Harbor and the oldest parts of Annapolis are also at risk, as are many communities along the Potomac, such as Old Towne Alexandria.

State and local officials are working to respond to the threat, with varying degrees of urgency.

In Maryland, which has 3,100 miles of coastline, sea-level rise has been on the agenda for close to 15 years. The state has shifted open-space acquisition away from the coast to avoid

preserving land that one day will be underwater. State agencies are required to take sea-level rise into account when planning new buildings and infrastructure. And last year, a Maryland commission recommended adopting an official forecast of two feet of sea-level rise by 2050 — at the high end of the scientific spectrum.

"Here in this region, Hurricane Isabel was a big wakeup call. Then [Hurricane] Sandy. And then these heavy precipitation events over the last year," said Zoe Johnson, program manager for climate change policy at the Maryland Department of Natural Resources. "There's been a lot of interest in this type of planning."

By contrast, Virginia, which has 3,400 miles of coastline, has been struggling to reach political consensus since at least 2012, when Republican state lawmakers refused to fund a study on "sea-level rise," but consented to a study of "recurrent flooding."

The resulting report, by the Virginia Institute of Marine Science, nonetheless predicted that tides along the Virginia coast would rise by three to five feet by 2100. Since then, Republican governor Robert F. McDonnell has been replaced by Democrat Terry McAuliffe, who last week convened his own statewide commission on climate change. McAuliffe gave the group a year to come up with some "big ideas" that could be implemented before his four-year term is over.

In the District, planning for sea-level rise is just getting underway. While local officials have long had strategies for combating historic flooding, District officials earlier this year hired a consulting team for the first time to start assessing the city's future risks, not only from higher ocean tides but also from other effects of climate change, including extreme heat and more frequent and heavy precipitation.

The team includes Katharine Hayhoe, director of the Climate Science Center at Texas Tech University. An evangelical Christian, Hayhoe gained national fame after appearing on the Showtime documentary about climate change, "Years of Living Dangerously."

The city is also consulting with federal agencies, such as the National Park Service, which manages the Mall and other big chunks of vulnerable land in the District. The Pentagon is conducting its own assessment of vulnerability to climate change at the nation's military bases, including those in the District.

Meanwhile, any change in the city's flood-risk assessment that makes building more expensive could draw the wrath of developers.

"It's going to be an interesting few months as this discussion progresses, particularly as you have more concrete numbers," Shane said. "With Climate Central, there's one map that shows risk levels. But there's another map for current building codes, and they're different.

"So we may be in this limbo area for a while, where we have competing visions for what the impacts of the climate change may actually be."

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Lori Montgomery covers U.S. economic policy and the federal budget, focusing on efforts to tame the national debt.

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