

PARIS CLIMATE PROMISE: A BAD DEAL FOR AMERICA

HEARING BEFORE THE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY HOUSE OF REPRESENTATIVES ONE HUNDRED FOURTEENTH CONGRESS

SECOND SESSION

February 2, 2016

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**PARIS CLIMATE PROMISE:
A BAD DEAL FOR AMERICA**

TUESDAY, FEBRUARY 2, 2016

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY &
SUBCOMMITTEE ON OVERSIGHT,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, D.C.

The Committee met, pursuant to call, at 10:09 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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Full Committee

Paris Climate Promise: A Bad Deal for America

Tuesday, February 2, 2016
10:00 a.m. – 12:00 p.m.
2318 Rayburn House Office Building

Witnesses

Mr. Stephen Eule, Vice President for Climate and Technology, U.S. Chamber of Commerce

Dr. John Christy, Professor of Atmospheric Science and Director of the Earth System Science Center, University of Alabama in Huntsville

Dr. Andrew Steer, President and CEO, World Resources Institute

Mr. Steven Groves, Bernard and Barbara Lomas Senior Research Fellow, Margaret Thatcher Center for Freedom, The Heritage Foundation

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

HEARING CHARTER

Paris Climate Promise: A Bad Deal for America

Tuesday, February 2, 2016
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 *Paris Climate Promise: A Bad Deal for America* on Tuesday, February 2, 2016, in Room 2318 of the Rayburn House Office Building. The hearing will examine the various scientific, economic, and other policy issues surrounding the United States' pledge at the recent United Nations-led effort to curtail greenhouse gas emissions.

WITNESS LIST

- **Mr. Steve Eule**, Vice President for Climate and Technology, U.S. Chamber of Commerce
- **Dr. John Christy**, Professor of Atmospheric Science and Director of the Earth System Science Center, University of Alabama in Huntsville
- **Dr. Andrew Steer**, President and CEO, World Resources Institute
- **Mr. Steven Groves**, The Bernard and Barbara Lomas Senior Research Fellow, Margaret Thatcher Center for Freedom, The Heritage Foundation

BACKGROUND

The United Nations Paris Climate Change Conference (COP21) concluded in December 2015. COP21's objective was "to achieve a legally binding and universal agreement on...keeping global warming below 2°C."¹ It is anticipated that a signing ceremony will occur at the United Nations by April 2016.

In November 2014, the Obama Administration announced that the U.S. would reduce its economy-wide greenhouse gas emissions by 26%-28% by 2025 compared to a 2005 baseline, and reiterated this pledge this past March to the United Nations through the submission of an "Intended Nationally Determined Contribution (INDC)."² In addition to a pledge to reduce such emissions, then-Secretary of State Hillary Clinton in 2009 pledged to raise \$100 billion annually

¹ <http://www.cop21paris.org/about/cop21>

² <https://www.whitehouse.gov/the-press-office/2015/03/31/fact-sheet-us-reports-its-2025-emissions-target-unfccc>

for a Green Climate Fund to aid developing countries.³ The COP21 agreement would require the United States contribute funds to the developing world to reduce carbon emissions. It is unclear how the Administration intends to honor this agreement by providing public financial support without regular Congressional approval through the authorization and appropriations process.⁴ The Green Climate Fund faces considerable uncertainty with a lack of financial commitments from developed nations.⁵

The Obama Administration expects the EPA's regulations through the Clean Power Plan, which went into effect in December 2015, to play a central role in achieving its COP21 pledge, despite significant questions about what impact the Plan will have on global warming.⁶ Furthermore, twenty-six states have joined a lawsuit against the EPA over the Clean Power Plan, citing an overreach of the agency's authority under the Clean Air Act and an unlawful attempt to usurp states' ability to regulate electrical generation systems as the basis for their challenge.⁷ These legal challenges, in addition to the complicated implementation schedules associated with regulations, make it unlikely that the Plan will be implemented on the Administration's intended timetable, if at all, and thus call into question the Administration's ability to make commitments to the United Nations.⁸

Despite statements about the historic and long-term nature of the promises made at COP21,⁹ the administration has no plans to formally present this agreement to Congress for ratification by the U.S. Senate. The President has the power to commit the United States to treaties, but only when the treaty is ratified with the advice and consent of two-thirds of the US Senate. Furthermore, the EPA's Clean Power Plan regulations—the cornerstone of the President's pledge to the United Nations to curb carbon dioxide emissions—has been disapproved by both the U.S. Senate and House of Representatives.

Without Congressional approval of the COP21 agreement, the prospects that the promises on behalf of the United States by the Obama Administration will actually be carried out is highly uncertain.

³ <http://www.state.gov/secretary/20092013clinton/rm/2009a/12/133734.htm> and <http://www.nytimes.com/cwire/2009/12/17/17climatewire-hillary-clinton-pledges-100b-for-developing-96794.html>

⁴ http://www.nytimes.com/2015/09/30/business/getting-to-100-billion-in-climate-change-aid.html?_r=0

⁵ http://www.business-standard.com/article/current-affairs/green-climate-fund-faces-uncertainty-115111300600_1.html

⁶ <https://science.house.gov/sites/republicans.science.house.gov/files/documents/HHRG-114-SY-WState-PKnappenberger-20151118.pdf>

⁷ <http://www.rpc.senate.gov/policy-papers/avalanche-of-opposition-hits-epas-co2-rule>

⁸ http://www.epw.senate.gov/public/_cache/files/21ffe37a-8052-4498-ba78-18395db0fc42/holmstead.pdf

⁹ <https://www.whitehouse.gov/the-press-office/2015/12/12/statement-president-paris-climate-agreement>

Chairman SMITH. The Committee on Science, Space, and Technology will come to order. Without objection, the Chair is authorized to declare recesses of the Committee at any time. Welcome to today's hearing, entitled "Paris Climate Promise: A Bad Deal For America." I'll recognize myself for an opening statement, and then the Ranking Member.

President Obama submitted costly new electricity regulations as the cornerstone of his agreement at the Paris U.N. Climate Conference last December. These severe measures will adversely affect our economy, and have no significant impact on global temperatures. In Paris, the President pledged that the United States will cut its greenhouse gas emissions by as much as 28 percent over the next decade, and by 80 percent or more by 2050. Moreover, the President's pledge creates an international agreement that binds the United States for decades to come, but lacks constitutional legitimacy, since it has not been ratified by the Senate.

The agreement not only requires the U.S. to reduce carbon emissions, but also compels our country to pay billions of dollars to developing nations to reduce their carbon emissions. Furthermore, even if all 196 countries continue their promised reductions for each year after 2031, until 2100, it will only reduce temperatures by one-sixth of a degree Celsius. The so-called Clean Power Plan will cost billions of dollars, cause financial hardship for American families, and diminish the competitiveness of American employers, all with no significant benefit to climate change. The U.S. pledge to the U.N. is estimated to prevent only one-fiftieth of 1 degree Celsius temperature rise over the next 85 years. EPA's own data shows that this regulation would reduce sea level rise by only one-hundredth of an inch, the thickness of three sheets of paper.

The President's power plan is nothing more than a power grab. A majority of Congress disapproved of the Clean Power Plan through the Congressional Review Act, and the governors of most states are challenging the rule in court. Meanwhile, the President attempts to justify his actions with scare tactics, worst case scenarios, and biased data. An example of how this administration promotes its suspect climate agenda can be seen at the National Oceanographic and Atmospheric Administration. Its employees altered historical climate data to get politically correct results in an attempt to disprove the 18 year lack of global temperature increases. NOAA conveniently issued its news release that promotes this report just as the administration announced its extensive climate change regulations. NOAA has refused to explain its findings and provide documents to this Committee, and the American people. The people have a right to see the data, evaluate it, and know the motivations behind this study. Last week, over 300 respected scientists and experts, which include a Nobel Prize winner, members of the National Academy of Sciences, and former astronauts, sent this Committee a letter that expressed concern over NOAA's efforts to alter historical temperature data. They agree that the issue deserves serious scrutiny.

This administration continually impedes Congressional oversight of its extreme climate agenda. Rightfully, Americans should be suspicious. Furthermore, statements by President Obama and others that attempt to link extreme weather events to climate change are

unfounded. The lack of evidence is clear. No increased tornadoes, no increased hurricanes, no increased droughts or floods. For instance, the United Nations Intergovernmental Panel on Climate Change found that there is “low confidence on a global scale” that drought has increased in intensity or duration. The same lack of evidence can be found in the IPCC reports for almost every type of extreme weather.

The administration’s alarmism and exaggeration is not good science, and intentionally misleads the American people. Congress has repeatedly rejected the President’s extreme climate agenda. Now the administration attempts to create the laws on its own, and has packaged all these regulations, and promised their implementation to the U.N. The President’s Paris pledge will increase electricity cost, ration energy, and slow economic growth. It ignores good science, and only seeks to advance a partisan political agenda. The President should present his Paris climate change agreement to Congress. He won’t, because he knows neither the Senate, nor the House, would approve it. As we will hear today, the President’s U.N. climate pledge is a bad deal for the American economy, the American people, and would produce no substantive environmental benefits.

[The prepared statement of Chairman Smith follows:]



COMMITTEE ON
SCIENCE, SPACE, & TECHNOLOGY
 Lamar Smith, Chairman

For Immediate Release
 February 2, 2016

Media Contact: Zachary Kurz
 (202) 225-6371

Statement of Chairman Lamar Smith (R-Texas)
Paris Climate Promise: A Bad Deal for America

Chairman Smith: President Obama submitted costly new electricity regulations as the cornerstone of his agreement at the Paris U.N. climate conference last December. These severe measures will adversely affect our economy and have no significant impact on global temperatures.

In Paris, the president pledged that the United States will cut its greenhouse gas emissions by as much as 28 percent over the next decade and by 80 percent or more by 2050.

Moreover, the president's pledge creates an international agreement that binds the United States for decades to come, but lacks constitutional legitimacy since it has not been ratified by the Senate. The agreement not only requires the U.S. to reduce carbon emissions but also compels our country to pay billions of dollars to developing nations to reduce their carbon emissions.

Furthermore, even if all 196 countries continue their promised reductions for each year after 2031 until 2100, it will only reduce temperatures by one-sixth of a degree Celsius. The so-called Clean Power Plan will cost billions of dollars, cause financial hardship for American families, and diminish the competitiveness of American employers, all with no significant benefit to climate change.

The U.S. pledge to the U.N. is estimated to prevent only one-fiftieth of one degree Celsius temperature rise over the next 85 years! EPA's own data shows that this regulation would reduce sea level rise by only 1/100th of an inch, the thickness of three sheets of paper. The president's "Power Plan" is nothing more than a power grab.

A majority of Congress disapproved of the Clean Power Plan through the Congressional Review Act. And the governors of most states are challenging the rule in court. Meanwhile, the president attempts to justify his actions with scare tactics, worst-case scenarios and biased data.

An example of how this administration promotes its suspect climate agenda can be seen at the National Oceanographic and Atmospheric Administration (NOAA). Its employees altered historical climate data to get politically correct results in an attempt to disprove the eighteen year lack of global temperature increases.

NOAA conveniently issued its news release that promotes this report just as the administration announced its extensive climate change regulations.

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This administration continually impedes Congressional oversight of its extreme climate agenda. Rightfully, Americans should be suspicious.

Furthermore, statements by President Obama and others that attempt to link extreme weather events to climate change are unfounded. The lack of evidence is clear: no increased tornadoes, no increased hurricanes, no increased droughts or floods.

For instance, the United Nation's Intergovernmental Panel on Climate Change (IPCC) found that there is "low confidence on a global scale," that drought has increased in intensity or duration. The same lack of evidence can be found in the IPCC reports for almost every type of extreme weather.

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The president's Paris pledge will increase electricity costs, ration energy and slow economic growth. It ignores good science and only seeks to advance a partisan political agenda. The president should present his Paris climate change agreement to Congress. He won't, because he knows neither the Senate nor the House would approve it.

As we will hear today, the president's U.N. climate pledge is a bad deal for the American economy, the American people and would produce no substantive environmental benefits.

###

Chairman SMITH. That concludes my opening statement, and the Ranking Member, the gentlewoman from Texas, Eddie Bernice Johnson, is recognized for hers.

Ms. JOHNSON. Thank you very much, Mr. Chairman, and good morning. Let me welcome our witnesses, and in particular I'd like to thank Dr. Steer for returning today. Your testimony in December, before the Paris conference, was enlightening, and greatly appreciated. Today I look forward to discussing your takeaways from Paris, as well as your thoughts on appropriate steps that need to be taken to address climate change.

The Paris agreement formalized what many across the world already knew must be done to meaningfully address our most serious environmental challenge. Establishing a commitment to action, not for some, but for all countries, is the first step toward a comprehensive global strategy to reduce carbon emissions. This commitment demands transparency, again, not for some, but for all countries, to ensure that effective policies are put in place, and that the objective of the agreement, to limit the warming of our planet is accomplished.

We can accomplish this in three ways. First we must need—we need to support the private sector's growing recognition of the threats posed by climate change. In the United States alone, 154 companies signed on to the American Business Act on Climate pledge. Through this pledge, companies like AT&T, Bank of America, Cargill, Coca-Cola, IBM, and even the Walt Disney Company are demonstrating their support for action by setting emission targets for their operations. As many of you will recall, days before the Paris climate talks, Bill Gates, along with a group of private investors, announced the creation of Breakthrough Energy Coalition, a coalition committed to investing in potentially transformative emerge—energy systems. Private sector efforts like this illustrate the potential impacts investments in technology can have on achieving both long and short term carbon reductions.

The Paris agreement requires all governments to be consistent with their commitments, and sends a signal to the private sector that a stable framework for action will be put in place, enabling private actors to invest, innovate, and inspire further action. Second, as our private sector responds to stable market signals, we must continue to identify opportunities for the Federal Government to invest in research and technologies that put us on a path to prevent a rise in global temperatures above 2 degrees Celsius. In addition to helping address climate change, investments in such innovative technologies will propel us forward into a new era of economic prosperity and environmental health. Third, we must capture the momentum of the Paris agreement, and take a leadership role in addressing the challenge of climate change, and not just react to changes as they occur. Maintaining our international commitments demonstrates strength, and provides certainty for all of our partners, including our private sector partners right here at home. As we act in a transparent manner to develop and implement policies to address our own carbon emissions, we will help move other nations to follow our example, and achieve an impactful global response to climate change.

I fear that we will hear today many of the same views and arguments that we've heard from the majority for years. They will warn us of the dire economic consequences of acting on climate change, or suggest that thousands of the world's most respected scientists are wrong about climate changing at all, or that any actions we take will be pointless. They will portray the Obama Administration as overreaching. They will say all of these things, but the reality is that the audience for those views is shrinking as the reality of climate change become evident. The rest of us acknowledge the task ahead, and recognize that delay is not an option. We must move forward to support policies that will address our climate challenge, and trust that our private sector will continue to innovate. The Paris climate agreement is a very positive development, and I hope that we can all build on it.

And, Mr. Chairman, I have a page here from the Washington Post dated Friday, December the 11th, 2015, that talks about the draft of the Paris agreement, and it also has a second article that's entitled, "In Paris, Majority View in GOP Congress Is In A Minority". I thank you, and I yield back.

[The prepared statement of Ms. Johnson follows:]

Opening Statement

Ranking Member Eddie Bernice Johnson
Committee on Science, Space, and Technology

“Paris Climate Promise: A Bad Deal for America”

February 2, 2016

Thank you Mr. Chairman and welcome to our witnesses. In particular, I'd like to thank Dr. Steer for returning today. Your testimony in December before the Paris Conference was enlightening and greatly appreciated. Today, I look forward to discussing your takeaways from Paris, as well as your thoughts on appropriate next steps that need to be taken to address climate change.

The Paris agreement formalized what many across the world already knew must be done to meaningfully address our most serious environmental challenge. Establishing a commitment to action, not for some, but for all countries, is the first step towards a comprehensive global strategy to reduce carbon emissions.

This commitment demands transparency, again not for some, but for all countries, to ensure that effective policies are put in place and that the objective of the agreement--to limit the warming of our planet-- is accomplished.

We can accomplish this in three ways. First, we need to support the private sector's growing recognition of the threats posed by climate change. In the United States alone, 154 companies signed on to the “American Business Act on Climate Pledge.” Through this pledge, companies like AT&T, Bank of America, Cargill, Coca-Cola, IBM, and even the Walt Disney Company are demonstrating their support for action by setting emissions targets for their operations.

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helping address climate change, investments in such innovative technologies will propel us forward into a new era of economic prosperity and environmental health.

Third, we must capture the momentum of the Paris agreement and take a leadership role in addressing the challenge of climate change, and not just react to changes as they occur. Maintaining our international commitments demonstrates strength, and provides certainty for all of our partners, including our private sector partners here at home.

As we act in a transparent manner to develop and implement policies to address our own carbon emissions, we will help move other nations to follow our example and achieve an impactful global response to climate change.

I fear that we will hear today many of the same views and arguments that we have heard from the Majority for years. They will warn us of the dire economic consequences of acting on climate change, or suggest that thousands of the world's most respected scientists are wrong about the climate changing at all, or that any actions we take will be pointless. They will portray the Obama Administration as overreaching. They will say all of these things, but, the reality is that the audience for those views is shrinking as the reality of climate change becomes evident.

The rest of us acknowledge the task ahead and recognize that delay is not an option. We must move forward to support policies that will address our climate challenge and trust that our private sector will continue to innovate. The Paris Climate Agreement is a very positive development, and I hope that we will build on it.

Thank you Mr. Chairman, I yield the balance of my time.

Chairman SMITH. Okay. Thank you, Ms. Johnson. Our first witness today is Mr. Stephen Eule, Vice President for Climate and Technology at the U.S. Chamber of Commerce. Prior to joining the Chamber, Mr. Eule was the Director of the Office of Climate Change Policy and Technology at the Department of Energy, and during this time Dr. Eule represented DOE at the Intergovernmental Panel on Climate Change, the G-20, and other multilateral forums. He also previously served as a Subcommittee Staff Director here at the Science Committee, so welcome back.

Dr. Eule received his Bachelor's Degree in Biology from Southern Connecticut State College, and his Master's Degree in Geography from George Washington University.

I'll now recognize the gentleman from Alabama, Mr. Palmer, to introduce our next witness.

Mr. PALMER. Thank you, Mr. Chairman. It is my pleasure and honor to introduce a fellow Alabamian. Our second witness is Dr. John Christy, distinguished Professor of Atmospheric Science, and Director of the Earth System Science Center at the University of Alabama in Huntsville. Dr. Christy, a data-driven climate scientist, has researched climate issues for 27 years, and has been Alabama State Climatologist since 2000. He was a contributor on four reports by the Intergovernmental Panel on Climate Change, and was lead author of a section of the 2001 IPCC third assessment report. In addition, Dr. Christy received NASA's Medal for Exceptional Scientific Achievement in 1991 for building a global temperature database, and in 2002 was elected a fellow of the American Meteorological Society.

Dr. Christy received his Bachelor's Degree in Mathematics from California State University, Fresno, and his Master's and Ph.D. in Atmospheric Sciences from the University of Illinois. It's our pleasure to have you here, Dr. Christy. Thank you for testifying.

Chairman SMITH. All right. Thank you, Mr. Palmer. Our third witness today is Dr. Andrew Steer, President and CEO of World Resources Institute. Dr. Steer joined WRI from the World Bank, where he served as Special Envoy for Climate Change since 2010. Prior to this position, Dr. Steer was Director, General, and Member of the management board at the United Kingdom Department of International Development. Dr. Steer worked at the World Bank for over 20 years, and has held a number of positions, that include Director of the Environment Department. Dr. Steer received his Ph.D. in Economics from the University of Pennsylvania.

Our final witness is Mr. Steven Groves, Senior Research Fellow at the Margaret Thatcher Center for Freedom at the Heritage Foundation. Before joining Heritage in 2007, Mr. Groves was Senior Counsel to the U.S. Senate Permanent Subcommittee on Investigations. Mr. Groves received his Bachelor's Degree in History from Florida State, his Master's Degree in Law from Georgetown, and his J.D. from Ohio Northern University.

We welcome you all, look forward to your testimony. And, Mr. Eule, if you'll begin?

**TESTIMONY OF MR. STEVE EULE,
VICE PRESIDENT FOR CLIMATE AND TECHNOLOGY,
U.S. CHAMBER OF COMMERCE**

Mr. EULE. Thank you, Chairman, Smith, Ranking Member Johnson, and members of the Committee. It's a pleasure to be back here in the Science Committee. The main points I'd like to make, which are detailed in my written testimony, are as follows. First, the Paris agreement clearly fulfills the Durban Platform's goal of an outcome with legal force, as it contains many legally binding provisions laying out what parties "shall" do. These include requiring the parties to make future increasingly ambitious mitigation pledges, and to provide financing and technology assistance. The binding aspects of the Paris agreement clearly require implementing legislation and regulation potentially affecting every sector of the U.S. economy. An agreement with such far reaching consequences, if it is to be considered durable and binding both politically and legally, should be approved by Congress.

Second, according to its own analysis, the Obama Administration's emission reduction commitment for Paris doesn't add up. In a report released New Year's Eve, the administration estimates that 41 percent to 57 percent of the President's 2025 emissions target remains unaccounted for, and that's assuming EPA's Clean Power Plan survives court scrutiny, a big if. Even when including the administration's wish list of additional measures, in almost all cases the projected emission reductions still fall short, and often well short, of the President's 2025 goal. That the administration, which has thus—shown thus far no reticence when it comes to regulating greenhouse gases, still can't figure out how to reach its 2025 goal without everything breaking just right demonstrates how unrealistic its goal really is.

Third, the Paris emissions pledges are hugely unequal, and will not change appreciatively the rising trajectory of global emissions. While the United States, Europe, Japan, and a few other countries have offered up deep emission cuts, nearly all developing countries, particularly the large emerging economies, have offered little beyond business as usual. Differentiation among the parties is alive and well. A recent report from the Framework Convention estimates that, even in the unlikely event all the Paris pledges are implemented to the letter, global emissions will still rise nearly 1/5 between 2010 and 2030, within the range of where emissions were headed anyway.

Fourth, the disparity in commitments results from the fact that most countries place greater emphasis on economic development than they do on cutting greenhouse gas emissions. More than a billion people worldwide still lack access to the modern energy services that could lift them out of poverty. Coal will remain for some time the fuel of choice for electrification in developing countries. Using data from plants, we estimate that during the Paris climate talks, about 1.2 trillion watts of new coal fired power plants were under construction, or planned throughout the world. That's about 3-1/2 times the capacity of the entire U.S. coal fleet. This is not a carbon constrained world.

Fifth, the administration's plan will likely result in emissions from the U.S. leaking to other countries, merely moving, not reducing them. The United States has a tremendous energy price advantage over many of its competitors. Overregulation from EPA, however, could force energy intensive industries to flee to other countries, similar to what we are seeing in Europe, where climate and other policies have driven up energy costs to industry two to four times higher than here in the United States.

Sixth, developing countries have made it plain they will not undertake any meaningful commitments without large doses of financial aid. Developed countries have pledged \$100 billion annually by 2020, and are expected to increase that amount by 2025. A great deal of the U.S. share of this—will have to be appropriated by Congress.

Seventh, although parties agree to a non-binding aim to limit the global temperature increase to well below 2 degrees C from the pre-industrial level, the parties, as they have in the past, refuse to agree to a global emissions pathway that they believe would be needed to meet this goal. It is exceedingly unlikely that they ever will. This temperature target, therefore, will remain what it has always been, a political symbol of little practical consequence.

Finally, technology is the key. At its most fundamental level, reducing greenhouse gas emissions is a technology challenge. Existing technologies can make a start, but as we have seen, they are not capable of significantly cutting emissions on a global scale, and at an acceptable cost. That is why the Chamber will continue to emphasize energy efficiencies and policies designed to lower the cost of alternative energies, rather than raising the cost of traditional energy.

In closing, back in 1997 the Clinton Administration offered up an unrealistic U.S. goal, disregarded clear guidance from the Senate, and signed the Kyoto Protocol, a treaty it knew was politically untenable, and therefore never bothered to submit to the Senate for its advice and consent. Now it looks like the Obama Administration may have repeated the mistake of ignoring Congress, signing on to a lopsided deal, and making promises future presidents and Congresses may be neither willing, nor able, to keep. As the late, great Yogi Berra once quipped, it's *deja vu* all over again. Thank you.

[The prepared statement of Mr. Eule follows:]



Statement of the U.S. Chamber of Commerce

ON: Paris Climate Change Agreement

**TO: U.S. House of Representatives
Committee on Science, Space, & Technology**

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

The U.S. Chamber of Commerce is the world's largest business federation representing the interests of more than 3 million businesses of all sizes, sectors, and regions, as well as state and local chambers and industry associations. The Chamber is dedicated to promoting, protecting, and defending America's free enterprise system.

More than 96% of Chamber member companies have fewer than 100 employees, and many of the nation's largest companies are also active members. We are therefore cognizant not only of the challenges facing smaller businesses, but also those facing the business community at large.

Besides representing a cross section of the American business community with respect to the number of employees, major classifications of American business—e.g., manufacturing, retailing, services, construction, wholesalers, and finance—are represented. The Chamber has membership in all 50 states.

The Chamber's international reach is substantial as well. We believe that global interdependence provides opportunities, not threats. In addition to the American Chambers of Commerce abroad, an increasing number of our members engage in the export and import of both goods and services and have ongoing investment activities. The Chamber favors strengthened international competitiveness and opposes artificial U.S. and foreign barriers to international business.

Thank you, Chairman Smith, Ranking Member Johnson, and members of the Committee. I am Stephen D. Eule, vice president of the Institute for 21st Century Energy, an affiliate of the U.S. Chamber of Commerce. The mission of the Institute is to unify policymakers, regulators, business leaders, and the American public behind common sense energy strategy to help keep America secure, prosperous, and clean. In that regard, we hope to be of service to this Committee, this Congress as a whole, and the administration.

Summary of Key Points

For the purposes of this testimony I will limit myself to these main points:

- The Paris Agreement fulfills the Durban Platform's goals of an outcome with legal force, as it contains many legally-binding "shall" provisions, including committing the Parties to make future, more ambitious if non-binding mitigation commitments and to provide financing and technology assistance.
- The binding aspects of the Paris Agreement would require implementing legislation and regulation potentially affecting every sector of the U.S. economy. An agreement with such far-reaching consequences, if it is to be considered binding on future administrations and Congresses, should be approved by Congress.
- As a recent State Department report demonstrates, the U.S. Paris pledge of a 26% to 28% reduction in net GHG emissions from the 2005 level by 2025 is completely unrealistic, and the administration still has no plan to achieve it. This and any future pledges should be approved by Congress.
- A review of the Paris emission pledges show that they are very uneven, with a handful of developed countries being responsible for nearly all of the actual emission reductions while others countries pursue "business as usual."
- While making emissions pledges is mandatory, the pledges themselves are not binding, so there is no guarantee any of the Paris goals will be achieved.
- Even if these goals were to be achieved, however, global emissions in 2030 would still be much higher than in 2010 (with a mid-range estimate of 18%) largely because of rapid emissions growth in economies in transition and in emerging and developing economies. Coal for power production will continue to increase throughout the world as developing economies work to reduce poverty and increase energy access to their people.
- The United States has a huge energy-price advantage over many of its competitors. The uneven nature of the emissions goals, however, could raise U.S. energy prices and lead to carbon leakage to other countries with fewer environmental controls.

- Although Parties have agreed to a non-binding aim to limit the global temperature increase to “well below 2°C” from the pre-industrial level, the Parties, as they have in past decisions, refused to identify a global emissions pathway that they believe would be needed to meet the goal. This temperature target, therefore, will remain what it always has been—a potent political symbol of little practical consequence.
- Intellectual property rights (IPR) are not mentioned in the agreement, but there is concern that other language in the Paris Agreement and COP decision could open the door to weakening IPR in future meetings. Continued diligence to protect IPR is required.
- Developed countries are on the hook for providing finance for developing countries, but many issues have been kicked down the road. Congress has a role in authorizing and appropriating the U.S. share of these funds.

Introduction and Background

The UN Framework Convention on Climate Change¹ (UNFCCC) was adopted in 1992 and entered into force in 1994. It was one of three conventions—the other two cover biodiversity and desertification—agreed to at the 1992 Earth Summit in Rio de Janeiro, Brazil.

The ultimate goal of the UNFCCC, found in Article 2, is the “stabilization of greenhouse gas concentrations in the atmosphere at a level [undefined] that would prevent dangerous anthropogenic interference with the climate system.” This goal should be “achieved within a time frame that would allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.”

More than 190 governments are Parties to the UNFCCC. The U.S. Senate gave its advice and consent to ratification of the agreement in 1992 by voice vote. This consent, however, came with the understanding that any future agreement pursuant to the UNFCCC that included emissions target and timetables would be subject to the Senate’s advice and consent.²

Since 1995, the Conference of the Parties (COP) to the UNFCCC has met annually, and in December 2015, the 21st meeting of the COP took place in Paris, France to complete a new agreement.

From the very beginning, the structure of the UNFCCC has virtually guaranteed gridlock. Consider the notion of historical responsibility, which plays an oversized role in the dynamics

¹ UN. 1992. “United Nations Framework Convention on Climate Change.” Available at: http://unfccc.int/files/essential_background/background_publications_htmlpdf/application/pdf/conveng.pdf.

² U.S. Senate. 1992. *Senate Executive Report No. 102-55*. 102nd Congress, 2nd Session.

between and among developed, emerging, and developing country Parties. Developing countries assert that as developed countries bear “historical responsibility” for most of the build-up of atmospheric carbon dioxide, they bear a greater responsibility to reduce emissions and to provide finance for reductions in developing countries.

Historical responsibility buttresses the UNFCCC principle of “common but differentiated responsibilities and respective capabilities” under which, “. . . developed country Parties should take the lead in combating climate change and the adverse effects thereof.” That is, developing countries are not expected to do as much as developed countries, which have greater economic and technological capabilities to curb emissions. This principle of common but differentiated responsibilities is on full display in the 1997 Kyoto Protocol,³ which only saddles developed countries with binding obligations to reduce emissions. (Although the Clinton Administration signed the Kyoto Protocol, it never sent it to the Senate for its advice and consent.)

Over the years, however, it has become readily apparent that developed countries alone cannot reduce global emissions by themselves—all countries have to participate. Developing countries, however, have been reticent to take on any substantial obligations for the reasons cited above and because economic development remains their priority. Paris was supposed to be the first agreement that would bring developing countries into the fold as full partners.

The first cracks in this UNFCCC wall separating developed from developing countries appeared in the Bali Roadmap⁴ that emerged from the UNFCCC talks in Indonesia in 2007, where developing countries agreed to consider “nationally appropriate mitigation actions” that are “measurable, reportable, and verifiable.” Bali began a two-year process to strengthen the international response to climate change through the “full, effective and sustained implementation of the Convention through long-term cooperative action, now, up to and beyond 2012, in order to reach an agreed outcome and adopt a decision.” This process was to culminate with the agreement of a new, comprehensive international treaty (or treaties) at COP-15 in Copenhagen, Denmark at the end of 2009.

In the months leading up to COP-15, it became apparent that the Parties would not be able to achieve a comprehensive treaty. With a treaty clearly out of reach, the leaders from about 30 countries negotiated a deal, the Copenhagen Accord,⁵ outside the UNFCCC process. This short-circuiting of the formal UN process was received with suspicion by many developing countries, which saw it as an attempt by the “big” countries to by-pass the UN process to strike a backroom deal that would be forced on the COP for its rubber stamp. It did not work out that

³ UNFCCC. 1998. “Kyoto Protocol to the United Nations Framework Convention on Climate Change.” Available at: <http://unfccc.int/resource/docs/convkp/kpeng.pdf>.

⁴ UNFCCC COP. 2007. “Report of the Conference of the Parties on its thirteenth session, held in Bali from 3 to 15 December 2007.” FCCC/CP/2007/6/Add.1*. Available at: <http://unfccc.int/resource/docs/2007/cop13/eng/06a01.pdf>.

⁵ UNFCCC COP. 2009. “Report of the Conference of the Parties on its fifteenth session, held in Copenhagen from 7 to 19 December 2009.” FCCC/CP/2009/11/Add.1. Available at: <http://unfccc.int/resource/docs/2009/cop15/eng/11a01.pdf>.

way. Instead of agreeing to the Accord, the COP decided to “take note” of it, a snub that gave credence to the view that the Copenhagen meeting was a political fiasco.

Nevertheless, the Accord did break some new ground with its call on countries—developed, emerging, and developing alike—to make bottom-up, voluntary emission pledges through 2020. More than 60 countries plus the European Union eventually made commitments of widely varying quality and ambition. Major aspects of the Copenhagen Accord were brought formally into the UNFCCC in Cancún, Mexico the following year.⁶

The Durban Platform for Enhanced Action,⁷ which was adopted at COP-17 in 2011, charged the Parties to adopt a “protocol, another legal instrument or an agreed outcome with legal force” at COP-21 and for it to “come into effect and be implemented from 2020.” The Parties at COP-17 approved the establishment of the Ad Hoc Working Group on the Durban Platform for Enhanced Action to shepherd such an agreement to a conclusion no later than the end of 2015.

Four years later, representatives of 195 countries met at COP-21 in Paris and concluded a new post-2020 climate change deal.⁸ The final text agreed to in Paris is in two parts:

- (1) an agreement that includes legally binding aspects; and
- (2) a decision that fills in details and focuses on implementation.

The 29 articles (12 pages) of the agreement and the 140 paragraphs (19 pages) of the decision include provisions covering broads issues areas, including but not limited to: objectives, mitigation, forests and land use, international carbon markets, adaptation, loss and damage, finance, technology development and transfer, capacity building, transparency of action and support, a global assessment of progress, and implementation and entry into force.

In many ways, the Paris Agreement could be described as a more comprehensive and robust version of the Copenhagen Accord. The Copenhagen and Cancún meetings put in place many elements of the Paris Agreement—non-binding, bottom-up national commitments, a global (if undefined) temperature goal, increased levels of finance and technology transfer, and recognition of the importance of measuring, reporting, and verifying implementation of national commitments.

⁶ UNFCCC COP. 2010. “Report of the Conference of the Parties on its sixteenth session, held in Cancun from 29 November to 10 December 2010.” FCCC/CP/2010/7/Add.1. Available at: <http://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf#page=2>.

⁷ UNFCCC COP. 2011. “Report of the Conference of the Parties on its seventeenth session, held in Durban from 28 November to 11 December 2011.” FCCC/CP/2011/9/Add.1. Available at: <http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf>.

⁸ UNFCCC COP. 2015. “Adoption of the Paris Agreement.” FCCC/CP/2015/L.9/Rev.1. Available at: <https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf>.

Paris Agreement: Summary of Key Provisions

Global Goal: The agreement objective is to hold the increase in the global average temperature to well below 2°C above pre-industrial levels, with an effort to limit it to 1.5 °C. To that end, it states that countries should aim to peak global emissions “as soon as possible” and to achieve net-zero GHG emissions sometime after 2050 but before 2100.

Mitigation: The Intended Nationally Determined Contributions (INDCs) countries have put forward, and expected periodic revisions to these INDCs, are the mainstays of the mitigation aspects of the agreement. Parties to the agreement are expected to submit new, more ambitious mitigation pledges beginning in 2020 and every five years thereafter. These revised pledges are supposed to be informed by a series of periodic “global stocktaking” exercises designed to measure progress, the first of which is scheduled for 2023. Although the agreement commits Parties to make emission pledges and review and report on their progress in implementing them, it does not require that they actually achieve their pledges.

Forests and Land Use Change: This part of the agreement largely reaffirms previous positions and encourages Parties to take action to implement and support activities to reduce emissions from deforestation and forest degradation and enhancing forest carbon stocks, especially in developing countries.⁹

Adaptation and Loss & Damage: Parties are urged to develop and share information to improve adaptive capability, in particular taking into account the needs of particularly vulnerable developing countries. Parties also seek to avoid or minimize climate change-related damages, but it does not rule out loss and damage compensation explicitly. The *decision* text, however, states that loss and damage “does not involve or provide a basis for liability or compensation,” a much better outcome, but one that has less force than the agreement.

International Emissions Trading: Although the Paris Agreement does not mention GHG markets specifically, it does recognize “internationally transferred mitigation outcomes,” a euphemism for international GHG markets, as a permissible mitigation tool.¹⁰ The language makes clear that these activities are to be voluntary and receive the approval of participating nations. It also calls for safeguards to assure environmental integrity and prevent double counting of emissions reduction. Business was generally very supportive of this outcome.

Finance: Developed countries agreed to support mitigation and adaptation activities in developing countries (other countries may do so voluntarily). This support is to be mobilized from a wide variety of sources and be a “progression beyond previous efforts.” Developed

⁹ Emissions from this sector accounted for about 11% of total global emissions in 2010, and much more than that in countries like Brazil and those like Ghana in Africa. In the United States, forests act as a carbon sink, that is, they absorb more carbon dioxide from the atmosphere than they emit.

¹⁰ The word “markets” is still too provocative for some countries, such as Bolivia and Venezuela, to countenance, and thus the linguistic somersaults in this section of the agreement.

countries are mandated to report on this climate finance every two years. The accompanying COP decision provides that developed nations should continue efforts to meet the current \$100 billion goal and agree to an increased post-2025 amount before 2025.

Technology Innovation and Transfer: There is recognition of the importance of technology development and transfer and a call to “strengthen co-operative action.” Developed countries are to provide financial and other support to developing countries to strengthen “cooperative action on technology development and transfer at different stages of the technology cycle.” There is no direct mention of IPR in the technology section of the agreement.¹¹

Compliance: The agreement creates a “mechanism to facilitate implementation of and promote compliance with the provisions of this Agreement.” This mechanism will be non-punitive and will be “facilitative in nature and function.” As even Secretary Kerry had to admit, there is no recourse for non-compliance other than “naming and shaming” the culprits.¹²

Entry into Force: The agreement will enter into force 30 days after accession by 55 nations accounting for at least 55% of global greenhouse gas emission. Countries will be able to sign the treaty from April 22, 2016 (Earth Day) to April 21, 2017 at the UN’s New York headquarters. At any time after three years from the date the agreement enters into force, Parties may withdraw from it by giving written notification, with withdrawal officially occurring one year after.

Implementation: The agreement establishes the Ad Hoc Working Group on the Paris Agreement to prepare for entry into force and to oversee the implementation of the work program resulting from the agreement and decision.

The remainder of this testimony will assess the significance of the Paris Agreement.

Does the Paris Agreement Satisfy the Durban Platform’s Call for an Outcome with Legal Force?: The “Shalls” that Bind

Parties agreed at COP-17 that the outcome of the Durban Platform would be “a protocol, another legal instrument or an agreed outcome with legal force” by the end of 2015. The Obama Administration made it quite clear before the Paris talks, however, that it had no intention of sending the Paris Agreement to the Senate for its advice and consent.

Indeed, at the 11th hour of the Paris negotiations, Secretary of State John Kerry made a point of insisting on replacing the word “shall” with “should” in the opening sentence of Article 4, Paragraph 4, which sets out the overall emissions goal of developed and developing countries:

¹¹ As explained later, even though IPR is not mentioned, other language in the agreement and decision could be used by some Parties to weaken IPR.

¹² NBC New. 2015. *Meet the Press*. Transcript available at: <http://www.nbcnews.com/meet-the-press/meet-press-december-13-2015-n479241>.

Developed country Parties ~~shall~~ should continue taking the lead by undertaking economy-wide absolute emission reduction targets.¹³

If the word “shall” had remained in that sentence, the administration believed that it would have triggered unavoidably the need for Senate advice and consent of the agreement based (presumably) on the “target and timetable” language the Senate included in its report language accompanying its 1992 vote on the UNFCCC.

Nevertheless, there are other provisions in the agreement that legally commit the United States to actions that, either individually or collectively, arguably could be claimed to require Article II advice and consent.

Article 3 of the agreement, which addresses Nationally Determined Contributions, is one example. It says in its entirety:

As nationally determined contributions to the global response to climate change, all Parties are to undertake and communicate ambitious efforts as defined in Articles 4, 7, 9, 10, 11 and 13 with the view to achieving the purpose of this Agreement as set out in Article 2. The efforts of all Parties will represent a progression over time, while recognizing the need to support developing country Parties for the effective implementation of this Agreement [emphasis added].

Article 4 covering Mitigation adds detail. Paragraph 2 of this section leaves no room for doubt that Parties are obligated to make future mitigation commitments and to implement domestic policies and measures:

Each Party shall prepare, communicate and maintain successive nationally determined contributions that it intends to achieve. Parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions [emphasis added].

The next paragraph also makes clear that each Party also is required legally to increase its level of ambition:

Each Party’s successive nationally determined contribution will represent a progression beyond the Party’s then current nationally determined contribution and reflect its highest possible ambition, reflecting its common but differentiated responsibilities and respective capabilities, in the light of different national circumstances [emphasis added].

¹³ The use of the word “shall” in this sentence in the penultimate agreement draft was blamed on ostensibly a clerical error by the UNFCCC Secretariat. See: J. Warrick. 2015. “How one word nearly killed the climate deal.” *The Washington Post*. Available at: https://www.washingtonpost.com/politics/anatomy-of-a-deal-how-the-climate-accord-was-won--and-nearly-lost/2015/12/13/2a9b3416-a1df-11e5-b53d-972e2751f433_story.html.

Paragraph 9 states further:

Each Party shall communicate a nationally determined contribution every five years in accordance with decision 1/CP.21 and any relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement and be informed by the outcomes of the global stocktake referred to in Article 14 [emphasis added].

So while targets and timetables are not included in the agreement *per se*,¹⁴ these provisions taken together unequivocally require future presidential administrations and Congresses to develop and put forward increasingly stringent targets and timetables according to a specific, open-ended timetable. This means, therefore, that parties have a legally binding commitment to make future commitments that, while not legally binding internationally, would necessarily have many elements that would be legally binding domestically.

If the administration's goal was to avoid Article II advice and consent, it is not entirely clear why it believes the provision that "Developed country Parties *shall* continue taking the lead by undertaking economy-wide absolute emission reduction targets," the language Secretary Kerry objected to, would have been more worthy of advice and consent than any of the similar provisions cited above (*e.g.*, "Parties shall pursue domestic mitigation measures . . .").

This is also true of the parts of the agreement obligating Parties to a ratcheting up of mitigation ambition, which if subsequent administrations and Congresses followed through on would certainly involve enacting implementing legislation with the potential to impact every energy producing or energy using sector in the United States.

The Paris Agreement's entry-into-force language certainly contemplates "ratification" or its equivalent. Article 20 of the agreement begins this way: "This Agreement shall be open for signature and subject to ratification, acceptance or approval by States and regional economic integration organizations that are Parties to the Convention."

Entry into force (Article 21) will begin 30 days after accession by 55 nations accounting for at least 55% of global greenhouse gas emissions, a threshold that should be easy to reach with or without U.S. ratification (though bear in mind that only those countries that accede to the treaty will be subject to it). Countries will be able to sign the treaty from April 22, 2016 to April 21, 2017 at the UN's New York headquarters.

Except for the specifics about thresholds, dates, and the like outlined earlier, the language on signature and entry into force is virtually the same as that appearing in the UNFCCC and the

¹⁴ Article 4, Paragraph 12 states that, "Nationally determined contributions communicated by Parties shall be recorded in a public registry maintained by the secretariat."

Kyoto Protocol, both clearly considered treaties requiring Senate consideration. This entry into force language does not appear in any previous COP decisions.

In addition to the Article 4 provisions on mitigation, the agreement includes other provisions with “shalls” that could, and most likely would, require legislation. Article 9 covering finance states: “Developed country Parties shall provide financial resources to assist developing country Parties with respect to both mitigation and adaptation in continuation of their existing obligations under the Convention.”

The technology section (Article 10) notes that efforts to accelerate innovation “shall be, as appropriate, supported, including by the Technology Mechanism and, through financial means, by the Financial Mechanism of the Convention . . .”

Both of these provisions imply a legally-binding commitment on the part of the United States to make government funds available for these activities, funds that would require Congressional authorization and appropriation.

The Chamber contends that an agreement of such consequence to the U.S. economy and employment that essentially sets the broad outlines of U.S. climate policy for decades into the future and calls for billions of dollars in assistance should be submitted to the Congress. Without the Senate, at a minimum, consenting to the Paris Agreement—and both the House and Senate endorsing the U.S. emissions and financing pledges—it is hard to see how the agreement the president will sign in April in New York will be binding, either politically or legally, on future administrations and Congresses.

The U.S. Paris Pledge is Unrealistic . . . And the Administration has no Plan to Achieve It

The administration has set an unrealistic goal of cutting U.S. net greenhouse gas emissions 26% to 28% from the 2005 level by 2025, with a “best effort” to achieve 28%. The internationally non-binding INDC¹⁵ submitted by the Obama Administration on behalf of the United States, however, fails to provide what it promises to deliver: “information to facilitate the clarity, transparency, and understanding of the contribution.” Indeed, nowhere does it explain how the administration intends to achieve the unrealistic goals it has set out.

According to the Environmental Protection Agency’s (EPA) most recent GHG emissions inventory,¹⁶ net GHG emissions—which include sinks—in 2025 will have to be about 1.7 billion to 1.8 billion metric tons of carbon dioxide equivalent (TCO₂ eq.) lower than the 2005 level of

¹⁵ All of the INDCs cited in this testimony are available at: <http://www4.unfccc.int/submissions/INDC/Submission%20Pages/submissions.aspx>.

¹⁶ EPA. 2015. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2013*. Available at: <http://www3.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2015-Main-Text.pdf>.

6.4 billion TCO₂ eq. (some of these reductions have occurred already). Reducing economy-wide GHG emission by such a large amount will be no easy task.

Recently the administration deigned to issue its own assessment of its 2025 INDC target, and it largely confirms what the Energy Institute¹⁷ and others¹⁸ have been saying all along—there is a large gap between the administration’s unrealistically ambitious pledge and its plan to reach it. The little-noticed *2016 Second Biennial Report of the United States of America*¹⁹ was submitted to the UNFCCC amid the New Year’s Eve revels, and it provides a look at where the Obama Administration believes U.S. net GHG emissions are headed in 2025 with “Current Measures” and where they might be headed with “Additional Measures.”

The Current Measures scenario includes a host of policies and measures already in place, such as the administration’s revisions to the Corporate Average Fuel Economy standards, EPA’s Clean Power Plan (CPP), the Renewable Fuel Standard, state-level Renewable Portfolio Standards, and the like.

According to the report, these and other Current Measures will cause the mid-range estimate of net GHG emissions to be 14% lower in 2025 compared to the 2005 base year figure (Table 1 and Figure 1). This means that by the administration’s own reckoning, the reductions that are expected from Current Measures will fall 49% short of the 1.8 million TCO₂ needed to achieve the goal of a 28% cut in GHG emissions in 2025.

Foreseeing the Forests and the Trees: This 49% emissions gap would be wider still were it not for a very large adjustment in the estimates of sequestration removals from U.S. land use, land use change, and forestry—known as LULUCF. The LULUCF sector in the United States acts as a carbon dioxide “sink,” meaning that on balance our forests and land *absorb* more carbon dioxide from the atmosphere than they release, thus offsetting carbon dioxide emissions from other sources.

¹⁷ U.S. Chamber of Commerce Institute for 21st Century Energy. 2015. “Mind the Gap: The Obama Administration’s International Climate Pledge Doesn’t Add Up.” Available at: <http://www.energyxxi.org/mind-gap-obama-administrations-international-climate-pledge-doesnt-add>.

¹⁸ For example, see:

D. Bailey and D. Bookbinder. 2015. “President Obama’s Dubious Climate Promises.” Niskanen Center. Available at: <https://niskanencenter.org/blog/president-obamas-dubious-climate-promises/>.

M. Belenky. 2015. *Achieving the U.S. 2015 Emissions Mitigation Target*. Climate Advisors. Available at: http://www.climateadvisers.com/wp-content/uploads/2013/12/US-Achieving-2025-Target_May-20151.pdf.

K. Hausker et al. 2015. *Delivering on the U.S. Climate Commitment: A 10-Point Plan Toward A Low-Carbon Future*. World Resources Institute. Available at: <http://www.wri.org/publication/delivering-us-climate-commitment-10-point-plan-toward-low-carbon-future>.

J. Miller. 2015. “Will the U.S. Comply with President Obama’s Paris COP21 INDC Pledge?” The Energy Collective. Available at: <http://www.theenergycollective.com/jemillerep/2291139/will-us-comply-president-obama-s-paris-cop21-indc-pledge>.

¹⁹ U.S. Department of State. 2015. *2016 Second Biennial Report of the United States of America Under the United Nations Framework Convention on Climate Change*. Available at: http://unfccc.int/files/national_reports/biennial_reports_and_iar/submitted_biennial_reports/application/pdf/2016_second_biennial_report_of_the_united_states.pdf.

Net GHG Emissions Estimates	Sequestration Removals Scenarios		
	Mid	Low	High
2025 Forecast Under Current Measures:			
Net GHG Emissions	5,526	5,672	5,379
% Reduction from 2005 Level	14%	12%	16%
Needed Reductions from 2005 to Achieve:			
26% 2025 GHG Emissions Goal	1,674	1,674	1,674
28% 2025 GHG Emissions Goal	1,803	1,803	1,803
Forecast Reductions with Current Measures:	913	766	1,059
Estimate of Additional Reductions Needed to Meet:			
26% 2025 GHG Emissions Goal	761	908	615
28% 2025 GHG Emissions Goal	890	1,036	743
% Gap Between Forecast and Needed Reductions:			
26% 2025 GHG Emissions Goal	45%	54%	37%
28% 2025 GHG Emissions Goal	49%	57%	41%

Source: U.S. Department of State. 2015. 2016 Second Biennial Report of the United States of America Under the United Nations Framework Convention on Climate Change.

In its *2016 Second Biennial Report*, the administration estimates that sequestration removals from LULUCF will reach between 910 million to 1,055 million TCO₂ in 2025.

Just two years earlier, in its *2014 Climate Action Report*²⁰ (CAR2014) to the UNFCCC, the administration was predicting a much lower volume of sequestration removals in 2025 in the range of 575 million to 920 million TCO₂. In fact, the State Department warned in this report that there were “. . . several long-term anthropogenic and natural forces that, absent changes in policy, demographic, or economic conditions, may act to *diminish and, over time, possibly eliminate the U.S. forest carbon sink.* [emphasis added]”

The 2016 report tells a much different story: “Over the past two years, the U S government has made significant strides in improving data and modeling of emission trends in the LULUCF sector. A multiagency effort was initiated following the *First U.S. Biennial Report* in 2014. This effort resulted in a number of immediate improvements that will be included in the 2016 US GHG inventory, as well as additional improvements that are being developed and will be included in subsequent Inventories. [citation omitted]”

²⁰ U.S. Department of State. 2014. *United States Climate Actions Report 2014*. Available at: <http://www.state.gov/documents/organization/219038.pdf>.

So in two years the administration went from cautioning that ability of U.S. forests to gobble atmospheric carbon dioxide was at risk of being significantly reduced if not eliminated entirely to arguing that the trees actually will have much healthier appetite for carbon dioxide in 2025.

The result is the big bump in the estimate of sequestration removals we see in the 2016 report compared to the 2014 report. How big a bump? About 42%, or 310 million TCO₂, for the mid-range estimate. This is not a trivial amount. It represents about 17% or so of the entire 1.8 billion TCO₂ needed to meet the president's 28% goal. This is a truly fortuitous—and from the administration's point of view, an undoubtedly very welcome—LULUCF adjustment, because without it, the administration would be looking at a gap of not 49%, but 67%.²¹

Clean Power Plan: As we mentioned, the 2016 report's Current Measures scenario also includes EPA's CPP regulating emissions from exiting fossil fuel-fired electricity generating units. This is the real centerpiece of the administration's pledge. In its *Regulatory Impact Analysis for the Clean Power Plan Final Rule*, EPA estimates that CPP would reduce emissions from the power sector an additional 232 million to 264 million TCO₂ in 2025.²²

CPP, however, has serious legal vulnerabilities (at a minimum). In its *Utility Air Regulatory Group v. EPA* ruling, the Supreme Court warned EPA that, "When an agency claims to discover in a long-extant statute an unheralded power to regulate 'a significant portion of the American economy,' we typically greet its announcement with a measure of skepticism. We expect Congress to speak clearly if it wishes to assign to an agency decisions of vast 'economic and political significance'" [citations omitted].²³

In using a little-used 300-word provision of the Clean Air Act to redesign fundamentally the nation's electricity markets, EPA has gone far beyond the bounds of the regulatory authority granted to it by Congress. It is no wonder, then, that CPP is facing substantial legal opposition, with lawsuits filed by 27 states, 24 national trade associations (including a coalition of 16 trade groups led by the U.S. Chamber), 37 rural electric cooperatives, 10 major companies, and three labor unions.

Additional Measures: The *2016 Second Biennial Report* also provides estimates of potential emissions reductions from prospective policies and programs. The report provides no detailed proposals, but rather a list of general items, including "reductions in industrial energy demand

²¹ Interestingly, in addition to an expected downward adjustment in the 2025 estimate for GHG emissions from energy in the 2016 report due to the inclusion of EPA's Clean Power Plan, there also is a very large upward adjustment to the 2005 base year estimate for net GHG emissions of about 240 million TCO₂ eq. (3.9%), with the largest adjustments coming from declining LULUCF removals and rising landfill and enteric fermentation methane emissions. Of course, an upward adjustment in the 2005 base year emissions makes any decline in 2025 seem that much steeper.

²² EPA. 2015. *Regulatory Impact Analysis for the Clean Power Plan Final Rule*. Available at: <http://www2.epa.gov/sites/production/files/2015-08/documents/cpp-final-rule-ria.pdf>.

²³ Supreme Court of the United States. 2014. *Utility Air Regulatory Group v. Environmental Protection Agency et al.* Available at: http://www.supremecourt.gov/opinions/13pdf/12-1146_4g18.pdf.

in several subsectors.” This is marginally more than what the administration had to say about industrial emissions in its INDC—which was nothing.

It is hard to contemplate that the administration does not envisage getting at least *some* reductions from regulation of energy-intensive industrial sectors. Indeed, EPA’s fiscal year 2015 budget proposal notes the agency intends to begin considering new GHG regulations on the refining, pulp and paper, iron and steel, livestock, and cement sectors, though this activity was not included in its fiscal year 2016 request. Nevertheless, reports from the American Council for Capital Formation²⁴ and *Inside EPA*²⁵ confirm that the administration is laying the groundwork for regulating GHG emissions from the industrial sector.

Even with the many Additional Measures sketched by the administration, in almost all cases the estimated GHG emissions reductions still fall short, and often well short, of the president’s 2025 goal (Table 2). The mid-range 20125 estimate, for example, still has a not inconsequential gap of 14% and 20% for the administrations 26% and 28% 2025 emissions goals, respectively.

Table 2. Obama Administration Estimates of Net GHG Emissions in 2025 Under Different Scenarios (MMTCO₂ eq., Except Where Noted)

Net GHG Emissions Estimates	Range of Sequestration Removals and Potential Reductions from Additional Measures		
	Mid	Low	High
2025 Forecast Under Current Measures:			
Net GHG Emissions	5,000	5,322	4,678
% Reduction from 2005 Level	22%	17%	27%
Needed Reductions from 2005 to Achieve:			
26% 2025 GHG Emissions Goal	1,674	1,674	1,674
28% 2025 GHG Emissions Goal	1,803	1,803	1,803
Forecast Reductions with Current Measures:	913	766	1,059
Range of Reductions with Additional Measures:	1,438	1,116	1,760
Reductions from Additional Measures:			
26% 2025 GHG Emissions Goal	236	558	(86)
28% 2025 GHG Emissions Goal	364	686	42
% Gap Between Forecast and Needed Reductions:			
26% 2025 GHG Emissions Goal	14%	33%	5%
28% 2025 GHG Emissions Goal	20%	38%	2%

Source: U.S. Department of State, 2015, 2016 Second Biennial Report of the United States of America Under the United Nations Framework Convention on Climate Change.

²⁴ G. D. Banks. 2015. *Success of U.S. Climate Pledge Depends on Future GHG Regulations of U.S. Industry, Other Sectors*. ACCF Center for Policy Research Special Report. Available at: http://accf.org/wp-content/uploads/2015/11/ACCF-Report_US-INDC-FINAL.pdf.

²⁵ D. Reeves. 2015. “Manufacturers Tout GHG Cuts As White House Eyes Regulatory Roadmap.” *Inside EPA*. Available at: <http://accf.org/manufacturers-tout-ghg-cuts-as-white-house-eyes-regulatory-roadmap/>.

When all is said and done, the administration—which has shown no reticence when it comes to regulating—still can't figure out how to reach its goal without everything breaking just right, and with a few very big and very lucky adjustments along the way, demonstrating just how unrealistic its 2025 emissions goal is. And if something unexpected happens—if, for example, the economy grows at a faster clip than the anemic 2.6% average annual growth the administration assumes—an already unfeasible goal will be that much more out of reach.

The Paris Pledges are Lopsided

Although they are not technically part of the agreement, the INDCs each country has submitted, and the revised pledges countries are supposed to submit in the future, are the primary means by which the Parties expect to achieve the objective of the Framework Convention. To date, all but a few countries have submitted INDCs, but their quality, level of ambition, and completeness varies widely.²⁶

If the world were truly serious about reducing GHG emissions appreciably, developing countries would have to take on meaningful commitments because they will be by far the biggest source of future emissions. The International Energy Agency's (IEA) most recent mid-range forecast for energy-related carbon dioxide emissions, for example, suggests developing countries will account for 70% of global carbon dioxide emissions from energy in 2030 and 170% of the increase in those emissions between 2013 and 2030.²⁷

Instead, the differentiation between developed and developing countries seems to have held sway in the agreement, with all but a few developing countries opting for little beyond business as usual, and even then with conditions attached (usually involving the need for financial aid and technology transfer). Old habits die hard.

Take for example the INDCs being offered up by some of the world's largest and growing emitters of GHGs:

- China—the world's #1 GHG emitter²⁸—pledged to: (1) peak its carbon dioxide emissions at (an unidentified level) “around” 2030; (2) reduce its carbon dioxide emissions intensity 60% to 65% from 2005 to 2030; and (3) increase its share of non-fossil fuel energy consumption to “around” 20% of total demand by 2030. An examination of the Chinese commitment reveals it to be little better than business as usual. For example, International Energy Agency's (IEA) most recent forecast data show that carbon dioxide emissions from fossil fuel combustion in China already are expected to peak around 2030 at not quite 9.5 billion TCO₂

²⁶ All of the INDCs cited in this testimony are available at the UNFCCC website here: <http://www4.unfccc.int/submissions/INDC/Submission%20Pages/submissions.aspx>.

²⁷ IEA. 2015. *World Energy Outlook 2015*. Available at: <http://www.worldenergyoutlook.org/>.

²⁸ GHG emissions rankings based on estimates from the Emissions Database for Global Atmospheric Research (EDGAR). These data include biomass burning, a large source of emissions for some countries (e.g., Brazil). Database available at: <http://edgar.jrc.ec.europa.eu/overview.php?v=GHGs1990-2012>.

and that zero-emitting energy will provide 18% of total energy demand.²⁹ Historical IEA data³⁰ also suggest that from 1980 to 2005, the previous 25-year period, China reduced its carbon dioxide emissions intensity (emissions per unit of GDP) by 67% to 70%—a rate faster than it is pledging for 2005 to 2030.³¹ (N.B. Estimates of China’s recent and future carbon dioxide emissions will almost certainly be revised upward since it was revealed that the country has been underestimating its coal consumption by about 17%.³²)

- India—the world’s #3 GHG emitter—has committed to reducing its GHG emissions intensity 33% to 35% between 2005 and 2030s, about one third of which was reached by 2010. We estimate that if it meets this goal, its emissions will grow from about 3 billion TCO₂ in 2010 to about 5 to 6 billion TCO₂ in 2030—at jump of at least 80%.³³ Importantly, India’s INDC is conditional on financial and technology assistance that it estimates could run to \$2.5 trillion out to 2050. (In the meantime, India announced that it intends to double domestic coal output over the next five years to fuel economic expansion.³⁴)
- The Russian Federation—the world’s #5 GHG emitter—has proposed a 25% to 30% reduction in net GHG emissions by 2030 from a 1990 baseline. Data submitted by Russia to the UNFCCC, however, show that in 2012, the country’s net GHG emissions were 50% below their 1990 level.³⁵ This means Russia actually is proposing to *increase* its emissions in 2030 from 900 million to 1 billion TCO₂ eq. compared to the 2010 level.

About the only large developing country making a serious pledge is Brazil—the world’s #4 GHG emitter—which intends to reduce unconditionally its net GHG emissions by 37% below 2005 levels in 2025. As impressive as this looks, Brazil is an unusual case. The vast majority of its GHG emissions come from deforestation, and the vast majority of the emission reductions will come for preventing deforestation and reforestation. Both are worthy goals, the remainder of Brazil’s INDC does not portend a great energy transition, but pretty much business as usual.

²⁹ IEA. 2015. *World Energy Outlook 2015*. Available at: http://www.iea.org/bookshop/700-World_Energy_Outlook_2015.

ExxonMobil’s 2016 forecast shows Chinese carbon dioxide emissions peaking around 2030 at about 10 billion TCO₂ and declining thereafter. See: ExxonMobil. 2016. *The Outlook for Energy: A View to 2040*. Available at: <http://corporate.exxonmobil.com/en/energy/energy-outlook>.

³⁰ IEA. 2015. *CO₂ Emissions From Fuel Combustion Highlights 2015*. Data available at: <http://www.iea.org/publications/freepublications/publication/co2-emissions-from-fuel-combustion-highlights-2015.html>.

³¹ To put the IEA’s energy-related carbon dioxide emissions estimate for China into perspective, the very large 413 million TCO₂ eq. reduction in U.S. power sector emissions EPA estimates CPP would deliver in 2030 would be offset by estimated 2030 Chinese carbon dioxide emissions in roughly two to three weeks.

³² C. Buckley. 2015. “China Burns Much More Coal Than Reported, Complicating Climate Talks.” *New York Times*. Available at: http://www.nytimes.com/2015/11/04/world/asia/china-burns-much-more-coal-than-reported-complicating-climate-talks.html?_r=0.

³³ Institute for 21st Century Energy. 2015. “India’s Conditional Unconditional Climate Pledge.” Available at: <http://www.energyxxi.org/indias-conditional-unconditional-climate-pledge>.

³⁴ R. Marandi and K. Sharma. 2015. “Modi looks to double coal production by 2020.” *Nikkei Asia Review*. Available at: <http://asia.nikkei.com/Politics-Economy/Policy-Politics/Modi-looks-to-double-coal-production-by-2020>.

³⁵ Country-level GHG data submitted to the UNFCCC are available at: http://unfccc.int/ghg_data/ghg_data_unfccc/time_series_annex_i/items/3814.php.

While much of the world continues to emit with abandon, the U.S. is proposing a goal of a 26% to 28% cut in net emissions by 2025 from the 2005 level and the European Union goal of a 40% reduction in emissions by 2030 from the 1990 level. Despite questions about its continued use of nuclear power after the Fukushima Daiichi incident, Japan also has a significant goal of a 26% reduction by 2030 from a 2013 baseline.

The Paris Commitments Will Not Result in a Carbon-Constrained World

A review of the INDCs makes it clear that almost all of the actual burden of reducing emissions would fall on Australia, Canada, Europe, Japan, New Zealand, and the United States, countries that accounted for just about 27% of total global GHG emissions in 2010.

We estimate that if these countries met the goals laid out in their INDCs, their emissions would drop a combined 4.1 billion TCO₂ eq. from 2010 to 2030. If the U.S. INDC goal is reached, it would account for more than half of the 4.1 million TCO₂ in reductions from this group of advanced economies.

In the meantime, we estimate, based on information provided in the UNFCCC's recent *Synthesis report on the aggregate effect of the intended nationally determined contributions*,³⁶ that emissions from the rest of the world would jump anywhere from 8.6 to 12.1 billion TCO₂ eq. from 2010 to 2030. This assumes the unlikely occurrence that all INDCs are fulfilled to the letter. If not, the emission increases from the rest of the world will be even greater.

The UNFCCC *Synthesis report* also found that even in the extraordinarily unlikely occurrence that each country fulfills its INDC to the letter—including unconditional as well as conditional elements—emissions in 2030 will be considerably higher (a median of about 8.6 billion TCO₂ eq., or about 18%³⁷) than they were in 2010.

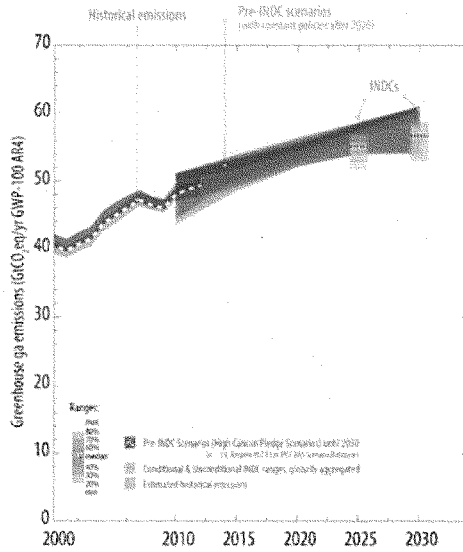
Moreover, it is questionable whether the INDCs will even *slow* global emissions growth appreciably. Figure 2, taken from the UNFCCC report, shows that when taking into account the broad range of possible outcomes, it is likely that even if countries fulfill their commitments, the resulting trajectory of global GHG emissions will not be all that much different from business as usual (or the “pre-INDC” scenarios in the chart).

³⁶ UNFCCC. 2015. *Synthesis report on the aggregate effect of the intended nationally determined contributions*. Available at: <http://unfccc.int/resource/docs/2015/cop21/eng/07.pdf>.

³⁷ With a range of about 10% to 22% higher in 2030 versus 2010.

Figure 2.

Global emission levels resulting from the implementation of the communicated intended nationally determined contributions by 2025 and 2030 in comparison with trajectories consistent with action communicated by Parties for 2020 or earlier



Source: Intergovernmental Panel on Climate Change Fifth Assessment Report scenario database and own aggregation.

Abbreviations: AR4 = Fourth Assessment Report of the Intergovernmental Panel on Climate Change, GWP = global warming potential, INDCs = intended nationally determined contributions.

Coal Use Will Continue to Grow

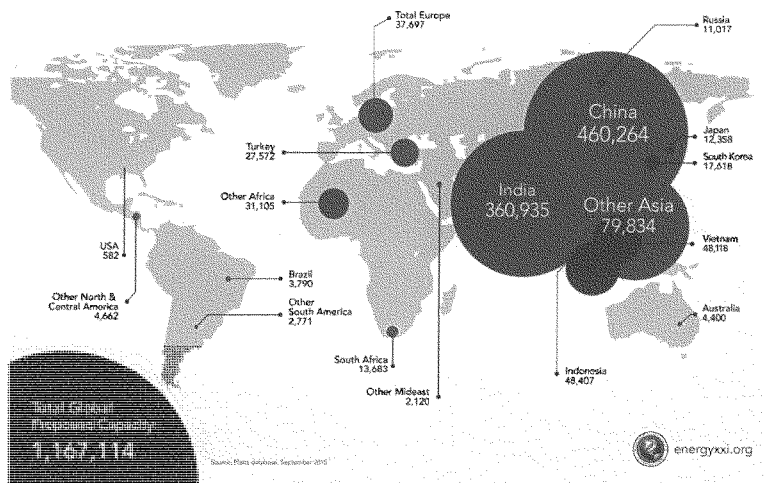
The UNFCCC analysis confirms what we noted earlier and what many of the INDCs from developing countries state plainly: The priority of most countries remains economic development and poverty eradication, and that takes energy. The International Energy Agency estimates that about 1.3 billion people lack access to modern energy services, particularly electricity. For the poor to be able capture the benefits of greater energy use and escape the cycle of poverty, energy resources and technologies must be “scalable,” that is, available in large quantities when and where they are needed and at an affordable price.

As the IEA's Executive Director, Fatih Birol, recently noted, "The importance of coal in the global energy mix is now the highest since 1971. It remains the backbone of electricity generation and has been the fuel underpinning the rapid industrialization of emerging economies, helping to raise living standards and lift hundreds of millions of people out of poverty."³⁸ That assessment is not likely to change anytime soon.

In fact, using data from Platts, we estimate that nearly 1.2 terawatts—or trillion watts—of new coal-fired power plants are under construction or in the planning phase (Figure 3). This is about 3.5 times the size of the entire current fleet of U.S. coal plants. Such a building spree is not the kind of activity one would expect to see in a carbon constrained world—even green Europe is building coal plants (and is a growing market for U.S. coal exports).

Figure 3.

Coal-fired Power Plants Planned and Under Construction
Total installed capacity (megawatts)



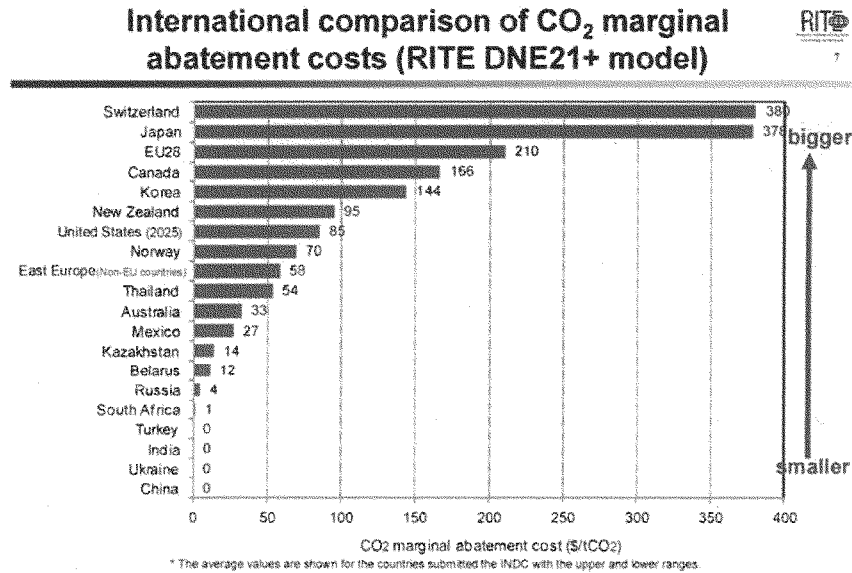
³⁸ Fatih Birol. 2015. "Coal's Role in the Global Energy Mix: Treading Water or Full Steam Ahead?" *Cornerstone*. Available at: <http://cornerstonemag.net/coal-roles-in-the-global-energy-mix-treading-water-or-full-steam-ahead/>.

Uneven Emissions Goals Could Lead to Carbon Leakage from the United States to Other Countries

The very large differences in the level of ambition detailed above are reflected in the very large differences in potential economic impacts. An analysis of many INDCs by Dr. Keigo Akimoto of Japan's well-respected Research Institute of Innovative Technology for the Earth supports the idea that many large emerging economies, and some economies in transition, have committed to little more than business as usual.³⁹

A slide from a recent presentation of Dr. Akimoto's results is reproduced in Figure 4. It shows that under their respective INDCs, the marginal abatement cost for a ton of carbon dioxide in China and India is about \$0, while for Russia it is about \$4. The cost for the U.S. would be \$85 per ton and for Japan a whopping \$378 per ton.

Figure 4.



³⁹ K. Akimoto, 2015 "Measuring Emission Reduction Efforts of the INDCs and the Expected Global Emission Reductions and Economic Impacts." Presentation available at: http://www.majoreconomiesbusinessforum.org/pdfs/KeigoAkimoto_RITE.pdf.

Differences of this magnitude are sure to pose significant implications for competitiveness, investment, supply and value chains, and operations. Moreover, they can lead to “carbon leakage” from the U.S. as energy intensive industries flee to more countries with less regulation and lower energy costs.

It is well understood that America’s abundance of affordable, reliable energy provides businesses a critical operating advantage in today’s intensely competitive global economy. IEA data show a huge comparative energy advantage in natural gas, electricity, and coal prices for U.S. industry compared to its OECD competitors, with prices for these energy sources in the United States often two to four times less.⁴⁰

Unfortunately, EPA’s CPP and other burdensome EPA regulations threaten to throw away this national energy advantage. Because U.S. businesses compete on a global scale, the electricity and related price increases resulting from EPA’s rule could severely disadvantage energy intensive, trade-exposed industries such as chemicals, manufacturing, steel, and pulp and paper. As a result, GHG emissions would not be reduced in the global sense, but simply *moved* to other countries that have not implemented similar restrictions.

Europe provides a cautionary tale. According to the Energy Information Administration, Europe’s residential electricity prices have increased at a much faster rate than in the United States.⁴¹ Regulatory structures—including the Emissions Trading System, taxes, user fees, large (and unsustainable) subsidies and mandates for renewable energy technologies, and the mix and cost of fuels—all conspire to make Europe’s electricity prices among the highest in the world. More and more, we are seeing European companies fleeing sky-high energy costs and shifting production to the United States and other countries.

For the United States, then, the Paris Agreement could be “all pain, no gain.”

The Long-Term Objective to Hold Temperature Rise to “Well Below 2°C” Lacks Clarity and Cannot be “Operationalized”

As noted above, the Framework Convention has as its objective the “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.” Attempts to define this have eluded the Parties over the years.

The 2009 Copenhagen Accord, which was “noted” at COP-15 but not adopted by the Parties, was the first agreement that set an aspirational global goal of “hold[ing] the increase in global

⁴⁰ IEA. 2015. *Key Energy Statistics*. Available at: http://www.iea.org/publications/freepublications/publication/KeyWorld_Statistics_2015.pdf.

⁴¹ Energy Information Administration. 2014. “European residential electricity prices increasing faster than prices in United States.” *Today in Energy*. Available at: <http://www.eia.gov/todayinenergy/detail.cfm?id=18851>.

temperature below 2 degrees Celsius” compared to the pre-industrial average. Subsequent COP decisions retained this formulation. Many developing countries, particularly the Least Developed Countries and the Small Island Developing States Parties, felt this objective was inadequate and pushed for many years to lower the goal to a 1.5°C average temperature rise.

Although the Paris Agreement moves in the direction of 1.5°C, it opts for some less. Article 2 sets it out the long-term goal this way:

This Agreement . . . aims to strengthen the global response to the threat of climate change by . . . [h]olding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels.

It is widely assumed that a 2°C target is consistent with a global GHG emissions reduction on the order of 40% to 70% by 2050 compared to 2010.⁴² That is, however, just an assumption. The fact remains that despite many opportunities to do so during and since the Copenhagen meeting, the Parties have never been able to agree on what these temperature targets actually mean in terms of either a global GHG emissions trajectory or, of more relevance to the UNFCCC’s original objective, an atmospheric GHG concentration.

The closest they have come is the language found in Article 4 stating that to achieve this goal, Parties “aim” to peak global GHG emissions “as soon as possible” and attain a “balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases [i.e., net-zero GHG emissions] in the second half of this century.” In short, there is no agreement on how to, in the lingo of the Framework Convention, “operationalize” the less than 2°C.

It isn’t hard to see why proposals for a 40% to 70% reduction in global emissions have not met with success. While GHG targets of this magnitude have been endorsed before by developed countries (by the G8, for example⁴³), developing countries have never done so and are exceedingly unlikely to do so anytime soon. A quick look at the data shows why.

Consider the EU’s 60-by-50 proposal. The latest Intergovernmental Panel on Climate Change Working Group III report put global greenhouse gas emissions in 2010 at about 49 billion metric tons of carbon dioxide equivalents.⁴⁴ A 60% cut would slash 2050 global emissions to 19.6 billion tons.

⁴² This is based on one common, but by no means the only, understanding of the Intergovernmental Panel on Climate Change’s (IPCC) Fifth Assessment Report. See: IPCC Working Group III. 2014. *Climate Change 2014: Mitigation of Climate Change Summary for Policymakers*. Fifth Assessment Report. Available at: https://www.ipcc.ch/odf/assessment-report/ar5/wg3/ipcc_wg3_ar5_summary-for-policymakers.pdf.

⁴³ See: G8 Leaders Statement. 2009. “Responsible Leadership for a Sustainable Future.” Available at: http://www.g8italia2009.it/static/G8_Allegato/G8_Declaration_08_07_09_final%2c0.pdf.

⁴⁴ IPCC WGIII. 2014. *Climate Change 2014: Mitigation of Climate Change Summary for Policymakers*. Op. Cit.

Such a global goal is completely unrealistic, especially for developing countries. Consider that even if all developed countries cut their emissions to “0” by 2050—a practical impossibility—total emissions from developing countries would still have to be about one-third lower than they were in 2010 to meet such a goal (as would emissions per capita).⁴⁵ But even that would not be enough. They also would have to avoid future emissions of around 30 billion TCO₂ eq. (more than five times current U.S. GHG emissions).

Put another way, to reach a 60-by-50 goal even if developed countries’ emissions collapse to zero in 2050, *more than all* of the additional economic activity in developing countries in 2050 compared to 2010—all the energy use, industrial processes, agricultural activity, *etc.*—would have to be zero-emitting or have their emissions offset in some way, and they would have to do this while adding an additional 2 billion people.

Unless developed countries agree to foot the trillions of dollars it would take to achieve this—and they will not—developing countries will never accept a global emissions goal approaching this level. Instead, they will carry on using affordable and scalable fossil fuels because they have an overriding interest in boosting growth, increasing energy access, and eradicating poverty. Cutting greenhouse gas emissions will always take a backseat to these goals.

It is more than likely, therefore, that after Paris the consequences of the “well below 2°C” goal will be little different from what the 2°C goal always has been—a potent political symbol of little practical consequence.

Intellectual Property Rights are Not Out of the Woods Yet

The Framework Convention states that Annex II Parties, a sub-set of Annex I Parties that includes the United States, “shall take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly developing country Parties, to enable them to implement the provisions of the Convention.”

Developing countries have used this provision as a cudgel to weaken IPR protections, ostensibly to beat down the supposed “barriers” to technology transfer posed by IPR. Compulsory licensing and a fund supported by developed countries to buy down IPR are two of many proposals that have been bruited in previous UNFCCC meetings.

The IPR discussion at Paris became very contentious, with India, speaking for many developing countries, advocating for severe restrictions on IPR for climate friendly technologies. Despite this push by India, all direct references to IPR were banished from the final agreement text.

⁴⁵ See for example: Institute for 21st Century Energy. 2015. “The European Union’s 2050 Global Greenhouse Gas Emissions Goal is Unrealistic.” Available at: <http://www.energyxxi.org/european-unions-2050-global-greenhouse-gas-emissions-goal-unrealistic>.

There are, however, a couple of instances where code words for IPR could cause difficulties in subsequent meetings.

The Technology Transfer language in Article 10 of the agreement, for instance, suggests that financial support could be used to “. . . facilitat[e] access to technology, in particular for early stages of the technology cycle, to developing country Parties.” That may sound harmless, but it leaves the door open for attempts to use financial support provided by developed countries to buy down intellectual property largely produced in developed countries.

That is not all. The Technology Development and Transfer section of the COP decision calls for an assessment of the “barriers to the development and transfer of socially and environmentally sound technologies.” Sad to say, but many developing countries continue to view IPR as a “barrier” to technology transfer.

Still, overall this is about as good an outcome as we could have expected given the dynamics of the Paris talks and the many other contentious issues on the table. During the COP, the U.S. Chamber joined nine other groups on a letter to the administration urging it to hold the line on IPR.⁴⁶

These efforts, and the efforts of other business organizations in Europe, Japan, *etc.*, appear to have paid off. Nevertheless, further diligence by the business community and U.S. negotiators will be needed to ensure IPR are protected in future UNFCCC meetings.

Finance: Promises, Promises

As expected, finance proved to be among the most contentious issues during the Paris talks. Many developing country INDCs, either in whole or in part, are conditioned on financial support and technology transfer (India’s INDC, for example, carries a price tag of \$2.5 trillion).

The Green Climate Fund (GCF) was proposed at COP-15 in Copenhagen in 2009, refined in subsequent meetings, and became operational in 2014. GCF aims to provide support to developing country efforts to reduce their GHG emissions and to adapt to climate change. President Obama pledged to GCF on behalf of the U.S. \$3 billion over four years during the G-20 meeting in Australia in 2014. The administration’s fiscal year 2016 budget request included \$500 million for the GCF, but this was not included in the recently-enacted omnibus spending bill.

In the Copenhagen and subsequent COP decisions, developed countries said they would “mobiliz[e] jointly USD 100 billion a year by 2020 to address the needs of developing countries.”

⁴⁶ U.S. Chamber of Commerce *et al.* 2015. Letter to Secretary of State John Kerry, U.S. Trade Ambassador Michael Froman, and Secretary of Commerce Penny Pritzker Re: U.S. IPR and the COP21 Climate Negotiation. Available at: <http://www.energyxxi.org/sites/default/files/2015-12-07%20-%20US%20Multiassociation%20Letter%20COP21%20-%20final.pdf>.

This is supposed to be “new and additional” money, not money moved from other funds. Moreover, before Paris developing countries made it be known that they viewed this \$100 billion figure as “only the starting point for the post-2020 period and not the ending point.”⁴⁷ In other words, more was expected.

The Paris Agreement’s Article 9 states that “developed countries shall provide financial resources to assist developing countries for both adaptation and mitigation,” though other countries were invited to contribute, as well. Article 9 also states that, “developed country Parties should continue to take the lead in mobilizing climate finance from a wide variety of sources, instruments and channels, noting the significant role of public funds, through a variety of actions,” and further that this be a “progression beyond previous efforts.” Developed countries are mandated to report on this climate finance every two years, and the review of national mitigation actions will take into account the flow of funding.

Not in the agreement, however, is any mention of the \$100 billion developed countries have said they will “mobilize” in 2020. The Paris COP *decision*, however, reaffirms the \$100 billion numeric goal and stipulates that developed countries will set a higher goal prior to the 2025 COP: “. . . developed countries intend to continue their existing collective mobilization goal through 2025 . . . [and] prior to 2025 . . . the Parties to the Paris Agreement shall set a new collective quantified goal from a floor of USD 100 billion per year, taking into account the needs and priorities of developing countries.”

This decision text raises a series of very complicated issues that have been kicked down the road. These include: How to count public and private funds? How will the funds be raised? What institutions will these funds flow through and under whose supervision? How will these funds be generated, disbursed, and used? Any many others.

Because the provision of financing by developed countries, if not the amount, is one area of the agreement that is binding, and because at least some of that funding, if not the majority of it, will be public funds, the Congress clearly will have a continuing role to play here through its power of the purse.

Conclusion

Christiana Figueres, Executive Secretary of UNFCCC, recently had this to say about the goal of the UNFCCC: “This is the first time in the history of mankind that we are setting ourselves the task of intentionally, within a defined period of time, to change the economic development

⁴⁷ Like-Minded Developing Countries. 2014. “LMDC Views on Identification of Elements in ADP Workstream 1.” Available at: http://unfccc.int/files/documentation/submissions_from_parties/adp/application/pdf/adp2-3_lmdc_workstream_1_20131118.pdf. The LMDC group consists of Algeria, Argentina, Bolivia, Cuba, China, Democratic Republic of the Congo, Dominica, Ecuador, Egypt, El Salvador, India, Iran, Iraq, Kuwait, Libya, Malaysia, Mali, Nicaragua, Pakistan, Philippines, Qatar, Saudi Arabia, Sri Lanka, Sudan, Syria, and Venezuela.

model that has been reigning for at least 150 years, since the Industrial Revolution.”⁴⁸ The Paris Agreement falls short of this goal, but not for lack of trying by many Parties in the negotiations.

As more and more people are coming to realize, this agreement will do precious little to solve the problem it is intended to solve, and it is not likely to anytime soon, with a small group of developed countries responsible for almost all of the actual emissions reductions out to 2030.

Based on what we have seen, large emerging economies have shown very little interest in reducing emissions in any meaningful way, certainly nothing coming close to what the administration is proposing for the United States. The Paris Agreement just locks into place the disparities in emissions pledges, and it does nothing to ensure that even the weakest of goals actually is achieved.

As its own report to the UN shows, the Obama Administration has put forward an unrealistic emissions pledge that if met would surely jeopardize America’s energy advantage, put our energy-intensive industries at a competitive disadvantage, and just send U.S. emissions overseas. Clearly, the administration anticipates that the industrial sector will have to make up for a big chunk of the gap in the U.S. pledge, but without any detail, neither domestic stakeholders nor Parties to the UNFCCC know how this gap might be filled.

We have argued before that we believe that the Paris Agreement and the U.S. INDC should be sent to the Congress for its approval, otherwise they should not be considered binding on future administrations or Congresses. The administration’s insistence on not consulting with the Congress or with stakeholders ensures that U.S. political backing for the agreement will remain weak.

The Paris agreement is by no means the end of this process. There is a huge amount of work on implementation that has to be done, with lots of potential avenues for mischief targeting business. There also undoubtedly will be a great deal of Congressional oversight, and we would encourage this Committee to continue to monitor this agreement and its implementation.

⁴⁸ UN Regional Information Center. 2015. “Figueres: First time the world economy is transformed intentionally.” Available at: <http://www.unric.org/en/latest-un-buzz/29623-figueres-first-time-the-world-economy-is-transformed-intentionally>.

**Biography of
Stephen D. Eule
Vice President, Institute for 21st Century Energy
U.S. Chamber of Commerce**

Stephen D. Eule is vice president at the U.S. Chamber of Commerce's Institute for 21st Century Energy (Energy Institute). Mr. Eule is an experienced voice on the nexus between energy, climate change, and technology. He travels around the world to speak with business, governments, think tanks, and the media in a variety of forums.

Mr. Eule oversees the collection and analysis of data on energy and climate and the impact of technology in the energy industry. He represents the U.S. Chamber in the UN Framework Convention on Climate Change and helped found the Major Economies Business Forum on Energy Security and Climate Change, a coalition of national cross-sector business organizations from major economies for which the Energy Institute acts as secretariat. Mr. Eule also is responsible for the Energy Institute's two annual and authoritative energy security reports—the *Index of U.S. Energy Security Risk* and the *International Index of Energy Security Risk*. These risks indices represent the first and most comprehensive efforts to quantify energy security risks over time and across a wide range of measures. They have been cited by the International Energy Agency and are used by universities and think tanks across the world.

Previously, Mr. Eule was director of the Office of Climate Change Policy & Technology at the Department of Energy (DOE). There he oversaw the development of the *U.S. Climate Change Technology Program Strategic Plan in 2006*, ran President Bush's Climate VISION program, and testified before Congress on DOE climate and energy programs. Internationally, Mr. Eule represented DOE as part of the U.S. government delegations to the Intergovernmental Panel on Climate Change, the G20, and other multilateral forums. He was lead chapter author on the *U.S. Climate Action Report—2006* and contributed to other government publications.

His prior experience includes a decade working in various public policy positions. He was a subcommittee staff director on the House Science Committee and served as legislative director for Rep. Nick Smith (R-MI). In addition, Mr. Eule was an environmental analyst in the Washington, D.C., office of New Jersey Gov. Christine Todd Whitman (R-NJ). Earlier, he worked for eight years as an Orkand Corporation consultant to the Energy Information Administration and worked at the Heritage Foundation.

Mr. Eule earned a Master of Arts degree in geography from The George Washington University and a Bachelor of Science degree in biology from Southern Connecticut State College.

Chairman SMITH. Thank you, Mr. Eule, and Dr. Christy?

**TESTIMONY OF DR. JOHN CHRISTY,
PROFESSOR OF ATMOSPHERIC SCIENCE AND
DIRECTOR OF THE EARTH SYSTEM SCIENCE CENTER,
UNIVERSITY OF ALABAMA IN HUNTSVILLE**

Dr. CHRISTY. Thank you, Chairman Smith, and Ranking Member Johnson, for the opportunity to speak about climate change. I'm John Christy, Professor of Atmospheric Science at the University of Alabama in Huntsville, and Alabama State Climatologist. I've served in many climate science capacities, including as lead author of the United Nations IPCC. My research might best be described as building datasets from scratch to help us understand what the climate is doing, and why.

I begin with the chart on display. This particular chart has caused considerable anxiety for the climate establishment, who want to believe the climate system is overheating, according to the theory of how extra greenhouse gases are supposed to affect it. The message is very simple. The theory does not match the observations as measured independently by both satellites and balloons. With that, a tax on those of us who pay attention to such evidence, and on the data themselves, have been remarkably sophisticated. From Congressional investigation of our finances, to well-funded videos, to reporters' inquiries, for all of our notes, phone calls, expenses, reimbursements, e-mails, letters, and so on.

At the core of these activities is the belief that someone who does not go along with the climate establishment must be on the payroll of scurrilous organizations. These attacks attempt to persuade people not to consider the data of the bulk atmosphere, the surface to about 50,000 feet. One attack says the satellites do not measure temperature. They do. As my colleague, Roy Spencer, points out, they measure temperature by emission, which is the same way a doctor measures your body temperature with an ear probe. Another attack says that the vertical fall of the satellites makes the readings unreliable. This problem was corrected 20 years ago for a different measurement, but the measurement shown here, this was never a factor involved.

In a similar assertion, the claim is made that there was an error in the correction for the east-west drift of the satellites, but, again, that does not apply to the measurements shown here, but to a different layer, and that was fixed ten years ago. My written testimony goes into more detail about how these attacks on the data are misdirections, or simply wrong. They are designed to divert your attention away from the critically important result of how significantly the theoretical impact of greenhouse effect, on which policy is based, differs from reality. It is a bold strategy on the part of many of the climate establishment to put one's confidence in theoretical models, and to attack the observed data. To a scientist, this just doesn't make sense.

My written testimony also examines issues, excuse me, related to the surface temperature datasets. I attempt to make the case that the surface temperature measurements are less effective at detecting climate change than the bulk atmospheric measurement shown here. First, the variations of the basic physical measurement are

not as directly related to greenhouse gas impact as is the upper air, and then there are other issues that affect the surface temperature, such as problems with human development around the stations, and huge changes in the way the measurement was actually made through the years.

What about the Paris agreement? No one knows the impact of this agreement, because no one knows whether any country will follow through on its voluntary aspirations at all. However, we do know that even so-called green countries, like Germany and Japan, are today adding to their carbon emissions by building more coal-fired power plants, and the rest of the world is moving forward with affordable carbon-based energy. These present trends of emissions indicate very little will be done because carbon-based energy is the foundation of the world's improving welfare, and I believe this will continue until something even more affordable is discovered.

With no certainty on future emissions, I've done a thought experiment. As I note in my written testimony, if the United States had disappeared in 2015, that's no more people, no cars, no industry, nothing, the impact on the climate system would be a tiny few hundredths of a degree over 50 years. And that's if you believe climate models. So, to me, it is not scientifically justifiable or economically rational that this nation should establish regulations whose only discernible consequence is an increase in economic pain visited most directly and harshly on the poorest among us. This happens when the scientific process that allegedly underpins regulations lacks objectivity and transparency, and becomes associate with attempts to shut out any evidence that questions the regulation's assumptions. Thank you very much.

[The prepared statement of Dr. Christy follows:]

U.S. House Committee on Science, Space & Technology
2 Feb 2016
Testimony of John R. Christy
University of Alabama in Huntsville.

I am John R. Christy, Distinguished Professor of Atmospheric Science, Alabama's State Climatologist and Director of the Earth System Science Center at The University of Alabama in Huntsville. I have served as Lead Author, Contributing Author and Reviewer of United Nations IPCC assessments, have been awarded NASA's Medal for Exceptional Scientific Achievement, and in 2002 was elected a Fellow of the American Meteorological Society.

It is a privilege for me to offer my analysis of the current situation regarding (1) the temperature datasets used to study climate, (2) our basic understanding of climate change and (3) the effect that regulations, such as the Paris agreement, might have on climate. I have also attached an extract from my Senate Testimony last December in which I address (1) the popular notion that extreme climate events are increasing due to human-induced climate change (they are not), and (2) the unfortunate direction research in this area has taken.

My research area might be best described as building datasets from scratch to advance our understanding of what the climate is doing and why – an activity I began as a teenager over 50 years ago. I have used traditional surface observations as well as measurements from balloons and satellites to document the climate story. Many of our UAH datasets are used to test hypotheses of climate variability and change.

(1.1) Upper air temperature data from satellites and balloons

I shall begin with a discussion that was precipitated by an increasingly active campaign of negative assertions made against the observations, i.e. the data, of upper air temperatures. Figure 1 in particular has drawn considerable attention from those who view the climate system as undergoing a rapid, human-caused transformation into a climate to which people would have great difficulty adapting. This simple chart tells the story that the average model projection, on which their fears (or hopes?) are based, does poorly for the fundamental temperature metric that is allegedly the most responsive to extra greenhouse gases - the bulk atmospheric temperature of the layer from the surface to 50,000ft. [The layer shown is known as the mid-troposphere or MT and is used because it overlaps with the region of the tropical atmosphere that has the largest anticipated signature of the greenhouse response by bulk mass – between 20,000 and 50,000 feet.] The chart indicates that the theory of how climate changes occur, and the

associated impact of extra greenhouse gases, is not understood well enough to even reproduce the past climate [much more in section (2)]. Indeed, the models clearly overcook the atmosphere. The issue for congress here is that such demonstrably deficient model projections are being used to make policy.

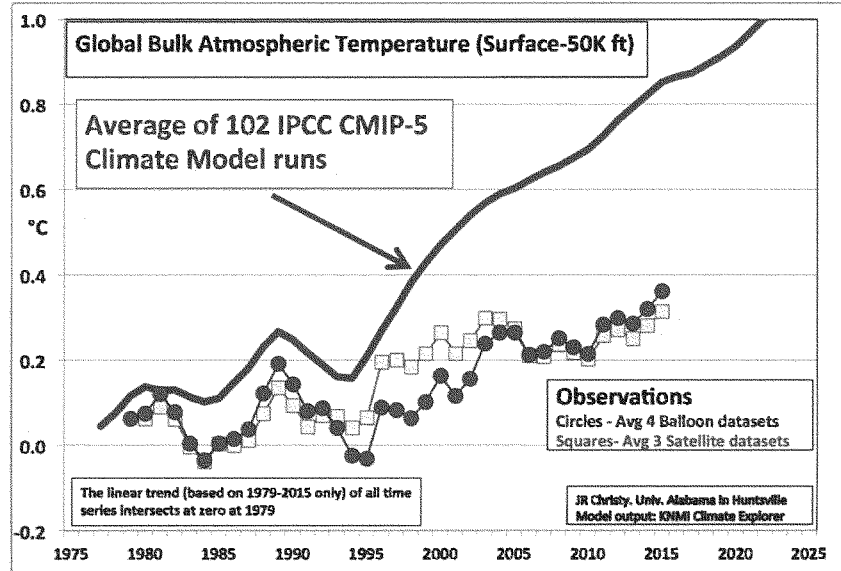


Fig. 1: Five-year averaged values of annual mean (1979-2015) global bulk (termed “mid-tropospheric” or “MT”) temperature as depicted by the average of 102 IPCC CMIP5 climate models (red), the average of 3 satellite datasets (green - UAH, RSS, NOAA) and 4 balloon datasets (blue, NOAA, UKMet, RICH, RAOBCORE).

Because this result challenges the current theory of greenhouse warming in relatively straightforward fashion, there have been several well-funded attacks on those of us who build and use such datasets and on the datasets themselves. As a climate scientist I’ve found myself, along with fellow like-minded colleagues, tossed into a world more closely associated with character assassination and misdirection, found in Washington politics for example, rather than objective, dispassionate discourse commonly assumed for the scientific endeavor. Investigations of us by congress and the media are spurred by the idea that anyone who disagrees with the climate establishment’s view of dangerous climate change must be on the payroll of scurrilous organizations or otherwise mentally

deficient. Also thrust into this milieu is promotional material, i.e., propaganda, attempting to discredit these data (and researchers) with claims that amount to nothing.

Several of these allegations against the data appeared a few weeks ago in the form of a well-made video. I shall address the main assertions with the following material, which in similar form has appeared in the peer-reviewed literature through the years.

The video of interest was promoted by a climate change pressure group (Yale Climate Connections, <http://www.yaleclimateconnections.org/2016/01/over-reliance-on-satellite-data-alone-criticized/>) in which well-known scientists make claims that are mostly meaningless or completely wrong relative to the evidence in Fig. 1. I wish to make four points regarding the video and demonstrate the misdirection for which such agendized videos, along with a happily mimicking media, are so famous.

First, the claim is made the satellites do not measure temperature. In reality, the sensors on satellites measure temperature by emitted radiation - the same method that a physician uses to measure your body temperature to high precision using an ear probe. Atmospheric oxygen emits microwaves, the intensity of which is directly proportional to the temperature of the oxygen, and thus the atmosphere. That the satellites measure temperature is evident by the following chart which compares our UAH satellite data with temperatures calculated from balloon thermistors. As an aside, most surface temperature measurements are *indirect*, using electronic resistance.

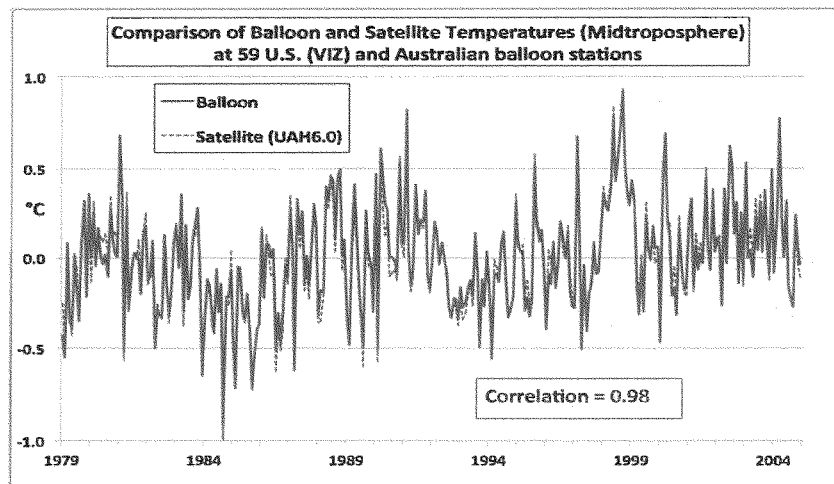


Fig. 2: Average temperature variations measured at 59 radiosonde stations in the U.S. (VIZ manufacturer) and Australia.

Secondly, the scientists claim that the vertical drop (orbital decay) of the satellites due to atmospheric friction causes spurious cooling through time. This vertical fall has an immeasurable impact on the layer (MT) used here and so is a meaningless claim. In much earlier versions of another layer product (LT or Lower Troposphere), this was a problem, but was easily corrected almost 20 years ago. Thus, bringing up issues that affected a different variable that, in any case, was fixed many years ago is a clear misdirection that, in my view, demonstrates the weakness of their position.

Thirdly, the scientists speak of the spurious temperature changes that occur as the satellites drift in the east-west direction, the so-called diurnal drift problem (which was first detected and accounted for by us). They speak of a sign error in the correction procedure that changed the trend. Again, this error was not a factor in the MT layer in Fig. 1, but for the different LT layer. And, again, this issue was dealt with for LT 10 years ago.

Finally, though not specifically mentioned in this video, some of these scientists claim Fig. 1 above is somehow manipulated to hide their belief in the prowess and validity of the climate models. To this, on the contrary, I say that we have displayed the data in its most meaningful way. The issue here is the rate of warming of the bulk atmosphere, i.e., the trend. This metric tells us how rapidly heat is accumulating in the atmosphere – the fundamental metric of global warming. To depict this visually, I have adjusted all of the datasets so that they have a common origin. Think of this analogy: I have run over 500 races in the past 25 years, and in each one all of the runners start at the same place at the same time for the simple purpose of determining who is fastest and by how much at the finish line. Obviously, the overall relative speed of the runners is most clearly determined by their placement as they cross the finish line – but they must all start together.

In the same way I constructed the chart so that the trend line of all of the temperature time series starts at the same point in magnitude and time (zero value at 1979) so the viewer may see how wide the spread is at the finish line (2015). One way to look at this is seen in Fig. 3 where I provide what is seen in Fig. 1 except this is only the trend line without the variations that occur from year due to volcanoes and such. This is analogous to plotting the overall average speed of a runner along the course even though they likely ran slower on an uphill, and faster on a downhill.

This image indicates the models, on average, warm this global layer about 2.5 times faster than the observations indicate. This is a significant difference that has not been

explained and indicates the theory of greenhouse impact on atmospheric temperature is not sufficiently known to even reproduce what has already happened. We are not talking about 10 or 15 years here, but 37 years - well over a third of a century. That two very independent types of measuring systems (balloons and satellites) constructed by a variety of institutions (government, university, private) all showing the much slower rate of warming gives high confidence in its result. Thus, the evidence here strongly suggests the theory, as embodied in models, goes much too far in forcing the atmosphere to retain heat when in reality the atmosphere has a means to relinquish that heat and thus warms at a much slower rate.

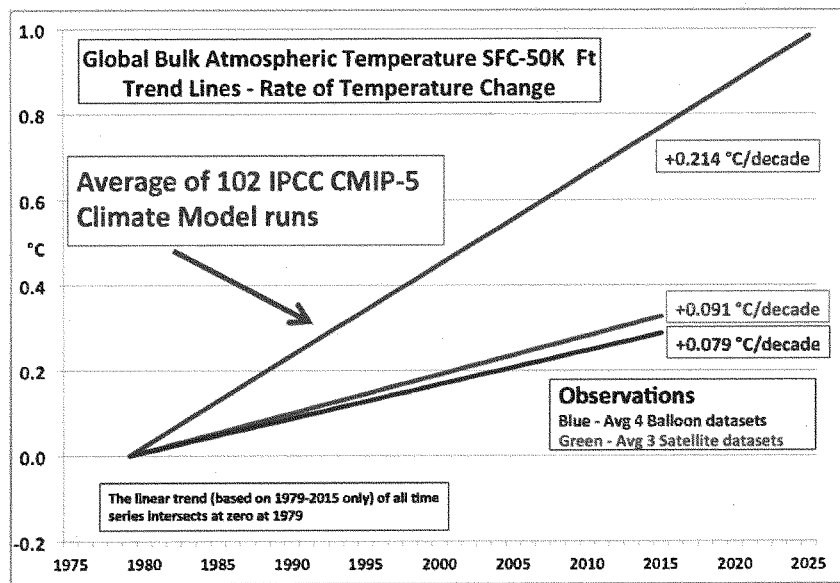


Fig. 3: The linear trend line over the period 1979-2015. The colors represent the same source data as in fig. 1.

I've shown here that for the global bulk atmosphere, the models overwarm the atmosphere by a factor of about 2.5. As a further note, if one focuses on the tropics, the models show an even stronger greenhouse warming in this layer. However, a similar calculation with observations as shown in Fig. 3 indicates the models over-warm the tropical atmosphere by a factor of approximately 3, (Models +0.265, Satellites +0.095, Balloons +0.073 °C/decade) again indicating the current theory is at odds with the facts. (again, see section 2.)

It is a bold strategy in my view to actively promote the output of theoretical climate models while attacking the multiple lines of evidence from observations. Note that none of the observational datasets are perfect and continued scrutiny is healthy, but when multiple, independent groups generate the datasets and then when the results for two completely independent systems (balloons and satellites) agree closely with each other and disagree with the model output, one is left scratching one's head at the decision to launch an offensive against the data. This doesn't make scientific sense to me.

(1.2) Surface temperature issues

There are several issues regarding surface temperature datasets that are too involved to discuss in this material. I shall focus on a few points with which I am familiar and on which I have published.

(1.2.a) Surface temperature as a metric for detecting the influence of the increasing concentrations of greenhouse gases

One of my many climate interests is the way surface temperatures are measured and how surface temperatures, especially over land, are affected by their surroundings. In several papers (Christy et al. 2006 *J. Climate*, Christy et al. 2009 *J. Climate*, Christy 2013 *J. Appl. Meteor. Clim.*, Christy et al. 2016 *J. Appl. Meteor. Clim.*) I closely examined individual stations in different regions and have come to the conclusion that the magnitude of the relatively small signal we seek in human-induced climate change is easily convoluted by the growth of infrastructure around the thermometer stations and the variety of changes these stations undergo through time, as well as the variability of the natural ups and downs of climate. It is difficult to adjust for these contaminating factors to extract a pure dataset for greenhouse detection because often the non-climatic influence comes along very gradually just as is expected of the response to the enhanced greenhouse effect.

In examining ocean temperatures (Christy et al. 2001, *Geophys. Res. Lett.*) I discovered that the trends of the water temperature (1m depth) do not track well with those of the air temperature just above the water (3m), even if both are measured on the same buoy over 20 years. This is important for the discussion below where NOAA used marine air temperatures to adjust water temperature measurements from ships.

There are many other factors that render surface temperature datasets to be of low effectiveness for the detection of enhanced greenhouse warming, (a) lack of systematic geographical coverage in time, (b) unsystematic measuring methods and instrumentation

in time and space, (c) the point measurement represents at best a tiny, local area and (d) is easily impacted by slight changes in the surroundings, which can occur for example when a station moves. There have been huge efforts to try and adjust the raw surface data to give a time series that would represent that of a pristine environment, and I have led or been a part in some of these (e.g. for Central California in Christy et al. 2006 and East Africa in Christy et al. 2009 and Christy 2013).

Thus, having experience in building surface, satellite and balloon temperature datasets, and taking into account the signal we are looking for to detect the enhanced greenhouse effect, the evidence suggests to me that utilizing the bulk atmospheric measurements provides the best opportunity to answer questions about the climate's response to this human-induced change in atmospheric composition. The deep atmosphere is much more coherent in space and time in terms of its variations. It is not affected by human development at the surface. It is measured systematically. To be sure, satellite and balloon temperatures require their own adjustments and cannot be considered "perfect", but do offer an independence from one another to allow direct comparison studies. Regarding the detection of the enhanced greenhouse effect, the troposphere, as indicated by models, happens to be the atmospheric region that will respond the most, i.e. warm the fastest, and thus, in my view, is a metric that provides a better way to detect human influence on the climate.

(1.2.b) The new NOAA surface temperature dataset

A series of papers appeared last year (including Huang et al. 2015 *J. Climate*, Karl et al. 2015 *Science*) describing a new surface temperature dataset constructed by NOAA which indicated a bit more warming in the past 10 to 25 years than the previous versions. The key change dealt with seawater temperatures in the dataset now known as ERSSTv4. This change introduced an additional warming into the record from about 1990 onward. The main reason for this new warming, as the authors note, was the adjustment applied to buoy data, adding about +0.12 °C to the buoy readings. In 1980, only about 10 percent of the data reports were from buoys, but by 2000 about 90 percent were buoy data. Thus, because the influence of the buoy data grew significantly through time, the simple addition of a bias to all the buoys from the beginning created a warmer trend as they became the dominant source of information.

Some background is necessary. Unlike satellite and balloon datasets which measure a systematic quantity (essentially atmospheric air temperature), surface temperature datasets are a mixture of air (over land) and water (over ocean) temperatures measured over a considerable range of instruments, exposures and methods. Over land, weather stations measure the temperature of the air in varying types of instrument shelters and by

varying techniques at a level about 5 ft above the ground. Over the ocean, however, the temperature utilized is that of the water itself, not the air above, so traditional global surface datasets do not measure a homogenous physical parameter over land versus ocean. Further, the depth of the water temperature measurement is quite varied from 2 ft to 50 ft or so, by methods that range from buckets drawn up on deck into which a thermometer is inserted to engine-intake temperatures much deeper in the water and to buoys, drifting or moored to the bottom. So the fact temperature varies by depth is an issue to tackle before the possibility of constructing a systematic dataset may be attempted. Then too, the measurements are not spatially or temporally consistent with large regions, such as Africa and the southern oceans, unmeasured.

Keep in mind that even though the trend of this NOAA dataset became more positive in the past 10 to 20 years, it is still below climate model projections over the longer term. For longer periods, such as the period since 1979 when satellites began measuring bulk atmospheric temperatures, the new global dataset is similar to that of the Hadley Centre (1979-2015: NOAA +0.155 °C/decade, Hadley Centre UKMet, +0.165 °C/decade). However, there are questions that remain concerning the new NOAA seawater dataset, especially how it indicates more warming in the last 20 years than others. Figure 4 displays the ocean trends for the region 20S to 60N (i.e. tropical and northern hemisphere oceans - there was too little data south of 20S for generating near-surface air temperatures there). There are 4 datasets represented, NOAA (NOAA, red), Hadley Centre (HadCRUT4, orange), a preliminary near-surface air temperature over the oceans by my graduate student Rob Junod (yellow) and the UAH deep layer air temperature from satellites (blue). Both NOAA and HadCRUT4 are temperatures of the seawater near the surface, so should be the same.

NOAA used a curious reference variable to calibrate the water temperatures measured from ship intakes – the Night Marine Air Temperature (NMAT). This is curious because there are considerable adjustments required for the NMATs themselves, i.e. corrections for height of ship deck, etc. In any case, from this, the buoy data were then adjusted to match the ship data. It appears, then, that the foundational adjustment process depends on NMATs to adjust the ship data to then adjust the buoy data. The final product from NOAA mixes all of these together, and because the geographic representation of the different systems changed dramatically (as noted, from approximately 10% buoys and 90% ships in 1980 to 90% buoys and 10% ships today – Huang et al. 2015), an adjustment applied to the buoys will automatically influence the trend.

I'm aware that the Committee sought information about this curious process and asked NOAA to generate datasets based only on consistent measuring systems, i.e. ships alone, buoys alone and NMATs alone, to see if one system might have impacted the trends

improperly due to distribution changes. NOAA was unable to accommodate this request. At the same time I asked my graduate student, Rob Junod, to do the work for NMAT. What is presented here is preliminary, but follows much of the previous work on NMATs (developed at the National Oceanographic Centre and the Hadley Centre in the UK) with that added advantage of being updated to 2014. The best geographical data coverage was found to be 20°S to 60°N, so this area was also applied to the other datasets for an apples to apples comparison. The results are shown in Fig. 4 in which all trends end in 2014 but cover periods in two-year increments from 20 years to 10 years.

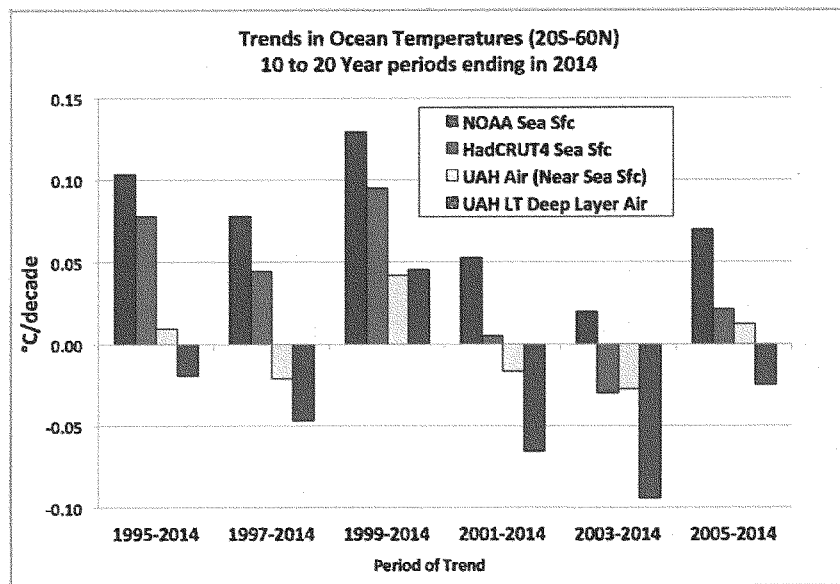


Figure 4. Decadal trends (°C/decade) of four temperature datasets over the oceans from 20°S to 60°N for varying periods ending in 2014. Red and orange are surface seawater temperature datasets from NOAA and the Hadley Centre (HadCRUT4). Yellow is a near-surface air temperature dataset (Night Marine Air Temperature) built by UAH (preliminary). Blue is the temperature trend of the deep atmosphere (surface to 35,000 ft or Lower Troposphere) from microwave emissions captured by satellites (also UAHv6.0b5.)

A number of observations are evident in Fig. 4. (1) In terms of the temperature trend, the air temperatures are less than those of the water (as indicated in my 2001 study mentioned above.) (2) NOAA warms the fastest in all periods. (3) In the past 10-14

years, the trends of the HadCRUT4 agree better with the near-surface air temperature dataset (being near zero and supporting the notion of a hiatus) than with the trends from its physically-identical quantity from NOAA. (4) The magnitude of the NMAT trends lies between the trends of the deep atmospheric and sea water.

This figure generates a number of data quality questions too. (1) If NMATs were used to calibrate the ship temperatures and then the ships were used to calibrate the buoy temperatures, why does the NOAA dataset differ so much from its basic reference point – NMATs? (2) What do the time series look like and what are the sub-period trends for seawater under the condition that only ships and/or only buoys are used to build the dataset for the past 20-25 years? (3) What does the time series of NOAA's NMAT (i.e. their reference) dataset show?

The real science questions here are those which have significant importance to the understanding of how extra greenhouse gases might affect the climate as shown in the following section.

(2) How well do we understand climate change?

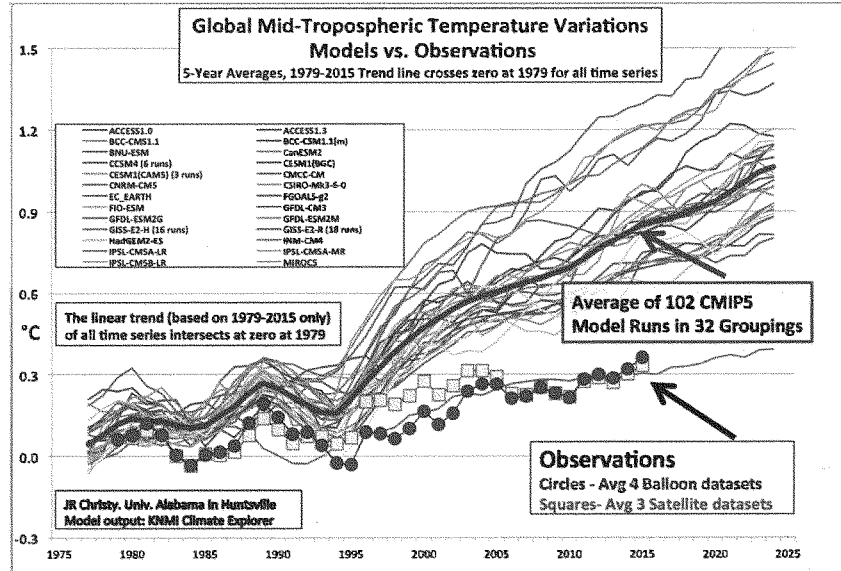
A critical scientific goal in our era is to determine whether emissions from human activities impact the climate and if so by how much. This is made especially difficult because we know the climate system already is subject to significant changes without the influence of humans. Because there is no measuring device that explicitly determines the *cause* of the climate changes we can measure, such as temperature, our science must take a different approach to seek understanding as to what causes the changes, i.e. how much is natural and how much is human induced. The basic approach today utilizes climate models. (The projections of these models are being utilized for carbon policies as well.)

It is important to understand that output from these models, (i.e. projections of the future climate and the specific link that increasing CO₂ might have on the climate) are properly defined as scientific hypotheses or claims – model output cannot be considered as providing proof of the links between climate variations and greenhouse gases. These models are complex computer programs which attempt to describe through mathematical equations as many factors that affect the climate as is possible and thus estimate how the climate might change in the future. The model, it is hoped, will provide accurate responses of the climate variables, like temperature, when extra greenhouse gases are included in the model. However, the equations for nearly all of the important climate processes are not exact, representing the best approximations modelers can devise and that computers can handle at this point.

A fundamental aspect of the scientific method is that if we say we understand a system (such as the climate system) then we should be able to predict its behavior. If we are unable to make accurate predictions, then at least some of the factors in the system are not well defined or perhaps even missing. [Note, however, that merely replicating the behavior of the system (i.e. reproducing “what” the climate does) does not guarantee that the fundamental physics are well-known. In other words, it is possible to obtain the right answer for the wrong reasons, i.e. getting the “what” of climate right but missing the “why”.]

Do we understand how greenhouse gases affect the climate, i.e. the link between emissions and climate effects? As noted above, a very basic metric for climate studies is the temperature of the bulk atmospheric layer known as the troposphere, roughly from the surface to 50,000 ft altitude. This is the layer that, according to models, should warm significantly as CO₂ increases – even faster than the surface. Unlike the surface temperature, this bulk temperature informs us about the crux of the global warming question – how much heat is accumulating in the global atmosphere? And, this CO₂-caused warming should be easily detectible by now, according to models. This provides a good test of how well we understand the climate system because since 1979 we have had two independent means of monitoring this layer – satellites from above and balloons with thermometers released from the surface.

I was able to access 102 CMIP-5 rcp4.5 (representative concentration pathways) climate model simulations of the atmospheric temperatures for the tropospheric layer and generate bulk temperatures from the models for an apples-to-apples comparison with the observations from satellites and balloons. These models were developed in institutions throughout the world and used in the IPCC AR5 Scientific Assessment (2013).



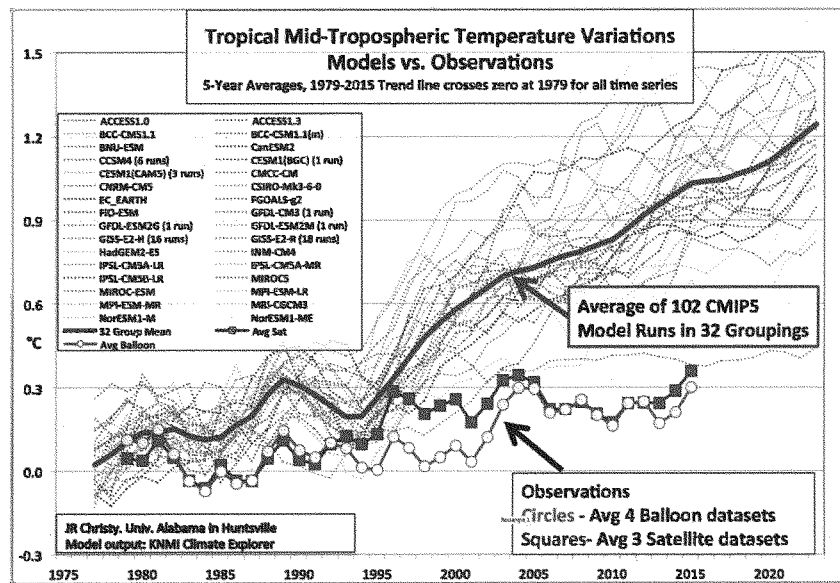
Above: Global average mid-tropospheric temperature variations (5-year averages) for 72 models (lines) representing 102 individual simulations. Circles (balloons) and squares (satellites) depict the observations. The Russian model (INM-CM4) was the only model close to the observations.

The information in this figure provides clear evidence that the models have a strong tendency to over-warm the atmosphere relative to actual observations. On average the models warm the global atmosphere at a rate 2.5 times that of the real world. This is not a short-term, specially-selected episode, but represents the past 37 years, over a third of a century. This is also the period with the highest concentration of greenhouse gases and thus the period in which the response should be of largest magnitude.

Following the scientific method of testing claims against data, we would conclude that the models do not accurately represent at least some of the important processes that impact the climate because they were unable to “predict” what has already occurred. In other words, these models failed at the simple test of telling us “what” has already happened, and thus would not be in a position to give us a confident answer to “what” may happen in the future and “why.” As such, they would be of highly questionable

value in determining policy that should depend on a very confident understanding of how the climate system works.

There is a related climate metric that also utilizes atmospheric temperature which in models has an even larger response than that of the global average shown above. This metric, then, provides a stronger test for understanding how well models perform regarding greenhouse gases specifically. In the models, the tropical atmosphere warms significantly in response to the added greenhouse gases – more so than that of the global average atmospheric temperature.



Above: Tropical average mid-tropospheric temperature variations (5-year averages) for 32 models (lines) representing 102 individual simulations. Circles (balloons) and squares (satellites) depict the observations.

In the tropical comparison here, the disparity between models and observations is even greater, with models on average warming this atmospheric region by a factor of three times greater than in reality. Such a result re-enforces the implication above that the models have much improvement to undergo before we may have confidence they will provide information about what the climate may do in the future or even why the climate

varies as it does. For the issue at hand, estimates of how the global temperature might be affected by emission reductions from regulations would be exaggerated and not reliable.

(3) Climate Impact of Regulations (i.e. Paris) Will Not Be Attributable or Detectable

No one knows the climate impact of the proposed carbon emission reductions agreed to in Paris. The main reason for this is that there is considerable latitude for countries to do as little or as much as they desire. Examining the history of global carbon emissions, it is clear that countries, especially developing countries, will continue to seek to expand energy use through carbon combustion because of their affordability in providing considerable positive benefits to their citizens.

In any case, impact on global temperature for current and proposed reductions in greenhouse gases will be tiny at best. To demonstrate this, let us assume, for example, that the total emissions from the United States were reduced to zero, as of last May 13th, 2015 (the date of a hearing at which I testified). In other words as of that day and going forward, there would be no industry, no cars, no utilities, no people – i.e. the United States would cease to exist as of that day. Regulations, of course, will only reduce emissions a small amount, but to make the point of how minuscule the regulatory impact will be, we shall simply go way beyond reality and cause the United States to vanish. With this we shall attempt to answer the question of climate change impact due to emissions reductions.

Using the U.N. IPCC impact tool known as Model for the Assessment of Greenhouse-gas Induced Climate Change or MAGICC, graduate student Rob Junod and I reduced the projected growth in total global emissions by U.S. emission contribution starting on this date and continuing on. We also used the value of the equilibrium climate sensitivity as determined from empirical techniques of 1.8 °C. After 50 years, the impact as determined by these model calculations would be only 0.05 to 0.08 °C – an amount less than that which the global temperature fluctuates from month to month. [These calculations used emission scenarios A1B-AIM and A1F-MI with U.S. emissions comprising 14 percent to 17 percent of the 2015 global emissions. There is evidence that the climate sensitivity is less than 1.8 °C, which would further lower these projections.]

As noted, the impact on global emission and global climate of the recent agreements in Paris regarding global emissions is not exactly quantifiable. Knowing how each country will behave regarding their emissions is essentially impossible to predict besides the added issue of not knowing how energy systems themselves will evolve over time.

Because halting the emissions of our entire country would have such a tiny calculated impact on global climate, it is obvious that fractional reductions in emissions through regulation would produce imperceptible results. In other words, there would be no evidence in the future to demonstrate that a particular climate impact was induced by the proposed and enacted regulations. Thus, the regulations will have no meaningful or useful consequence on the physical climate system – even if one believes climate models are useful tools for prediction.

Summary

Climate change is a wide-ranging topic with many difficulties. Our basic knowledge about what the climate is doing (i.e. measurements) is plagued by uncertainties. In my testimony today I have given evidence that the bulk atmospheric temperature is measured well-enough to demonstrate that our understanding of how greenhouse gases affect the climate is significantly inadequate to explain the climate since 1979. In particular, the actual change of the fundamental metric of the greenhouse warming signature – the bulk atmospheric temperature where models indicate the most direct evidence for greenhouse warming should lie - is significantly misrepresented by the models. Though no dataset is perfect, the way in which surface datasets have been constructed leaves many unanswered questions, especially for the recent NOAA update which shows more warming than the others. Finally, regulations already enforced or being proposed, such as those from the Paris Agreement, will have virtually no impact on whatever the climate is going to do.

Appendix A

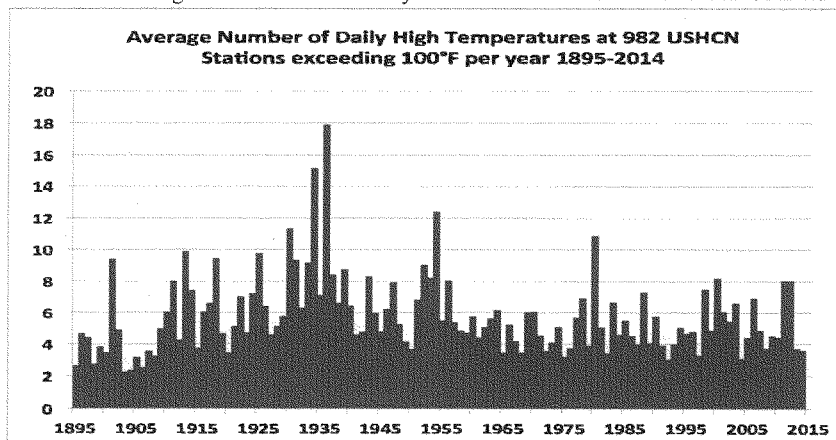
This appendix is an extract from my written testimony presented at the following Hearing:

U.S. Senate Committee on
Commerce, Science, & Transportation
Subcommittee on Space, Science and Competitiveness
8 Dec 2015
Testimony of John R. Christy
University of Alabama in Huntsville.

Alleged impacts of human-induced climate changes regarding extreme events

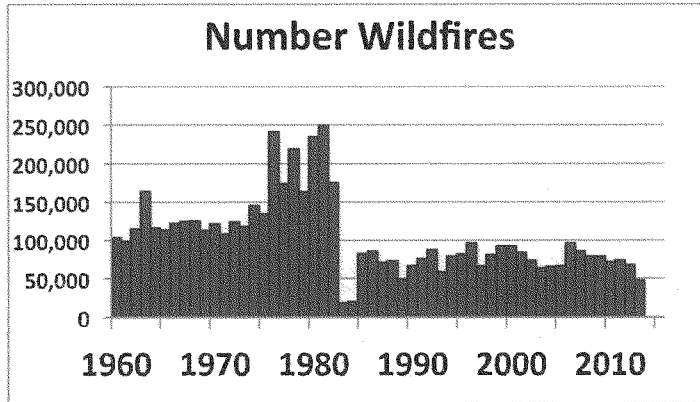
Much of the alarm related to increasing greenhouse gas concentrations shifted in the past decade from global temperature changes to changes in extreme events, i.e. those events which typically have a negative impact on the economy. These events may be heat waves, floods, hurricanes, etc.

In terms of heat waves, below is the number of 100 °F days observed in the U.S. from a controlled set of weather stations. It is not only clear that hot days have not increased, but it is interesting that in the most recent years there has been a relative dearth of them.

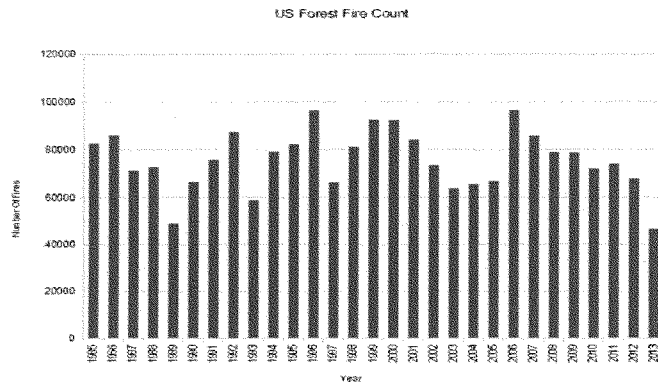


Above: Average number of days per-station in each year reaching or exceeding 100°F in 982 stations of the USHCN database (NOAA/NCEI, prepared by JRChristy).

Forest and wild fires are documented for the US. The evidence below indicates there has not been any change in frequency of wildfires. Acreage (not shown) shows little change as well.



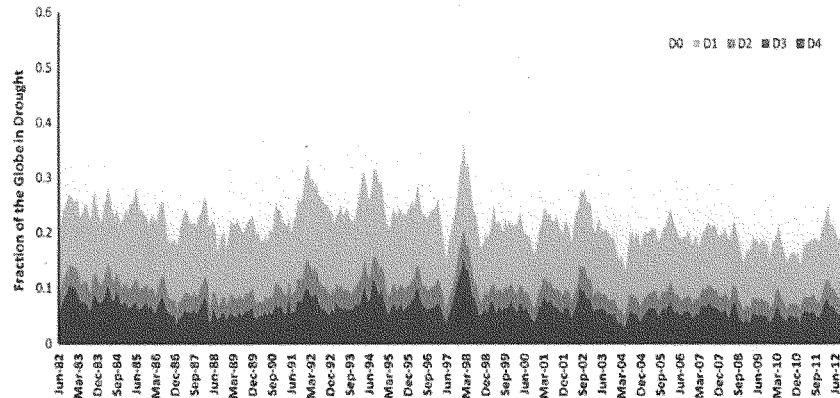
Above: Number of U.S. wildfires. As the management of these events changes, and thus the number also changes, but the number of events since 1985 has remained constant. (National Interagency Fire Center <https://www.nifc.gov/fireInfo/nfn.htm>)



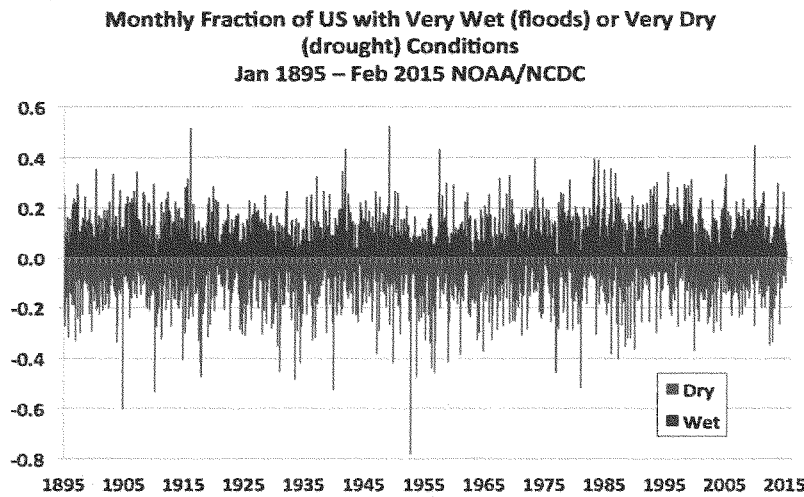
Above: Number of U.S. forest fires per year since 1965.

The two figures above demonstrate that fire events have not increased in frequency in the United States during the past several decades.

The claims that droughts and floods are increasing may be examined by the observational record as well.

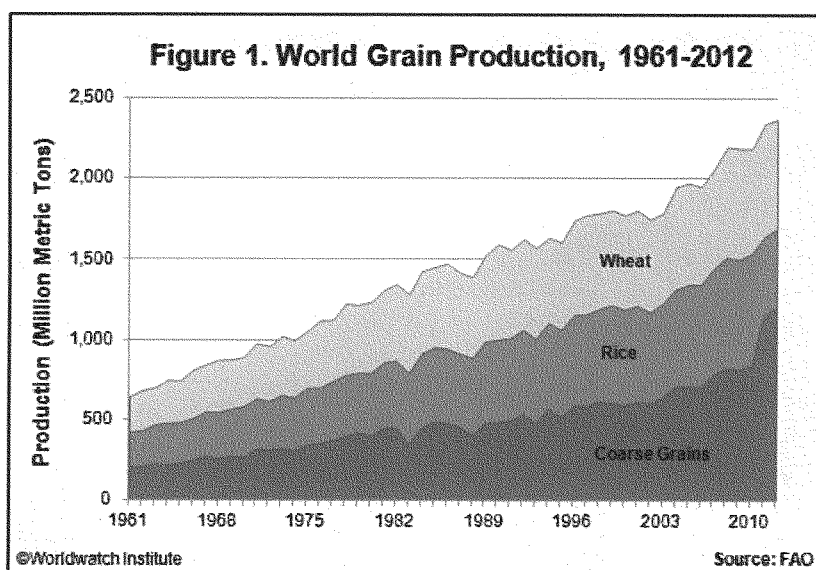


Above: Global areal extent of five levels of drought for 1982-2012 where dryness is indicated in percentile rankings with $D0 < 30$, $D1 < 20$, $D2 < 10$, $D3 < 5$ and $D4 < 2$ percentile of average moisture availability. (Hao et al. 2014)



Above: Areal fraction of conterminous U.S. under very wet (blue) or very dry (red) conditions. NOAA/NCEI.

The two figures above demonstrate that moisture conditions have not shown a tendency to have decreased (more drought) or increased (more large-scale wetness). Such information is rarely consulted when it is more convenient simply to make unsubstantiated claims that moisture extremes, i.e. droughts and floods (which have always occurred), are somehow becoming even more extreme. Over shorter periods and in certain locations, there is evidence that the heaviest precipitation events are tending to be greater. This is not a universal phenomenon and it has not been established that such changes may be due to changes in greenhouse gas concentrations as demonstrated earlier because the model projections are unable to reproduce the simplest of metrics.



Above: World grain production 1961-2012. U.N. Food and Agriculture Organization.

It is a simple matter to find documentation of the ever-rising production of grains. One wonders about the Federal Council on Environmental Quality's allegation that there has been "harm to agriculture" from human-induced climate change because when viewing the total growth in production, which appears to be accelerating, one would assume no "harm" has been done during a period of rising greenhouse gases.

With the evidence in these examples above, it is obviously difficult to establish the claims about worsening conditions due to human-caused climate change, or more generally that any change could be directly linked to increasing CO₂. This point also relates to the issue of climate model capability noted earlier. It is clear that climate models fall short on some very basic issues of climate variability, being unable to reproduce “what” has happened regarding global temperature, and therefore not knowing “why” any of it happened. It is therefore premature to claim that one knows the causes for changes in various exotic measures of weather, such as rainfall intensity over short periods, which are not even explicitly generated in climate model output.

The Disappointing Scientific Process

I have written much for previous congressional hearings and other venues about the failure of the scientific community to objectively approach the study of climate and climate change. (See Appendix) Climate science is a murky science with large uncertainties on many critical components such as cloud distributions and surface heat exchanges. As mentioned above, there is no objective instrumentation that can tell us “why” changes occur. That being the case, we are left with hypotheses (claims) to put forward and then to test. The information given above, in my view, is clear evidence that the current theoretical understanding of “why” the climate changes, as embodied in models (and on which current policy is based), fails such tests. Indeed, the theoretical (model) view as expressed in the IPCC AR5 in every case overestimated the bulk tropical atmospheric temperature response of extra greenhouse gases (see above and IPCC Supplementary Material Figure 10.SM.1) indicating the theoretical understanding of the climate response is too sensitive to greenhouse gases.

One problem with our science relates to the funding process for climate studies, the vast majority of which is provided through federal agencies. Funding decisions are decided by people, and people have biases. Our science has also seen the move toward “consensus” science where “agreement” between people and groups is elevated above determined, objective investigation. The sad progression of events here has even led to congressional investigations designed to silence (with some success) those whose voices, including my own, have challenged the politically-correct views on climate (i.e. congressional investigation by Rep. Grijalva, 22 Feb 2015, <http://www.scribd.com/doc/256811029/Letter-to-UAH-re-John-Christy>.)

Today, funding decisions are made by review panels. In this process, many proposals for funding are submitted to the agencies, but the agencies only have a fraction of the funds available to support the proposals, so only a few proposals can be funded and these are selected by panels. In the area of climate, it is clear the agencies are convinced of the

consensus view of dangerous climate change as indicated by their various statements and press releases on the issue. Therefore, when a contrarian proposal is submitted that seeks to discover other possible explanations besides greenhouse gases for the small changes we now see, or one that seeks to rigorously and objectively investigate climate model output, there is virtually no chance for funding. This occurs because the panel determines by majority vote whom to fund, and with tight competition, any bias by just a couple of panel members against a contrarian proposal is sufficient for rejection. Of course, the agencies will claim all is done in complete objectivity, but that would be precisely the expected response of someone already within the “consensus” and whose agency has stated its position on climate change. This brings me to “consensus science.”

The term “consensus science” will often be appealed to regarding arguments about climate change to bolster an assertion. This is a form of “argument from authority.” Consensus, however, is a political notion, not a scientific notion. As I testified to the Inter-Academy Council in June 2010, wrote in *Nature* that same year (Christy 2010), and documented in my written testimony for several congressional hearings (e.g., House Space, Science and Technology, 31 Mar 2011) the IPCC and other similar Assessments do not represent for me a consensus of much more than the consensus of those selected to agree with a particular consensus.

The content of these climate reports is actually under the control of a relatively small number of individuals - I often refer to them as the “climate establishment” – who through the years, in my opinion, came to act as *gatekeepers* of scientific opinion and information, rather than *brokers*. The voices of those of us who object to various statements and emphases in these assessments are by-in-large dismissed rather than accommodated. This establishment includes the same individuals who become the “experts” called on to promote IPCC claims in government reports such as the endangerment finding by the Environmental Protection Agency.

As outlined in my previous testimonies, these “experts” become the authors and evaluators of their own research relative to research which challenges their work. This becomes an obvious conflict of interest. But with the luxury of having the “last word” as “expert” authors of the reports, alternative views vanish. This is not a process that provides the best information to the peoples’ representatives. The U.S. Congress must have the full range of views on issues such as climate change which are (a) characterized by considerable ambiguity (see model results) (b) used to promote regulatory actions which will be economically detrimental to the American people and, most ironically, (c) will have no impact on whatever the climate will do.

I've often stated that climate science is a "murky" science. We do not have laboratory methods of testing our hypotheses as many other sciences do. As a result what passes for science includes, opinion, arguments-from-authority, dramatic press releases, and fuzzy notions of consensus generated by preselected groups. This is not science.

We know from Climategate emails and many other sources that the IPCC has had problems with those who take different positions on climate change than what the IPCC promotes. There is another way to deal with this however. Since the IPCC activity and climate research in general *is* funded by U.S. taxpayers, then I propose that five to ten percent of the funds be allocated to a group of well-credentialed scientists to produce an assessment that expresses legitimate, alternative hypotheses that have been (in their view) marginalized, misrepresented or ignored in previous IPCC reports (and thus the EPA Endangerment Finding and National Climate Assessments).

Such activities are often called "Red Team" reports and are widely used in government and industry. Decisions regarding funding for "Red Teams" should not be placed in the hands of the current "establishment" but in panels populated by credentialed scientists who have experience in examining these issues. Some efforts along this line have arisen from the private sector (i.e. *The Non-governmental International Panel on Climate Change* at <http://nipccreport.org/> and Michaels (2012) *ADDENDUM: Global Climate Change Impacts in the United States*). I believe policymakers, with the public's purse, should actively support the assembling all of the information that is vital to addressing this murky and wicked science, since the public will ultimately pay the cost of any legislation alleged to deal with climate.

Topics to be addressed in this "Red Team" assessment, for example, would include (a) evidence for a low climate sensitivity to increasing greenhouse gases, (b) the role and importance of natural, unforced variability, (c) a rigorous and independent evaluation of climate model output, (d) a thorough discussion of uncertainty, (e) a focus on metrics that most directly relate to the rate of accumulation of heat in the climate system, (f) analysis of the many consequences, including benefits, that result from CO₂ increases, and (g) the importance that affordable and accessible energy has to human health and welfare.

What this proposal seeks is to provide to the Congress and other policymakers a parallel, scientifically-based assessment regarding the state of climate science which addresses issues which here-to-for have been un- or under-represented by previous tax-payer funded, government-directed climate reports. In other words, our policymakers need to see the entire range of findings regarding climate change.

Summary of Extract

The messages of the two points outlined in the extract above are: (1) the claims about increases in frequency and intensity of extreme events are generally not supported by actual observations and, (2) official information about climate science is largely controlled by agencies through (a) funding choices for research and (b) by the carefully-selected (i.e. biased) authorship of reports such as the EPA Endangerment Finding and the National Climate Assessment.



About John:

Dr. John R. Christy is the Distinguished Professor of Atmospheric Science and Director of the Earth System Science Center at the University of Alabama in Huntsville where he began studying global climate issues in 1987. Since November 2000 he has been Alabama's State Climatologist. In 1989 Dr. Roy W. Spencer (then a NASA/Marshall scientist and now a Principle Research Scientist at UAH) and Christy developed a global temperature data set from microwave data observed from satellites beginning in 1979. For this achievement, the Spencer-Christy team was awarded NASA's Medal for Exceptional Scientific Achievement in 1991. In 1996, they were selected to receive a Special Award by the American

Meteorological Society "for developing a global, precise record of earth's temperature from operational polar-orbiting satellites, fundamentally advancing our ability to monitor climate." In January 2002 Christy was inducted as a Fellow of the American Meteorological Society.

Dr. Christy has served as a Contributor (1992, 1994, 1996 and 2007) and Lead Author (2001) for the U.N. reports by the Intergovernmental Panel on Climate Change in which the satellite temperatures were included as a high-quality data set for studying global climate change. He has served on five National Research Council panels or committees and has performed research funded by NASA, NOAA, DOE, DOT and the State of Alabama and has published many articles including studies appearing in *Science*, *Nature*, *Journal of Climate* and *The Journal of Geophysical Research*. Dr. Christy has provided testimony to several congressional committees.

Dr. Christy received the M.S. and Ph.D. degrees in Atmospheric Sciences from the University of Illinois (1984, 1987). Prior to this career path he had graduated from the California State University in Fresno (B.A. Mathematics, 1973, Distinguished Alumnus 2007) and taught Physics and Chemistry as a missionary teacher in Nyeri, Kenya for two years. After earning a Master of Divinity degree from Golden Gate Baptist Seminary (1978) he served four years as a bivocational mission-pastor in Vermillion, South Dakota where he also taught college math. He was featured in the February 2001 issue of *Discover magazine* and in a National Public Radio profile in 2004 in which his diverse background was highlighted.

Dr. Christy has been active in local educational groups. At Grissom High School he served as chairman of the Facilities committee, helping to secure the new Science wing and Gymnasium and was President of its PTSA, Alabama's largest, in 1997-98. He also served on the Huntsville City Schools Strategic Planning Committee and its Finance sub-panel. He is a member of the Huntsville City Surface Water Management Committee.

Dr. Christy was married to the former Babs Joslin for almost 39 years until her death in 2014 of cancer. She was a fellow missionary whom he met in Kenya. Their two married children are, Mrs. Alison Fields, an Applied Math

graduate of Auburn University and Brian, a Physics/Math graduate of Auburn and PhD graduate from University of Maryland. He is now a Post-Doc Physicist at Franklin and Marshall University. Gareth and Alison Fields are parents of three of their grandchildren and Brian and Kristen Christy of two more. Dr. Christy's favorite hobby is gold panning which he developed as a teenager in California, and he also runs, completing races from 2 to 31.1 miles over rugged terrain.

Chairman SMITH. Thank you, Dr. Christy. Dr. Steer?

**TESTIMONY OF DR. ANDREW STEER,
PRESIDENT AND CEO,
WORLD RESOURCES INSTITUTE**

Dr. STEER. Thank you very much indeed, Chairman Smith, and Ranking Member Johnson. It's a great honor for me to be back in front of this Committee again. My name is Andrew Steer, and I'm President and CEO of the World Resources Institute. WRI is a non-profit, non-partisan research institution, our 500 professionals work in 50 countries.

Mr. Chairman, the Paris agreement is a big deal for the world, and a good deal for America. It has transformed the climate change landscape. 187 countries submitted their climate pledges as part of an agreement, a remarkable level of participation that we've never seen before. Developed and developing countries are now united in a common framework, as the U.S. has been pushing for. The World Resources Institute has analyzed over a dozen major studies, adding up the pledges, and found that they will substantially reduce global emissions below our current path. They'll put us on a track for a world that warms 2.7 to 3.7 degrees Celsius, compared to a business as usual increase of 4 to 5 degrees Celsius. But they still don't go far enough to avoid some of the worst impacts of climate change, but fortunately the agreement sets up the right conditions for future improvement. It establishes an ongoing regular process to increase action every five years, with an ultimate goal of limiting temperatures well below 2 degrees Celsius.

We believe the agreement strikes the right balance between what is legally binding and what is not. If the country targets had been legally binding, not so many countries would have signed up, probably including the United States. What is legally binding is a set of actions relating to measurement, reporting, transparency, and a review mechanism designed to ramp up ambition. In this regard, it's actually a very modern form of an agreement, particularly in the context of rapidly falling costs of green technology, and a growing recognition that strong climate action is good for business. Countries like China and India have stepped up to the plate to take action. In 2015 China once again broke world records for the most wind and most solar capacity installed in one year, almost twice the investment here in the United States. India is aiming to install 100 gigawatts of solar power by 2022, 30 times the current level, and 5 times higher than their previous target.

Mr. Chairman, America's businesses and cities are supportive of the Paris agreement. It wasn't just national governments taking action in Paris. It was CEOs, bankers, mayors, governors who were pushing the hardest for the deal, and announcing new climate efforts of their own. 114 companies, including Coca-Cola and General Mills, committed to setting serious ambitious emissions targets aligned to climate science. 63 companies, including Walmart, Google, and Microsoft, pledged to transition to 100 percent renewable power in the shortest practicable timeframe. The six biggest banks in the United States issued a statement in favor of a global agreement. 450 cities joined the Compact of Mayors, a coalition of

city leaders dedicated to reducing emissions, including 120 from the United States.

This flood of support is indicative of a new understanding of the relationship between climate change and the economy. Growing evidence from groups like the Global Commission on the Economy and Climate is proving that strong climate action is compatible with, and actually even necessary, for economic growth. And this is why 365 companies, including Adidas, Unilever, Gap, and Staples, wrote to U.S. governors last year in strong support of the EPA's carbon pollution standards for existing power plants. They wrote, "Our support is firmly grounded in economic reality. Clean energy solutions are cost-effective and innovative ways to drive investment. Increasingly, businesses rely on renewable energy, and energy efficiency solutions, to cut costs and improve corporate performance." The 365 companies who wrote this letter know that the smart money increasingly lies in the sustainable economy.

Mr. Chairman, the United States is a leader in delivering improvements in energy efficiency, cleaner fuels, and new technologies. We're already seeing the benefits. Last year the U.S. solar industry added workers at a rate nearly 12 times faster than the overall economy. Transitioning to a clean energy economy will create hundreds of thousands of more jobs, increase GDP, and save families money on energy bills. But, if unchecked, the negative economic impact of climate change will profoundly undermine the U.S. economy.

Mr. Chairman, our analysis shows that the U.S. is already well positioned to meet its international climate commitments, but it will require continued strong leadership. The Paris agreement was a great achievement, but now is the time to go to work. Thank you, I look forward to answering your questions.

[The prepared statement of Dr. Steer follows:]

TESTIMONY OF DR. ANDREW STEER
PRESIDENT AND CEO, WORLD RESOURCES INSTITUTE
HEARING BEFORE THE HOUSE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY:
“The Paris Climate Promise: A Good Deal for America”
February 2, 2016

My name is Andrew Steer, and I am President and CEO of the World Resources Institute. The World Resources Institute is a non-profit, non-partisan research institution that goes beyond research to provide practical solutions to the world’s most urgent environment and development challenges. We work in partnership with scientists, businesses, governments, and non-governmental organizations in more than seventy countries to provide information, tools and analysis to address problems like food and energy security, water management, urbanization, and climate change. Our focus is on how to grow the economy, while protecting it for our grandchildren.

My testimony has three main themes:

1. **The Paris Agreement has transformed the climate change landscape in ways that reflect the leadership and longstanding objectives of the United States.** All countries – both developed and developing – are now taking climate action, with nationally-determined climate plans submitted by 187 nations as part of the Agreement. The Agreement also includes a set of universal, binding requirements for transparency and accountability.
2. **The private sector and subnational governments played a major role at Paris,** making new climate commitments and calling for strong market signals. Moreover, the Paris Agreement itself sends clear long-term signals that can set the course for investment in a prosperous low-carbon and climate resilient economy.
3. **The United States has much to gain from positioning itself as a climate leader.** Swift action on climate change will continue to enable the United States to benefit from economic opportunities, stimulate further global action on climate, and build resilience to climate impacts and their associated costs at home.

The Paris Agreement is a Result of United States Leadership

First, the events at the UNFCCC Conference of the Parties (COP) in Paris last year have transformed the climate change landscape in a way that represents a significant success for the United States. The Paris Agreement is built on national climate plans, known as Intended Nationally Determined Contributions (INDCs), submitted by 187 countries in the lead-up to the Paris COP. The provisions of the Agreement cement this universal approach to international climate policy in which all countries take action. As the United States has long sought, the Agreement marks a new type of international cooperation where both developed and developing countries are united in a common framework.

The Paris Agreement also establishes an enhanced robust architecture for transparency and accountability. In particular, the Agreement includes clear, binding mechanisms for monitoring progress and holding countries accountable, including common timeframes for reporting by all countries and a

requirement to put in place common rules for verifying countries' actions. It also includes provisions that ensure that all countries will revisit and regularly increase their ambition every five years.

Collectively, the INDCs will substantially bend the global emissions trajectory below our current path, but they still don't go far enough to limit warming to below 2 degrees C (3.6 degrees F) and avoid some of the worst climate impacts.¹ There is still more work to be done. With action by all countries that will increase over time, the Paris Agreement establishes a clear pathway forward and provides greater assurance than ever before that emissions will be reduced globally.

The Influence of American Businesses and Cities

Second, the private sector and subnational governments played a significant role at Paris, making new climate commitments and calling for strong market signals, sending a powerful message to negotiators and policymakers. Initiatives and commitments on cities, forests, business and finance were among the many launched or strengthened during the Paris conference.

Thousands of business leaders and mayors attended the COP to make the case for a low-carbon economy and offer climate pledges. A wide range of companies pledged to cut their emissions in line with climate science and transition to 100% renewable energy. Subnational governments made new climate commitments through the Compact of Mayors and the Compact of States and Regions. These companies and governments didn't need to be coerced to act; they did so because they knew it was in their economic interest.

Forward-thinking businesses in the United States, such as Microsoft and Walmart, are taking the risks of climate change seriously, and are already seizing the opportunities afforded by a transition to a low-carbon economy. Members of the private sector, including Coca-Cola and General Mills, have long been ahead of national government in calling for climate action, and now with the Paris Agreement, they finally have the kind of policy clarity they desire.

The Paris Agreement itself also sends a powerful market signal to businesses and investors about the long-term direction of travel on climate change policy, providing a vital foundation for a healthier, stronger, and more prosperous United States economy. From now on, the smart money will shift away from fossil fuels and into cleaner energy, smarter cities, and more sustainable land use. And by spurring innovation, the Agreement has the potential to dramatically ramp up the speed and scale of the economic transition and ensure the United States can take advantage of the benefits this global transition will bring.

The financial sector can see which way the wind is blowing, and is already moving to minimize risk from high-carbon investment. The investment landscape is shifting rapidly. Clean energy investment broke numerous records in 2015,² while demand for high-polluting fuels such as coal is stalling globally.³ The implementation of the nationally determined contributions, particularly in fast-growing economies like India and China, has the potential to shift global markets, as do rapid drops in the price of renewable energy.

A Good Deal for America

Third, The United States has much to gain from positioning itself as a climate leader. Swift action on climate change will continue to enable the United States to benefit from economic opportunities,

stimulate global action on climate, and build resilience to climate impacts and their associated costs at home.

The historical record is clear: environmental protection is compatible with economic growth, and U.S. environmental policies have delivered huge benefits to Americans. The United States can achieve its commitments through the Paris Agreement in concert with economic growth. It is in our economic interest to act.⁴

Furthermore, no nation is immune to the impacts of climate change and no nation can meet the challenge alone. Every nation needs to work together, take ambitious action, and do its fair share. Now, as all nations take stronger action, all nations gain greater assurance that a concerted, global effort is underway, and gain greater reason to take stronger action themselves. The positive effect of American leadership in concert with other nations was apparent in the lead-up to Paris in such events as the joint announcement of climate commitments by the United States and China in November 2014, which helped drive stronger action internationally.

The United States has always provided leadership when the world faces big challenges, and climate change should be no exception. That leadership can ensure a livable planet for future generations and ourselves.

Delaying action on climate change will only result in climate-change-related events becoming more frequent and severe, leading to mounting costs and harm to businesses, consumers, and public health. The EPA report, *Climate Change in the United States: Benefits of Global Action*,⁵ estimates that billions of dollars of damages could be avoided in the U.S. as a result of global efforts to reduce greenhouse gas emissions. These efforts range from reduced damage to agriculture, forestry, and fisheries, to reductions in coastal and inland flooding, to fewer heat-driven increases in electricity bills.

If nations fail to combat climate change, the U.S. will suffer billions of dollars of damages to agriculture, forestry, and fisheries, experience coastal and inland flooding and heat-driven increases in electricity bills, just to cite some of the impacts.

My testimony is organized as follows: Section I discusses the Paris Agreement, highlighting the key elements that contribute to its universality, durability and effectiveness. Section II covers the important role of business and non-state actors as well as the economic implications of the Paris Agreement. Section III explains how the Paris Agreement presents opportunities for the United States. Section IV provides some concluding remarks on climate policy and practical next steps for U.S. action.

Section I: The Paris Agreement

a. Universal Participation

The Paris Agreement is a truly universal agreement that is the result of efforts from all countries, both developed and developing. This is reflected not only in the adoption of the Paris Agreement by all 196 Parties to the UNFCCC at COP21 in Paris but the unprecedented climate contributions that were communicated last year. This demonstrates both the commitment that all countries have to the Paris Agreement as well as the success of United States leadership. The United States played an important

role in achieving broad universal participation. Through historic international partnerships such as the US-China Joint Announcement on Climate Change and Mission Innovation the United States has been central to moving worldwide action forward.

To date, 145 developing countries have submitted a national climate plan (INDC) to the UNFCCC,⁶ a significant increase from the 46 developing nations that submitted pre-2020 plans following the Copenhagen climate talks.⁷ Under the Paris Agreement, these INDCs will become Nationally Determined Contributions. This is an unprecedented effort, and indicates developing countries' increased seriousness in addressing climate change.

The language "nationally determined" underscores that these national climate plans are established by countries in accordance with their national circumstances.⁸ This means that INDCs can be tailored to domestic priorities and capabilities. As a result, INDCs are diverse, particularly so for developing countries. However, all developing countries address GHG mitigation in some form in their INDC,⁹ and many use their INDCs as a platform to communicate additional policies, goals, and actions that will enhance climate action—whether it be in the form of shifts to renewable energy, increases in energy efficiency, climate change adaptation, or the restoration of forests:

- 85 developing countries set quantitative renewable energy targets to be achieved between 2020 and 2030.¹⁰ The achievement of these targets will limit GHG emissions, support economic growth, boost energy security, and provide energy access to the millions of people who lack it now.¹¹ China, for example, plans to increase the share of non-fossils in primary energy consumption to around 20 percent by 2030,¹² which could see renewable energy supply in the country jump by 76 percent between 2012 and 2030.¹³ India, on the other hand, will increase its renewable electrical capacity to 40 percent of total installed electrical capacity by 2030.¹⁴ This builds on Prime Minister Modi's earlier commitment to increase solar power to 100 gigawatts by 2022—30 times the current level and five times above the previous renewable energy target.¹⁵ This renewable energy target will require aggressive domestic action, as it significantly exceeds current policy scenario projections¹⁶—notable, given India's per capita emissions are only one-third of the global average.¹⁷ Brazil, too, is ramping up its renewable energy portfolio, and plans to increase the share of renewables (other than hydropower) in the power supply to at least 23% by 2030. This target will be achieved by raising the share of wind, biomass and solar. WRI analysis shows that target exceeds current policy scenario projections by more than 40 percent,¹⁸ demonstrating the additional effort that will be required to achieve the country's commitment.
- 136 developing countries outline adaptation plans in their INDCs,¹⁹ describing activities and goals in vulnerable sectors like water, agriculture and human health. Most countries clearly identify existing gaps, barriers, and needs associated with adapting to their local climate change impacts, which begins to outline a roadmap for global efforts to build capacity, develop and share technology, and scale up adaptation finance.²⁰
- Several developing countries set land-use and forest restoration targets, which form part of the greatest collective commitment to reduce land-use emissions ever seen in international climate negotiations.²¹ Moreover, China, Brazil, Bolivia and the Democratic Republic of the Congo have put forth targets that could alone contribute to the protection of more than 50 million hectares of forest over the next 15 years, an area the size of Spain. This could achieve a reduction of 17 gigatonnes of CO₂ over 15 years, or 2.5 percent of the current total annual emissions globally.²²

While some developing countries have put forward unconditional INDCs, many require the support of developed nations to fully realize their goals—whether in the form of financial support, capacity building or technology transfer. Some countries have explicitly expressed these needs, such as South Africa, who presents cost estimates for individual mitigation activities.²³ Other countries, like Bangladesh, caveat their contributions in more general terms, along the lines of their commitments being “subject to appropriate international support in the form of finance, investment, technology development and transfer, and capacity building.”²⁴ Ultimately, the extent to which developing countries can achieve their INDCs will largely depend on the adequate provision of finance, technology and capacity-building support from developed nations.

The climate actions of major developing countries are particularly worth noting. The November 2014 U.S.-China Joint Announcement on Climate Change was an historic accord that included unprecedented actions by China. China committed to reach a peak in its carbon dioxide emissions around 2030 and make best efforts to peak earlier, and to increase the non-fossil fuel share of its energy use to around 20 percent by 2030.²⁵ China’s Paris climate action plan, submitted in June 2015, formalized these targets and also set additional targets to reduce the carbon intensity (carbon emitted per unit of GDP) of its economy by 60 to 65 percent, and increase its forest stock by around 4.5 billion cubic meters, from 2005 levels by 2030.²⁶ In addition to national targets, eleven cities and provinces from across China committed to reach a peak in their carbon emissions before the national goal to peak around 2030.²⁷ This group comprises a quarter of China’s urban carbon emissions, roughly equivalent to the total annual carbon emissions of Japan or Brazil.²⁸

China has made significant progress in decoupling emissions from economic growth in recent years, and as of 2014 was on track to exceed the carbon intensity and energy intensity targets in its 12th Five Year Plan (2011-2015).²⁹ These are key steps to achieving China’s commitment to reduce its carbon intensity by 40 to 45 percent from 2005 levels by 2020.³⁰

China’s 2030 targets are in line with even stronger efforts. A 2014 study by MIT and China’s Tsinghua University found that a scenario with emissions leveling off between 2025 and 2035 and slowly declining after that involves stronger measures well beyond current policies, including a rising price on carbon.³¹ Stronger steps will also be needed to achieve the non-fossil target. China will need to install 800-1,000 gigawatts (GW) of non-fossil fuel electricity generation capacity to achieve its 2030 non-fossil energy target, greater than its current coal-fired capacity and almost the total current electricity generation capacity of the United States.³²

Expert projections³³ of a peak in China’s carbon emissions and an increased share of non-fossil energy are supported by several major building blocks: scaling up non-fossil energy, limiting coal use,³⁴ improving energy efficiency, placing a price on carbon, and rebalancing the economy from heavy industry toward services.³⁵ China is already taking significant action in each of these areas.

China led the world with over a third of global investment in clean energy in 2015,³⁶ leads the world in installed wind power capacity,³⁷ is likely to have overtaken Germany for the lead in installed solar power capacity in 2015,³⁸ and has set targets to increase its wind capacity to 200 gigawatts and its solar capacity to 100 gigawatts by 2020.³⁹ China has banned new coal plants in three key industrial regions⁴⁰ and many provinces have targets to reduce coal use.⁴¹ China has been strengthening and expanding policies to increase energy efficiency across its economy, including targets for the efficiency of coal plants,⁴² energy-saving targets for industrial enterprises,⁴³ building energy codes,⁴⁴ and fuel economy standards.⁴⁵ President Xi Jinping announced in September that in 2017 China will launch a national

emissions trading system,⁴⁶ which has the potential to be a powerful instrument to reduce emissions over time.⁴⁷ Finally, China is seeking to shift away from its old growth model driven by investment in energy-intensive industry toward a new model driven by consumption, services, and advanced manufacturing,⁴⁸ which should have an emissions reduction benefit.⁴⁹

China is working on including additional steps in its upcoming 13th Five Year Plan, to be released in March.⁵⁰ The decline in China's physical coal use over the past two years⁵¹ and other trends has led some experts to predict that China's coal use may have already reached its structural peak (controlling for cyclical factors)⁵² and that China's emissions will likely peak before 2030, consistent with the government's stated aim to make best efforts to peak early.⁵³

We have all witnessed the evolution of China's negotiating position over the past six years from wary in Copenhagen to collaborative in Paris. Xie Zhenhua, the Chinese climate envoy, addressing the Plenary at COP21, said the pact may not be perfect, and some areas needed improvement. "But it does not prevent us from marching forward in historic steps. The agreement is fair, just, comprehensive, and balanced, with legally binding force." Now that Paris is over, what more shall we expect from China?

- **More accountability.** China committed to have data subject to international scrutiny just as will other countries.
- **Ramping up of national measurement and reporting systems.** In order to fulfill the strong provisions contained in the Paris Agreement to regularly report their emissions and progress made towards achieving their emission reduction targets (as reflected in their INDC), China will need to continue to strengthen its GHG monitoring and reporting system and strengthen its domestic rules for monitoring and reporting GHG emissions, including finalizing the mandatory GHG reporting system for all key industrial sectors.
- **Demonstration of progress through regular submissions of national reports on:**
 - Information required by the Agreement: China can be expected to incorporate the provisions of the agreement and steps to implement their INDC into the next national five year plan that sets the long-term social and economic policies for the 2016-2020 time period. This is to be adopted in March 2016. Every 2 years updates on progress on emissions and other information required by the agreement will be submitted to UNFCCC.
 - China's steps to showcase the benefits of tackling air pollution (which remains at high levels in 2015 despite some progress⁵⁴), e.g. saving thousands of lives while continuing to limit and reduce coal consumption.
 - China's continuing leadership on non-fossil energy, scaling up work on green buildings as stated in China's INDC and joint statement with the U.S., and clean transportation.
 - As per Article 2 (on the objectives of the Paris Agreement), China's steps on its commitment made in September last year to further strengthen green and low carbon policies and regulations, with a view to controlling public investment into high carbon projects domestically and internationally.

b. Key Elements of the Paris Agreement

The Paris Agreement is a global agreement comprised of national commitments which establish a clear pathway for reducing global emissions. Several recent studies have shown that the Intended Nationally-Determined Contributions (INDCs) to the Paris Agreement will make a significant difference in reducing global emissions in comparison to current policy trajectories. WRI analysis of the studies found that the INDCs collectively reduce global emissions relative to the current trajectory, though additional effort will

be needed to limit the global temperature increase to a rise of less than 2 degrees Celsius (3.6 degrees F) above pre-industrial temperatures, the globally agreed goal for limiting climate change.⁵⁵

The International Energy Agency's Energy and Climate Change Report⁵⁶ concludes that full implementation of INDCs would contribute to 4-8 gigatons (GtCO₂e) of greenhouse gas emissions reductions by 2030. The report estimates that the path set by the INDCs would be consistent with an average global temperature increase of around 2.7 degrees Celsius by 2100. That contrasts with the Agency's projections of an almost 4 degrees Celsius temperature increase by 2100 given business as usual (BAU) policies.⁵⁷

The Synthesis Report of the INDCs conducted by the UNFCCC estimates that the implementation of INDCs would result in emissions in 2025 that are 2.8 gigatons (and up to 5.5 gigatons) of greenhouse gas emissions (GtCO₂e) lower than current policy trajectories and emissions in 2030 that are 3.6 gigatons (and up to 7.5 gigatons) lower. The synthesis report does not present the effect of INDCs on global temperature.⁵⁸

The Paris Agreement takes the world further than it has ever gone before on climate policy. Five elements in particular were secured in Paris and demonstrate that the Agreement is the start of a new era of international action on climate change.

1. It establishes a clear pathway for future emissions. The Paris Agreement sets landmark goals aiming to keep temperature rise to well below 2 degrees C (3.6 degrees F) and to pursue efforts to limit temperature increase to 1.5 degrees C (2.7 degrees F). To achieve this, countries will aim to peak global emissions as soon as possible and reduce emissions rapidly to reach net-zero greenhouse gas (GHG) emissions in the second half of the century.
2. For the first time in the history of global climate policy, the Paris Agreement establishes an ongoing, regular process to increase ambition by all countries over time. This mechanism is what makes the Paris Agreement a dynamic and long-lasting accord that can respond to the science of climate change, shifts in technology and economic opportunities, and to growing public support for action.
Building on the momentum from countries' INDCs, countries have agreed to ramp up action on emissions every five years. By 2020, countries have agreed to come back and either submit new or updated national climate plans (known as nationally determined contributions). Every five years after that, countries will submit new contributions, increasing the ambition of their previous efforts.
3. The Agreement establishes a common system of transparency and reporting for all countries. Through an enhanced transparency framework all countries will be required to regularly report on their emissions and track progress on achieving their nationally determined contributions. The information provided by all parties will be subject to review and multilateral consideration of progress. The framework provides flexibility and support that takes account of different countries' capacities. Developed countries will report on the finance and support they provide, and developing countries will report on the finance and support needed and received.
4. The Agreement strongly recognizes the risks of climate impacts. Unlike previous international climate agreements, which focused solely on mitigation, the Paris Agreement provides equal attention to building resilience in all countries, especially the most vulnerable. It establishes a global goal of enhancing adaptive capacity, strengthening resilience and reducing vulnerability. The Agreement also creates a cycle of action for strengthening adaptation efforts regularly, similar to the mitigation cycle.

5. The Agreement shifts finance toward low-carbon, sustainable development. Finance will provide the needed power to turn the world toward a low-carbon, climate-resilient future, and the purpose of the Agreement states that all financial flows – both public and private – need to be shifted from high to low emissions activities and risky to resilient investments. The Agreement makes clear that developed countries will continue to provide and mobilize finance to support developing countries, and developed countries agreed to meet their 2020 commitment to mobilize \$100 billion a year until 2025. The Agreement opens the door for developing countries to provide support to their peers, recognizing that some developing countries are already doing so.

c. Legal Form

The Paris Agreement is a universal agreement that contains both legally binding and non-binding components under international law. The Obama Administration was clear before COP21 last year that it was seeking a hybrid agreement with a mix of binding and non-binding elements, as is the case with many international agreements including the UN Framework Convention on Climate Change.⁵⁹

The Paris Agreement does not contain legally binding emission reduction targets. The type and level of target pledged by each individual country is discretionary, based on each individual country's national circumstances. What is binding is the obligation for all countries to prepare, communicate, and maintain these nationally determined targets.

This approach to emissions reduction targets reflects long-standing objectives of the United States. During the Bush Administration Secretary of State Rice called for Parties to agree on a long-term goal for greenhouse gas reduction and to set individual mid-term national targets, stating that "Every country will make its own decisions, reflecting its own needs and interests."⁶⁰ The need for governments to work with private industry to develop energy technologies was also emphasized. Each of these core ingredients, advocated by the Bush Administration in 2007, have their analogue in the Paris Agreement which reflects further evolution.

To ensure that countries follow-through on the targets and other actions in their INDCs, the Paris Agreement includes a legally binding process of measuring, reporting and verification (MRV). All countries will be required to measure and report on their emissions in the same format every year two years and have those reports verified through an independent technical process. The Agreement also ensures that countries must come to a multilateral setting to discuss progress on implementation of their emissions reduction targets. This legally binding commitment from all countries provides the means to track progress on how countries implement their national targets.

Transparency and accountability mechanisms not only work at the international level, but also play an important role in helping to mobilize and facilitate domestic action.⁶¹ Research has shown that this form of incentive is far more effective to fulfil international obligations.⁶² To cite one example, the power of international scrutiny and regular international moments of review was seen in the case of 1975 Helsinki Declaration which has been one of the most successful human rights instruments, despite being non-legal in nature. This was due to its regular review conferences, which provided domestic advocates with a basis for mobilization.

The Agreement's combination of components, balancing nationally-based decisions on emission targets with strong provisions on process and transparency, makes the Paris Agreement fundamentally different

from the Kyoto Protocol. The Kyoto Protocol was a product of its time, with only a limited number of countries taking on binding emission reduction targets.⁶³ The Paris Agreement moves beyond that, achieving universal participation.

The Paris Agreement also reflects a sophisticated understanding of psychology and the process of political change. Advances in cognitive and social psychology suggest that major sustained changes in behavior are most likely to come from shifts in perception, the behavior and urging of others, and the exposure that transparent reporting and review brings.⁶⁴ Such “nudging” is often more effective than efforts to formally regulate even within national legal jurisdictions, but especially so when international cooperation is required.⁶⁵

Whether an international agreement is effective is not dependent solely on its legal form but rather is a function of three factors: (1) ambition; (2) the level of participation by states; and (3) the likelihood of compliance.⁶⁶ Looking at the Paris Agreement in this way, there are a number of key reasons why countries will deliver on their contributions:

- **The “nationally determined contributions”** are the foundation of the Agreement. These are based on national policy, and countries have carefully considered the appropriate climate action for their national circumstances. In most countries, much of this climate action is already underway and supported by domestic legislative and policy frameworks. This strongly supports countries delivering on their commitments.
- **It is a universal agreement that includes the participation of all countries**, both developed and developing. Having all countries undertake climate action creates significant reasons for following through on contributions – climate action has become the norm, as opposed to the exception.
- **Enhanced transparency and accountability through a common framework for all countries will be a strong incentive** for countries to deliver on their contributions.

d. Raising Ambition

The Paris Agreement is not a static agreement. For the first time in the history of global climate policy, the Paris Agreement establishes an ongoing, regular process to increase action by all countries. Each year success will be highlighted, and every five years achievements will be reviewed and gaps assessed.

Low-carbon investments in energy, city development, agriculture, and forestry will be profiled, and the positive synergies between climate action, technological progress, economic growth, and the quality of life highlighted. Leaders of nations, cities and corporations will learn from each other and the pace will accelerate. This can already be seen in China and India, both countries accelerating their domestic energy transitions during 2015. China is expected to have set two new clean energy world records in 2015 – one for installing a record 30.5 gigawatts (GW) of wind in a single year, and the second for installing 16.5GW of solar.⁶⁷ India is continuing to rapidly decrease the cost of solar, with a further 7% reduction in tariffs this year. The total installed cost for solar in India dropped by more than 20% in 2015 alone.⁶⁸

As part of this ambition mechanism, the Agreement establishes a strong process for countries to regularly assess implementation and take stock of climate action every five years, called the Global Stocktake. This will assess implementation of action on mitigation, finance, adaptation, and support, and will inform implementation of countries’ climate plans. Assessment will start in 2023, but countries have agreed to return in 2018 to review implementation of mitigation measures to inform their 2020 mitigation contributions.

This ambition mechanism, or ‘cycles of action’, is what makes the Paris Agreement a dynamic and long-lasting agreement that will be responsive to the science of climate change, shifts in technology, economic opportunities, and to growing public support for action. This process of review and revision every five years provides the means through which the Paris Agreement’s goal—to keep temperature rise to well below 2 degrees C (3.6 degrees F) and pursue efforts to limit temperature increase to 1.5 degrees C (2.7 degrees F)—can be achieved.⁶⁹ COP21 established a new form of international cooperation to accelerate the transition to a clean, resilient economy and achieve more than individual countries or small groups could on their own. The unity displayed between developed and developing countries was unprecedented in the history of the climate negotiations. In Copenhagen, the negotiations were sharply divided along the lines of developed and developing countries. This was not the case in Paris. The success of Paris was built on what was known as the “High Ambition Coalition” – a group led by the Marshall Islands and consisting of over 100 developing and developed countries, including the United States. Developing countries stepped up and showed leadership, joining with the US and others to call for a high ambition outcome. The debate in Paris was not about developed and developing – it was about the willing and the unwilling. Anyone unwilling would be left out of the majority and the benefits that the Paris Agreement brings.

e. Robust and Universal Transparency

As noted above, the Paris Agreement has set the world on course for transformative climate action to cut emissions, promote clean energy, build climate resilience, and catalyze climate action investments. The backbone of the Agreement includes provisions that ensure transparency and accountability of action. This transparency is vital for building international trust and confidence that action is taking place and assessing how to facilitate further action. The Paris Agreement contains the most robust, credible and balanced transparency requirements agreed to date in the international climate regime.

The Agreement’s provisions on Measurement, Reporting, and Verification (MRV) are central to this transparency system. The transparency framework will provide countries and wider stakeholders with the information and feedback they need on actual progress to improve efforts and promote efficient and cost-effective policies while also providing domestic and international accountability.

The Paris Agreement unquestionably delivers a strong, enhanced transparency and accountability framework that is:

- **Balanced:** covering mitigation and adaptation actions, as well as support provided and received.
- **Universal and harmonized:** with common guidelines to be agreed for reporting and verification accounting requirements.
- **Strong and pragmatic:**
 - The rules are legally binding holding all countries accountable.
 - Recognizing that it has taken about 15 years for developed countries to build their current monitoring systems and that many developing countries, based on their national circumstances and stages of development may need more help to meet these new and more demanding requirements, the agreement allows for enhancement overtime and puts particular emphasis on capacity building.
- **Supportive of effective implementation:**
 - The agreed-upon technical expert review process includes consideration of countries’ implementation and achievement of their INDCs, identification of areas for improvement, and review of whether the information provided is consistent with the rules agreed, hence trustworthy.

- The outcome of the MRV process will trigger the review by the committee established under the agreement to address implementation questions and promote compliance in a facilitative and transparent way.

The Paris Agreement's transparency framework places all countries on a level playing field in a cooperative spirit. While the full set of common related rules and procedures will be designed starting in 2016, the Agreement has already established the foundation for strong and ambitious actions and support needed to achieve a climate transformation.

f. Building Resilience to Climate Impacts

The Paris Agreement places unprecedented importance on actions needed to help people, especially the most vulnerable communities, to adapt—both nationally and globally. Recognizing that 80% of the 186 INDCs have a significant adaptation component, building resilience plays a large role in the Agreement and is provided political parity with mitigation.

The Agreement includes a long-term adaptation goal alongside the goal for mitigation. The Agreement's goal of "enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the temperature goal" explicitly links adaptation to the mitigation goal of limiting global temperature rise to well below 2 degrees C (3.6 degrees F). This connection makes it clear that if mitigation activities succeed in limiting the rise in global temperature, less adaptation will be needed.

Through "cycles of action" on adaptation that are parallel to the cycles for mitigation, the Agreement will also stimulate and accelerate increasingly effective adaptation action over time. Every five years, countries will review and increase the ambition of their climate plans. Countries will also submit and periodically update information about their adaptation priorities, implementation, and support needs to a public registry.

In Paris countries acknowledged that funding for adaptation has historically lagged behind support for mitigation. The set of decision and provisions in the final Agreement provide more support for adaptation, including efforts to:

- Balance overall climate finance between adaptation and mitigation. In particular, developed countries must increase the share of funding going to adaptation by 2020. This will be checked through the reporting and verification regime.
- Recognize that public grants-based resources are especially important for adaptation, because it is more difficult to attract private investment. Again, this resource will be monitored through the reporting and verification regime since all countries will be asked to provide regular information on the source and type of support provided for all actions.
- Help the most vulnerable nations better access climate finance, especially through funds that place an emphasis on adaptation. In particular, in Paris more countries pledged to fund the Least Developed Countries Fund and the Adaptation Fund, and the United States committed to double⁷⁰ its annual public grant funding for adaptation to \$800 million by 2020. The US also announced a \$30 million contribution to the G7 Climate Risk Insurance Initiative⁷¹, which aims to increase access to direct or indirect insurance coverage against the impacts of climate change for up to 400 million of the most vulnerable people in developing countries by 2020. The G7 recognizes that significant funding will be necessary and can leverage several billion USD of risk

from the private insurance and re-insurance industry and will require close partnership with emerging countries as well.

Section II: The Role of Business and Non-State Actors

a. Contributions from businesses and non-state actors

The contributions of the business community and non-state actors were a significant reason why the Paris conference was so successful. There was remarkable support for the agreement by the global business elite, including CEOs of world-leading companies, as well as by mayors and governors. These leaders realize that by reducing emissions, they can unlock significant savings in energy and resource costs and boost productivity and innovation.

Subnational governments made bold moves in Paris. It was announced at the conference that more than 400 cities have joined the Compact of Mayors, a coalition of city leaders dedicated to significantly reducing emissions.⁷² Based on an analysis of 360 cities, WRI found that Compact of Mayors signatories can collectively reduce their emissions by nearly 17 percent below 2010 levels by 2030.⁷³ To put that in perspective, they can avoid emitting 740 million tons of greenhouse gas emissions annually in 2030, more than what Mexico emits every year.

A similar initiative called the Compact of States and Regions, comprising 44 states and regions, announced during the Paris COP their intentions to reduce their emissions by 12.4 Gt CO₂e by 2030, greater than China's current annual output.⁷⁴ Additionally, the Pacific Coast Collaborative, a partnership between three US states and British Columbia that would be the world's fourth largest economy if combined, committed to deep emissions reductions and low-carbon economic integration.⁷⁵

The private sector too, made strides to seize the opportunities of the low-carbon economy and avoid the negative impacts of climate change. During COP21, it was announced that 114 companies with more than \$923 billion in profits and 476 million tonnes of CO₂ emissions have committed to setting serious, ambitious emissions targets aligned with climate science.⁷⁶ These companies have said that they are not only going to do their fair share, but are going to do enough to get the job done and limit climate change to 2 degrees C. They include Coca-Cola, which has committed to reduce absolute GHG emissions from their core business operations 50% by 2020, using a 2007 base year; General Mills, which has committed to reduce absolute emissions 28% across their entire value chain by 2025, using a 2010 base year; and Sony, which has committed to reduce GHG emissions from its operations by 2020, using 2000 as a base year, and also plans to reduce its environmental footprint to zero by 2050.⁷⁷

The CEO of General Mills put his reasoning for the commitment this way:

"As a global food company, we recognize the significant impacts climate change can have on our business if left unaddressed. That's why we are taking action across our value chain. However, we understand that no one company, industry or government will mitigate climate change. It is an urgent and shared global challenge. Real progress toward more sustainable emission levels will require unprecedented collaboration and collective innovation."

-Ken Powell, chairman and CEO of General Mills.⁷⁸

As part of the RE100 initiative, during the Paris conference companies like Google⁷⁹ and Microsoft⁸⁰ committed to transition to 100% renewable power in the shortest practical timescale. The total number

of companies that have made such commitments is now at 63, including BMW, Goldman Sachs, Unilever, and Walmart.⁸¹

The business commitments go on and on. 119 companies are now committed to responsible corporate engagement in climate policy.⁸² 181 companies are committed to reporting how climate change impacts their company as a fiduciary duty.⁸³ 51 companies have committed to remove commodity-driven deforestation from all their supply chains by 2020.⁸⁴ The Carbon Disclosure Project reported in Paris that more than 1,000 companies have in place or plan to implement an internal carbon price, often of \$40 or more.⁸⁵

The private sector also played a big role in developments around clean energy innovation, which will be vital for an economic transition. In Paris a group of 27 billionaires, including Bill Gates (Microsoft), Jack Ma (Alibaba), and Mukesh Ambani (Reliance Industries), came together and launched the Breakthrough Energy Coalition.⁸⁶ This group of private investors is putting billions of dollars on the table to help new, clean energy technologies come to market. It will operate in support of Mission Innovation, an initiative launched by 19 countries, representing 80% of global clean energy R&D, that have committed to double their respective research and development investments over five years.⁸⁷

The mayors, governors, and CEOs who converged on Paris had a big impact on the success of the conference. They made it clear that they were ready for a strong signal on climate action from the world's governments and would even go further than they were required.

America's businesses offered overwhelming support for the Paris Agreement. During the COP21 conference it was announced that 154 companies have signed the American Business Act on Climate Pledge. These companies have operations in all 50 states, employ nearly 11 million people, represent more than \$4.2 trillion in annual revenue, and have a combined market capitalization of over \$7 trillion.⁸⁸ By signing the pledge these companies voiced support for a strong Paris outcome and demonstrated an ongoing commitment to climate action. As part of this initiative, each company is announcing significant pledges to reduce their emissions, increase low-carbon investments, deploy more clean energy, and take other actions to build more sustainable businesses and tackle climate change.⁸⁹ They include companies from a range of sectors, including 21st Century Fox, Adobe, Dupont, Jetblue, Kohl's, News Corp., and Verizon.⁹⁰

Six financial giants, Bank of America, Citi, Goldman Sachs, JPMorgan Chase, Morgan Stanley, and Wells Fargo, also issued a statement in favor of a global agreement on climate change.⁹¹ They, like the rest of the private sector clamoring for change, believe climate action to be in their best interest.

It's not just the Paris Agreement that American companies support; they also back the actions the U.S. is taking to meet its commitments. For example, 365 companies, including General Mills, Adidas, Nestle, eBay, Gap, Levis, and Staples, sent a letter to U.S. governors last year in strong support of the EPA's carbon pollution standards for existing power plants.⁹²

"Our support is firmly grounded in economic reality. Clean energy solutions are cost effective and innovative ways to drive investment and reduce greenhouse gas emissions. Increasingly, businesses rely on renewable energy and energy efficiency solutions to cut costs and improve corporate performance."

Letter to National Governors Association, July 31, 2015

b. The Paris Agreement sends a powerful market signal

The Paris Agreement gives businesses and investors the policy signals they crave and provides a vital foundation for a healthier, stronger and more prosperous economy. It makes clear the future direction of travel of the world economy. From now on, the smart money will move away from fossil fuels and into cleaner energy, smarter cities, and more sustainable land use. And by spurring innovation, the agreement has the potential to dramatically ramp up the speed and scale of the economic transition.

The Agreement represents an unprecedented political acknowledgement of the risks of climate change.⁹³ There will now be greater economic opportunities for those businesses that help deliver the transition to a net zero-carbon emissions future, and greater risks for those that don't.

Because of the Agreement's long-term goal⁹⁴ and five-year cycles of increased ambition,⁹⁵ businesses can now be confident that climate regulation and action will progress, not backslide. This will enlarge the global market for low-carbon goods and services and create incentives for innovation.

In addition, the agreement's provisions for enhanced transparency and accountability⁹⁶ will help businesses know what's coming. The regular submission of nationally determined climate action plans will give companies the transparency they need to anticipate each country's climate and energy regulatory programmes and identify potential investment opportunities. The new common transparency and accountability regime will further enhance confidence that governments are serious about delivering.

The timing of the economic signal is perfect for a global economy stuck in a low-growth trap and desperately searching for certainty and new growth opportunities. The agreement should shift and align expectations that a low-carbon growth model is possible, and indeed inevitable. The fact that many countries are already demonstrating this and making good money out of it is also helping to shape expectations. Instead of claiming that others should be acting first, countries will race to compete in the low-carbon economy.

c. The new climate for doing business

The business sector is certainly heeding the signal that the Paris Agreement sent, and considering the risks of climate change with absolute seriousness. Every year, the World Economic Forum (WEF) conducts a Global Risks Perception Survey, asking members of its global multi-stakeholder community what they believe to be the greatest threats to the economy and society. This year, the Global Risks Report 2016 found that "failure of climate-change mitigation and adaption" was the number one risk in terms of impact and the number three risk in terms of likelihood.⁹⁷

As leading businesses factor in the risks of climate change, they are also looking forward to seizing the opportunities afforded by a transition to a low-carbon economy. For example, at the WEF's annual meeting in Davos two weeks ago, at an event entitled "A New Climate for Doing Business," the CEO of Walmart, Doug McMillon, expressed how encouraged he was by what happened in Paris. He articulated how Walmart believed that "doing the right thing is good business" and that making Walmart's products and processes more low-carbon "increase[s] the value we're able to offer our customers."⁹⁸

Walmart is not alone. Business leaders around the world hailed the Paris Agreement, including from Microsoft, NIKE, IKEA, Mars, Royal DSM,⁹⁹ HSBC,¹⁰⁰ Unilever,¹⁰¹ Virgin,¹⁰² General Mills,¹⁰³ and Siemens.¹⁰⁴

The We Mean Business Coalition, which brings together more than 500 businesses and investors, called the Paris Agreement a “catalytic moment.”¹⁰⁵ The Confederation of British Industry, representing over 190,000 British businesses, welcomed the deal, with director-general Carolyn Fairbairn saying the deal “can provide the framework for business to invest with confidence.”¹⁰⁶

It’s clear why businesses want to be a part of the low-carbon economy: it’s good for their bottom line. Companies taking the strongest climate action outperformed the Bloomberg world index of top companies by almost 10% from 2010-2014.¹⁰⁷ More than half of the Fortune 100 companies are already saving around \$1.1 billion per year from energy efficiency, renewable energy and other emission reduction initiatives.¹⁰⁸

The WEF considers the Paris Agreement a turning point for business-as-usual and a signal of the future direction of investment and opportunity.

“In the coming months and years, the impact of the Paris Agreement will be felt in board rooms, banks and stock exchanges across the world. The expectation is that, as a result, trillions of dollars needed for investments will be unlocked to put the world onto a climate-safe pathway. The time has come to pivot from business-as-usual...”

“For businesses, the Paris Agreement is a license not only to implement climate-friendly practices but also to innovate and develop the next generation of solutions. The race is on for forward-looking businesses and governments alike to capitalize on these new business opportunities for growth and resilience.”

Global Risks Report 2016, 11th edition – World Economic Forum, 2016¹⁰⁹

d. Investment is shifting

The financial sector can also see which way the wind is blowing. It has already been changing the way it approaches high-carbon vs. low-carbon investment, and the signals sent in Paris will accelerate the changes. Over 400 investors representing \$24 trillion in assets have signed the Global Investor Statement on Climate Change, pledging to seek out and scale up low-carbon and resilient investments.¹¹⁰

Part of the reason investors are so excited about the low-carbon market is because technological innovation is lowering the price of renewable energy much faster than anticipated. The cost of solar PV modules has fallen 80% since 2008, and solar and wind are cost-competitive with fossil fuels in many regions.¹¹¹ This has led to a drastic market shift: in 2013, new clean power capacity exceeded that of new fossil fuel capacity for the first time ever.¹¹² We can expect this trend to continue, especially since the Paris Agreement calls for cycles of increasing ambition on emissions targets.

Because of the advantages of the low-carbon economy, the opportunity cost of investing in carbon-intensive sectors is increasing. According to research from Corporate Knights, fourteen prominent funds holding over \$1 trillion in assets could have saved \$22 billion had they shifted investments from the highest carbon companies to those that receive at least 20% of their revenues from environmental markets or new energy.¹¹³

The financial community is already moving to minimize risk from high-carbon investment. Last month, the Portfolio Decarbonization Coalition, a joint effort by UNEP, its Financial Initiative, and major funds and asset managers, announced that over \$600 billion in assets had been committed to

decarbonization, six times its original target.¹¹⁴ This is a clear indication that the smart money is already moving in the low carbon direction.

While awareness of the risks of high-carbon investment is growing, there is ongoing work to make it even clearer. At the request of the G20, the Financial Stability Board, which drafts global financial regulation recommendations, launched a task force at the Paris conference to develop consistent and voluntary disclosures on climate risk.¹¹⁵ Launched by Mark Carney, the Governor of the Bank of England, and led by Michael Bloomberg, former Mayor of New York, the task force will help investors, insurers, and lenders in G20 countries better understand companies' climate risk. The financial community should expect increasing pressure on companies to disclose their exposure to climate risk and to improve transparency and awareness around the carbon intensity of investment.

Globally, the investment landscape is rapidly shifting. According to Bloomberg New Energy Finance, clean energy investment attracted a record \$329 billion in global investment in 2015, nearly six times its 2004 total.¹¹⁶ Surges in China, Africa, the U.S., Latin America and India drove the world total to its highest ever figure, beating the 2011 record by 3%. This was driven by an expanded list of new markets that committed billions to clean energy, with record growth in Mexico (114%), Chile (157%), South Africa (329%), and Morocco (reaching \$2 billion from almost zero in 2014).¹¹⁷ 2016 is expected to be another strong year for renewable investment.¹¹⁸ Renewable energy was largely immune to the upheaval that has plagued the fossil fuel industry, which has experienced crashing prices and retreating investment over the past year.

The implementation of the renewable energy targets set as a part of the Paris Agreement by countries like India and China has the potential to drastically shift global markets. China invested twice as much in solar capacity in 2015 as the United States,¹¹⁹ and is on track to become a superpower of the low-carbon economy. Indian Prime Minister Narendra Modi increased India's solar power capacity goal for 2030 from 20 GW to 175 GW.¹²⁰ For comparison, the U.S. has only about 25 gigawatts of solar capacity.¹²¹ Prime Minister Modi didn't make this decision because he's a member of Greenpeace. He did it because it makes the most sense for India's economic development.

At the same time as investment in renewables is surging, demand for high-polluting fuels such as coal is stalling globally¹²² and even declining in fast-growing economies like India, where imports dropped by 34% in 2015.¹²³ Around \$1.1 trillion of energy-sector assets are at risk of stranding if financial markets fail to anticipate the transition to low-carbon energy. Coal mining investments face the majority of lost value.¹²⁴ Spending money on a coal plant becomes a much more risky decision when 195 governments are planning for a world economy with net-zero carbon emissions by the second half of the century.

e. Debunking the false dilemma – climate action is in our economic interest

The reason why businesses, investors, countries, and cities are so eager to act on the Paris Agreement is because they believe it is in their economic interest to do so. This is true for the United States as well.

A growing body of evidence had found that economic growth and action on climate change can be mutually compatible. The Global Commission on the Economy is an independent initiative that consists of 28 leaders in government, business, and finance from 20 countries. In a landmark report in 2014, *Better Growth, Better Climate: The New Climate Economy Report*, it found that the perceived choice between growth and climate action is a false dilemma.¹²⁵ Around \$90 trillion globally will be invested in cities, land use and energy infrastructure between now and 2030. It would only cost a fraction more to

make these investment choices low-carbon, and the higher investment costs could be fully offset by reduced fuel expenditure and other savings.¹²⁶

Many of the pessimistic economic models cited by opponents of climate action have serious shortcomings, as described in *Better Growth, Better Climate*.

The view that there is a rigid trade-off between low-carbon policy and growth is partly due to a misconception in many model-based assessments that economies are static, unchanging, and perfectly efficient.... Indeed, once market inefficiencies and the multiple benefits of reducing greenhouse gases, including the potential health benefits of reduced air pollution, are taken into consideration, the perceived net economic costs are reduced or eliminated.

Better Growth, Better Climate: The New Climate Economy Report -- Global Commission on the Economy and Climate, 2014¹²⁷

In 2015, the Global Commission issued a second report, *Seizing the Global Opportunity: Partnerships for Better Growth and a Better Climate*.¹²⁸ It found that essentially all of the emissions cuts we need to stop severe climate change can be met through actions that boost the economy. Smart climate policies promote economic efficiency, drive technological advances, provide policy predictability for investors, generate huge economic co-benefits, and reduce the negative impact on growth of climate change itself.

In the U.S., the historical record is clear: environmental protection is compatible with economic growth, and U.S. environmental policies have delivered huge benefits to Americans. In 2010, The Office of Management and Budget reviewed 20 years of major Federal regulations (1999-2009) for which agencies estimated and monetized both benefits and costs, and found aggregate annual benefits of \$128-\$616 billion, while annual costs were estimated at \$43-\$55 billion. Research also shows that the actual cost of environmental regulations frequently ends up being less than *ex ante* predictions by industry, and even the EPA.¹²⁹

The movement toward a low-carbon economy is already being demonstrated throughout the United States. Already between 2005 and 2012, greenhouse gas emissions dropped by 8 percent while real GDP grew by 8 percent.¹³⁰ Projections from the U.S. Energy Information Administration (EIA) estimate that the intensity of energy use in the economy will continue to decline through 2040, even in the absence of new policies. With reduced energy intensity in manufacturing, more efficient appliances and buildings, and more fuel-efficient vehicles coming to market, the overall economy is becoming more energy efficient. The EIA projects that GDP will grow at an average 2.4 percent per year through 2040, while energy use will grow at only 0.4 percent per year.

This is happening not just at the federal level either. Efforts to reduce greenhouse gas emissions have already proven to be a win for local economies and jobs in the northeast United States. The Regional Greenhouse Gas Initiative (RGGI) is a cooperative effort by nine New England and Mid-Atlantic states to cap and reduce emissions from the power sector. Economic growth in the nine RGGI states has been higher than in the rest of the states, at the same time as they have reduced their emissions by 18% compared to 4% in other states. The RGGI contributed a net benefit of \$1.3 billion to these member economies in 2012-2014 alone, generating 14,200 new job years. All nine participating U.S. states showed net job additions.¹³¹

The United States can achieve its commitments through the Paris Agreement in concert with economic growth. Over the next decade, the proposed Clean Power Plan will play a key role in meeting the target.

Damage to health from air pollution in the United States is estimated to amount to as much as 4% of GDP per year on average.¹³² From a benefit-cost perspective, EPA estimates that just the air pollution co-benefits of the Clean Power Plan are worth \$25-\$62 billion, far more than the estimated \$7-9 billion in compliance costs.¹³³ Adding in global climate benefits increases total benefits to \$55-\$93 billion.

Research has shown us that environmental policies everywhere have become stricter over time, but that this increase in stringency does not harm productivity growth¹³⁴ and that the effect on trade and investment locations is negligible.¹³⁵ Moreover, well-designed environmental regulations can lead to increased innovation¹³⁶ and the benefits to society, particularly in terms of public health, outweigh the costs.¹³⁷

Too many policies miss the full economic picture by failing to account for the costs of the impacts of climate change. Failure to reduce emissions will increase economic, social, and environmental risks for the United States and all nations.¹³⁸ With global GHG emissions still on the rise,¹³⁹ delaying action on climate change will only result in climate-change-related events becoming more frequent and severe, leading to mounting costs and harm to businesses, consumers, and public health. Inaction on climate change could reduce the United States' per capita GDP up to 36% by the end of the century, according to a new estimate from leading researchers in *Nature*.¹⁴⁰ According to *Risky Business*, if we continue on our current emissions path without significant adaptation, by the end of the century some states in the Southeast, lower Great Plains, and Midwest risk up to a 50% to 70% loss in average annual crop yields (corn, soy, cotton, and wheat), absent agricultural adaptation.¹⁴¹

Climate-smart policies reduce these negative impacts on growth.

The true costs of continuing with a high-carbon economic growth model in the United States are much higher than previously realized, and they are rising as concentrations of greenhouse gases in the atmosphere increase each year. The true job killer is inaction on climate change – not the solutions we need to stop it.

Section III. A Good Deal for the United States

The United States has a massive leadership role to play and is uniquely positioned to impact the global course of action to address climate change. There are three key reasons the United States must act:

1. There are undeniable economic opportunities from taking action.
2. U.S. leadership is capable of stimulating broader action globally, and we are already well positioned to meet our international climate commitments.
3. The U.S. is not immune to the impacts of climate change and delaying action will only create higher costs and more drastic impacts in the long run.

- a. The clean energy economy of the future

There are major opportunities for better growth and a better climate in three key economic systems in the United States – cities, land use and energy. By improving efficiency, investing in infrastructure and stimulating innovation across these sectors, government and business can deliver strong growth with lower emissions.

The costs of uncoordinated, sprawled city planning in the United States are high. Urban sprawl is immensely expensive, costing the United States around \$1 trillion per year.¹⁴² Sprawl raises the costs of infrastructure and service delivery up to 40%.¹⁴³ U.S. commuters lose 7 billion hours and 3 billion gallons of fuel in traffic each year.¹⁴⁴

However, there is a smarter model of urban development. Compact, connected, and coordinated cities can generate stronger growth, create jobs, alleviate poverty, reduce investment costs, and improve quality of life through lower congestion and air pollution. Worldwide, investing in public transport, building efficiency, and better waste management could save cities around \$17 trillion globally by 2050 and reduce emissions by more than the current annual emissions of India.¹⁴⁵

By encouraging smarter urban growth, the United States could save an estimated \$200 billion annually through savings in infrastructure investment and provision of services.¹⁴⁶ Spending \$1 billion on public transport could boost GDP by \$1.8 billion per year.¹⁴⁷ It could also support 36,000 jobs on average. This is 9% and 19% higher than the number of potential jobs created in road maintenance or new road projects respectively (using the same amount of resources).¹⁴⁸ Making urban settings more transit-oriented could reduce car use by 50%, and could reduce household expenditure by 20%.¹⁴⁹

Land use can also benefit from more sustainable practices, which in turn can make a big difference for the climate and the economy. Forests provide vital ecosystem services for agricultural productivity, including pollination and regulation of water flows. Each hectare of forest provides the equivalent value of up to \$6,000 in ecosystem services annually.¹⁵⁰ Initiating restoration of at least 350 million hectares of forest by 2030 could generate \$170 billion per year worldwide in net benefits from watershed protection, improved crop yields, and forest products.¹⁵¹

Many of the gains to be made in land use are more applicable to other countries, especially those with tropical rainforests. With that said, food waste is a key area where the U.S. can make a big difference.

An estimated one third of all food produced in the world ends up in the trash, taking with it a substantial chunk of consumers' food budgets and causing substantial carbon emissions. As the global middle class expands, global consumer food waste will cost \$600 billion per year by 2030. A 20-50% reduction in global consumer food waste could save between \$120 and \$300 billion per year by 2030. This could reduce GHG emissions by as much as 1 billion tonnes CO₂e per year, which is more than the annual emissions of Germany.¹⁵²

The energy system presents a prime opportunity for the U.S. to improve the economy while reducing emissions. The renewable energy industry can simultaneously create jobs, improve public health, and reduce emissions. Already an important part of the U.S. economy, the renewable energy industry will only become more vital as time goes on.

The National Solar Jobs Census released in January 2016 found that the U.S. solar industry added workers at a rate nearly 12 times faster than the overall economy, and that it accounted for 1.2% of all jobs created in the U.S. over the past year.¹⁵³ The solar industry now employs nearly 209,000 workers, and wages paid to solar workers remain competitive with similar industries.¹⁵⁴ The solar industry expects employment to increase to around 240,000 over the next 12 months, which reflects an annual growth rate of 14.7%.¹⁵⁵ In total, 724,000 Americans worked in renewable energy as of 2014, according to a January 2016 report from the International Renewable Energy Agency.¹⁵⁶

Through the transition to a clean energy economy, we can deliver hundreds of thousands of new jobs and huge economic co-benefits in the United States. A clean energy future in the U.S. could create on average 550,000 net jobs per year between now and 2050, according to a study from Synapse Energy.¹⁵⁷ Another new economic analysis from ICF International found that a clean energy economy will create more than 1 million additional jobs by 2030, increase U.S. GDP by \$145 billion, increase household disposable income by \$350-\$400, and save families \$5.3 billion on energy bills.¹⁵⁸

Increasing energy efficiency is another powerful way to reduce emissions and unlock savings for U.S. citizens. By 2035, investment in energy efficiency could boost global cumulative economic output by \$18 trillion, according to the New Climate Economy.¹⁵⁹ The United States' Energy Star program has already lowered household utility bills by an estimated \$360 billion since 1992.¹⁶⁰ States with energy efficiency targets and programs in place are saving customers at least \$2 for every \$1 invested.¹⁶¹

b. The United States' Intended Nationally Determined Contribution

As demonstrated in the previous sections, opportunities are emerging across the economy in multiple sectors to harness fuels, technologies, and processes as we move toward a low-carbon economy. The actions taken to date by the Obama Administration under the Climate Action Plan seize many of these opportunities. They also build an important foundation for meeting its target of reducing emissions 26–28 percent below 2005 levels by 2025, as outlined in its Intended Nationally Determined Contribution (INDC).

In May 2015, WRI published *Delivering on the U.S. Climate Commitment: A 10-Point Plan Toward A Low-Carbon Future*. The study demonstrates that the United States can meet, and even exceed, its INDC target with a broad policy portfolio using existing federal laws combined with actions by states. This would include expanding and strengthening some current and proposed policies and standards, as well as taking action on emission sources that are not yet addressed. Since we completed our analysis, the Administration has already started to move on some of the additional actions we identified as necessary for the US to meet its INDC target, including steps toward improving the efficiency of medium- and heavy-duty trucks, aircraft, and rooftop air conditioning units.

Figure 1 presents emissions projections for three low-carbon pathways that could reduce U.S. emissions by 26–30 percent below 2005 levels by 2025, and 34–38 percent by 2030. *Delivering on the U.S. Climate Commitment* outlines specific steps that federal agencies and state governments can take to achieve these reductions, recognizing that other pathways could also reach those targets by applying different policy portfolios. Notably, our pathways do not include steps to reduce emissions and increase sequestration from the agriculture and forestry sectors. However, in April 2015 the Administration announced an initiative titled *Building Blocks for Climate Smart Agriculture & Forestry*.¹⁶² By 2025, USDA expects this comprehensive set of voluntary programs and initiatives to reduce net emissions and enhance carbon sequestration by over 120 million metric tons of CO₂ equivalent per year. The opportunities in agriculture and forestry reinforce the notion that there are multiple pathways to achieve the U.S. INDC target.

Figure 1. Net U.S. Greenhouse Emissions: Reference Case and Low-Carbon Pathways Using Existing

Federal Authorities and Additional State Action

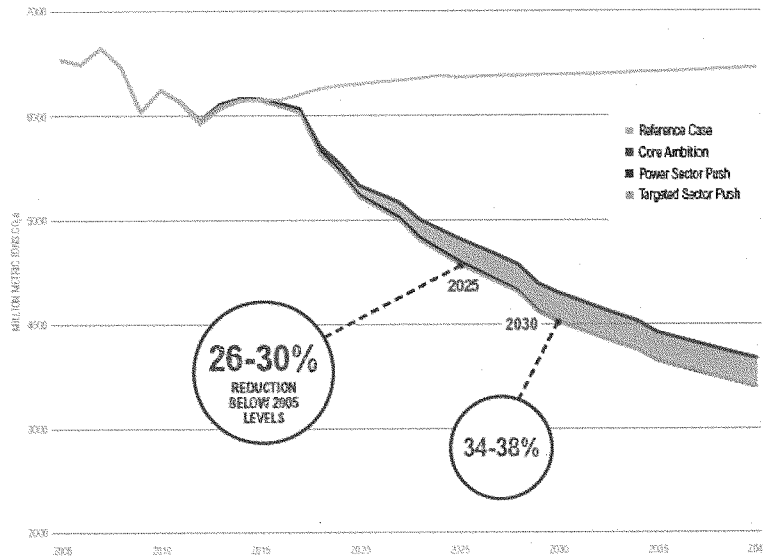


Figure 1 depicts net GHG emissions under three low-carbon pathways that WRI modeled in an analysis that could be pursued using existing federal laws and additional state action. The “Core Ambition” pathway reflects the EPA’s proposed Clean Power Plan (CPP), as well as emission abatement opportunities across other sectors of the economy. “Power Sector Push” builds on Core Ambition by assuming that states and utilities go beyond the CPP as proposed, or that EPA strengthens the proposal to take advantage of cost-effective energy efficiency resources and continued decreases in renewable energy costs. “Targeted Sector Push” assumes that the CPP is finalized as proposed, but pushes the envelope in a few key areas outside the power sector to achieve economy-wide reductions similar to “Power Sector Push”. Both of these pathways were designed to achieve very similar levels of emission reductions, illustrating alternative ways to go beyond a 26 percent reduction across the economy, either through increased action in the power sector or outside the power sector. The shaded area between the pathways indicates that reductions anywhere in this range are possible given mixtures of policies that blend these three pathways. The full report contains all the details and assumptions underlying these pathways and the Reference Case projection, and the modeling approaches used.

c. Benefits of Climate Protection

The Paris Agreement sets landmark goals for taking action on climate change. It aims to keep temperature rise to well below 2 degrees C (3.6 degrees F) and to pursue efforts to limit temperature increase to 1.5 degrees C (2.7 degrees F). Failure to meet these goals will increase economic, social, and environmental risks for the United States and all nations.¹⁶³ With global GHG emissions still on the rise,¹⁶⁴ delaying action on climate change will only result in climate-change-related events becoming more frequent and severe, leading to mounting costs and harm to businesses, consumers, and public health. The new EPA report, *Climate Change in the United States: Benefits of Global Action*,¹⁶⁵ estimates billions of dollars of avoided damages in the U.S. would result from global efforts to reduce greenhouse gas emissions. Actions range from reduced damage to agriculture, forestry, and fisheries, to reductions in coastal and inland flooding, to fewer heat-driven increases in electricity bills.

We are already experiencing the impacts of climate change. 2015 replaced 2014 as the hottest year on record¹⁶⁶. Fourteen of the fifteen hottest years on record have occurred since 2000.¹⁶⁷ In the United States, some regions are experiencing a higher frequency of flooding, heavier precipitation events, and more frequent heat waves and wildfires.¹⁶⁸

Extreme weather events are expensive. Between 1980 and 2014, the United States experienced 178 extreme weather and climate events that cost at least \$1 billion each, with total damages of more than \$1 trillion.¹⁶⁹ The frequency and severity of these types of events have increased over the same period, as four of the six years with the most billion dollar disasters on record in the United States have occurred since 2010. A similar increase in these costly events is happening around the world.¹⁷⁰ Many factors contribute to the cost of these events, such as growing population density and increased development in vulnerable areas that are more prone to extreme events. Meanwhile, increasing global temperatures and climate variability are making certain types of these costly events more frequent and severe.

U.S. leadership is critical to the success of the global efforts necessary to avoid billions of dollars in damages to our country. That leadership has already begun to pay off, as the international community adopted a new Agreement at the climate negotiations in Paris last December.

Section IV: Concluding Comments

The United States has the opportunity in the coming years to lay the foundation for a path to economic growth that delivers significant climate benefits. The key drivers of economic growth—including more efficient use of energy and natural resources, smart infrastructure investments, and technological innovation—can also lead to a low-carbon future. By bringing a spirit of competition, ingenuity, and innovation to the climate challenge, the United States can be a leader in delivering the improvements in energy efficiency, the cleaner fuels, and the new technologies and processes that can lower emissions and create net economic benefits. With more than 50 years' experience in addressing environmental problems, the United States has demonstrated that environmental protection is compatible with economic growth, and environmental policies have delivered huge benefits to Americans.

The U.S. emissions reduction target of reducing emissions by 26 to 28 percent below 2005 levels by 2025 is both ambitious and achievable. Use of existing federal laws combined with actions by the states

can help accelerate recent market and technology trends in renewable energy, energy efficiency, alternative vehicles, and many other areas in order to meet or beat that target.

This year, there are six steps the United States should take to help meet its greenhouse gas reduction targets and play a leadership role in climate action:

1. Implement the Clean Power Plan (CPP)

EPA should continue working with states, electric utilities and other stakeholders to ensure that states are on track to submit their implementation plans. EPA projects that the CPP will reduce power sector GHG emissions by 32 percent below 2005 levels by 2030.

2. Propose Standards to Reduce Methane Emissions from Existing Natural Gas Infrastructure

In August, EPA proposed its first-ever rules targeting methane emissions from new and modified oil and gas equipment and infrastructure. However, WRI research shows much more can be done¹⁷¹ by also addressing methane leaks from existing sources.

3. Step up Action on Hydrofluorocarbons (HFCs)

Building on EPA's actions on HFCs last year, the environmental agency should propose new rules to ban even more of the most potent HFC uses while also expanding the current list of climate-friendly alternatives. EPA should also finalize its proposed rule to extend requirements for the servicing and disposal of air conditioning and refrigeration equipment that apply to other ozone-depleting substances (like chlorofluorocarbons and hydrochlorofluorocarbon) to include HFCs. That would help capture, reclaim and recycle more HFCs from existing equipment to reduce the amount of new HFCs produced. The United States Government should also work with the international community to amend the Montreal Protocol to curb HFC production and use.

4. Lay the Groundwork for the Next Administration to Address Emissions from Industry

In December 2010, EPA announced its intent to establish GHG performance standards for new and existing refineries, though it has not met its own deadlines for action. White House officials met with leaders from the industrial sector at the end of 2015 to discuss their efforts to reduce GHG emissions. The Obama administration should continue meeting with stakeholders to lay the groundwork for the next administration to address emissions from the largest industrial sources, like refineries and cement, pulp and paper, chemicals, and iron and steel manufacturers.

5. Follow Through on Actions Addressing the Transport Sector

EPA and DOT should finalize the proposed second round of fuel efficiency standards for medium- and heavy-duty trucks.¹⁷² EPA should also keep working on emissions standards for new aircraft while the Federal Aviation Administration expands programs to improve the operational efficiency of the existing aircraft fleet through its NextGen program.¹⁷³

6. Increase Support to Local Communities to Boost Climate Resilience

This includes releasing a progress report on the recommendations from the president's Local Task Force on Climate Preparedness and Resilience, enhancing coordination of efforts at all levels of government to

address climate impacts, creating better incentives for local and state governments to proactively invest in resilience strategies to avoid unnecessary costs and mandating that federal agencies better account for and track the costs of impacts from climate change.

These actions are consistent with WRI's 10-point action plan coming out of Delivering on the U.S. Climate Commitment,¹⁷⁴ which examined pathways the United States can take to achieve its 2025 emission reduction target of reducing emissions 26-28 percent below 2005 levels by 2025. To achieve its climate goals domestically, the United States must act in these areas. Future administrations can then build on this action to ensure deep U.S. cuts in GHG emissions by mid-century.

The United States has always provided leadership when the world faces big challenges and strong domestic action can continue to build U.S. international climate leadership. By showing the resolve to cut its own emissions, the United States can accelerate climate action around the world.

Thank you for the opportunity to testify before the Committee, and I look forward to answering any questions.

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Dr. Andrew Steer, President and CEO of the World Resources Institute – Biography

Dr. Andrew Steer is the President and CEO of the World Resources Institute, a global research organization that works in more than 50 countries, with offices in the United States, China, India, Brazil, Indonesia and Europe. WRI's 450 experts work closely with leaders to address six urgent global challenges at the intersection of economic development and the natural environment: food, forests, water, climate, energy and cities.

Dr. Steer joined WRI from the World Bank, where he served as Special Envoy for Climate Change from 2010 - 2012. From 2007 to 2010, he served as Director General at the UK Department of International Development (DFID) in London.

Dr. Steer serves on the Executive Board of the UN Secretary General's Sustainable Energy For All initiative; is a Trustee for the World Economic Forum Global Agenda for Environment and Natural Resources Security; and is a member of the China Council for International Cooperation on Environment and Development (CCICED), the Energy Transitions Commission, the Leadership Council of the Sustainable Development Solutions Network, IKEA's People and Planet Positive Advisory Group, and the Bank of America's National Community Advisory Council.

Prior to joining the UK Government, Andrew held several senior posts at the World Bank, including Director of the Environment Department. He also has directed World Bank operations in Vietnam and Indonesia and served as Chief of the Country Risk Division and Director and Chief Author of the 1992 World Development Report on Environment and Development. Andrew was educated at St Andrews University, Scotland, Cambridge University, and the University of Pennsylvania, where he received his PhD in economics.

Chairman SMITH. Than you, Dr. Steer. That was perfectly timed at five minutes. Mr. Groves?

**TESTIMONY OF MR. STEVEN GROVES,
THE BERNARD AND BARBARA LOMAS
SENIOR RESEARCH FELLOW,
MARGARET THATCHER CENTER FOR FREEDOM,
THE HERITAGE FOUNDATION**

Mr. GROVES. Thank you, Mr. Chairman, for inviting me to testify today regarding the Paris agreement on climate change, and whether it's a bad deal for America. And I'll leave it to climate scientists and economists to say whether it's a bad deal for the economy, but as a lawyer, what I can say is that the Paris agreement is a bad deal for the Constitution, for the separation of powers doctrine, and for the already strained relationship between Congress and the Executive Branch.

Over the course of the past seven years, President Obama has taken many unilateral actions of dubious legitimacy. The President's decision to treat the Paris agreement as an executive agreement, instead of a treaty, is just his latest use of executive power to achieve an end that he knows full well would not pass Congressional muster. The President's decision is particularly egregious because it flies in the face of an agreement made between the White House and the Senate in 1992. Back then, during the ratification debate over the U.N. Framework Convention on Climate Change, the Senate was concerned that President Bush, or future presidents, would negotiate agreements that contained emissions targets and timetables without submitting those agreements to the Senate. The Senate, then controlled by Democrats, required assurances that any future agreement containing targets and timetables be submitted for advice and consent. President Bush agreed on behalf of the Executive Branch, and the commitment was memorialized in the Senate's ratification documents for the Framework Convention.

The next president lived up to this agreement. When President Clinton negotiated the Kyoto Protocol in 1997, he treated it as a treaty, requiring the advice and consent of the Senate. But the Kyoto Protocol was so unpopular that the Senate passed a resolution of disapproval on it by a vote of 95 to 0 before it could even be submitted to the Senate. To his credit, President Clinton did not attempt to circumvent the Senate, nor did he simply declare that the Kyoto Protocol was an executive agreement that didn't require Senate approval. He lived up to the commitment that was made in 1992.

But here we are in 2016, with a president that is unwilling to live up to the commitments of his predecessors. The President has negotiated a major climate change agreement under the auspices of the Framework Convention that contains targets and timetables, but he has refused to submit it to the Senate. The President is treating the Paris agreement as an executive agreement, and the reason is simple, political expediency. The President knows that there are nowhere 67 votes in the Senate to approve an agreement that requires the United States to send billions of dollars to the

Green Climate Fund annually, and in perpetuity, to make aggressive emissions reductions, and to ratchet those reduction levels up every five years, and to submit itself to an International Review Committee that will shame the U.S. in the event that the U.S. does not live up to its obligations.

Now, in addition to ignoring the 1992 agreement with the Senate, the President is simply pretending that the Paris agreement isn't a treaty in its own right, even though the objective criteria used by the State Department indicate that the Paris agreement is a treaty, and not a mere executive agreement. Specifically, when the U.S. is negotiating an international agreement, the State Department uses something called the Circular 175 Procedure to determine whether it is a treaty or an executive agreement. And as I detail in my written testimony, when you apply the eight factors of the C-175 Procedure to the Paris agreement, it's very clear that it should be treated as a treaty. But the President has chosen to ignore the C-175 Procedure, in the same way that he has chosen to ignore the 1992 agreement between the Executive Branch and the Senate.

As a result of the President's unilateral actions, and his abuse of executive authority, in my view, the Paris agreement lacks democratic legitimacy. For that reason, unless and until the Paris agreement is submitted to the Senate, Congress should refuse to appropriate U.S. taxpayer dollars for the Green Climate Fund, or any other financial mechanism associated with either the Paris agreement or the Framework Convention. Congress should also continue to resist and disapprove all regulations meant to implement the Paris agreement domestically.

Thank you again, Mr. Chairman, for inviting me, and I look forward to answering any of your questions, or the questions of the Committee.

[The prepared statement of Mr. Groves follows:]



CONGRESSIONAL TESTIMONY

Paris Climate Promise: A Bad Deal for America

Testimony before the Committee on Science, Space, & Technology

United States House of Representatives

February 2, 2016

Steven Groves

Bernard and Barbara Lomas Senior Research Fellow
The Heritage Foundation

My name is Steven Groves. I am the Bernard and Barbara Lomas Senior Research Fellow at The Heritage Foundation. The views I express in this testimony are my own and should not be construed as representing any official position of The Heritage Foundation.

It should come as no surprise that the Obama Administration has no intention to submit the Paris Agreement on climate change to the Senate for its advice and consent. Months before the 21st Conference of Parties (COP-21) the White House made its plan clear. During a March 31, 2015, press briefing, White House spokesman Josh Earnest was asked whether Congress has the right to approve the climate change agreement set to be negotiated in Paris:

[Reporter]: ...Is this the kind of agreement that Congress should have the ability to sign off on?

[Earnest]: ...I think it's hard to take seriously from some Members of Congress who deny the fact that climate change exists, that they should have some opportunity to render judgment about a climate change agreement.¹

¹ "Earnest: House GOP Climate Deniers Not the Right People to Vote on Emissions Deal," *Graben*, undated, https://graben.com/story.php?id=25399&utm_source=cliplist20150401&utm_medium=email&utm_campaign=cliplist&utm_content=story25399.

The White House view was mirrored by other nations as well, including the host of COP-21, French foreign minister Laurent Fabius. Addressing a group of African delegates at the June climate change conference in Bonn, Germany, Fabius expressed his desire to bypass Congress on the Paris Agreement: "We must find a formula which is valuable for everybody and valuable for the U.S. without going to Congress.... Whether we like it or not, if it comes to the Congress, they will refuse."²

Apparently, no Member of Congress who questions climate science, or who disagrees with the Obama Administration's climate change policies, is competent to review a major international agreement negotiated by the President. That is an alarming view on the role of Congress and particularly the Senate where, as in this case, the international commitments made by the executive branch in the Paris Agreement have significant domestic implications.

The Administration's position regarding the Paris Agreement is particularly alarming for two reasons: (1) the Agreement negotiated in December has all the hallmarks of a treaty that should be submitted to the Senate for its advice and consent under Article II,

² "Climate Deal Must Avoid US Congress Approval, French Minister Says," *The Guardian*, June 1, 2015, <http://www.theguardian.com/world/2015/jun/01/un-climate-talks-deal-us-congress>.

Section 2 of the U.S. Constitution; and (2) the Agreement contains targets and timetables for emissions reductions and, as such, the Administration's failure to submit the Agreement to the Senate breaches a commitment made by the executive branch to the Senate in 1992 in regard to ratification of the U.N. Framework Convention on Climate Change (UNFCCC).

THE PARIS AGREEMENT SHOULD BE TREATED AS A TREATY

There is no statutory definition of what constitutes a treaty versus an international agreement that is not a treaty. There is, however, a process established by the State Department to guide its decision to designate an international agreement one way or the other. This is known as the Circular 175 Procedure (C-175).³

C-175 establishes, *inter alia*, eight factors for determining whether a proposed international agreement should be negotiated as a treaty (requiring Senate approval through the standard Article II process) or as an "international agreement other than a treaty" (such as a "sole executive agreement"). In determining how to treat an international agreement, the executive branch must give "due consideration" to the following:

- (1) The extent to which the agreement involves commitments or risks affecting the nation as a whole;
- (2) Whether the agreement is intended to affect state laws;
- (3) Whether the agreement can be given effect without the enactment of subsequent legislation by the Congress;
- (4) Past U.S. practice as to similar agreements;
- (5) The preference of the Congress as to a particular type of agreement;
- (6) The degree of formality desired for an agreement;

³ U.S. Department of State, *Foreign Affairs Manual*, Vol. 11 (2006), § 720, et seq., <http://www.state.gov/documents/organization/88317.pdf>; "Circular 175 Procedure," U.S. Department of State website, <http://www.state.gov/s/l/treaty/c175/> ("The Circular 175 procedure refers to regulations developed by the State Department to ensure the proper exercise of the treaty-making power. Its principal objective is to make sure that the making of treaties and other international agreements for the United States is carried out within constitutional and other appropriate limits, and with appropriate involvement by the State Department. The original Circular 175 was a 1955 Department Circular prescribing a process for prior coordination and approval of treaties and international agreements.")

- (7) The proposed duration of the agreement, the need for prompt conclusion of an agreement, and the desirability of concluding a routine or short-term agreement; and
- (8) The general international practice as to similar agreements.⁴

C-175 provides no guidance whether any one of the eight factors should be given more weight than the others, or whether one, some, or all of the factors must be satisfied. In any event, the terms of the Paris Agreement satisfy most or all of the eight factors indicating that it should be considered a treaty requiring the advice and consent of the Senate. Each of the eight factors are discussed below.

- (1) *The extent to which the agreement involves commitments or risks affecting the nation as a whole.*

If the executive branch negotiates an international agreement that is geographically limited or affects a situation in a foreign country (e.g. a status of forces agreement) it is likely that the President may conclude such an agreement as a sole executive agreement. In contrast, if the commitments made in an agreement directly impact the United States "as a whole" it is likely to be a treaty requiring Senate approval.

The Paris Agreement certainly "involves commitments or risks affecting the U.S. as a whole." Under the Agreement, the United States is obligated to undertake "economy-wide absolute emission reduction targets"⁵ and provide an unspecified amount of taxpayer dollars "to assist developing country Parties with respect to both mitigation and adaptation."⁶ Commitments to reduce carbon emissions across the U.S. economy and send billions of taxpayer dollars to poor nations "affects the nation as a whole" as opposed to narrow commitments that may best be left to sole executive agreements.

Moreover, the Obama Administration made clear in its nationally determined contribution submission to the COP that it intends to fulfill its mitigation commitments under the Paris Agreement by enforcing emissions standards through existing and new regulations on power plants, vehicles, buildings, and

⁴ *Ibid.*, § 723.3.

⁵ Paris Agreement, Art. 4(4), December 12, 2015, <https://unfccc.int/resource/docs/2015/cop21/eng/109r01.pdf>.

⁶ *Ibid.*, Art. 9(1).

landfills.⁷ These are multi-sectoral, comprehensive, nationwide commitments without geographic limitation. These commitments will affect the entire nation since American taxpayers, energy consumers and energy producers alike, will be impacted by the President's regulations.

As such, the comprehensive nature and breadth of the Paris Agreement "involves commitments or risks affecting the nation as a whole" and is therefore more likely a treaty than a sole executive agreement.

(2) *Whether the agreement is intended to affect state laws.*

While the Paris Agreement does not mandate specific changes to state laws in the U.S., the intentions of the Obama Administration to enforce the Agreement through changes in state laws is abundantly clear. Specifically, in its nationally determined contribution the Administration committed that the U.S. would enforce the Agreement domestically through the implementation of regulations, among them the "Clean Power Plan" (CPP) to reduce emissions from power plants. Under the CPP the Environmental Protection Agency will set state-specific emissions limits based on the greenhouse-gas-emissions rate of each state's electricity mix.⁸ Individual states are then required to develop and implement their own plans to meet the limits set by the EPA.

As such, it is clear that the Administration intends the Paris Agreement to affect state laws.

(3) *Whether the agreement can be given effect without the enactment of subsequent legislation by the Congress.*

The Paris Agreement requires major financial commitments by the United States. All such funds must be authorized and appropriated by Congress—i.e. the Paris Agreement cannot be "given effect without the enactment of subsequent legislation by the Congress." Since subsequent Congressional

⁷ UNFCCC, "Party: United States of America—Intended Nationally Determined Contribution," March 31, 2015, <http://www4.unfccc.int/submissions/inde/Submission%20Pages/submissions.aspx>.

⁸ "FACT SHEET: Components of the Clean Power Plan," Environmental Protection Agency website, <http://www.epa.gov/cleanpowerplan/fact-sheet-components-clean-power-plan>.

legislation is necessary to give effect to the Paris Agreement it meets the criteria of a treaty rather than an executive agreement.

The funding required by the Paris Agreement will be significant and continuing. The principal depository for such funds is the "Green Climate Fund" (GCF), which assists developing countries in adapting to climate change. The GCF was established by the 2009 Copenhagen Accord, which committed developed countries by 2020 to provide \$100 billion per year, every year, seemingly in perpetuity.⁹ The Paris Agreement obligates developed countries such as the U.S. to "provide financial resources to assist developing country Parties with respect to both mitigation and adaptation."¹⁰ In the decision adopting the Paris Agreement, the COP-21 set the goal of these funds at "a floor of USD 100 billion per year."¹¹ Only developed nations like the U.S. are obligated to contribute to the GCF, while developing nations are "encouraged" to make "voluntary" contributions.¹²

The amount the U.S. is obligated to pay into the GCF is likely to be many billions of dollars each year. President Obama has pledged to contribute at least \$3 billion as a down payment to the GCF, and Republicans were unsuccessful in blocking the first \$500 million of that pledge in the 2016 omnibus spending legislation.¹³

In any event, a central aspect of the Paris Agreement—green climate finance—cannot be given effect without the enactment of legislation by Congress, indicating that the Agreement is more likely a treaty than a sole executive agreement.

(4) *Past U.S. practice as to similar agreements.*

Past U.S. practice regarding international environmental agreements has been uniform—such agreements are usually concluded as treaties and submitted to the Senate. Major environmental

⁹ Copenhagen Accord, ¶ 8, December 18, 2009, <http://unfccc.int/resource/docs/2009/cop15/eng/107.pdf>.

¹⁰ Paris Agreement, Art. 9(1).

¹¹ Adoption of the Paris Agreement, December 12, 2015, FCCC/CP/2015/L.9/Rev.1, ¶ 54.

¹² Paris Agreement, Art. 9(2).

¹³ "Obama, in latest climate move, pledges \$3 billion for global fund," *Reuters*, November 14, 2015, <http://www.reuters.com/article/us-usa-climatechange-obama-idUSKCN0FY1LD20141115>; "Funds for Obama climate deal survive in spending bill," *The Hill*, December 16, 2015, <http://thehill.com/policy/energy-environment/263447-spending-bill-wont-stop-funds-for-obama-climate-deal>.

agreements treated in this manner include the 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora, the 1973 International Convention for the Prevention of Pollution from Ships, the 1985 Vienna Convention for the Protection of the Ozone Layer (and the 1987 Montreal Protocol thereto), the 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, the 1991 Protocol on Environmental Protection to the Antarctic Treaty, and the 1994 U.N. Convention to Combat Desertification.

Regarding climate change, the UNFCCC was submitted to the Senate by the first Bush Administration as a treaty, and the Clinton Administration treated the Kyoto Protocol as a treaty and would have submitted it to the Senate had the Senate not already rejected it out of hand when it passed the Byrd–Hagel Resolution by a vote of 95-0.¹⁴

The Paris Agreement certainly qualifies as a major international environmental agreement. After its adoption in Paris, President Obama said the Agreement “represents the best chance we have to save the one planet we’ve got.”¹⁵ The White House also released a statement to the press referring to the Agreement as “historic” and “the most ambitious climate change agreement in history.”¹⁶ Secretary of State John Kerry stated that the Agreement “will empower us to chart a new path for our planet.”¹⁷

An international agreement of such import and historic significance should merit review by the legislative branch. Almost all other significant environmental agreements were not completed as sole

executive agreements. Past U.S. practice has been to submit significant international environmental agreements to the Senate, and so should the Paris Agreement.

(5) *The preference of the Congress as to a particular type of agreement.*

Determining congressional preference as to the legal form of an international climate change agreement is difficult, but it is significant that the major agreements leading up to COP-21—i.e. the UNFCCC and the Kyoto Protocol—were both considered treaties requiring the Senate’s advice and consent. Moreover, a significant number of members in both houses have expressed their specific preference regarding the Paris Agreement, and have demanded that President Obama submit it to the Senate for advice and consent.

Prior to COP-21, Sen. Mike Lee (R-UT) and Rep. Mike Kelly (R-PA) introduced a concurrent resolution expressing the sense of Congress that the President should submit the Paris climate change agreement to the Senate for advice and consent.¹⁸ The resolution urged Congress not to consider budget resolutions and appropriations language that include funding for the GCF until the terms of the Paris agreement were submitted to the Senate. The concurrent resolution currently has 33 Senate cosponsors and 74 House cosponsors.

In addition, several prominent Senate Republicans made clear that they object to the White House’s end run around the Senate. Sen. John McCain (R-AZ) stated, “All treaties and agreements of that nature are obviously the purview of the United States Senate, according to the Constitution.” Sen. McCain added that “the President may try to get around that...but I believe clearly [that the] constitutional role, particularly of the Senate, should be adhered to.”

¹⁴ S. Res. 98, “A resolution expressing the sense of the Senate regarding the conditions for the United States becoming a signatory to any international agreement on greenhouse gas emissions under the United Nations Framework Convention on Climate Change,” <https://www.congress.gov/bills/105th-congress/senate-resolution/98>.

¹⁵ “Obama: Climate Deal is ‘Best Chance We Have to Save the One Planet We’ve Got,’” *NBC News*, December 12, 2015, <http://www.nbcnews.com/news/us-news/obama-climate-deal-best-chance-we-have-save-one-planet-n479026>.

¹⁶ “U.S. Leadership and the Historic Paris Agreement to Combat Climate Change,” The White House, Office of the Press Secretary, December 12, 2015, <https://www.whitehouse.gov/the-press-office/2015/12/12/us-leadership-and-historic-paris-agreement-combat-climate-change>.

¹⁷ “Factbox: World reacts to new climate accord,” *Reuters*, December 12, 2015, <http://www.reuters.com/article/us-climatechange-summit-reaction-factbox-idUSKBN0TV0Q420151213>.

¹⁸ S. Con. Res. 25, “A concurrent resolution expressing the sense of Congress that the President should submit the Paris climate change agreement to the Senate for its advice and consent,” <https://www.congress.gov/bills/114th-congress/senate-concurrent-resolution/25>; H. Con. Res. 97, “Expressing the sense of Congress that the President should submit to the Senate for advice and consent the climate change agreement proposed for adoption at the twenty-first session of the Conference of the Parties to the United Nations Framework Convention on Climate Change, to be held in Paris, France from November 30 to December 11, 2015,” <https://www.congress.gov/bills/114th-congress/house-concurrent-resolution/97>.

Chairman of the Senate Republican Conference John Thune (R-SD) stated that any deal that commits the U.S. to cut greenhouse gas emissions “needs to be reviewed, scrutinized and looked at and I think Congress has a role to play in that.”

(6) *The degree of formality desired for an agreement.*

It stands to reason that the more formal an international agreement is the more likely that it should require approval by the Senate, whereas less formal agreements may be completed as sole executive agreements.

The Paris Agreement is certainly a “formal” agreement. It contains 29 articles dealing with a comprehensive set of binding obligations including mitigation, adaptation, finance, technology transfer, capacity-building, transparency, implementation, compliance, and other matters. These articles refer to obligations concerning other treaties and bodies (such as the UNFCCC and the Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts) and establish new bodies such as a committee to facilitate compliance and implementation of the Agreement.¹⁹

There is nothing “informal” about the Agreement, which has all the hallmarks of a treaty. It has clauses regarding when it will be open for signature and how instruments of ratification may be deposited and under what conditions a party may withdraw from the Agreement once ratified.²⁰

(7) *The proposed duration of the agreement, the need for prompt conclusion of an agreement, and the desirability of concluding a routine or short-term agreement.*

Sometimes it is necessary for the President, acting as the “sole organ” of the U.S. government in the field of international relations²¹ to promptly negotiate routine international agreements of limited duration. The President must have the flexibility and authority to conclude such sole executive agreements without receiving the advice and consent of the Senate. If, however, there is no need for prompt conclusion of an

agreement, or if the agreement commits the U.S. for a lengthy duration, or if the agreement is not “routine” then it should likely be completed as a treaty.

The Paris Agreement is not “routine” in any regard, and has been touted by some, including President Obama, as a measure that will save Planet Earth. Nor was there a need for a “prompt conclusion” of the Agreement, which was negotiated beginning in 2011 with the launch of the Durban Platform at COP-17. Finally, the Agreement is not “short-term” by any measure. In fact, the Agreement appears to be completely open-ended with no termination date. By the terms of the Agreement, parties are legally obligated to communicate a new mitigation commitment every five years, and each successive commitment must be a “progression” beyond its previous commitment.²² There is no stated end date to those commitments.

Since the Paris Agreement is of unlimited duration, is not “routine” by any meaning of that term, and did not require prompt conclusion (having been negotiated over a five-year period), it is more likely than not a treaty, and not a sole executive agreement.

(8) *The general international practice as to similar agreements.*

To the extent that a “general international practice” exists regarding significant international climate change agreements, that practice has been to conclude them as formal treaties rather than non-binding political agreements.

The best examples of this practice is, of course, the predecessors to the Paris Agreement—the UNFCCC and the Kyoto Protocol, both of which were negotiated and completed as binding treaties, as opposed to non-binding aspirational or political agreements. Other significant environmental agreements have been, as noted above, negotiated as treaties.

In sum, arguably all eight of the C-175 factors, when applied to the terms of the Paris Agreement, indicate that it should be treated as a treaty requiring the advice and consent of the Senate: The Agreement involves commitments that will affect the U.S. on a nationwide basis, and the Obama Administration intends to meet those commitments by requiring changes to state law; The Agreement cannot be given effect without congressional legislation, particularly in

¹⁹ Paris Agreement, Art. 15.

²⁰ *Ibid.*, Art. 20, 28.

²¹ *United States v. Curtiss-Wright Export Corp.*, 299 U.S. 304 (1936).

²² Paris Agreement, Art. 4(3), (9).

terms of providing appropriations for the Green Climate Fund; The U.S. has, in the past, treated pacts such as the Agreement as treaties, and not sole executive agreements; Significant numbers of Senators and Representatives have stated their preference to treat the Agreement as a treaty; The Agreement is highly formal in nature, and not informal in any way that would suggest it was only a sole executive agreement; The Agreement is of unlimited duration and was negotiated over a term of several years; Finally, the general international practice as to climate change agreements is to conclude them as treaties as opposed to non-binding political agreements.

THE PRESIDENT IS BREAKING A COMMITMENT MADE DURING UNFCCC RATIFICATION

The UNFCCC was negotiated, signed, and ratified by the U.S. in 1992 during the Administration of President George H. W. Bush. By ratifying the convention, the United States agreed to be legally bound by its provisions. However, while the UNFCCC requires the U.S. to “adopt national policies and take corresponding measures on the mitigation of climate change, by limiting its anthropogenic emissions of greenhouse gases,”²³ it does not require the U.S. to commit to specific emissions targets or timetables.

The ratification history of the UNFCCC indicates that the Senate intended any future agreement negotiated under the auspices of the convention that adopted emissions targets and timetables would be submitted to the Senate.²⁴ Specifically, during the hearing process before the Senate Foreign Relations Committee regarding ratification of the UNFCCC, the Bush Administration pledged to submit future protocols negotiated under the convention to the Senate for its advice and consent. In response to written questions from the committee, the Administration responded as follows:

Question. Will protocols to the convention be submitted to the Senate for its advice and consent?

²³ United Nations Framework Convention on Climate Change, Art. 4.2(a), May 9, 1992, <https://unfccc.int/resource/docs/convkp/conveng.pdf>.

²⁴ See Emily C. Barbour, “International Agreements on Climate Change: Selected Legal Questions,” Congressional Research Service, April 12, 2010, pp. 7–8, <http://fpc.state.gov/documents/organization/142749.pdf>.

Answer. We would expect that protocols would be submitted to the Senate for its advice and consent; however, given that a protocol could be adopted on any number of subjects, treatment of any given protocol would depend on its subject matter.

Question. Would a protocol containing targets and timetables be submitted to the Senate?

Answer. If such a protocol were negotiated and adopted, and the United States wished to become a party, we would expect such a protocol to be submitted to the Senate.²⁵

Moreover, in the event that the UNFCCC conference of parties adopted targets and timetables, that too would require Senate advice and consent. When the Foreign Relations Committee reported the UNFCCC out of committee, it memorialized the executive branch’s commitment on that point: “[A] decision by the Conference of the Parties [to the UNFCCC] to adopt targets and timetables would have to be submitted to the Senate for its advice and consent before the United States could deposit its instruments of ratification for such an agreement.”²⁶

The Senate gave its consent to ratification of the UNFCCC based on the executive branch’s explicit promise that any future protocol “containing targets and timetables” would be submitted to the Senate. The agreement struck between the Democrat-controlled Senate and the Republican President in 1992 made no exception for “non-binding” targets and timetables. Rather, the Senate relied on the good faith of future presidential Administrations to adhere to the commitment that any future agreement “containing targets and timetables” be submitted to the Senate for advice and consent.

Emissions targets and timetables—referred to in the Paris Agreement as “nationally determined contributions”—are integral to the Agreement since they reflect the mitigation commitments made by each party to the Paris Agreement. The term “nationally determined contributions” is used in Article 3, Article 4(2), (3), (8)-(14), (16), Article 6(1)-(3), (5), (8), Article 7(11), Article 13(5), (7), (11), (12), and Article 14(3). The fact that the nationally determined

²⁵ Hearing, *U.N. Framework Convention on Climate Change (Treaty Doc. 102-38)*, Committee on Foreign Relations, U.S. Senate, 102nd Cong., 2nd Sess., September 18, 1992, pp. 105–106.

²⁶ S. Exec. Rept. 102-55, 102d Cong., 2d Sess., 1992, p. 14.

contributions are themselves submitted separately by each nation and posted on a website is irrelevant since they are incorporated by reference throughout the Agreement. By any measure, then, it must be conceded that the Paris Agreement “contains targets and timetables”.

Because the Paris Agreement contains targets and timetables, and the Obama Administration has refused to submit it to the Senate, the Administration is breaching the commitment made during the ratification process for the UNFCCC.

CONCLUSION

While the executive branch must be permitted a certain amount of discretion to choose the legal form of international agreements it is negotiating, there must also be a corresponding duty by the executive branch to treat comprehensive, binding agreements that result in significant domestic impact as treaties requiring Senate approval.

President Obama has placed his desire to achieve an international environmental “win” and bolster his legacy above historical U.S. treaty practice and intragovernmental comity. Major environmental treaties that have significant domestic impacts should not be developed and approved by the President acting alone. An agreement with far-reaching domestic consequences like the Paris Agreement lacks sustainable democratic legitimacy unless the Senate or Congress as a whole, representing the will of the American people, gives its approval.

Unless and until the White House submits the Paris Agreement to the Senate for its advice and consent, the Senate should:

- **Block funding for the Paris Agreement.** An illegitimate Paris Agreement should not be legitimated by subsequent congressional action. One step that Congress should take is to refuse to authorize or appropriate any funds to implement the Agreement, including the tens of billions of American taxpayer dollars in adaptation funding to which the U.S. will commit itself annually. The Obama Administration has successfully received at least \$7.5 billion in U.S. taxpayer dollars from Congress to fulfill a “nonbinding” international climate change agreement—the 2009

Copenhagen Accord.²⁷ That “success” should not be repeated in connection with the Paris Agreement.

- **Withhold funding for the UNFCCC.** If the Administration bypasses the Senate in contravention of the commitment made by the first Bush Administration in 1992, it goes to prove what mischief can result from ratifying a “framework” convention such as the UNFCCC. The Administration has based its Senate end run, in part, on the argument that the UNFCCC authorizes it to do so. As such, U.S. ratification of the UNFCCC has become precisely the danger that the Senate sought to prevent in 1992. Defunding the UNFCCC would prevent the U.S. from participating in future conferences, submitting reports, and otherwise engaging in the dubious enterprise.
- **Take prophylactic legislative measures.** In addition to specific legislative efforts to ensure that no adaptation funding committed under the Paris Agreement is authorized, Congress should include language in all legislation regarding the Environmental Protection Agency and related executive agencies and programs that no funds may be expended in connection with the implementation of any commitment made in the Agreement.

The Executive Branch has shown its contempt for the U.S. treaty process and the role of Congress, particularly the Senate. The President is attempting to achieve through executive fiat that which could not be achieved through the democratic process. The Obama Administration has ignored the assurances made to the Senate in 1992 by his predecessor by treating the Paris Agreement as a “sole executive agreement” in order to bypass the Senate, and by seeking to enforce the Agreement through controversial and deeply divisive regulations. Those actions evince an unprecedented level of executive unilateralism, and should be opposed by Congress by any and all means.

²⁷ The U.S. has “fulfilled our joint developed country commitment from the Copenhagen Accord to provide approximately \$30 billion of climate assistance to developing countries over FY 2010–FY 2012. The United States contributed approximately \$7.5 billion to this effort over the three year period.” Executive Office of the President, “The President’s Climate Action Plan,” June 2013, p. 20, <https://www.whitehouse.gov/sites/default/files/image/president27climateactionplan.pdf>.

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Steven Groves

Expert on Democracy and Human Rights, United Nations, Human Rights Council, Sovereignty

Steven Groves works to protect and preserve American sovereignty, self-governance and independence as leader of The Heritage Foundation's Freedom Project.

Groves, who is the Bernard and Barbara Lomas senior research fellow in Heritage's Margaret Thatcher Center for Freedom, also advocates American leadership on issues involving international political and religious

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He has testified before Congress on international law, human rights, the United Nations and controversial treaties such as the U.N. Convention on the Law of the Sea, the Convention on the Rights of Persons with Disabilities, and the Convention on the Elimination of All Forms of Discrimination against Women.

In 2013, Groves was awarded the Dr. W. Glenn and Rita Campbell Award for his work. The award is given annually to the Heritage employee who made "an outstanding contribution to the analysis and promotion of a free society."

Before joining Heritage in 2007, Groves was senior counsel to the U.S. Senate Permanent Subcommittee on Investigations. He played a lead role in the subcommittee's investigation of the U.N. "oil-for-food" scandal, the most extensive congressional probe ever conducted of the United Nations.

Groves previously was an associate at Boies, Schiller & Flexner LLP, specializing in commercial litigation. Before that he served as assistant attorney general for the state of Florida, where he litigated civil rights cases, constitutional law issues and criminal appeals, among other matters, in state and federal court.

Groves is a frequent guest commentator on domestic and international television and radio. He has appeared on ABC, BBC, CNBC, CNN and CNN International, Fox News

Chairman SMITH. Thank you, Mr. Groves. Let me direct my first question to Mr. Eule, and it is this. In your opinion, what are the costs of implementing the Paris agreement to the United States? And when I mention costs, I include the impact on jobs as well. Make sure your mike is on there.

Mr. EULE. It's difficult to say what exactly the costs will be, but it's surely going to cost quite a bit. When you look at some of the projections for reducing greenhouse gas emissions significantly globally, we're talking trillions of dollars, perhaps tens of trillions of dollars in costs. And the U.S. share of that would depend on what happens in negotiations, but it would be a significant amount.

Now, when you talk about the \$100 billion that's supposed to be mobilized by 2020, that's supposed to be ratcheted up by 2025, the U.S. share of that is under negotiation. And there's a big discussion within the Framework Convention as to whether that should be government funding, or whether that should be private sector funding, or a combination of both. But I think it's safe to say that a large percentage of that will have to come from the government, and that will be money that has to be appropriated by the Congress, and it's going to run into billions of dollars.

The impact this is going to have on the United States is significant. The United States, as I mentioned in my testimony, has an energy price advantage over many of its competitors. Two to four times—we pay two to four times less than many of our competitors in the OECD. You know, if that competitive advantage goes away, I think we can see a lot of energy intensive industries fleeing the country, as we're seeing in Europe. We're seeing, in Europe, steel mills closing. We're seeing—saying—companies saying they're not going to be investing in Europe anymore. We're seeing power companies saying they're not going to invest in Europe anymore. The same thing could happen here, and I think that's why we have to take a strong look at the big disparity in what the U.S. is promising, and what other countries are promising.

Chairman SMITH. Okay. Thank you, Mr. Eule. Dr. Christy, NOAA recently claimed, to great fanfare, that 2015 was the warmest year on record. Now, this is the same organization that claimed 2014 was the warmest year on record, and when we read the footnotes, they actually said they were only 38 percent sure that that was the case. In regard to their claim about 2015 being the warmest year on record, what are the weaknesses with the data they're using? How good is their accuracy?

Dr. CHRISTY. Well, this is a new dataset that's come out, and hasn't had much scrutiny on it. We've tried to reproduce parts of it, and have been unable at this point. It's a strange kind of way to—that it was constructed. Relative to 2015, we have a better way, I think, to measure the climate system, and that's the bulk atmosphere. That's where the real mass of the climate system exists, in terms of the atmosphere, and 2015 was not the warmest year. It was either second to fourth, depending upon which dataset you use. So the fact that that information is not provided to the American public by a government agency is disturbing to me, because the evidence is there that 2015 was not the warmest year.

Chairman SMITH. Okay. Thank you, Dr. Christy. Mr. Groves, thank you for your strong testimony, and appreciate especially your

history of the 1992 agreement between the Senate and the Executive Branch, and also the definition of agreement and treaty as the State Department itself has determined. And it is breathtaking to have a president that ignores this, and abuses his executive authority, in my judgment.

My question is this: to what extent are President Obama's promises at the Paris meeting legally binding upon our country?

Mr. GROVES. Well, I mean, there are commitments made throughout the Paris agreement. The Paris agreement is a legally binding agreement. Just because it's not—he doesn't consider it a treaty doesn't mean it's not legally binding. Executive agreements can be legally binding, like status of forces agreements, or even the agreement that we're working out with Iran on the nuclear deal. The important thing to note is that the other 195 countries certainly believe that the United States will be legally bound by its commitments. Not only its commitments to reduce its emissions on certain targets and timetables, but mostly important for them to transfer billions and billions of dollars annually to the Green Climate Fund, and other climate mechanisms that they're going to use in their countries.

Chairman SMITH. What power does the next president have? I mean, is the next president obligated to enforce what this president agreed to?

Mr. GROVES. Well, the rest of the world would certainly believe that the next president would be required to live up to the U.S. commitments under the Paris agreement. However, since the President currently characterizes the Paris agreement as a mere sole executive agreement, any incoming president may withdraw from it, in the same way they can withdraw from other executive agreements made with other countries. There are going to be political consequences to that with our allies, but, unlike a treaty, it's much more simple to unwind a sole executive agreement.

Chairman SMITH. Okay. Thank you, Mr. Groves. And the gentlewoman from Texas, Ms. Johnson, is recognized for her questions.

Ms. JOHNSON. Thank you very much, Mr. Chairman. Dr. Steer, before I ask you a question, I'd like to congratulate you on—and all the staff at WRI for being named the number one environmental policy think tank in the world by the 2015 Global Go To Think Tank Index Report.

The launching of the Breakthrough Energy Coalition, the world's largest clean energy research and development partnership, is a prime example of the commitment by the private sector to addressing climate change, and it is clear that, from your testimony, that businesses have recognized the importance of taking action against climate change. Can you please comment on the importance of the private sector in addressing climate change?

Dr. STEER. Thank you very much indeed. Yes, I think one of the things that's happened in the last five years is a radical shift in our understanding about the link between economic growth and climate change. I was in Davos last week, at the World Economic Forum. There's an overwhelming sense now on the part of business leadership in the largest companies in the world that actually we have to do something about climate change, and doing it smartly will make us more efficient, more competitive. And that's why you

have these really remarkable sort of major companies, you know, 1,000 companies have now said, we want a price on carbon.

And one of the reasons for that is that they're currently living in no man's land. You know, they don't know, well, there is, or there isn't going to be, and so investment is lower than it should be. And what we now know—there's a lot of empirical evidence that if you take smart actions on climate change, you can promote efficiency, you can bring in technology, and you can give long term confidence, which is what business really needs. So it's a very exciting time.

Now, one of the interesting things is that it's not only the manufacturers and the retailers, it's actually the financial sector as well. I mean, in Paris, 400 investors, representing 24 trillion in assets, have signed up to the global investment statement on climate change, pledging to seek out and scale up low carbon and resilient investments. And so what we're seeing, and it's very relevant to this Committee, obviously, is that the agreement by the United States and 20 other countries to double their investment in research at the public level, plus the Bill Gates commitment, together with another 25 billionaires, if you like, to really move things forward, and to link together, is an incredibly exciting development.

Ms. JOHNSON. Yes. In his testimony, Mr. Eule stated that the emerging economies have showed very little interest in reducing emissions in any meaningful way, and that most developing countries will just continue to operate in a business as usual manner under this agreement. You have a much more optimistic view of the impact and effectiveness that the Paris agreement will have on global emissions. Can you please elaborate on why you believe all countries, including developing countries, will deliver on this emissions reduction commitment?

Dr. STEER. I don't think it's that I'm optimistic. I think we look at the facts. We leave our opinions at home, and we look at the facts. In China—most people still perceive China to be opening up hundreds of coal powered plants, and increasing their use of coal. In 2014 China shrank its consumption of coal. In the first 10 months of 2015, coal consumption in China fell by nearly five percent. So coal consumption in China is actually now peaking. We're not absolutely certain whether it'll go up this year or not, but it looks like it's now on a downward trajectory. In the meantime, China invested \$120 billion on renewable energy last year. So things are changing, and countries like Brazil are now committed to actually reducing, in an absolute sense, as I think Mr. Eule made that in his written testimony, that—an absolute reduction. And countries like Mexico as well are really doing very remarkable things.

Ms. JOHNSON. Thank you. Now, what do you make of the claim that the U.S. Chamber of Commerce made, that most businesses in the U.S. are opposed to this deal?

Dr. STEER. Well, I think we're still on a journey, quite frankly. Just because the United States as a whole, our economy and our society, would benefit from serious action, that doesn't mean that every single industry and every single company—and the history of change is that those who have a vested interest in the—in not

changing are much more vocal, including in trade associations, than those who would benefit.

And so we're on a journey, as we have been in many other areas, and each year we're seeing more and more coming on board, and we've seen it in the last 12 months in an unprecedented way.

Ms. JOHNSON. Thank you very much. Mr. Chairman, I'd like to enter the articles I mentioned earlier into the record, in my opening statement.

Chairman SMITH. Without objection, so ordered.

[The information appears in Appendix II]

Chairman SMITH. Thank you, Ms. Johnson, for your questions. And the gentleman from California, Mr. Rohrabacher, is recognized for his questions.

Mr. ROHRABACHER. So let's talk about the economic impact, and maybe Mr. Eule would like to have his say on that as well. Mr. Eule, could you—we just heard about how it's going to be more efficient to go over to a non-carbon-based energy source. That's what we're really talking about. It's my understanding that oil, and gas, and coal, at their fundamental, is much more efficient than any other method that we've got at this point to produce the same amount of energy. Thus, if we're not using those efficient methods, that means that some sort of wealth is having to be consumed that otherwise wouldn't be consumed, which it seems to me destruction of the manufacturing of wealth would hurt normal people. Maybe you could comment on that?

Mr. EULE. Yeah. I think I understand the question.

Mr. ROHRABACHER. I mean, fundamentally, the economics—we're being told the economics—

Mr. EULE. Right.

Mr. ROHRABACHER —is actually working in behalf of moving in the direction—the global warming direction, pardon me, of—making that a major goal, bringing down the climate—bringing down the temperature. I mean, is that what you're reading? Obviously it's not. Maybe you could just get in a discussion—

Mr. EULE. Yeah, I—

Mr. ROHRABACHER. —over that.

Mr. EULE. Yeah, I think when you look at where alternate technologies are, they're still more expensive than more traditional energy technologies. I think that's pretty plain. They intermittency issues, so that—and, you know, the question is, can they be scaled up to provide the energy that people need to lift themselves out of poverty worldwide?

You know, when you think about climate change, like I said in my testimony, it's a technology challenge. And as long as alternate technologies are more expensive and less reliable than traditional technologies, people are going to use traditional technologies, because it's more important, especially in the developing world, it's more important for them to provide energy to their people. And they will continue to use these technologies, because they make sense.

Once alternate technologies are competitive with traditional technologies, a lot of these issues go away, quite frankly. The—we won't need a big international—

Mr. ROHRABACHER. Right.

Mr. EULE. —conference to decide how to change the, you know, the energy systems of these countries, because people adopt these technologies anyway because they make sense. They don't at this point, but they will one day in the future, but we just don't know when that's going to happen.

Mr. ROHRABACHER. So any businessman that runs a corporation that is not going to more efficient use of energy is wasting the resources of his company, and that would happen naturally, hopefully, that people are making their adjustments to go to more efficient methods of using the energy for their company.

Let me ask Dr. Christy—the—when we talk about what was the most—the hottest day, this— isn't this important? Because if indeed there's been this massive increase in the amount of CO₂ in the atmosphere over these last 20 and 30 years, if indeed the—that has not resulted in these hottest days, does that not disprove the CO₂ theory of—that CO₂ is causing the climate to change?

Dr. CHRISTY. Okay, in terms of the hottest days, I think you're referring to the chart on—when a number of 100 degree days occurred in the United States, that one that shows in the '30s many more occurred than today. So when you look at the United States' record of extreme high temperatures, you do not see an upper trend at all. In fact, it's slightly downward. That does fly in the face of climate model projects.

I just had a paper accepted for a publication in which we looked at Alabama, and that very thing. Not one single one of the 76 climate models ran came close to producing what actually happened in Alabama's climate over the last 120 years. So I think my bottom line here is I would not trust model projections on which all the policy is based here, because they just don't match facts right now.

Mr. ROHRABACHER. So if the facts are that we are not having this dramatic increase in temperature that we've been told that we're having, at a time when CO₂ has been increasing dramatically, and use—the amount of CO₂ going into the atmosphere has been dramatically increasing, well, then that would suggest that the CO₂ theory of climate change is just inaccurate.

Dr. CHRISTY. Well, I'm very happy to say you're acting like a scientist here. When a theory contradicts the facts, or the other way around, you kind of try to change the theory. And that's what we've shown, is that the key metric, the bulk atmospheric temperature, is not obeying what climate models say. The real world is not going along with that rapid warming, and so that should tell us our understanding is not sufficient to explain what is happening in the real world. We don't know how CO₂ is affecting the climate.

Mr. ROHRABACHER. So the models based on this are obviously incorrect?

Dr. CHRISTY. The models need to go back to the drawing board, I think.

Mr. ROHRABACHER. Thank you very much.

Chairman SMITH. Thank you, Mr. Rohrabacher. And the gentleman from Maryland, Ms. Edwards, is recognized for her questions. I'm sorry, the gentlewoman from Maryland is not here. The gentleman from California, Mr. Bera, is recognized.

Mr. BERA. Thank you, Mr. Chairman. You know, as a scientist and a physician, I agree, you gather the facts, and you take those

facts, and you make a decision. I don't think anyone disputes that both NASA and NOAA look at 2015 as the hottest year on record. I don't think anyone disputes, you know, that the—that climate does change. I mean, in my home state of California, we've gone through several years of devastating droughts, loss of the snow pack. I'm grateful that we're getting a lot of snow, and, you know, we're getting that snow pack, and we're getting a lot of rain, and El Nino, but climate does fluctuate, and it changes, so I think we can agree on that as well.

You know, we do—if we look at extremes of climate, we're having more extremes of climate. If we take the fact that, you know, look at our poles, North Pole, Antarctica, you know, we're seeing more glacial melt off, and, you know, more extremes of melt. So those are the facts, and we should accept those facts. We can debate what's causing this, and we certainly should have that robust debate, but based on those, I think many of us take these as just objective facts of what's happening.

We're seeing, you know, in my colleague, Congressman Derek Kilmer's district, you know, Native American tribes that have lived on coastal plains for thousands of years are now subject to chronic flooding, and having to move to high ground. So, again, we can take those facts. This body then has to debate what can we do to help move this forward?

You know, Dr. Steer, if I think about it, it can't just be one country moving forward, because we're talking about a global climate. The reason why you have to act as an international community is setting targets. And, again, I think—what I was pleasantly surprised about at the Paris accords is, you know, some of the countries that we have the most concern about, countries like India, who, I think, many of us thought could really undermine the Paris accords, really stepped up to the plate. I mean, and this is a country that will be making massive investments in energy. You know, the—300 million Indians have no reliable electrical source. There is a real opportunity to come up with innovative electrical sources in a very different way, using alternative and renewable energies.

And, you know, I guess, Dr. Steer, as we look at this, you've already indicated corporate America gets the economic opportunity here. Many of us get the job creation opportunity here. And what would you say if, you know, the next concrete steps, and also what the facts are?

Dr. STEER. Well, thank you, Congressman Bera. I agree very much with you. Look, no individual country operating on its own can address this problem. Global problems require international cooperation. That's been massively lacking for the last quarter century. And what we've seen in the last year, actually, is potentially the emergence of a new multilateralism, and it's a multilateralism led by the United States.

Because the United States, including the George W. Bush Administration, and the current administration, have said, look, we are not going to put ourselves under some global treaty. We are going to have a situation where we are going to pledge, we're going to be transparent, and something very dynamic is going to happen. And it's going to happen because costs are falling, and because sig-

nals will be given to the private sector. And what we have now in the Paris deal is precisely that.

It's actually a very modern type of deal, because it's not based upon sending you to prison, or sending you a requirement to pay something if you don't deliver. It's rather saying, look, we are going to move in a certain direction. Every year that passes, costs are falling. And that's why Prime Minister Modi, you know, as you say, he came into power—he didn't come in, you know, committed to the environment. He came in to promote economic growth. He looked at his solar targets, which were 20 gigawatts by 2022, and he said, let's quintuple them, to 100. Why did he do that? It wasn't because he, you know, wanted to look good on the international stage. He actually did it because he wanted to promote a new industry. He wanted the notion that there were factories that are going to be built, and that's exactly what he's going to do, and that's why China is spending 120 billion on renewable energy last year. So something is going on out there that is going to lead to an upward—

Mr. BERA. Because the economics make sense. And if we want to be smart, and we're looking at 21st century industry, I want our companies to be creating those new energy sources. I want our company to—our companies to lead solar and wind, the thousands of jobs that are going to be created. And, again, let's be smart about this, and let's win this. And this is smart business, it's smart investment, and it does protect our planet for the next generation. It's the right thing to do, so thank you. I yield back.

Chairman SMITH. Thank you, Mr. Bera. The gentleman from Texas, Mr. Weber, is recognized for questions.

Mr. WEBER. Thank you, Mr. Chairman. Mr. Steer, in your exchange with my good friend Eddie Bernice Johnson from Texas, you got pretty exuberant one time, and you said there's 25 billionaires involved. Do you remember that exchange with her? Do you remember that? Yeah. So I take it, because of the, I guess, status of being a billionaire, I take it, in this current presidential campaign, you would be a Donald Trump supporter?

If—so—here's my question for you, Dr. Steer. If climate change theory is right, assuming that all other countries comply—that all the other countries comply, and don't cheat, then we will all stay equal, as it were, quote, unquote, in our respective competitive positions. We're talking about global marketing now. But, if the theory is wrong, or if countries cheat, not that they would ever do that, the U.S. stands to lose the most, in terms of our competitive position. Does either one of those two scenarios I just laid out concern you?

Dr. STEER. Well, as—I think it was—Mr. Eule made the point that, actually, at the moment, the United States, for example, has a great cost advantage in electricity. Consider the steel industry in Indiana. The cost of electricity to the steel industry is about 60 percent what it is in Hebei Province, which is the sort of big steel section of China. Under the U.S. Clean Power Plan, the estimation is that electricity prices will rise between five and ten percent, and then would fall back down again. So even under that, we don't have to worry about the competitiveness of the United States steel industry. The academic evidence—

Mr. WEBER. Well, that's really my question, is are you concerned about either one of those two scenarios, whether we lose our competitiveness, or that the other companies—other countries would cheat? Are you concerned about either one of those?

Dr. STEER. I fear that we will lose our competitiveness if we do not act on climate.

Mr. WEBER. If you don't act?

Dr. STEER. Yeah.

Mr. WEBER. Mr. Eule, let's go to you. Do you—do I need to lay out those two scenarios again? Are you—

Mr. EULE. Congressman, it's a very big concern. I mean, all you have to do is look at what's going on in Europe. There—in Europe, energy intensive industries are becoming an endangered species, and they're even recognizing now that they have a real problem. And when you talked five years ago in Europe about energy, it was all focused on climate change. Now it's—there's still a focus on climate change, but they're talking more now about competitiveness, and how they're going to position themselves in a competitive world. And I think we're headed down the same path—

Mr. WEBER. Yeah.

Mr. EULE. —if we're not careful. And I would like to point out, about China, and China's adoption of renewable energy, it's also true that China has, under construction, planned about 460 billion lots of coal fired power plants, and India has about 360 billion lots of coal fired power plants, either planned or under construction.

Mr. WEBER. So are you suggesting—

Mr. EULE. India—

Mr. WEBER. Are you suggesting we sic the EPA on them?

Mr. EULE. Well, I'm just saying, you know, in the—made the pledge in Paris, and after Paris they still said that they're going to go ahead with their goal to double coal production in five years. So while a lot of countries are making baby steps toward renewables and alternative technologies, coal is still going to be the go-to fuel for providing electricity in these countries.

Mr. WEBER. Okay. Thank you. And, Dr. Christy, I'm coming to you, those same two scenarios. Are you concerned about either of those two scenarios?

Dr. CHRISTY. Well, I look—are you talking about if the climate models are wrong?

Mr. WEBER. Well, if climate change theory is right, okay, then, assuming all countries comply, and don't cheat, and we all stay equal, as it were, in our respective competitive positions, but if it's wrong, or if those countries cheat, then we lose our competitive position. Are you concerned about that?

Dr. CHRISTY. Well, the one I study is the climate model issue the most, and the evidence, to me, indicates they're wrong. They just—the data is not matching up with—

Mr. WEBER. And you're very concerned about that?

Dr. CHRISTY. I'm very concerned. That's why I showed the picture.

Mr. WEBER. Let me move on to Mr. Groves, thank you. Mr. Groves, I know you raised a Constitutional issue, which I appreciate, and I am concerned about that, but just as you and me talking now—

Mr. GROVES. Um-hum.

Mr. WEBER. —the scientists don't get the Constitutional issue, so—

Mr. GROVES. And I don't get the—

Mr. WEBER. You didn't hear me say that, right? But you're—would you be concerned about that scenario as well?

Mr. GROVES. Well, the area that I would be concerned about is non-compliance by the other parties. I mean, the U.S.—

Mr. WEBER. Thank you.

Mr. GROVES. —tends to take its treaty commitments much more seriously than other countries. That goes to arms control treaties, that goes to human rights treaties. And even if the U.S. joined this one, and lived up to the letter of its commitments, I wouldn't be confident that countries like India, or China, or even countries—developing countries around the world would find it economically feasible to live up to their commitments.

Mr. WEBER. So we would be tying our, as it were, proverbial arm behind our back?

Mr. GROVES. Since we would be complying and they—

Mr. WEBER. Absolutely.

Mr. GROVES. —would not, yes.

Mr. WEBER. Thank you. Mr. Chairman, I yield back.

Chairman SMITH. Thank you, Mr. Weber. And the gentleman from Virginia, Mr. Beyer, is recognized for his questions.

Mr. BEYER. Thank you, Mr. Chairman, very much. Dr. Christy, it was fun to read about your resume. I understand—your emphasis on this bulk atmosphere measurement. I mean, I saw you won a very distinguished award from NASA in 1991 for your work on that, a special medal from the American Meteorological Society in 1996 for your work on that and you lay out some criticisms of other climate scientists about using atmospheric data. You talked about—that they say—you're only measuring radiation, not temperature, that you don't allow for orbital decay and vertical drop, that you don't allow for the diurnal drift problem, the east to west. And then you also responded and say, no, you've adjusted for all that stuff.

But then you go on to criticize the surface measurement, saying, you know, one meter deep in the ocean is not the same as three meters above, that there's infrastructure buildup that they don't allow for. In fact, you even say, and I quote, that those who measure at the surface use “unsystematic measuring methods and instrumentation”. So question number one is doesn't it make sense to use all of the data we have, both yours and the stuff on the surface? And number two, does it really make a difference whether 2015 was the first warmest, or the second, or fourth, if we're looking at all recorded data?

And three, doesn't it make sense to look at what's really happening, not between 20,000 and 50,000 feet, where we don't live, but here, where we have sea level rise all along the Virginia coast, where the surges in Norfolk, Virginia are getting worse, and worse, and worse, as developed by Lockheed? The migration of animals, the migration of insects, and the decimation of forests in the north, the migration of tropical diseases, which is on the front page of the papers, these days, the disappearing Arctic ice, and Greenland ice,

and other stuff. Shouldn't we put all of these things together, as opposed to—you don't like the models, but let's also look at what's happening to our lives.

Dr. CHRISTY. I'll try to back up with those. I might have to ask you to remind me what the question—

Mr. BEYER. I'm sorry.

Dr. CHRISTY. But for the third one, the bulk atmospheric temperature is where the signal is the largest, so that's where you go to look for it, if you're a scientist. We have measurements of that. It doesn't match up with the models.

Now, all those other things you've mentioned, if you take systematic measurements back 1,000 years for those very issues you talked about, I'll bet you'll see the same type of variations. The droughts mentioned in California, they were 100 years long when you go back about 9 or 800 years, not just four years, as this one has shown. So I think there's a little bit of hyperbole, and all those things that people see changing right now, they've always changed, I suspect. What was your second question? And then we'll—

Mr. BEYER. Does it make any difference whether it's the first warmest, or the second, or fourth?

Dr. CHRISTY. No. Individual years, no, it's really not critical on that. It's the longer term trend, which is what I was showing. That's the more critical parameter, because it talks about the accumulation of heat. It's not happening the way models project it to. And number one was?

Mr. BEYER. That's good. I would've loved to have seen the rest of that. You stopped at 2025, or 2020, to see where it went in 2050 and 2100.

Dr. CHRISTY. It just kept going.

Mr. BEYER. Kept going up?

Dr. CHRISTY. Yeah.

Mr. BEYER. Mr. Eule, you talked—really fascinating, from a Chamber perspective, I'm a businessman also, that you're going to look at where the cost-effectiveness of the technologies are, that when solar, and wind, and tidal and stuff begin to approach the cost of fossil fuel, the problem will take care of itself. Exxon-Mobil has come out for a carbon tax, carbon pricing. I had a good conversation with the Chairman of BP in Davos last week, who said they also support a carbon tax. Would the Chamber support a carbon tax to bring these different methods into balance, especially if all of the revenue is returned to the American citizens, so it was revenue neutral?

Mr. EULE. We would have to see what the proposal looked like. We're—we've never said we were opposed to a carbon tax, never said we were in favor of a carbon tax. Never said we were opposed to cap and trade, never said we were in favor of cap and trade. We always have to see what the legislation says, and then we make a decision.

Mr. BEYER. Okay. That's fair. Thank you very much. Dr. Steer, it's been alleged that all of the Paris agreements and stuff will have a devastating economic impact. How do you reconcile that with the fact, since 2009, no country in the world has reduced its carbon footprint more than the United States, and we've had 70

straight months of private sector job growth, 18 million new jobs since January 20, 2009? How do you put those together?

Dr. STEER. Well, I agree with you, Congressman, that actually this is part of this learning that we're doing right now. The United States, we here, in this economy, are on the forefront of something we didn't understand before, which is if you actually focus on the efficiency of economy, you will want to emit less greenhouse gases. And smart policies for climate change will lead to more efficiency, more technology, more long term certainty. So, I mean, I think you're absolutely right.

The Global Commission on the Economy and Climate, which is chaired by President Felipe Calderon, the previous President of Mexico, a conservative President of Mexico, you know, he said, you know, that—when I was a young politician, he said, I believed there was a tradeoff between climate action and economic growth. When I was president, and I was chairing the G-20, I believed that, actually, economic growth and climate action could be compatible. He said, now, I've looked at the facts, and I know that long term healthy economic growth is only possible with climate action. So I agree very much with you, Congressman.

Mr. BEYER. Thank you much. Thank you, Mr. Chair.

Chairman SMITH. Thank you, Mr. Beyer. And the gentleman from Florida, Mr. Posey, is recognized.

Mr. POSEY. Thank you very much, Mr. Chairman. Several of you have, and almost everybody else has referenced the increase in cost—energy cost to Americans, and this is all about energy. And further down the chain, the increases affect virtually every product or service of every American. Example, I talked to some people in the cement manufacturing business, and they said, under the proposed EPA rules now, if they're allowed to go into effect, in my state, half the manufacturing will close immediately, and the other half will be able to hang on for a year, long enough to get re-established in Mexico. And I don't think there's any environmental protection regulations of significance in Mexico regulating cement, and the manufacturing. And so, you know, unless you believe in such a thing as a no peeing section of a swimming pool, you know, we still get the pollution, we just pay 400 percent more for the product, you know?

So I wondered, Mr. Eule and Mr. Groves, you had expressed to us the bottom line of your thoughts about the U.N. climate negotiation. Do you think this is simply an attempt to transfer wealth, or do you see other, more legitimate purposes?

Mr. GROVES. Sure. Well, both Mr. Eule and I were there in Paris during these negotiations, and we can tell you from firsthand experience that the big issue in Paris was money. I studied not just agreements like these, but other agreements that deal in wealth transfers from the global north to the global south, from the developed world to the developing world, and the Paris agreement is no exception to the general trend in global U.N. agreements regarding global wealth transfer. And if it's enforced, that's essentially what will happen.

Only the developed countries are required to pay into the Green Climate Fund, which is going to be \$100 billion a year as a floor, beginning in the year 2020. And all of those dollars go to the devel-

oped world, which is in the global south. So if that's not kind of a global wealth transfer, I'm not sure what is.

Mr. EULE. I would say there are mixed incentives in the talks. But I think what's interesting is what Christiana Figueres said. She's the Executive Secretary of the U.N. Framework Convention on Climate Change. And it's in my testimony, and I'll quote what she said. "This is the first time in the history of mankind that we are setting ourselves the task of intentionally, within a defined period of time, to change the economic development model that has been reigning for at least 150 years, since the Industrial Revolution."

So I think a lot of people see these talks as a way to change the economic development system, and I think that's something we should be concerned about, because the free enterprise system that we have has been responsible for the biggest boost in human health and welfare in history, and so I think we have to be cautious about where these talks go.

Mr. POSEY. And I agree. And it's—and I hadn't intended to make this comment, but, you know, we won the Second World War. The world is more free today because we had enabled industrialists to produce, and we out produced the enemy. And here, I mean, I think most people have the common sense to understand that most of the rest of the world is in favor of us being less productive if it makes them more productive.

But based on so much that we've seen in the governments that they're actually trying to help with our money here, do you think that's—any probability that the funds would be properly used, or would we see more waste, fraud, and abuse, like we have with many other—with many of the other resources we use to disperse Americans' wealth to other people?

Mr. EULE. Well, I think, certainly, if Congress is going to be appropriating the money that goes into the fund, Congress should have a say in how it's spent. And there are rules that are being set up in the Green Climate Fund to oversee how the money is being spent. But, you know, I think the focus on the Green Climate Fund is a little bit displaced, because a lot of the money is not going to go through the Green Climate Fund. Even the Obama Administration has said we're not going to be sending \$100 billion through the Green Climate Fund. That is just not going to happen. A lot of it's going to go through the World Bank. A lot of it's going to go through other development banks. Some of it will go through the Green Climate Fund. But it's going to be coming from—the \$100 billion that the developed countries have pledged to mobilize is going to be coming from a lot of different sources, and so that makes it a little bit more complicated to track actually who's providing the money, and where it's going.

Mr. POSEY. Yeah, there's just such a historical problem with corruption in those processes every time we get involved. And I assume my time has expired. Thank you, Mr. Chairman.

Chairman SMITH. Okay. Thank you, Mr. Posey. The gentleman from California, Mr. Swalwell, is recognized.

Mr. SWALWELL. Thank you, Chair, and I'm glad Mr. Posey brought up World War II, because when I think of the challenges of the 20th century, and what we're facing now in the 21st century,

it was America's role in World War II that really changed the dynamic of that cause, and I think the world is a better place because America acted. And Dr. Steer, I'm wondering, what does climate change look like if America does not act? Like, if we were, you know, in this next, I think, greatest challenge to the world since, you know, World War II, probably separate from, you know, extreme terrorism is climate change. And what happens if the United States does not act?

Dr. STEER. The United States is the indispensable leader, in terms of the technologies that are required, the pro-market approaches, the pro-business, pro-growth, approaches. That is the only way we can address it. This is something that the United States is uniquely qualified to lead in. We would not have the Paris deal, had the United States not been a leader there, and so we look forward to continued leadership.

Mr. SWALWELL. And, Dr. Steer, are you familiar with the U.S. military, and its belief on whether or not climate change is happening, and whether or not it should adjust in its modeling for the future?

Dr. STEER. Yes. Look, the United States military is a leader in understanding climate change. It, more than most other institutions, has said we have to act, because climate change is affecting us in several ways. It's making the world much less secure. It's also raising our costs, quite frankly. The U.S. Navy, as you know, is exploring just how much it is going to cost to raise the moorings for its ships, given they're projecting over a meter rise in sea level this century.

So the U.S. military, and actually NATO—I met last week with the head of NATO, Prime Minister—ex-Prime Minister Stoltenberg in Davos, and NATO is concerned, deeply concerned, about climate change.

Mr. SWALWELL. Great. Thank you, Chair, and I yield back.

Chairman SMITH. Thank you, Mr. Swalwell. The gentleman from Oklahoma, Mr. Lucas, is recognized for his questions.

Mr. LUCAS. Thank you, Mr. Chairman, and I would like to introduce into the record a letter led by my friend from Oklahoma, Congressman Mark Wayne Mullin, and Congressman Tim Murphy, signed by myself and 26 other colleagues.

Chairman SMITH. Without objection.

[The information appears in Appendix II]

Mr. LUCAS. Thank you, Mr. Chairman. The letter was sent to the EPA, seeking clarification on potential EPA plans to embed U.S. federal employees in foreign countries to help monitor their progress towards the Paris climate promise's goals. The EPA has yet to respond to the letter, but I'm hopeful they will take the letter seriously, and address our concerns soon.

With that, Mr. Groves, are you concerned that the EPA is going beyond their legal authority by sending employees overseas?

Mr. GROVES. Well, that article and that letter is the first that I've heard of this, Mr. Lucas. But I think what it does show is kind of the mischief that can—our federal agencies can get themselves into once you have something like the Framework Convention on Climate Change, and the Paris agreement being signed, is you have something that they can point to that authorizes them to en-

gage in this type of international cooperation. I mean, I would be interested in seeing where the funding is coming from to pay U.S. employees taxpayer dollars to go help other countries with their climate change issues.

But from a legal standpoint, you know, when the President signs things, and treats them as executive agreements, like he's treating the Paris agreement, then it gives agencies like the State Department and the EPA clearance to go out and do this, or at least some type of justification they can point back to. But I think it's something that's worthy of further examination.

Mr. LUCAS. Absolutely. Mr. Eule, on principle, wholeheartedly disagree with the concept of devoting U.S. taxpayers' money to enforce an international agreement that the Senate's not yet even ratified. With that being said, I understand it's the EPA's intent to move forward and help China get a handle on its greenhouse gas emissions. Do we really have a clue how much greenhouse gas China is emitting?

Mr. EULE. No, Congressman, we don't. There was an interesting report in the New York Times a few months ago which said that Chinese had been underestimating their coal consumption by 17 percent. Just to give you an idea of how big that is, in emissions terms, that's equivalent to the greenhouse gas emissions—not just CO₂ emissions, but the greenhouse gas emissions of Germany, so this is not a trivial error. And one of the aspects of the Chinese pledge is to set up a trading system, emissions trading system. And, you know, the question I have is how can you set up an emission trading system when you really don't know how—what your emissions are? So, yeah, that's a big problem. And it's not just with China, by the way. I think this is a problem a lot of developing countries have. They really don't have a handle on how much they're emitting.

Mr. LUCAS. So it's hard to enforce an agreement that you don't have any details for at home, you don't have any facts to work from of substance?

Mr. EULE. Well, I mean, one of the things in the Paris agreement is to set up a system where they're supposed to be able to do that, but we'll just have to see how that works out.

Mr. LUCAS. Absolutely. Well, it'll be fascinating to see how the EPA responds on this concept of sending U.S. employees out to enforce agreements that the Senate hasn't yet approved. With that, Mr. Chairman, I wait with intensity on our friends at the EPA to respond, and I yield back.

Chairman SMITH. Thank you, Mr. Lucas. And the gentleman from Texas, Mr. Veasey, is recognized.

Mr. VEASEY. Thank you, Mr. Chairman. Dr. Steer, I wanted to ask you about the transfer of wealth from developed to developing nations that was a part of this agreement. Can you comment on that a little bit, and why it's important to include a financial mechanism in the agreement, and what are the consequences for the U.S. not committing resources to developing nations?

Dr. STEER. Thank you, Congressman. Yes, the 100 billion that is often referred to is not all public money. It includes private money. It includes the money that comes from the private sector that can actually be stimulated by the public money. And only a very small

portion of that will go through the Green Climate Fund, by the way. Most of it will go through many other channels, as Mr. Eule says.

Look, countries in Africa are severely affected by climate change. I think the science is pretty clear on that. Yields will, other things being equal, decline, and it's—quite frankly, it's not pleasant, if you are a very poor farmer, and your yields decline further. They need help on new seeds. We know how to do that. So too, of the 1 billion people that would be affected by a rising sea level of a meter, most of those are poor. Most of them are living in very low lying areas. They need help, quite frankly. And so, to us, it's pretty obvious that poor people require help. It needs to be provided, in link with private investment, and it needs to be provided in a way that promotes jobs and growth.

So, I mean, quite frankly, under the agreement in Paris, the obligation for the United States, or any other country, to give any specific amount of money does not exist. That is not a legal obligation. What is required is that we are transparent about the extent to which we are willing to help low income countries.

Mr. VEASEY. You know, you kind of—in that same lane, when it comes to opportunities for American businesses being able to export technologies to the developing world, what kind of opportunities do you see there?

Dr. STEER. Look, I think that I would—I'm pretty confident that for every dollar of public money that the United States puts in to help developing countries on their mitigation, on their adaptation, because it will be leveraged with private investment, I'm pretty confident that more than a dollar will come back to the United States in terms of additional trade and investment.

Mr. VEASEY. Well, yeah, that's remarkable. Thank you, Dr. Steer, I appreciate it. Mr. Chairman, I yield back my time.

Chairman SMITH. And thank you, Mr. Veasey. And the gentleman from Illinois, Mr. LaHood, is recognized for his questions.

Mr. LAHOOD. Thank you, Mr. Chairman, and I want to thank the witnesses for being here today, and your testimony. Mr. Groves, I wanted to ask a couple questions on the legal issues and Constitutional issues. Obviously, I was not in Paris. It sounds like you were, and many of the panelists were. In terms of the discussion that went on on why this was not a treaty, and an agreement, or a promise, you know, it seems like so much of our foreign policy is premised on the rule of law, our democracy, Constitutional democracy, how we do things in our country. And so when the question is asked by other countries or other entities, why is this not a treaty, and that's posed to this administration, what's the response, and what are the consequences of that?

Mr. GROVES. Well, the response—and it's not like our delegation was shy about this in Paris. The response was, you know, we cannot get this through the Senate, and so that's why we're not going to treat it as a treaty. This didn't come out of the blue when White House Spokesman Jose Earnests was asked about this in March of last year, about whether the Senate would be able to review the Paris agreement. He said, well, I don't really think that the Senate, who's full of climate deniers, should have a say on making climate change policy. And when the host of the Paris conference, Laurent

Fabias of France, the Foreign Minister, was asked about this, he said, well, no matter what we do, we can't have an agreement that would have to go to the U.S. Congress, because it's not going to pass. So it was the biggest open secret in Paris, that whatever they agreed to, it was—it would have to be something that the U.S. would have to come back to the United States and not have to pass Congressional muster with.

So, although the rest of the world will require and expect the United States to live up to its mitigation reduction commitments, and live up to its financial commitments to send billions of dollars every year, the fact that it didn't have any type of Congressional scrutiny I think really speaks to the legitimacy of the agreement.

Mr. LAHOOD. And in terms of the commitments and promises made in this non-binding agreement, tell me how that affects our domestic law, and how is that binding on corporations here, and whether there's compliance or non-compliance, and is there precedent for that?

Mr. GROVES. Well, it's a clever thing that the White House did, is you go and you make an international commitment in Paris, you bypass Congress completely, and then you go to enforce it domestically through EPA regulations. So there's a lack of democratic legitimacy on almost every level of the creation of this document and its enforcement. And these EPA regulations, like the Clean Power Plan, will be litigated. You know, Congress has passed resolutions disapproving of them. But, of course, those EPA regulations will be binding on U.S. corporations.

Mr. LAHOOD. Yeah. And, Mr. Eule, I would just—following up on that, it seems incongruent to me that we continually, around the world, talk about democracy, and Constitution, and the system of government we have here, but we are doing this the opposite way here, and, you know, and not going through the treaty process, which, of course, is cloaked with the legalities that are binding. Can you comment on that?

Mr. EULE. Yeah. I think, you know, if you want a durable climate change agreement, and durable climate change policy, you have to involve Congress. It's as simple as that. And this administration has chosen not to do that. And so the question is, is this a durable treaty, politically and legally? And I would venture to say that the answer is no.

Mr. LAHOOD. Thank you. Those are all my questions, Mr. Chairman.

Chairman SMITH. Thank you, Mr. LaHood. And the gentlewoman from Oregon, Ms. Bonamici, is recognized for her questions.

Ms. BONAMICI. Thank you very much, Mr. Chairman, and thank you to all of our witnesses for appearing before the Committee. I represent Northwest Oregon, and climate change is a very important issue for my constituents. I go out to the Oregon Coast, that's the western boundary of my district. People there rely on a healthy ocean. You may have heard of our famous Pinot Noir wine from Yamhill County, Oregon. They need a particular climate for those grapes to grow well. We have entrepreneurs who are developing new clean energy technologies.

So there are many Oregonians who are working to address and mitigate climate change. In fact, this weekend I'm looking forward

to meeting with the Willamette Valley Wineries Association, and they want to talk about climate change. And they're calling it climate migration. We're getting people coming up from California, it's too dry, it's too hot. I don't want to lose our industry to our wonderful state to the north, or to Canada.

So I wanted to also talk about shellfish growers on the Oregon coast. And they've spoken with me about significant losses because of ocean acidification. Oyster production is a multi-million dollar industry on the West Coast. It supports thousands of jobs, and ocean acidification is threatening that industry, but also—not just in Oregon, Gulf of Mexico, New England, the Mid-Atlantic. And this issue doesn't just matter to coastal representatives. All of us have restaurants, and grocery stores, and people who eat shellfish in our districts around the country.

So, Dr. Steer, I wanted to ask you a little bit about how climate change affects oceans, and as a result, our fisheries, what happens to the fish population, migration, and food chain dynamics. And if you could also comment about the recent El Nino, and how it's affecting the West Coast fisheries. And then I do want to save time for another quick question, please.

Dr. STEER. Well, look, I think the understanding of science is firming up year by year. The impact on fisheries is potentially very great indeed. We know a lot about where fish come from. We know how their habitat can be spoiled by acidification, and by rising temperatures, and so there's now a very large literature on this. So I think your constituents are right to demand action for that.

Over the last year, as you know, there was a very major piece of work called Risky Business that looked at the impact of climate change at the county level throughout the entire United States. It was sponsored by Hank Paulson, and by Michael Bloomberg, and by Tom Steyer, so you had the entire political spectrum that were there, and it was quite devastating, quite frankly. And so we need to look at these facts.

Now, obviously, the science is not absolutely firm, and so it's very legitimate there'll be some scientists on different sides, but you've got to look at the bulk of where the scientific opinion is, and it's crystal clear.

Ms. BONAMICI. Thank you. And, Dr. Steer, I'd—I know you were in Paris. Welcome back to the Committee. I know there's been some discussion already this morning about U.S. leadership, but I wanted to really follow up and have you expand on that. The United States has a long history of leading on global issues that have ramifications beyond our own borders, whether it be human rights, world health, technology, innovation. We ought to be applauding the administration for being ready to lead the international response to climate change. And we have, in a relatively short period of time, seen developing countries step up and make commitments to reduce their greenhouse gas emission.

So I wanted you to comment on the perception in Paris about the role of U.S. leadership, but also, would you please address this lack of—some people are saying the lack of a binding mitigation commitment in the agreement as a negative, and there's this naming and shaming concept. Could you comment on that, and can mean-

ingful carbon reductions be achieved without legally binding mitigation commitments? How can we effectively enforce that?

Dr. STEER. Look, in Paris there was—Congresswoman, there was a remarkable gratitude for United States leadership, and I would, you know, I think we should be proud of that, actually, and this Committee should be proud of that. We wouldn't have the deal without United States leadership. But it's a mistake to say that only the United States didn't want, you know, the country deals to be—or the country promises to be legally binding. Many, many other countries, including some of the most important in the world, said count us out if, you know, if we are going to have legally binding—so this was something that was negotiated.

In our view, and remember, you know, we don't have a dog in this race. We are a research institution. Having looked at this very carefully, with our legal scholars, our scientists, our economists, our view is actually the balance between legally binding and non-binding. Given where we are as a civilization today, and a global polity today, we believe this is a smart decision, and we believe there's a potential dynamic that's going to go on, whereby, as costs fall, as we learn more, as private sector leaders, you know, and I loved what you said about the United States leadership. Great thing about the United States leadership is it's not just government.

Ms. BONAMICI. Right.

Dr. STEER. It actually—it's, you know, it's Apple, it's Walmart. It's a whole range of issues. Amazon, Kohl's Verizon, they've all made huge commitments. These are powerful institutions that are part of the partnership of change.

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

Chairman SMITH. Okay. Thank you, Ms. Bonamici. And the gentleman from Texas, Mr. Babin, is recognized.

Mr. BABIN. Thank you, Mr. Chairman, and I want to thank the witnesses for being here. Quite frankly, I'm very concerned that there is going to be a very harmful and detrimental impact on the United States of America, including, and especially, my district in Texas, the 36th Congressional District.

Mr. Eule, the regulations associated with climate change will increase the costs of energy for American citizens, especially hard-working families already struggling to get by. I would like to ask you if you could describe how the increased energy costs will impact the macroeconomic health of the United States, both for primary energy users, and also end use consumers?

Mr. EULE. Well, thank you. NERA Consulting took a look at the Clean Power Plan, and it concluded that electricity rates would rise between 10 and 14 percent, and so that's obviously going to have a big impact on the poor, minorities, the elderly, and people on fixed incomes. They also estimated that this would result in 64 to \$79 billion in losses to consumers. And, you know, when you think about the energy price advantage we have over other countries, we have to, you know, ask ourselves, is this really the road we want to go down? So I think it could have a very devastating impact on consumers and on businesses.

Mr. BABIN. Okay. And then, to follow that up, would U.S. jobs be lost if these electricity and natural gas prices increased for energy intensive trade exposed manufacturers here in the United States?

Mr. EULE. Yeah, almost certainly they will be.

Mr. BABIN. Yeah.

Mr. EULE. Again, we have a tremendous energy advantage here, and we have to thank the oil and gas industry, and the fracking revolution that's going on in this country.

Mr. BABIN. Right.

Mr. EULE. And we have a completely different energy situation than they have in many parts of the world, and we need to protect that.

Mr. BABIN. Okay. Well, if our colleagues on the other side of the aisle were being told that these new green jobs are going to increase the incomes of a lot of extra people, would these green jobs be enough to offset the manufacturing jobs we're talking about losing from the recent U.S. promise at the Paris negotiations?

Mr. EULE. It's very difficult to say, but I will say this. When you look at the last seven or so years, since the recession, the one shining star in the U.S. economy has been the oil and gas sector—

Mr. BABIN. Right.

Mr. EULE. —and that's because of fracking. From the end of 2007 to today, employment in that sector has increased by about 38, 39, 40 percent, while for the rest of the economy it stayed pretty much flat. We're pretty much back where we were back in 2007. So the one shining spot here has been the oil and gas sector, and that's because of innovation, and that's because of the entrepreneurship of U.S. companies, many of which are small and mid-sized companies. So the shale revolution in the United States has been a great boon to our economy.

Mr. BABIN. Okay. To even go further with what you just said, if you could elaborate on what the abundance of affordable natural gas, via this hydraulic fracking, means in terms of contributing to a cleaner environment, what can the fracking boom, and the new technology, what does that mean for a cleaner environment and increased standards of living, both here in the United States, and around the globe? There will be a positive impact in that regard as well, is that right?

Mr. EULE. Absolutely. And this is one thing, I think, that doesn't get enough attention in the international negotiations. And, to be perfectly honest with you, these people—these negotiators, they live in a bubble. I remember talking with a negotiator a couple years ago, and I mentioned the fracking revolution, and I said, this is going to create headwinds for any sort of agreement. And he looked at me, and he said, is this fracking thing for real? Yes, the fracking thing is for real. When people were talking about, a few years ago, peak oil, we're not talking about peak oil anymore. We have more oil than we know what to do with. We have more natural gas than we know what to do with. There are shale formations throughout the entire world. This is going to be a tremendous boom for economies not just in the United States, but for those economies that can develop their shale resources.

And so, when I look at this, and then I look at the Paris agreement, and I look at where people are actually putting their money—I mean, people talk green, but they're putting their green into shale, they're putting the green into oil, they're putting their green into natural gas, and they're putting their green into coal, because it's cheap, affordable, and scalable. So I think the shale revolution potentially is going to have a huge impact globally. Maybe not in the next five years, but certainly beyond that.

Mr. BABIN. I know it's had a huge impact on my state, the State of Texas.

Mr. EULE. And a very positive impact, not only for Texas, but for North Dakota, and Pennsylvania, and Ohio, and Colorado, and many other places.

Mr. BABIN. Right. Thank you so very much. And my time's expired, Mr. Chairman.

Chairman SMITH. Thank you, Mr. Babin. And the gentlewoman from Connecticut, Ms. Esty, is recognized.

Ms. ESTY. Thank you, Mr. Chairman, and Ranking Member Johnson, for holding today's hearing to examine policy issues surrounding the United States' pledge at the recent U.N. conference to curtail greenhouse gas emissions. I come from the great State of Connecticut, where we have found, and shown, that good environmental protection leads to economic growth, not the contrary. And I—when I look at a world where the human species needs two things, clean water and clean air, to survive, we need clean energy to be affordable and available to the entire world. So I'd like to follow up on some of the issues raised by my colleagues, because I think in Connecticut, where we're part of the regional greenhouse gas initiative, where our state and our governor have been leaders on financing clean energy projects, as well as conservation projects that are bringing down the cost of energy, and spurring innovation that is leading to job creation in our state.

The—three quick topics for you, Dr. Steer. Can you talk about the following? First, can you talk about the value of a bottom up approach? I know you were part of that in Paris, about—the reason we got U.S. mayors, states, Canadian provinces, and most importantly major U.S. corporations, who are investing in these efforts because they see the dollar imperative to do so for world markets.

Number two, can you talk about the health impacts of not addressing climate change? One of the reasons we moved early and vigorously in Connecticut, because the same rules that address climate change are helping bring down asthma rates in our cities from dirty air that's blown over from other parts of the country. It doesn't just stay there, as many of our colleagues on the panel have pointed out. It moves, but also that pollution moves with it, and has major health impacts on others, who many not get to vote on those rules.

And last, the role of technology, the upside of U.S. technology to address these issues, and license them to the world. These same engineers who developed fracking technology can also be developing, and I would argue, better off developing, clean, renewable energy technologies that can be licensed to the world, where they need them desperately. So if you could address those, I'd be very grateful. Thank you.

Dr. STEER. Thank you very much, Congresswoman Esty. First, I commend Connecticut for certainly doing exactly what you say. Until recently, your Commissioner of Environment was one of the best known environmental economists in the world, Dan Esty, and it's—it—what you managed to do is not only do the right thing, but you actually analyzed it, and you've actually shown that it works, which is a really remarkable thing.

And, by the way, it illustrates the point—I mean, coming back to fracking for a moment, fracking is a great blessing. If it's gas fracking, it can promote jobs, and so on. By no mean is that killed by the Paris deal whatsoever. On the contrary, one of the most important things we can do to address climate change is actually reduce methane leakage from fracking, and that actually would save money. It will help the frackers. In the moment, like in energy efficiency more generally, we're allowing stuff that we could be making money out of. So I think it illustrates the point that you were making, Congresswoman.

On mayors, I mean, it really is amazing, you think about it. Why would 120 American mayors say, sign me up. We, as a city, we are going to measure our greenhouse gases, we're going to be transparent about our greenhouse gases, we're going to have plans for doing something about greenhouse gases, and every year we're going to come back, be totally transparent as to whether or not we're getting there. They don't have to do that. No one is telling them. It's not a law, and so too the 450 around the world. The reason they do it is because mayors are realizing their citizens want action, and they also see it as a way of doing things that they know they should've done all the time.

And, actually, this is giving them a little political boost to do things like smarter public transportation, like bike paths, things like that, which, actually, citizens want. I mean, my—we have 350 staff 200 yards from here in our office. Half of them don't own cars, they don't want to be. It's a new era. They want bike paths. And so that would be one example.

On the health impacts, Congresswoman, you know, we tend to think, well, China, obviously, you know, people are dying, and we know that 7 million people are dying every year from air pollution, but clearly in this country, you know, we breathe clean air. Turns out that analysis shows that actually the Clean Power Plan action will pay for itself just in health gains alone. That's a really remarkable thing.

And on technology licensing, I mean, this is so crucial. I mean, why is it the high tech companies are so keen that we take strong action? I mean, why are they lobbying? Why are they committed to, you know, 100 percent renewable? Why—and the reason is they see this as an amazing growth opportunity for the United States.

Ms. ESTY. Thank you very much. I believe my time has expired. Thank you.

Chairman SMITH. Thank you, Ms. Esty. Before we adjourn, a couple of items. First of all, without objection, I'd like to put in the record a letter signed by 300 independent scientists that expressed concern over NOAA's efforts to alter historical temperature data.

[The information appears in Appendix II]

Chairman SMITH. Also, Dr. Steer, a colleague of ours, Senator Bill Cassidy, has asked me to pass along a question to you relevant to today's hearing. And could I give you that question momentarily, and ask you to respond in writing to me sometime in the next week or so? Would that be all right? Okay, thank you.

I just want to thank our witnesses. This has been an excellent hearing. We've learned a lot, and I appreciate all the expertise represented at our witness table today. We stand adjourned.

[Whereupon, at 11:50 a.m., the Committee was adjourned.]

Appendix I

ANSWERS TO POST-HEARING QUESTIONS

ANSWERS TO POST-HEARING QUESTIONS

*Responses by Mr. Steve Eule***United States House of Representatives
Committee on Science, Space and Technology****Hearing on February 2, 2016
“Paris Climate Promise: A Bad Deal for America”****Questions for the Record****Stephen D. Eule
Vice President
Institute for 21st Century Energy
U.S. Chamber of Commerce****The Honorable Lamar Smith**

- 1. How accurate are claims that efforts to combat climate change are beneficial to public health in the United States? How reliable and replicable are these scientific studies (if any) that these claims are based on? Are there any confounding variables and issues that would make it hard to verify these or other claims?**

With the plethora of new regulations coming out of the Environmental Protection Agency (EPA) targeting the power sector, double counting of benefits is becoming a growing problem. The Clean Power Plan is a case in point. EPA claims that the Clean Power Plan is justified, in large part, by the health benefits associated with expected reductions in small particulate matter (PM_{2.5}) and ozone. The benefits attributed to PM_{2.5} and ozone, however, are open to doubt. EPA already has rules in place to reduce these pollutants down to levels, in the words of the Clean Air Act, “requisite to protect the public health.” The benefits of achieving reductions for these pollutants already are accounted for in the rules setting the specific standards for them. As even EPA agrees, reducing emissions of these pollutants further would be unlikely to have any significant benefits (“[T]he available evidence . . . does not justify a [lower] standard as necessary to protect public health.”). EPA therefore cannot claim benefits for a climate change rule that already have been claimed for other rules regulating actual pollutants.

- 2. Why should Congress be skeptical of how WRI analyzes the economic impacts of the Clean Power Plan, as opposed to the NERA report? Please explain.**

There is no indication in WRI’s testimony that it has undertaken any analysis of the economic impacts of the Clean Power Plan, though it does cite EPA’s estimate that annual compliance costs will be between \$7 billion and \$9 billion annually. Several other analyses undertaken for state and industry stakeholders have estimated much higher compliance costs. Perhaps most notably, NERA Economic Consulting estimates that annual compliance expenditures will range between \$29 billion and \$39 billion annually, which translate to annual average electricity rate increases of between 11 and 14 percent. Even these estimates

may be conservative, as NERA's analysis does not include increased costs for electricity transmission and natural gas infrastructure, both of which are likely to be substantial.

Finally, these costs do not capture the broader economic ripple effect: as families and businesses spend more on monthly energy bills, less money is left over for food, housing, health care, and other necessities.

Channel, National Public Radio, Voice of America, NHK, Al Jazeera, Alhurra, and the Canadian Broadcasting Corp.

His commentary and opinion pieces have been published by journals such as National Review, The Weekly Standard, The Daily Signal, and Human Events, as well as by The Washington Times and other major newspapers across America.

Groves holds a master of laws from Georgetown University Law Center, a juris doctorate from Ohio Northern University's College of Law, and a bachelor of arts in history from Florida State University.

Responses by Dr. Andrew Steer

**QUESTION FOR DR. STEER ON BEHALF OF SENATOR BILL CASSIDY
The Honorable Lamar Smith (R-TX)
U.S. House Committee on Science, Space, and Technology**

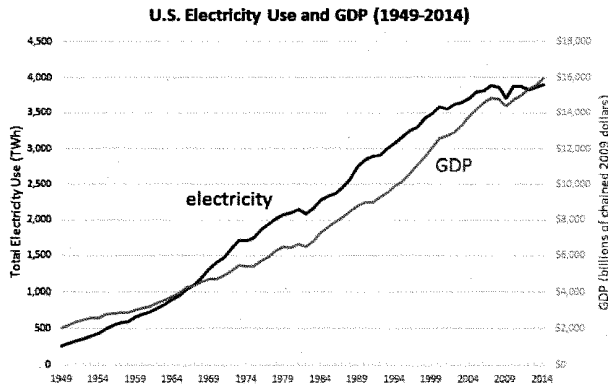
Paris Climate Promise: A Bad Deal for America

Wednesday, February 03, 2016

1. The Environmental Protection Agency (EPA) projected in its recent Clean Power Plan (CPP) rule that when completely implemented, total electricity generation in the United States in 2020 will be 4159 Terawatt-hours and ten years later, in 2030, will be 4110 Terawatt-hours, a decrease of 49 Terawatt-hours over a ten year period. Relative to the Energy Information Agency (EIA) forecast of 4691 Terawatt-hours generated, this is a 14% decrease. This is peculiar to me since, according to EIA data which dates back to 1949, there has never been a 10-year period in the US over which electricity demand in the final year was lower than the first year. Indeed, history shows a very strong, positive correlation between economic growth and per capita energy use. Assuming that the EPA is not expecting a less robust U.S. economy by 2030, will we be the first country to reduce electricity demands while simultaneously experiencing economic growth or have other countries accomplished this?

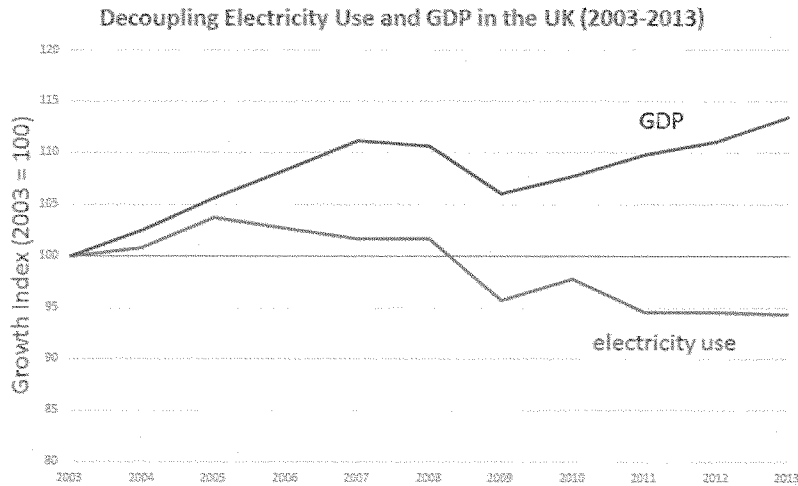
[WRI response]

Decoupling electricity use and economic growth is feasible in the U.S. and has been achieved by several countries over a period of at least ten years. As illustrated in the figure below, U.S. electricity use has largely plateaued since 2005 while real GDP grew by 12% between 2005 and 2014. This is due to a number of factors including efficiency improvements and economic restructuring away from heavy industry, and these trends are likely to continue under the Clean Power Plan rule.



Sources: U.S. Energy Information Administration; U.S. Bureau of Economic Analysis

Numerous countries have already achieved decoupling of electricity use and economic growth over at least a ten year period including the United Kingdom, Canada, Sweden, and Denmark. In the United Kingdom from 2003 to 2013, total GDP grew from \$2.29 trillion to \$2.60 trillion (calculated by the World Bank using market prices with constant 2005 US\$) while total electricity use declined from 336 TWh to 317 TWh over the same period. As illustrated in the figure below, UK electricity use dropped 6% between 2003 and 2013 while real GDP grew 13% over the same period.



Sources: OECD, World Energy Statistics; World Bank, World Development Indicators

The clear and sustained decoupling of electricity use and GDP in numerous industrialized countries demonstrates the feasibility, and increasing prevalence, of the transition to a cleaner mode of economic growth. The Clean Power Plan and the Paris Agreement present clear pathways for the U.S. to address global climate challenges while preserving economic security.

Responses to Questions for the Record Submitted by Ranking Member Eddie Bernice Johnson for the House Committee on Science, Space, and Technology
Andrew Steer, President and CEO, World Resources Institute

1) Regulations like the Clean Power Plan will not substantially drive up energy costs in the U.S. and will not have a negative impact on our competitiveness in the global energy market. For one, the U.S. is not acting unilaterally to reduce its emissions. Other major economies are also taking strong actions and putting regulations in place to combat climate change, including China, which is implementing a nation-wide emissions trading scheme.

Let's take a look at one example that demonstrates why the U.S. won't lose its competitive advantage because of climate regulations. In Hebei, China's largest steel-producing province, the average estimated electricity price for electric arc furnace steel producers in 2013 was roughly \$85 per megawatt-hour, compared to roughly \$50 per megawatt-hour in Indiana, the largest steel-producing state in the U.S.¹ Under the Clean Power Plan, EPA modelling projects that in the industrial Midwest, retail electricity prices will be roughly five percent higher in 2020 than business-as-usual, but this increase will diminish after that. Thus electricity is likely to remain significantly cheaper for U.S. electric arc furnace steel producers than for Chinese producers.

In fact, the U.S. could hurt its competitiveness by not acting on climate. Regulations encourage innovation and energy efficiency, which are drivers of cost savings and economic growth. The U.S. can't afford to be left behind while other countries become pioneers and leaders in the low-carbon economy.

2) Yes, it is necessary to implement climate policies to ensure the long term health of both the U.S. and global economy. In 2013, WRI helped set up the Global Commission on the Economy and Climate, a group of leaders in government, finance, and business. The Global Commission, whose work was overseen by a panel of the world's top growth economists, found that actions taken to tackle climate change can also generate better, more sustainable economic growth.²

Climate policies such as the Clean Power Plan can have a positive effect on the U.S. economy. They are a smart investment in public health. The EPA estimates that the air pollution cobenefits of the Clean Power Plan are worth \$25-\$62 billion alone, far more than the estimated \$7-9 billion in compliance costs.³ Adding in global climate benefits increases total benefits to \$55-\$93 billion.

A new study from *Nature Climate Change* found that if the U.S. reduced emissions consistent with its Paris Agreement commitments it could prevent approximately 295,000 premature deaths in the U.S. and have an economic benefit of \$250 billion by 2030, which is likely to exceed implementation costs. When including longer-term climate impacts, the economic benefits become roughly 5-10 times higher than the estimated implementation costs.⁴

If we don't go far enough to prevent climate change, the negative economic impacts will be profound. "Business-as-usual" policies are not sufficient to safeguard the economy or the environment. Damage to health from poor air quality in the U.S., much of which is associated with burning fossil fuels, is valued at almost 4% of GDP. Sea level rise will put valuable coastal property underwater. States in the Southeast, lower Great Plains, and Midwest risk up to a 50% to 70% loss in average annual crop yields (corn, soy, cotton, and wheat), absent agricultural adaptation.⁵ By acting on climate, the US can avoid these economic costs while spurring innovation, efficiency, and productivity.

3) WRI's work on the economic impacts of the Clean Power Plan (CPP) is ongoing and will be released later this year. Of the studies of the CPP final rule released thus far, the study conducted by NERA Economic Consulting (and prepared for the American Coalition for Clean Coal Electricity⁶) is the only one we are aware of that forecasts such negative effects on consumer electricity expenditures. MJ Bradley and Associates found that the CPP would lead U.S. households to save between 5 and 20 percent on their monthly electricity bills in 2030.⁷ A study by Synapse Energy Economics concluded that if U.S. states comply with the CPP using strategies that encourage energy efficiency, U.S. households can expect to save an average of \$17 per month on their electricity bills as a result of the CPP.⁸ Finally, in its regulatory impact assessment of the CPP, EPA found that average retail electricity bills would increase between 2 and 3 percent in 2020, decrease between 2 and 4 percent in 2025 and decrease between 7 and 8 percent in 2030.⁹

The effects on electricity expenditures is just one of many important effects of the CPP on the U.S. economy. The CPP will reduce emissions of harmful air pollutants like sulfur dioxide and nitrogen oxide. While no study has attempted to estimate the economic effects of reduced air pollution as a consequence of the CPP, an EPA study of the Clean Air Act Amendments of 1990 found that the positive effects of a healthier workforce on gross domestic product (GDP) of reducing air pollution will outweigh the negative effects on GDP of regulatory compliance costs by 2020.¹⁰ The CPP is also an important demonstration to the international community of U.S. action and leadership to reduce greenhouse gas emissions, and the long-run benefits to the economy of avoiding climate change are likely to be quite large.

4) The Green Climate Fund's mission is to support much-needed climate mitigation and adaptation activities in developing countries and catalyze further investments from a range of actors, including the private sector. It is expected to support a broad spectrum of countries. At least half of the Fund's adaptation resources will go to African States, Small Island Developing States, and Least Developed Countries, with more going to the most vulnerable states, many of which are in Sub-Saharan Africa. Addressing impacts of climate change is critical to avoid undermining or reversing development gains in poor countries, especially those in vulnerable regions like Sub-Saharan Africa. Furthermore, the fund is well-positioned to leverage private capital from public resources, much more so than other climate funds.

By enabling dynamic economies to grow with lower emissions, the GCF will help ensure that U.S. efforts to cut GHG emissions are reciprocated by other countries and have a real chance to arrest climate change. Many emerging markets are already among the largest GHG emitters, and their emissions are growing quickly. Enabling them to make the transition to cleaner energy sources and increased resource efficiency will be essential for the success of our collective effort to keep GHG emissions below dangerous levels.

Climate change is also an important security issue. Experts, including those at the Department of Defense, have identified climate change as a "threat multiplier" that can exacerbate existing threats to U.S. and international security, such as competition for natural resources, disease, and civil strife.¹¹ Many of the world's poorest countries are also among the most vulnerable to climate change. By helping vulnerable countries to build resilience to changing weather patterns, sea level rise, and extreme weather events, our investments through the GCF will help counter security threats that otherwise would have to be confronted with more costly interventions.

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- ¹ International Energy Agency, 2014. *World Energy Outlook 2014*. Accessible at: <http://www.worldenergyoutlook.org/weo2014/>.
- ² Global Commission on the Economy and Climate, 2014. *Better Growth, Better Climate: the New Climate Economy Report*. Accessible at: <http://2014.newclimateeconomy.report/>.
- ³ U.S. Environmental Protection Agency. "Regulatory Impact Analysis for the Proposed Carbon Pollution Guidelines for Existing Power Plants and Emission Standards for Modified and Reconstructed Power Plants", RIA, Table ES-10, p. ES-23.
- ⁴ D. Shindell, Y. Lee, and G. Faluvegi, February 22, 2016. "Climate and Health Impacts of US emissions reductions consistent with 2°C." *Nature Climate Change*. Accessible at: <http://www.nature.com/nclimate/journal/vaop/ncurrent/full/nclimate2935.html>.
- ⁵ Risky Business, 2014. "A Climate Risk Assessment for the United States." Accessible at: http://riskybusiness.org/site/assets/uploads/2015/09/RiskyBusiness_Report_WEB_09_08_14.pdf.
- ⁶ See American Coalition for Clean Coal Electricity website: <http://www.americaspower.org/nera>.
- ⁷ MJ Bradley & Associates. *EPA's Clean Power Plan: Summary of IPM Modeling Results*. January 13, 2016.
- ⁸ Synapse Energy Economics. *Cutting Electric Bills with the Clean Power Plan: EPA's Greenhouse Gas Reduction Policy Lowers Household Bills*. January 14, 2016.
- ⁹ U.S. Environmental Protection Agency. *Regulatory Impact Analysis for the Clean Power Plan Final Rule*. August 2015.
- ¹⁰ U.S. Environmental Protection Agency Office of Air and Radiation. *The Benefits and Costs of the Clean Air Act from 1990 to 2010*. April 2011.
- ¹¹ U.S. Department of Defense <http://www.defense.gov/News-Article-View/Article/603440>

Andrew Steer, CEO of World Resources Institute, response to *Statement and Questions for the Record Hearing of the House Committee on Science, Space, and Technology "Paris Climate Promise: A Bad Deal for America" February 2, 2016, posed by Congresswoman Esty.*

Question: Thank you, Chairman Smith and Ranking Member Johnson, for holding today's hearing to examine policy issues surrounding the United States' pledge at the recent United Nations-led effort to curtail greenhouse gas emissions. Connecticut is proof that local and state governments can partner with industries to deliver a more bottom-up climate action agenda. Connecticut has bolstered a 21st century model that coalesces international commitments of reducing greenhouse gas emissions with other key players who are leading us toward a carbon-free world. In my state, Mayors, Governors, CEOs, corporations, and energy companies are now taking the reins on climate action like never before.

Most impressive is Connecticut's participation in the Regional Greenhouse Gas Initiative (pronounced "reggie"), a cooperative effort among nine states that reduces carbon pollution in the electrical sector. And it's no coincidence that the RGGI states have the highest economic growth in the nation. It has been shown time and again that environmental protection and economic growth are not mutually exclusive, and such is the case in Connecticut. Under the RGGI plan, Connecticut's economic growth has been vast: 863 jobs were created and our economy grew by \$56.2 million.

Connecticut's success doesn't stop there. Under the leadership of Governor Dannel Malloy, Connecticut established the nation's first ever Green Bank, a program that leverages public and private funds to make green energy more accessible and affordable for folks in Connecticut. Solar companies in Connecticut are thriving because of the Green Bank: more than one hundred and forty-seven solar companies are powering 15,000 Connecticut homes. Compounding this success are state programs that empower residents and businesses to use energy more efficiently, like Energize Connecticut, an initiative that has saved neighborhoods, in my hometown of Cheshire, thousands of dollars in energy costs.

Forward-thinking corporations headquartered in Connecticut, such as United Technologies, General Electric, Xerox, and LeGrand North America have joined more than 150 companies across the United States in signing the American Business Act on Climate Pledge. United Technologies, in Farmington, Connecticut, has pledged to honor its long-held commitment of helping the state

remain on a trajectory that will yield an 80% reduction of emissions below 2001 levels by 2050.

Dr. Steer, how do we convince developing nation, skeptics, and all other parties that a broadened approach, one that includes state governments, cooperatives, businesses, and energy companies is the vastly superior mechanism to mitigating climate change?

Response: Climate change is not just a national problem; it is a global challenge that will require concerted effort from all levels of government and all types of actors. For the complex major economies of developed and developing countries we need to work with the systems in place, not against them in order to maximize opportunities and minimize the negative impacts from efforts to mitigate carbon emissions. As urgent action is needed, businesses, local governments, energy companies and other key actors are a key part of the solution. These actors are often more agile and have more flexibility than large national governments, and they also have in-depth understanding of the different levers and linchpins where transformational opportunities lie. Furthermore, the actions of governments and non-state actors are inextricably linked and mutually reinforcing. When national governments set climate targets or adopt new policies, they send clear signals to non-state actors. When non-state actors take action and set targets, they help provide confidence that national governments need to set and meet ambitious goals. A broad approach that encompasses and supports all actors, will get us further, and at a faster pace, toward the goals of the Paris Agreement.

Appendix II

ADDITIONAL MATERIAL FOR THE RECORD

STATEMENT SUBMITTED BY REPRESENTATIVE DONALD S. BEYER, JR.

DRAFT

Statement for the Record by Rep. Don Beyer (VA-08)

House Committee on Science, Space, and Technology Hearing:

“Paris Climate Promise: A Bad Deal for America”

February 16, 2016

On February 2, 2016, the Chairman of the House Committee on Science, Space, and Technology provided an opening statement at the hearing titled, “Paris Climate Promise: A Bad Deal for America.” The hearing ostensibly sought to weigh the benefits and costs of U.S. participation in and implementation of the recent climate agreement reached in Paris, France in December of 2015, but as the hearing title indicates, the majority is bent on casting the agreement in a negative light – unfairly in my view. The Chairman’s opening statement contained numerous errors, omissions, and misleading statements, both regarding the agreement and regarding the science, impacts, and economics of climate change. Given the importance of strong U.S. leadership in recognizing and addressing the causes and effects of global climate change, I hereby respectfully offer this rebuttal for the record in order to refute the inaccuracies contained in the Chairman’s statement.

Chairman: “President Obama submitted costly new electricity regulations as the cornerstone of his agreement at the Paris U.N. climate conference last December. These severe measures will adversely affect our economy and have no significant impact on global temperatures.”

- **Congressman Beyer:** Incorrect. Most importantly, failure to act to mitigate rising global temperatures will likely cause the U.S. to suffer billions of dollars of damages to agriculture, forestry, and fisheries, experience coastal and inland flooding, and become increasingly subject to heat-driven spikes in electricity bills, among other impacts. Furthermore, contrary to the tired argument that environmental protection must come at the expense of economic prosperity, environmental protection is compatible with economic growth, and U.S. environmental policies have delivered huge benefits to Americans. The United States can achieve its commitments through the Paris Agreement in concert with economic growth. It is in our economic interest to act.¹
- This sentiment is echoed loudly by the business community, as evidenced by a letter sent last year from 365 companies—including General Mills, Adidas, Nestle, eBay, Gap, Levis, and Staples—to the governors of more than two dozen states to voice support for state implementation of the Clean Power Plan. They declared, “Our support is firmly grounded in economic reality. Clean energy solutions are cost effective and innovative ways to drive investment and reduce greenhouse gas emissions. Increasingly, businesses rely on renewable energy and energy efficiency solutions to cut costs and improve corporate performance. In

¹ Dr. Andrew Steer testimony at “Paris Climate Agreement: A Bad Deal for America?” (Feb. 2, 2016).

2014, a study by Ceres, Calvert Investments and the World Wildlife Fund revealed that 60 percent of Fortune100 companies have set their own clean energy targets and have saved more than \$1 billion a year in the process.²

Chairman: “[T]he president’s pledge creates an international agreement that binds the United States for decades to come, but lacks constitutional legitimacy since it has not been ratified by the Senate.”

- **Congressman Beyer:** The Paris Climate Agreement is an executive agreement properly entered into by President Obama under his authority as President. The Congressional Research Service (CRS) has noted that “The great majority of international agreements that the United States enters into are not treaties but executive agreements—agreements entered into by the executive branch that are not submitted to the Senate for its advice and consent. . . . Executive agreements are not specifically discussed in the Constitution, but they nonetheless have been considered valid international compacts under Supreme Court jurisprudence and as a matter of historical practice.”³ The CRS goes on to state that “over 18,500 executive agreements have been concluded by the United States since 1789 (more than 17,300 of which were concluded since 1939), compared to roughly 1,100 treaties that have been ratified by the United States.”⁴

Chairman: “The agreement not only requires the U.S. to reduce carbon emissions but also compels our country to pay billions of dollars to developing nations to reduce their carbon emissions.”

- **Congressman Beyer:** The Chairman mischaracterizes the nature of U.S. support to developing countries envisioned in the Paris Agreement. The Paris Agreement builds upon and affirms a goal established under the 2009 Copenhagen Accord, whereby the global community aims to “mobilize” \$100 billion annually by 2020 to aid developing countries in their efforts to mitigate and adapt to climate change. The Paris Agreement affirms and builds upon that commitment, and rightfully so: countries with greater economic means must work to ensure that the entire global community can take meaningful steps to mitigate and adapt to climate change. Mobilization of aid funding is not the direct payment of money from the U.S. to developing countries, but rather the commitment of money, including from private investment, to established and managed funds for disbursement. For example, more countries pledged to fund the Least Developed Countries Fund and the Adaptation Fund, and the United States committed to double its annual public grant funding for adaptation to \$800 million by 2020. The US also announced a \$30 million contribution to the G7 Climate Risk

² Letter from Ceres to National Governors Association, “Support for State Implementation of Carbon Pollution Standards” (Jul. 31, 2015).

³ “International Law and Agreements: Their Effect upon U.S. Law” at 4, Congressional Research Service (Feb. 18, 2015).

⁴ Id. at 5 (footnotes omitted).

Insurance Initiative, which aims to increase access to direct or indirect insurance coverage against the impacts of climate change for up to 400 million of the most vulnerable people in developing countries by 2020.⁵

Chairman: *“Furthermore, even if all 196 countries continue their promised reductions for each year after 2031 until 2100, it will only reduce temperatures by one-sixth of a degree Celsius. The so-called Clean Power Plan will cost billions of dollars, cause financial hardship for American families, and diminish the competitiveness of American employers, all with no significant benefit to climate change.”*

- **Congressman Beyer:** The Chairman’s assertions run directly counter to the conclusions offered by the accomplished team of UNFCCC scientists who studied the aggregate effect intended nationally determined contributions (INDCs). Of relevance, Christina Figueres, Executive Secretary of the UNFCCC, summarized a key finding as follows: “The INDCs have the capability of limiting the forecast temperature rise to around 2.7 degrees Celsius by 2100, by no means enough but a lot lower than the estimated four, five, or more degrees of warming projected by many prior to the INDCs.” While no one on Earth can fully predict the greenhouse-gas-emitting habits of 187 countries’ current and future generations, what’s important is that we establish a framework for increasingly robust action that brings to the table all the most relevant parties. Notably, Bjorn Lomborg, lead author of the paper the Chairman is apparently referencing in this statement, emphatically calls upon the global community to “make green energy so cheap everybody will shift to it.” On that point we agree.

Chairman: *“The U.S. pledge to the U.N. is estimated to prevent only one-fiftieth of one degree Celsius temperature rise over the next 85 years! EPA’s own data shows that this regulation would reduce sea level rise by only 1/100th of an inch, the thickness of three sheets of paper. The president’s “Power Plan” is nothing more than a power grab.”*

- **Congressman Beyer:** If the majority genuinely believes the Clean Power Plan, the Paris Agreement, or any other U.S. effort to address the roots and threats of climate change is less than adequate, whether from an economic standpoint or an emissions reduction standpoint, I would welcome the opportunity to talk optimal solutions. To do so, however, the majority would first need to move past its dangerously irresponsible “climate skeptic” narrative and its insistence that only economic Armageddon can possibly come from mitigating our dependence on greenhouse gas-emitting activities. The President’s Clean Power Plan is a meaningful step towards a green energy economy filled with opportunity for U.S. businesses.

⁵ Dr. Andrew Steer testimony at “Paris Climate Agreement: A Bad Deal for America?” (Feb. 2, 2016) (endnotes omitted).

Chairman: *“A majority of Congress disapproved of the Clean Power Plan through the Congressional Review Act. And the governors of most states are challenging the rule in court. Meanwhile, the president attempts to justify his actions with scare tactics, worst-case scenarios and biased data.”*

- **Congressman Beyer:** Meanwhile, parties have intervened in the court case in support of EPA and Administrator McCarthy, including a coalition of 18 states,⁶ the District of Columbia, and five other cities and a county (including some in states that have filed petitions challenging the Clean Power Plan (CPP)). “Other parties intervening in support of the CPP include regional, state, and municipal utilities and power companies, more than a dozen non-profit organizations (including environmental organizations), and several energy industry associations. Two former EPA Administrators are supporting the CPP as amici curiae (non-party “friends of the court”): William Ruckelshaus, who headed the agency under President Nixon in 1970, when the CAA was enacted, and again under President Reagan in the 1980s; and William Reilly, the EPA Administrator under President George H. W. Bush at the time Congress passed the Clean Air Act Amendments of 1990. A public policy institute and a local government coalition comprising the National League of Cities, the U.S. Conference of Mayors, and 14 cities are also supporting the CPP as amici curiae.”⁷

Chairman: *“An example of how this administration promotes its suspect climate agenda can be seen at the National Oceanographic and Atmospheric Administration (NOAA). Its employees altered historical climate data to get politically correct results in an attempt to disprove the eighteen year lack of global temperature increases.*

NOAA conveniently issued its news release that promotes this report just as the administration announced its extensive climate change regulations.

NOAA has refused to explain its findings and provide documents to this Committee and the American people. The people have a right to see the data, evaluate it, and know the motivations behind this study.

Last week, over 300 respected scientists and experts – which include a Nobel Prize winner, members of the National Academy of Sciences, and former astronauts – sent the Committee a letter that expressed concern over NOAA’s efforts to alter historical temperature data. They agree that the issue deserves serious scrutiny.”

- **Congressman Beyer:** The NOAA investigation referenced by the Chairman amounts to little more than a witch-hunt designed to support, however dubiously, the widely discredited

⁶ These states include California (and its Air Resources Board), Connecticut, Delaware, Hawaii, Illinois, Iowa, Maine, Maryland, Massachusetts, Minnesota (via the Minnesota Pollution Control Agency), New Hampshire, New Mexico, New York, Oregon, Rhode Island, Vermont, Virginia, and Washington.

⁷ “EPA’s Clean Power Plan for Existing Power Plants: Frequently Asked Questions,” Congressional Research Service (Jan. 13, 2016).

“climate skeptic” narrative pushed by certain extreme members of the Republican party. In truth, the NOAA adjustments to historical temperature data reflect sound science and the reality that historical temperature data come with caveats for purposes of comparison to modern temperature data. As the authors of a recent study on this issue explain, “[Temperature measurement] Stations have moved to different locations over the past 150 years, most more than once. They have changed instruments from mercury thermometers to electronic sensors, and have changed the time they take temperature measurements from afternoon to morning. Cities have grown up around stations, and some weather stations are not ideally located. All of these issues introduce inconsistencies into the temperature record.”⁸

- To account for these issues, NOAA began setting up a U.S. Climate Reference Network starting in 2001. “The Climate Reference Network includes 114 stations spaced throughout the U.S. that are well sited and away from cities. They have three temperature sensors that measure every two seconds and automatically send in data via satellite uplink. The reference network is intended to give us a good sense of changes in temperatures going forward, largely free from the issues that plagued the historical network.”⁹ While scientists cannot travel back in time to the 1800s to deploy a throng of ideally-placed, continually-reading temperature measurement devices, they can compare Climate Reference Network data to historical network data to come up with an informed estimate as to how the historical network data should be interpreted for purposes of optimally accurate climate trend analyses. This is precisely what NOAA has done, making the referenced “investigation” unfair and of no merit.
- I have included the study, “Evaluating the impact of U.S. Historical Climatology Network homogenization using the U.S. Climate Reference Network,” as part of my submission for the record.

Chairman: “As we will hear today, the president’s U.N. climate pledge is a bad deal for the American economy, the American people and would produce no substantive environmental benefits.”

- **Congressman Beyer:** Even if the majority would like to remain skeptical of the science and reality of greenhouse gas emissions and climate change, reducing our rates of combustion of fossil fuels would come with a suite of ancillary benefits to human health and the environment, ranging from cleaner air and water for communities to preserving countless acres of healthy plant and animal habitat to mitigating the increasing acidity of our oceans.

⁸ “Evaluating the impact of U.S. Historical Climatology Network homogenization using the U.S. Climate Reference Network,” Zeke Hausfather, Kevin Cowtan, Matthew J. Menne, and Claude N. Williams, Jr (Background available at <<http://www-users.york.ac.uk/~kdc3/papers/crn2016/background.html>>; full study available at <<http://www-users.york.ac.uk/~kdc3/papers/crn2016/CRN%20Paper%20Revised.pdf>>).

⁹ Id.

In summary, the Chairman's views represent an exceedingly small minority. As noted in his State of the Union Address, the President said, "if anybody still wants to dispute the science around climate change, have at it. You will be pretty lonely, because you'll be debating our military, most of America's business leaders, the majority of the American people, almost the entire scientific community, and 200 nations around the world who agree it's a problem and intend to solve it." I agree with the President. The world has moved beyond the scientific evidence in support of acting and is now focused on what actions should occur. I am hopeful that my colleagues on the other side of the aisle will take note and join that conversation and give up their efforts to delay action.

Respectfully,

Congressman Don S. Beyer

DOCUMENTS SUBMITTED BY CHAIRMAN LAMAR S. SMITH

January 28, 2016

Chairman Lamar Smith
Committee on Science, Space and Technology
House of Representatives
Congress of the United States

Dear Chairman Smith,

We, the undersigned, scientists, engineers, economists and others, who have looked carefully into the effects of carbon dioxide released by human activities, wish to record our support for the efforts of the *Committee on Science, Space and Technology* to ensure that federal agencies complied with federal guidelines that implemented the *Data Quality Act*. This is an issue of international relevance because of the weight given to U.S. Government assessments during international negotiations such as those of the IPCC.

The Data Quality Act required government-wide guidelines to “**ensure and maximize the quality, objectivity, utility, and integrity of information, including statistical information,**” that was disseminated to the public. Individual agencies, such as the EPA, NOAA and many others were required to issue corresponding guidelines and set up mechanisms to allow affected parties to seek to correct information considered erroneous.

We remind you that controversy previously arose over EPA’s apparent failure to comply with these guidelines in connection with its Greenhouse Gas Endangerment Finding, which was the subject of a report by the EPA Office of the Inspector General in 2011, see tinyurl.com/jbk8qkd.

In that case, EPA failed to comply with peer review requirements for a “highly influential scientific assessment” and argued that the Greenhouse Gas Endangerment Finding was **not** a “highly influential” scientific assessment. If it wasn’t, then it’s hard to imagine what would be. (For a contemporary discussion of the EPA’s stance see tinyurl.com/juwhkla).

In our opinion, in respect to Karl *et al.* 2015 and related documents, NOAA has failed to observe the OMB (and its own) guidelines, established in relation to the Data Quality Act, for peer review of “influential scientific information” and “highly influential scientific assessments.”

We urge you to focus on these important compliance issues. For your consideration, the following pages contain a draft letter which directly connects these issues to your committee’s prior request for documents.

A list of signers with brief identifications is attached as a separate document.

DRAFT LETTER TO NOAA

In our letters of 14 July 2015, 10 September 2015 and 25 September 2015 to Katherine D. Sullivan, Administrator of the National Oceanic and Atmospheric Administration (NOAA), together with subpoena on 13 October 2015 and letters of 18 November and 1 December 2015 to Secretary Pritzker, we requested documents pertaining to the widely publicized paper, *Possible artifacts of data biases in the recent global surface temperature warming hiatus* (*Science*, 26 June 2015) (“Karl *et al* 2015”) co-authored by NOAA employees, including Thomas R. Karl, director of NOAA’s National Centers for Environmental Information.

Karl *et al* assessed “the observational evidence related to a “hiatus” in recent global surface warming” and concluded that the evidence did not “support the notion of a “slowdown” in the increase of global surface temperature”, as previously reported by many others including the latest climate assessment report from the Intergovernmental Panel on Climate Change.

At the time of publication of Karl *et al* 2015, NOAA issued an accompanying press release¹ stating that Karl *et al* “refutes the notion that there has been a slowdown or “hiatus” in the rate of global warming in recent years”. The press release stated that the work had been carried out by a “team of scientists from the National Oceanic and Atmospheric Administration’s (NOAA’s) National Centers for Environmental Information (NCEI) and LMI using the latest global surface temperature data.” The release also contained a link to a new NOAA temperature dataset (<ftp://ftp.ncdc.noaa.gov/pub/data/scpub201506/>) (“scpub201506”) presumably based on Karl *et al* 2015.

Absent from Karl *et al*. 2015, the press release and the dataset was any statement that “the findings and conclusions in this report are those of the author(s) and do not necessarily represent the views of NOAA.” In the sense of the OMB Peer Review Guidelines, there was nothing to indicate that the results did not have the “imprimatur of the federal government.

We note that NOAA failed to include the assessment by Karl *et al* of the observational evidence related to a “hiatus” in recent global surface warming in its list² of highly influential scientific assessments and/or its failure to include the associated information product in its list³ of influential scientific information; omissions that we find inexplicable given that under the terms of the OMB Peer Review Guidelines and NOAA policy with respect to those guidelines, sscpub201506 was clearly “influential scientific information” and Karl *et al* 2015 was a “highly influential” scientific assessment.

Given the above, sscpub201506 and Karl *et al* 2015 are required to comply with Part II and Part III of the OMB procedures, respectively.

NOAA policy² states explicitly that “Peer review of these [influential and highly influential] information products will be conducted in accordance with that Bulletin.” In accordance with these policies, NOAA publishes a list of influential and highly influential scientific information

¹ <https://www.ncdc.noaa.gov/news/recent-global-surface-warming-hiatus>

² http://www.cio.noaa.gov/services_programs/IQ_Guidelines_103014.html

and assessments for which it has already, or plans to carry out peer review³ and a “peer review record” is published for such products.

For example, NOAA classified their recent assessment of the effects of anthropogenic sound on marine mammal species as a “highly influential scientific assessment”, which was then peer reviewed according to OMB Part III procedures. The published peer review record⁴ included milestone dates, charge statements to the reviewers, peer review nominations and reviewer credentials for the initial peer review. Then the initial peer review report, a letter and charge statement were sent to a second set of peer reviewers. CVs of the second set of peer reviewers were published. In like manner the second peer review report, and associated documentation was sent to a third set of peer reviewers.

In refusing to supply requested documents, NOAA claimed⁵ that there was a “long-standing practice in the scientific community to protect the confidentiality of deliberative scientific discussions”:

Because the confidentiality of these communications among scientists is essential to frank discourse among scientists, those documents were not provided to the Committee,” the agency said. “It is a long-standing practice in the scientific community to protect the confidentiality of deliberative scientific discussions

However, in the present case, we are not discussing communications among university researchers but communications among federal employees in respect to influential scientific information and highly influential scientific assessment disseminated by an agency of the federal government and bearing the imprimatur of the federal government. OMB Guidelines, together with NOAA policy implementing such guidelines, unambiguously supersede any privilege claimed for communications among scientists. The OMB (and later NOAA) was well aware of the confidentiality that is traditional for scientific work that is not “influential or highly influential,” but it nonetheless unambiguously rejected confidentiality when it established the OMB Peer Review Guidelines.

Further, we note that agency obligations under Part III cannot be met merely by peer review by a refereed scientific journal. Even in respect of Part II, OMB Guidelines also explicitly instruct the agency to note that peer review by the journal may not satisfy Part II standards and require the agency to assess whether the journal peer review met Part II standards:

Publication in a refereed scientific journal may mean that adequate peer review has been performed. However, the intensity of peer review is highly variable across journals. There will be cases in which an agency determines that a more rigorous or transparent review process is necessary. For instance, an agency may determine a particular journal review process did not address questions (e.g., the extent of uncertainty inherent in a finding) that the agency determines should be addressed before disseminating that information. As such, prior

³ http://www.cio.noaa.gov/services_programs/prplans/PRsummaries.html

⁴ http://www.cio.noaa.gov/services_programs/prplans/ID43.html

⁵ <http://www.nature.com/news/us-science-agency-refuses-request-for-climate-records-1.18660>

peer review and publication is not by itself sufficient grounds for determining that no further review is necessary.

NOAA (and OMB) guidelines also require that agency peer review under Parts II and III demonstrate compliance with NOAA conflict of interest policy,⁶ but such compliance is typically impossible to prove under the procedures of many refereed journals, as appears to be the case here.

We note that NOAA failed to include the assessment by Karl *et al* of the observational evidence related to a “hiatus” in recent global surface warming in its list⁷ of highly influential scientific assessments and/or its failure to include the associated information product in its list⁸ of influential scientific information, an omissions that we find inexplicable

Further, we had previously sought information about contact between NOAA and the White House. We note that acknowledgements by Karl *et al* 2015 include acknowledgement to a White House staffer (Philip Duffy).

We reiterate our request for all documents and communications concerning Karl *et al* 2015, including, without limitation, all documents relating to its peer review record, all communications regarding or relating to the form of peer review, and all communications with White House staffers, including, without limitation, Philip Duffy.

Sincerely,

....

⁶ http://www.cio.noaa.gov/services_programs/IO_Guidelines_103014.html;

http://www.cio.noaa.gov/services_programs/NOAA_PRB_COI_Policy_110606.html

⁷ http://www.cio.noaa.gov/services_programs/prplans/PRsummaries.html

⁸ http://www.cio.noaa.gov/services_programs/prplans/PRsummaries.html

ALEXANDER, Ralph B, PhD Physics, University of Oxford, former Associate Professor, Wayne State University, Detroit, author of book, Global Warming False Alarm, Canterbury Publishing, 2012.

ALLEN, Dr D. Weston, MB,BS, FRACGP, Grad. Dip. Phys. Med., Medical Director of Kingscliff Family Medical Practice, NSW, Australia. Author of The Weather Makers Re-Examined (2011: Irenic Publications). (AUSTRALIA)

ALLEN, James L., PhD, Physics, Vanderbilt University; Engineer/Scientist (Retired), The Boeing Company, International Space Station Program, Houston, TX.

ANDERSON, Charles R, Ph.D., Physics, Case Western Reserve University; Sc.B., Physics, Brown University; Founder and President of Anderson Materials Evaluation, Inc., previously Senior Scientist at Lockheed Martin Laboratories -- Baltimore and Research Physicist in the Department of the Navy; 43 years' experience using particle beams, gamma rays, x-rays, ultra-violet light, visible light, and infra-red radiation to characterize materials.

ANDERSON, David V, Senior Fellow of American Physical Society.

ARMSTRONG, J. Scott, Professor, The Wharton School, University of Pennsylvania, One of the world's leading experts on forecasting, he has also published 19 papers on the scientific method.

ASHWORTH, Robert A., Vice President of ClearStack Power LLC, Chemical Engineer with over 50 scientific papers published.

ÅSTRÖM Sture M.Sc. engineering Royal Institute of Technology, Stockholm, managing experience in international business, founder and working secretary of the Network KLIMATSANS (Climate Sense) <http://klimatsans.com/> (SWEDEN)

BAHR, David A, Ph.D. (University of Virginia), Assoc. Prof. of Physics, Bemidji State University.

BALL, Dr. Tim, Retired professor of climatology.

BARRANTE, James R., Emeritus Professor of Physical Chemistry, Southern Connecticut State University, New Haven, CT; author of book Global Warming for Dim Wits: A Scientist's Perspective of Climate Change, Universal Publishers, Boca Raton, FL, 2010.

BARTLETT, David F, Prof of Physics (emeritus) University of Colorado, Fellow American Physical Society; Member American Geophysical Union.

BASTARDI, Joe, Bastardi, Chief meteorologist, Weatherbell Analytics.

BATTIG, Dr. Charles G, M.S. E.E.; M.D, Life member IEEE, American Society of Anesthesiologists; President, Piedmont Chapter, Virginia Scientists and Engineers for Energy and Environment;. Policy advisor, Heartland Institute.

BAUM, Dr. Peter J, Geophysicist, Solar Physicist. Retired from Institute of Geophysics and Planetary Physics UCR and General Research Corp. MTS. Lifetime Member American, Geophysical Union, former member of American Physical Society, former Director UCR T1 Terrella, Laboratory for solar-earth plasma studies.

BELL, Larry: Launched the research and education program in space architecture at the University of Houston and author of Climate of Corruption: Politics and Power Behind the Global Warming Hoax.

BELLER, Denis Beller, PhD, Lt. Col, USAF, retired (first tenured uniformed professor in the then-70-year history of the USAF Institute of Technology) co-author of seminal Foreign Affairs essay The Need for Nuclear Power, Jan/Feb 2000 (with Pulitzer Prize-winner Richard Rhodes), former Research Prof. of Nuclear Engineering, Univ. of Nevada, Las Vegas.

BENARD, David J, Ph.D Physics (University of Illinois, 1972) Co-inventor of the oxygen-iodine chemical laser

BERAN, Max, Retired hydrologist and Climate Change Science coordinator Terrestrial Sciences, Natural Environment Research Council (NERC); Coordinator of NERC Terrestrial Initiative in Global Environmental Research; also chairman organising committee of NATO Special Programme on Science of Global Environmental Change. (UNITED KINGDOM)

BERGSMARK, Stein. Physicist. Senior research scientist. Retired head of Renewable Energy study programmes at University of Agder, Norway. Written several reports on climate change science and politics. (NORWAY)

BERRY, Edwin X, PhD, Physics, Climate Physics LLC, Bigfork, MT, Memberships: American Meteorological Society, AMS, Certified Consulting Meteorologist #180, American Physical Society.

BEVELACQUA, Joseph John, PhD Physics (Florida State University, 1976), CHP, RRPT. President of Bevelacqua Resources and former USDOE Senior Technical Advisor. Author of over 100 papers published in scientific and technical journals and four textbooks.

BEZDEK, Roger. Ph.D, Economics, President, MISI; former research Director in ERDA and DOE and Senior Advisor, U.S. Treasury Department. Author of 6 books and 300 papers published in scientific and professional journals.

BIGHAM, C Bruce, Phd, Nuclear Physics, AECL, Retired, Chalk River, ON, (CANADA)

BLETHEN, John, Ph.D, physics, Stanford University, 1974, McGill, Nevada

BLOEMERS, Dr H.P.J, Emeritus Professor of biochemistry at the Radboud University of Nijmegen (NETHERLANDS).

BOGARD, Donald D., PhD in geochemistry. 43 years NASA basic research scientist, retired; over 150 peer-reviewed scientific papers published in field of planetary geochemistry and volatiles.

BOHNAK, Karl, WLUC-TV6 NBC & FOX U, Chief Meteorologist.

BOEHMER-CHRISTIANSEN, Dr.Sonja, Geography and geology graduate (Adelaide); PhD in International Relations (Sussex, UK). Five years of UK government funded research into the science and politics of the IPCC. Energy policy research at SPRU, Science Policy Research Unit, University of Sussex 1987 to 1995. Reader in Environmental Management at Hull University and editor of Energy & Environment since 1995. Several books on environmental policy and politics, including climate policy. (UNITED KINGDOM)

BOSTICK, JERRY C., BS Civil Engineering, Mississippi State University. Retired NASA, Flight Operations and Program Management.

BOUTEILLE, Pierre ; HEC'71 business school ; BSN Glass Containers Division (France), Overseas Export Dept, 1973-87 ; Flo-Pak Int'l (Redwood City, Calif) 1988-2009, including : Director of European Development 2000-09, VP Recycling Dept of French Plastics Converters Board 1992-94. (FRANCE)

BRADY, F Paul, PhD, Professor of Physics, University Of California, Davis [retired]. Fellow of the American Physical Society. Ford Foundations Fellow. Senior Fulbright Scholar to Germany, 1982/83 and 1990/91.

BRESLOW, Jan L, M.A. Physical Chemistry Columbia University, Doctor of Medicine Harvard Medical School, Fredrick Henry Leonhardt Professor Rockefeller University, Member National Academy of Sciences, Member National Academy of Medicine, Member German National Academy of Sciences (Leopoldina), published more than 250 original peer reviewed research papers.

BRIGGS, William, Statistician with specialty in evaluating the goodness and usefulness of models.

BRIGHAM, Ben M., B.S. Geophysics, University of Texas, Austin, TX, 1983.

BROERE, Ir. Adriaan, Geophysicist and Climate Researcher. (NETHERLANDS).

BROOKS, Scott, Electronic-Electromechanical Engineering, Albuquerque, NM.

BRUMM, Douglas B, Ph.D., Electrical Engineering, Professor of Electrical Engineering (Emeritus), Michigan Technological University, Houghton, Michigan; Life Member, Institute of Electrical and Electronic Engineers.

BUFALO, David J, B.S. Civil Engineering, Missouri University of Science and Technology, 1966; Licensed Professional Engineer in Missouri and Colorado. Retired major, U.S Army Corps of Engineers. Forty years experience in the engineering design and construction of civil infrastructure projects and building construction projects including four years of arctic experience in constructing projects on permafrost.

BURDETT, William R., B.A. Mathematics, Univ. of South Florida, Ph.D.-level studies in particle physics at Vanderbilt Univ., conducted geophysical research for the U.S. Navy, helped bring the computer revolution to Wall Street, retired as e-Government Architect for the U.S. Dept. of Justice.

BUTOS, William N, George M. Ferris Professor of Corporation Finance & Investments Department of Economics, Trinity College, Hartford, CT 06106.

BUTTLER, William Tillman. PhD physicist currently employed at LANL, area of research is Materials Science, Applied physics. Thesis was in an area of atmospheric physics. Postdoc in quantum physics with applications. Studied physics at the University of Texas at Austin. Runs hydrodynamics codes.

CAMPBELL, Mark L, Professor, United States Naval Academy, PhD, Chemical Physics.

CAMPANELLA, Angelo, Ph.D., Physics and Electrical Engineering, Pennsylvania State University, 55+ year experience in infrared physics, military electronics, and applied physics.

CARLIN, Alan, PhD Economics, Massachusetts Institute of Technology; BS, Physics, California Institute of Technology; senior analyst and manager, USEPA, 1971-2010; author or co-author of about 40 publications; author of Environmentalism Gone Mad: How a Sierra Club Activist and Senior EPA Analyst Discovered a Radical Green Energy Fantasy, 2015, Stairway Press.

CASEY, Jeffrey A, Ph.D. Plasma Physics, 1985. President, Rockfield Research Inc., Las Vegas, NV.

CATANESE, Carmen, M.S., Ph.D. in physics (Yale University), Retired Exec. VP, The Sarnoff Corp (SRI), Author of 12 peer-reviewed articles in science and engineering, Holder of 12 issued US patents.

CHAPAS, Jorge David, MSc Environmental economics. Executive director of Red de Amigos de la Naturaleza (Rana), Guatemala, Central America. Professor of the Master of Environmental Economics of the Universidad Francisco Marroquín. (GUATEMALA)

CHOI, Yong-Sang, Ph.D., assistant professor, Ewha Womans University, deputy director, Center for Climate/Environment Change Prediction Research, author of many papers in climate and atmospheric science. (SOUTH KOREA)

CHRISTENSEN, Charles R., PhD Chemistry, California Institute of Technology. Retired Research Physicist, U.S. Army Missile Command. Seven Patents and numerous journal publications in optics and optical materials.

CLOUGH, Charles A, M.S., Atmospheric Science, Founder and Chief of the US Army Atmospheric Effects Team (now retired), Aberdeen Proving Ground, MD Professional Member, American Meteorological Society.

COHEN, Roger W, Fellow, American Physical Society.

COLEMAN, John, BS, University of Illinois, Former Professional Member of the American Meteorological Society; Broadcast Meteorologist of the Year (1982) of the American Meteorological Society, Founder of "The Weather Channel", original Meteorologist on ABC "Good Morning, America", TV Meteorologist for 61 years on stations in New York, Chicago, San Diego, etc.

CONDON, William F., Ph.D., Electroanalytical Chemistry, Professor Emeritus of Chemistry (analytical and environmental), Southern Connecticut State University.

COX, John W., PhD Chemical Physics (Johns Hopkins University, 1983) and National Academy of Sciences Postdoctoral Fellow (Naval Research Laboratory, 1983-85).

COX, Ricky, M.S. Geosciences, Texas Tech University, Lubbock, TX, 1982.

CRANBERG, Alex. MBA Stanford University; BS Petroleum Engineering. Member, Board of Regents, University of Texas System.

CRENWELGE, Otto E., PhD, PE; Principal Senior Engineer – Barrios Technology/Jacobs/NASA - JSC Structural Loads and Dynamics. Previous experience: Consultant - Sound & Vibration Engineering (petrochemical, mining, academia), Staff Research Engineer – Shell Development Co., teaching/research professorships at Texas A&M and Northern Arizona universities.

CROWE, Donald R, B.S. Mechanical Engineering, University of Miami, Coral Gables, Florida; licensed Professional Engineer (P.E., Florida); Consulting Construction Executive; over 40 years' experience in construction, product engineering, manufacturing, and information technology.

CUNNINGHAM, Walter; MS Degree in Physics; Physicist, RAND Corp; Astronaut, Apollo 7; Founder, Earth Awareness Foundation, 1970; Advisory Board, National Renewable Energy Laboratory (5 years); Writer and Lecturer on the global warming issue.

CURTIS, Marjorie, B.Sc. 1st class Honours in Geology 1959. Diploma in Micropalaeontology, University College, London, 1960. Ph D, London University of London, 1964. Since then I have worked in research applied to finding oil and mineral deposits, and lectured about Climate Change to many classes over the years.

D'ALEO, Joseph, AMS Fellow, CCM, Chair of Committee on Weather Analysis and Forecasting, Former Professor of Meteorology/Climatology, Lyndon State College, Co-founder the Weather Channel, Chief Meteorologist, WSI, Weatherbell Analytics.

D'ALONZO, Raphael P, Ph.D., Analytical Chemistry, University of Massachusetts Amherst, Retired - the Procter & Gamble Company, former Department Head, Data Management.

DEARS, Donn, BS United States Merchant Marine Academy. Engineer and retired senior executive GE Company, with worldwide experience with energy issues. Author of Nothing to Fear and over 600 articles on energy issues.

DE LANGE, Willem. DPhil, Senior Lecturer, School of Science, University of Waikato. Contributor to IPCC, NIPCC and New Zealand Government Climate Assessment reports in relation to coastal hazards and sea level rise. (NEW ZEALAND)

DELLEVIGNE, Paul - BA Chemistry, University of Pennsylvania; MBA in Finance and International Business, New York University; former research biochemist in protein chemistry and enzymology, software entrepreneur, currently consultant in tax software implementation.

DE LONG, James V., J.D., Harvard Law School, mcl; former Research Director of the Administrative Conference of the United States; former Senior Analyst, Program Evaluation Office, U.S. Bureau of the Budget; author of numerous articles on administrative law, regulatory, and environmental issues, including Climate Issues and Facts (Marshall Institute, 2015), A Skeptical Look at the Carbon Tax (Marshall Institute 2013), and Out of Bounds and Out of Control: Regulatory Enforcement at the EPA (Cato Institute 2002).

DE VRIES, Geert F, Pr Sci Nat, M Nuc I (London), M SFEN (Paris), EmM SAIP, M EPS, M DPG, MSc(Physics) Pretoria. (SOUTH AFRICA)

DEYE, James A, PhD, Nuclear Physics, retired medical physicist and program director in radiation research, National Cancer Institute.

DOIRON, Harold H, PhD, Mechanical Engineering, Vice President, Engineering (retired) InDyne, Inc. Houston, Texas, Chairman, The Right Climate Stuff Research Team of retired NASA Apollo Program scientists and engineers. Member, American Society of Mechanical Engineers.

DOMENECH, The Honorable Douglas W. Former Secretary of Natural Resources, Commonwealth of Virginia. Former Deputy Chief of Staff U.S. Department of the Interior. B.S.F. Forestry and Wildlife Management, Virginia Tech.

DONZE, Terry W., BS Geological Engineering, Missouri University of Science & Technology, 40+ year career as a geophysicist, majority independently, with ten years of climate studies. Author, Climate Realism: Alarmism Exposed.

DOOGUE, James W, Economist and Financial Analyst, Statistical analysis a speciality. Past Director and Chairman of Practitioners, Financial Planning Association of Australia, Life Member FPA, CFP, MEcon, B Econ & Finance, Grad Dip FP. (AUSTRALIA)

DOSKOCIL, Albert C, Jr; retired Raytheon Senior Engineer.

DOUGLASS, David, Professor of Physics, University of Rochester.

DOYLE, Jeffrey M, PhD Resource Economics Michigan State University, President, Thermoeconomics

DRALLOS, Paul J, PhD Theoretical Atomic Physics, Wayne State University, Detroit. Past president of Plasma Dynamics Corporation. More than thirty years experience in particle, fluid and plasma simulations.

DRIESSEN, Aert, BSc (Geology) Sydney University, 1960, BEc Australian National University, 1980, Grad. Dip. Information systems, University of Canberra 1990, Fellow Australian Institute of Geoscientists. (AUSTRALIA)

DRIESSEN, Paul K: BA, geology and ecology, Lawrence University; JD, environmental and natural resource law, University of Denver; author of Eco-Imperialism: Green Power - Black Death, Miracle Molecule: Carbon Dioxide, Gas of Life, and other books; author of many articles and reports on energy, mining, climate change, sustainable development, malaria control and other topics; senior policy analyst, Committee For A Constructive Tomorrow and Congress of Racial Equality.

DROZ, John Jr. Physicist. Energy expert with over 35 years of environmental advocacy.

DUFFY, William T. Jr., Ph.D., Member American Physical Society, Professor of Physics Emeritus, Santa Clara University.

DUKE, Charles M., BS US Naval Academy, MS Aeronautics MIT, Brigadier General USAF (retired), Graduate and Instructor USAF Test Pilot School, NASA Apollo 16 Lunar Module Pilot, Member: Air Force Association, Society of Experimental Test Pilots, South Carolina Hall of Fame.

DUNN, John Dale, MD JD, Policy advisor Heartland Institute, Chicago, IL, and American Council on Science and Health, New York City, Civilian Faculty, Emergency Medicine, Carl R. Darnall Army Medical Center, Fort Hood, Texas, Clinical Instructor, Uniformed Services University of the Health Sciences, Bethesda, Maryland. Lecturer and writer on human health effects of air pollution and climate as well as environmental law and air pollution science for 25 years.

EASTERBROOK, Don: Professor Emeritus of Geology at Western Washington University. He has studied global climate change for five decades, has written three textbooks and a dozen other books, published more than 185 papers in professional journals, and has presented 30 research papers at international meetings in 15 countries.

ENDRIZ, John Endriz, BS. (Engineering, MIT), PhD (Eng., Stanford, U), Retired VP, SDL, Inc.

ENSTROM, James E., PhD, Physics; MPH, Epidemiology; Research Professor/Researcher (retired), UCLA School of Public Health, and President, Scientific Integrity Institute, Los Angeles; Life Member, American Physical Society; Founding Fellow, American College of Epidemiology; extensive scientific expertise on health effects of air pollution.

ESSEX, Christopher, PhD, Professor, Department of Applied Mathematics, The University of Western Ontario, co author of the book Taken by Storm. (CANADA)

EVANS, David M.W., climate researcher for ScienceSpeak.com. Instrumental in building the carbon accounting system Australia uses to estimate carbon changes in its biosphere, for the Australian Greenhouse Office. Six university degrees related to modeling and applied mathematics over ten years, including a PhD from Stanford University. (AUSTRALIA)

EVERETT, Bruce, Faculty Tufts University's Fletcher School, over forty years of experience in the international energy industry.

EVERETT, Robert, Electrical Engineer, Retired President of the MITRE Corporation.

FAGAN, Matthew J, PhD, B.Sc(Hons) Nuclear Physics. Founder and president of FastCAM Inc. with 17 robotic technology patents and published patent applications in the US.

FAJARDO, Mario E., Ph.D. Chemistry, U. of California, Irvine; B.S. Chemistry, California Institute of Technology. Principal Research Chemist, USAF Research Laboratory. Lead- and co-author of 50+ peer-reviewed publications on condensed phase chemical reaction photodynamics, cryogenic matrix isolation spectroscopy, high-resolution molecular spectroscopy in quantum solids, and advanced energetic materials research.

FORBES, Vivian R, BScApp, FAusIMM, geologist, financial analyst, company director, founder of the Carbon Sense Coalition, author of many articles on carbon, climate and energy, winner of the Adam Smith Award (Australia) and Author of Freedom (Germany). (AUSTRALIA)

FORBING, Irv, PhD in oral surgery, MS in bacteriology, College of Physicians and Surgeons in San Francisco.

FORREST. Mike, geophysicist, Exploration Consultant, retired Shell Oil Company.

FRANK, Neil, Ph.D., meteorology, Florida State University, Former Director National Hurricane Center and former Chief Meteorologist KHOU TV, CBS Houston. member, American Meteorological Society.

FRANK, Patrick, Ph.D. Chemistry, Stanford University. More than 60 peer-reviewed publications, including several assessing uncertainty in the surface air temperature record and in climate model air temperature projections.

FRIEDMAN, Peter D., Ph.D., P.E, Retired Chairman, Department of Mechanical Engineering, University of Massachusetts Dartmouth.

FRICKE, Martin Ph.D.: Nuclear physicist; Senior Fellow of the APS; elected to the APS Executive Panel on Public Affairs (POPA); nuclear physics research at the Oak Ridge National Laboratory; Corporate Officer of seven R&D companies; Extraordinary Minister of Catholic Diocese of San Diego.

FULKS, Gordon J, PhD Physics, The Laboratory for Astrophysics and Space Research at the University of Chicago. Five decades of experience studying physical, astrophysical, and geophysical phenomena for universities, government agencies, and private clients.

GAMBLIN, Rodger L, Former VP Mead Corporation. Inventor. Author or coauthor on 46 U.S. patents.

GAMOTA, George Ph.D.: Physics; former professor University of Michigan, Fellow of the APS; Fellow of the AAAS; Senior Member of the IEEE; elected to the APS Executive Panel on Public Affairs (POPA); Founding Director of Research, Department of Defense; Corporate Board member and Executive at several R&D companies; former Bedford Chief Scientist MITRE Corporation.

GERHARD, Lee C, PhD., Senior Scientist Emeritus, Univ. of Kansas, Director and State Geologist, Kansas Geological Survey (Ret.), meteorology background. Extensive published research in both geology and climate change. Honorary member, American Association of Petroleum Geologists, Association of American State Geologists and others. Member Russian Academy of Natural Science (US Br.), Kansas Geologist license #1. Former Getty Professor of Geological Engineering, Colorado School of Mines.

GERLACH, Ulrich H., PhD Relativistic Astrophysics, Princeton University, Professor of Mathematics, Ohio State University, Columbus, Ohio.

GERONDEAU, Christian, engineer and scientist, graduated from ECOLE POLYTECHNIQUE in PARIS, an energy expert, the author of many books on climate matters, two of them available in English: "CLIMATE, THE GREAT DELUSION " and " UNITED NATIONS CLIMATE LIARS". (FRANCE)

GIAEVER, Ivar, Applied BioPhysics, Inc.; Nobel Prize in Physics, 1973.

GIOVANIELLI, Damon, former Physics Division Leader at Los Alamos National Laboratory, and former President of Sumner Associates, a scientific consulting company in Santa Fe, NM.

GLATZLE, Albrecht, Agro-Biologist, Dr. sc. agr. (Hohenheim University, Germany), Director of Research of INTTAS (retired), Loma Plata Paraguay Asociación Rural del Paraguay (ARP), Society of Range Management, US Grassland Society of Southern Africa, Fellow of the Tropical Grassland Society of Australia (GERMANY/PARAGUAY)

GOSSELIN, Pierre, Mechanical Engineering, author of the blog, <http://notrickszone.com/#sthash.PhRMBOBJ.dpbs>. (GERMANY)

GOLDBERG, Dr. Fred, Swedish Polar Institute (AB). (SWEDEN)

GOREHAM, Steve, MSEE/MBA, Executive Director Climate Science Coalition of America, author of two books, researcher, speaker.

GOULD, Laurence I, Professor of Physics, University of Hartford, Past Chair (2004); New England Section of the American Physical Society.

GRAY, Vincent, Ph D, Editor of New Zealand Climate Truth Newsletter. (NEW ZEALAND)

GRAY, William M., Professor Emeritus, Dept. of Atmospheric Science, Colorado State University (1961-present). Ph.D. Meteorology from U. Chicago. Tropical meteorology specialist - initiated Atlantic seasonal hurricane prediction.

GREEN, James Craig, BS Mechanical Engineering, U. New Mexico, hydrologist U.S. Air Force in February of 1969, Captain, US Air taught courses to Air Force officers in orbital mechanics, spacecraft subsystems, ground-to-satellite control systems & operations and other space sciences.

GREEN, Kesten C., Ph.D., forecasting researcher at University of South Australia. Lead author of the journal articles "Global warming: Forecasts by scientists versus scientific forecasts" (2007), "Validity of climate change forecasting for public policy decision making" (2009), and the book chapter "Forecasting global climate change" in Climate Change: The Facts 2014 among other works on the topic of climate forecasting and policy. (AUSTRALIA)

GREGORI, Giovanni P, Associate" of the Royal Astronomical Society; Honorary Member of the Deutsche Geophysikalische Gesellschaft e. V., Arbeitskreis Geschichte der Geophysik; retired from CNR (Italian National Research Council), author of two books and of a few hundred papers on international peer reviewed journals. Topics: Galaxy - Sun - Earth relations; fundamental gnoseology in theoretical physics; applications of acoustic emission to environment, climate, and security (holder of an international patent). (ITALY).

GREGORY, William D., PhD, PE, Registered Patent Agent (US); BS(physics) Georgetown University; PhD(physics), MIT; Professor Emeritus of Electrical Engineering and Health Sciences, and former Dean of the College of Engineering and Applied Sciences, University of Wisconsin, Milwaukee; Senior Member IE,EE, Phi Beta Kappa, Tau Beta Pi; author on 100+ peer reviewed articles, inventor on 100+ US and foreign patents; currently Chair of the Board and Chief Science Officer, NovaScan LLC, developer of cancer detection devices.

GRIFFIN, Gerald D, former Director of the NASA Lyndon B. Johnson Space Center in Houston, Lead Flight Director for three lunar landing missions: Apollo's 12, 15 and 17, Fellow of the American Institute of Aeronautics and Astronautics and the American Astronautical Society.

HAAPALA, Kenneth A. President, Science and Environmental Policy Project, Quantitative Economist. Under government contract, correctly identified deficiencies in Federal Energy Models predicting the world would run out of oil and the US out of natural gas by the end of the 20th century. Identified similar deficiencies in global climate models. Past President, Philosophical Society of Washington.

HACKEN, George, PhD (Physics) Senior Director, Safety-Critical Systems MTA/New York City Transit, Affiliations: Sigma Xi, New York Academy of Sciences, American Physical Society, American Mathematical Society, American Institute of Aeronautics and Astronautics, Association of Computing Machinery.

HAMEED, Sultan, Professor, School of Marine and Atmospheric Sciences, Stony Brook University.

HANCOCK, Lucy, Consultant, Weather and Climate Services.

HAPPER, William, PhD, Cyrus Fogg Brackett Professor of Physics (emeritus) at Princeton University, former Director of the Office of Energy Research Director of Research, U.S. Department of Energy, Member National Academy of Sciences.

HAPPS, John. D.Phil. Geosciences; retired academic.

HARDE, Hermann, Professor of Physics (emeritus) at Helmut-Schmidt-University Hamburg, Germany, specialized in laser physics, spectroscopy and gas sensors, former Vice President of the University.

HARRISON, Thomas, BS Mathematics, with Physics and Computer Science, Dartmouth College. Owner of TS4, electronics and computing design and consulting. Webmaster for Global Warming Realists.

HARSH, Eugene S, M.S., Meteorology, Lt Col (Ret) US Air Force, Member American Geophysical Union, Life Member IEEE, Member Association for Computing Machinery.

HARTNETT WHITE, Kathleen, Distinguished Senior Fellow Texas Public Policy Foundation. Former Chairman of Texas Commission on Environment and former Officer of multiple Commissions on water, energy and environmental policies.

HAVAS, Magda, PhD. Pollution Ecologist and Environmental Toxicologist, Trent University. (CANADA)

HAYDEN, Howard C, Professor Emeritus of Physics, University of Connecticut. Editor and Publisher, The Energy Advocate, now in 20th year of publication.

HAYES, Dennis B, PhD, Research Physicist Sandia and Los Alamos National Laboratories, President, Lockheed Martin Nevada Technologies, Inc. (retired) Fellow APS.

HENDL, Richard G., PhD Meteorology (MIT, 1974), MS Astrogeophysics (U Colorado, 1968), BS Meteorology (Penn St U, 1963), Chief Scientist Emeritus, Geophysics Directorate, Air Force Space Technology Center.

HENNIGAN, Thomas D, Environmental and Forest Biology, Associate Professor of Biology, Truett-McConnell College, Cleveland, Georgia, Ecological Society of America.

HESS, Michael L, BS Computer Information Systems, Raytheon Senior Field Engineer, Retired, U. S. Army, CW3, Retired, Florida State University.

HIGGINBOTHAM, Richard, DoD Retiree, Past Member of the Defense Acquisition Regulatory Council's Environmental Regulatory Committee MBA form American Graduate University, Covina, CA.

HO, Chang-Hoi, Ph.D., Professor, Seoul National University, Author of many papers in climate and atmospheric sciences. (SOUTH KOREA)

HOLLANDER, Jack M., PhD Nuclear Chemistry, University of California Berkeley, Professor Emeritus of Energy and Resources, Univ of Calif. Berkeley. Vice-President for Research Emeritus, The Ohio State University, Columbus, OH.

HOLLIDAY, George H., : PhD, University of Houston, Civil Engineering. PE, Board Certified Environmental Engineer, American Society of Mechanical Engineers Life Fellow. Previously Environmental Engineering Advisor to Shell Oil Co. Production Department. (Retired) Author or coauthor of books regarding USA Environmental Regulations, Safety and Soil Remediation. Currently prepare an weekly Newsletter discussing Climate Change.

HOLTRUP, Dr. Jan F. Holtrop, Emeritus Professor of Petroleum Engineering, Technological University Delft (TUD). (NETHERLANDS)

HONG YAN, Dr. (晏宏), Professor, Vice director of State Key laboratory of Loess and Quaternary Geology, Institute of Earth Environment, Chinese Academy of Science, Xi' an, Shaanxi Province. (CHINA)

HOOVER, Erik, BS Petroleum Engineering, Texas A & M University, 1988.

HOPSON, Kevin S P.G., Vice President/Sr. Scientist, Daniel B. Stephens & Associates, Inc., Hydrology, Engineering, Geosciences

HOVLAND, Martin, professor emeritus, Center for Geobiology, University of Bergen, Norway. Member of the Environmental Pollution Prevention and Safety Panel, International Ocean Discovery Programme. (NORWAY)

HUCKANS, John H., Ph.D. Associate Professor of Physics, Laser Cooling and Trapping, Bloomsburg University of Pennsylvania.

HUGHES, Terence J., Professor Emeritus of Earth Sciences and Climate Change, University of Maine. A half-century career studying the interaction of global climate with continental ice sheets, past, present, and future, focused on inherent instabilities in ice sheets that facilitate their rapid gravitational collapse.

HUMLUM, Ole, Professor of Physical Geography, Physical Geography, Institute of Geosciences, University of Oslo. (NORWAY)

HURLEY, Stephen, M.S. Geology, University of Arkansas, 1975.

IDSO, Craig: Founder and Chairman of the Center for the Study of Carbon Dioxide and Global Change, Member of the American Association for the Advancement of Science, American Geophysical Union, and the American Meteorological Society.

JACOBS, Albert F, Geol.Drs., P.Geo., Co-founder, Friends of Science Society, Calgary. (CANADA)

JELBRING, Hans, MSc, Electronics, Royal Institute of Technology, Stockholm. BSc, Meteorology, University of Stockholm, PhD, Paleogeophysics & Geodynamics, University of Stockholm, Title of thesis: Wind Controlled Climate Technical head of a radar station during military service, CEO, Inventex Aqua AB. (SWEDEN)

JENSEN, Dennis, PhD Monash (Materials Science). (AUSTRALIA)

JOHNSON, W. Reed, Professor Emeritus, Nuclear Engineering, University of Virginia. Former member of the Nuclear Regulatory Commission's Atomic Safety and Licensing Appeal Board, Fellow, American Nuclear Society.

JOONDEPH, Brian C, MD, MPS, FACS - Retina Surgeon, Denver, CO and Writer. Member of American Academy of Ophthalmology, American Society of Retina Specialists, Macula Society, Retina Society, American College of Surgeons.

KAIJSER Sten, professor emeritus of mathematics, Uppsala University. (SWEDEN)

KAIJSER, Thomas, professor emeritus of applied mathematics, Linköping University. (SWEDEN)

KAISER, Klaus L.E., Dr. rer. nat. (Technical University Munich, Germany), Research Scientist (retired), Natl. Water Research Institute. Author/coauthor of numerous scientific papers, author of numerous popular public press articles, author/editor of several books. (CANADA)

KALMANOVICH, Norman, Professional Geophysicist, Alberta. (CANADA).

KAPLAN, Alexander E, Professor, PhD, Department of Electrical and Computer Engineering, The Johns Hopkins University; Max Born Award (Optical Society of America) 2005; Senior Alexander von Humboldt Award (von Humboldt Foundation) 1996; Fellow OSA, laser physics, nonlinear and quantum optics, USA.

KARAJAS, John, retired geologist, specialist stratigrapher and sedimentologist who, as a result has gained a wide-ranging understanding of the geological history of planet earth and its climatic history.

KARLÉN, Wibjörn, Professor emeritus, My major concern since the late 1950s has been changes in the climate. I have worked with glaciers, lacustrine sediments, treelimit, tree-rings etc. I have conducted work in Scandinavia, the Arctic (e.g. Svalbard), Africa, New Guinea, and Antarctica. (SWEDEN)

KARRAS, Thomas W, Ph.D. UCLA, B.S. U. of Chicago. Retired Fellow Lockheed Martin/GE. Fifty years technical, programmatic and management experience in Space Systems, Propulsion, Remote Sensing and Communications.

KAUFMAN, John, Retired, Faculty of Cornell University 1973-191976 & Michigan State University 1976-1981, Research Agronomist.

KAUPPINEN, Jyrki, PhD in Physics, University of Oulu, Finland, Professor of Physics (emeritus), University of Turku, Finland, research activities : IR-spectroscopy, interferometry, gas sensors, and climate change. (FINLAND).

KEEN, Richard A., Ph.D. Climatology/Geography, University of Colorado, Emeritus Instructor of Atmospheric Science, University of Colorado, Author of 7 books and numerous reports and scientific papers on Climate and Meteorology. NWS climate change, Observer for Monsanto (retired as Science Fellow) 1981-2002 & Agrium 2003-2007.

KENDRICK, Hugh, Ph.D. Nuclear Engineering, University of Michigan; former Director, Plans & Analysis, Office of Nuclear Reactor Research, US.DOE; retired VP SAIC.

KHANDEKAR, Madhav, PhD, Former Research Scientist Environment Canada Expert Reviewer IPCC 2007 Climate Change Documents, Lead Author on EW (extreme weather) Chapter in NIPCC 'Climate Change Reconsidered II' 2013 (Physical Science) Pub. by Heartland Institute Chicago USA (INDIA and CANADA)

KEMM, Dr Kelvin, CEO: Nuclear Africa. (SOUTH AFRICA).

KIMOTO, Kyoji, Climate science researcher revealing basic mathematical errors in the AGW theory of the IPCC (JAPAN).

KININMONTH, William, MS MAdmin: Retired former head of Australia's National Climate Centre; member of the WMO Commission for Climatology; author of Climate Change: A Natural Hazard (2004), (AUSTRALIA).

KNOX, Robert S, Ph. D., Physics and Optics, U. of Rochester, 1953. Professor of Physics Emeritus, U. of Rochester, fellow, American Physical Society; charter member, American Society for Photobiology.

KOLDEWYN, William A, PhD Physics Wesleyan University (1976) retired Aerospace physicist (Ball Aerospace)

KRAMM, Gerhard, Dr. rer. nat. (Humboldt-University of Berlin, Germany), Research Associate Professor of Meteorology (retired), author and co-author of numerous papers on meteorology and textbook co-author. (GERMANY)

KVALHEIM, Olav M, Professor, Dept. of Chemistry, University of Bergen, Norway, Primary competence: Multivariate modelling and data analysis. Norwegian Research Council Prize for outstanding use of Research and several other awards also from U.S. organizations. (NORWAY)

KYLE, Gary S., Ph.D. Physics, University of Minnesota. Professor and Head of the Physics Department at New Mexico State University (retired). Research field: High Energy Nuclear Physics.

LABOHM, Hans H.J, independent economist without affiliation. Former dpt. Head of the Planning Staff of the Netherlands Ministry of Foreign Affairs, former dpt. Permanent Representative of The Netherlands to the OECD. Author specialised in climate issues. Lead author of: Man-Made Global Warming: Unraveling a Dogma.

LANDER, Richard L. Ph.D., Fellow American Physical Society. Emeritus Professor University of California at Davis.

LANGNER, Carl G, PhD, Retired senior staff engineer for Shell E&P Technology Co, author or co-author of 31 patents along with numerous industry papers, member NAE.

LAPOINT, Patricia A, Ph.D. Professor of Management, Author of several articles on wind energy.

LEDGER, John Alexander, PhD, Associate Professor of Energy Studies, University of Johannesburg; Visiting Associate Professor, University of the Witwatersrand, Johannesburg. (SOUTH AFRICA)

LEGATES, David R, Ph.D., Climatology, U of Delaware, 1988, Professor, University of Delaware, Member: AMS.

LEHR, Jay Ph.D. Science Director, The Heartland Institute, author or co-author of 35 science books relating to water, energy and the environment.

LE PAIR, Dr. Cornelis , KONL, Former director of FOM, the Netherlands Research Organization of Physics and former director of STW, the Netherlands Technology Foundation. Ex member of the Netherlands General Energy Council and of the Defence Research Council. (NETHERLANDS).

LESSER, Jonathan A, PhD, President, Continental Economics, Inc. Sandia Park, NM.

LESTER, David H, Ph.D. in Chemical Engineering, retired consultant in Environmental Analysis and Nuclear Technology, former Asst. Vice-President SAIC, San Diego, CA, Currently Chairman of the Board of Go-Nuclear.

LEVINE, Robert E., PhD, Physics, University of Pennsylvania, 1970

LIMBURG, Dipl.-Ing Michael, Vice President, European Institute for Climate and Energy (EIKE), (GERMANY)

LINDL, John, Fellow of AAAS and Fellow of the APS. Recipient of the 2007 Maxwell Prize from the APS

LINDSTROM, Richard E., Ph.D., Physical Chemistry, Thermodynamics of Phase Changes, Professor Emeritus, University of Connecticut

LINDZEN, Richard: emeritus, Alfred P. Sloan Professor of Meteorology, Member of National Academy of Sciences, author of numerous papers on climate and meteorology

LIPMAN, Everett, Associate Professor of Physics, University of California, Santa Barbara.

LIPPINCOTT, William, PhD Genetics UCSD, Environmental Consultant.

LIVERMORE, Martin, BA (Oxon) Chemistry; Director, Scientific Alliance, supporting evidence-based policymaking on environmental issues. (UNITED KINGDOM)

LLOYD, Prof Philip, PhD, Professor of environmental chemical engineering at the University of the Witwatersrand, Senior research fellow and Professor at the Energy Research Centre, University of Cape Town. (SOUTH AFRICA)

LONGHURST Alan. Retired oceanographer. (Ph.D. Univ. London, 1969). Director, NOAA/NMFS SW Fishery Center, La Jolla, Ca. (1967-1971), Director-General, Bedford Institute of Oceanography, Canada (1979-1987). (CANADA)

LUEDECKE, Horst-Joachim, Professor (retired) of physics, University of applied sciences, Saarbrücken. (GERMANY)

LYNCH, William T, IEEE Fellow, Former Director at Semiconductor Research Corporation, Former Dept. Head of VLSI Device Technology at Bell Laboratories, Former member of the U.S. Nuclear Emergency Team #1, and a nuclear and radiation effects specialist.

LUPO, Anthony R, Professor, Atmospheric Science, University of Missouri.

LYTLE, Farrel W, Fellow APS and NAAS.

MACDONALD, James, M.S. Meteorology, Massachusetts Institute of Technology, Retired Chief meteorologist, Travelers Research Center Weather Service, Hartford, CT. 35 years weather forecasting experience.

MACDOUGALD, Harry W, Partner, Caldwell Propst & DeLoach, LLP, Atlanta, GA.

MADARASZ, Frank Ph.D., Condense Matter Theoretical Physics, Retired Research Professor University of Alabama in Huntsville, former Scientific Advisor Taiwan-AFOSR Nano Science Initiative, and Project Scientist for International Space Station experiment.

MALKAN, Matthew, Professor of Physics and Astronomy at UCLA. He received his PhD in Astronomy from Caltech. He is the lead author or co-author of over 350 peer-reviewed articles.

MANGINO, Martin J, Ph.D., Professor, Virginia Commonwealth University, Research Director, VCU Trauma Center, President, Virginia Scientists and Engineers for Energy and Environment (VA-SEEE), Richmond.

MANNHEIMER, Wallace, PhD, Fellow of APS and IEEE, retired as a senior scientist at the US Naval Research Laboratory and is now a consultant, worked on fusion and other areas of plasma science. For the past 20 years he has advocated the fusion project switch to fusion breeding (<http://link.springer.com/article/10.1007/s10894-015-0055-9>) and has attempted to compare assertions of harm from climate change with actual data (https://www.ijeas.org/download_data/IJEAS0212036.pdf). The latter concludes there is little evidence of any environmental catastrophe.

MANNS, Francis T, Ph.D., Geoscientist, Principal, Artesian Geological Research, 323 Blantyre Avenue, Toronto, M1N 2S6, Canada (CANADA)

MANUEL, Oliver K, Emeritus Professor, University of Missouri, Former NASA Principal Investigator for Apollo, PhD - Nuclear Chemistry, Postdoc - Space Physics, Fulbright - Astrophysics.

MARKO, Pr. Dr. István E, Organic, organometallic and medicinal chemist, Université catholique de Louvain, Laboratoire de Chimie Organique et Médicinale, Institut IMCN, Unité MOST, More than 250 peer-reviewed articles, over 400 lectures worldwide, 2 books. (BELGIUM)

MAROHASY, Dr Jennifer, Senior Fellow, Institute of Public Affairs, Melbourne. (AUSTRALIA)

MARSH, James A, Professor of Immunology (emeritus), Department of Microbiology and Immunology, College of Veterinary Medicine, Cornell University.

MARTINIS, John, Professor of Physics, University of California, Santa Barbara.

MCCALL, Gene, Ph. D., former chief scientist of Air Force Space Command and former chair of the Air Force Scientific Advisory Board.

MCCLELLAND, Thomas, Ph.D., Vice President Advanced Development, Frequency Electronics, Inc.

MCDAVID, A. Dax, Master of Arts, Petroleum Geology, University of Texas, Austin, TX.

MCLEAN, John, Ph. D candidate James Cook University, writing dissertation on the accuracy of temperature data; Author of four peer-reviewed papers on climate including one that addresses the "pause"; Most prolific Expert Reviewer of IPCC 5AR WGI second order draft.

MEDLOCK, Patrick, BS Geology, University of Kansas, 1982 and MS Oklahoma State University, 1984.

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NISKANEN C E N T E R

Supreme Court Stays Enforcement of EPA Clean Power Plan: What it Means

The Supreme Court delayed implementation of the EPA's regulations to limit carbon dioxide emissions (CO₂) from existing power plants, known as the Clean Power Plan (CPP), until legal challenges are settled by the courts (circa early 2018). This stay creates regulatory uncertainty for state planners and utilities, but will not change the market conditions that are transforming the electricity sector away from coal and toward lower-carbon energy sources.

Legal status of the CPP is unknown.

- A coalition of 27 states and industry groups have sued to overturn the CPP in the D.C. Circuit court, which will hear arguments in June 2016. The most expedient timetables predict that the Supreme Court will rule on these regulations by late 2017 or spring 2018.
- The Court's new vacancy means that it is now far less likely to reject the CPP than it was previously. And, even in the unlikely event it were to do so, that decision would not disturb EPA's underlying regulatory authority over CO₂.

Practical implications of the stay create uncertainty for state planners.

- EPA may not enforce its regulatory timetables until litigation is complete.
- States will **not** be required to submit preliminary compliance plans in September 2016, as the CPP would have required. If the Court upholds the CPP, deadlines for states to submit plans and comply with the EPA regulations will be subject to uncertain delays.
- Industry observers expect utilities will continue low-carbon investments in expectation of market conditions favoring natural gas and renewables, as well as state and future federal regulation, meaning the stay may have little impact on anticipated emissions reductions.

The CPP stay makes case for the U.S. Paris pledge more ambiguous.

- Before the Paris climate talks, the Obama administration pledged to reduce U.S. greenhouse gas emissions 26-28% of the 2005 levels, by 2025. The Administration's own report to the U.N. says that policies in place (the CPP being the largest single component) will not achieve the pledged emissions reductions.
- This stay makes the Administration's plans to meet the Paris pledge more ambiguous. Since the Paris deal relies on peer-pressure and voluntary actions by individual countries, U.S. ambiguity may undermine how other countries carry out their pledged reductions.

Market trends still spell trouble for the coal industry.

- This stay does nothing to change market trends in the energy sector—principally the expansion of cheap natural gas and renewables.
- Price competition has created severe market challenges for the coal industry.
- Even if the Supreme Court eventually rejects the CPP (now less likely, as noted above), the market conditions for coal will be no better in 2018 as a result.

Further Info: Joseph Majkut – Director of Climate Science – jmajkut@niskanencenter.org
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ARTICLE SUBMITTED BY RANKING MEMBER
EDDIE BERNICE JOHNSON

2/3/2016

In Paris, majority view in GOP Congress is in minority : National

In Paris, majority view in GOP Congress is in minority

DECEMBER 10, 2015 7:33 PM • THE WASHINGTON POST

PARIS -- The Paris talks had just reached the halfway point when a small band of climate skeptics made their stand at a hotel on the opposite side of town. With charts and slides, the group repeated a claim that is familiar to Washington but wildly out of sync with the discussions here: Man-made global warming is a fiction.

"To limit CO2 emissions is not only wasteful but also counterproductive," Fred Singer, a Virginia physicist and longtime critic of the scientific consensus on climate change, told the gathering, billed as an exercise to "bring climate realism to Paris."

But at the real climate talks north of the city, such views were nowhere to be found. As negotiations entered their 11th day on Thursday, diplomats representing nearly every nation on Earth gathered in noisy conference rooms to haggle over the scope and timing of a proposed international accord on fighting the causes of climate change. They argued, sometimes passionately, over the costs of the pact and over how to pay for it. But they did not debate whether the problem is real.

Indeed, doubts about the science of climate change -- once a staple of international climate talks, used by nations as well as energy companies to argue against controls on fossil-fuel emissions -- appears to have vanished from the public discourse here, relegated to side events organized by veteran climate skeptics, or by visitors from the one major legislative body that has actively sought to block a climate agreement in Paris: the U.S. Congress.

"They are the lone holdouts," Alden Meyer, director of strategy and policy for the Union of Concerned Scientists, said of the denier caucus that dominates the Republican majority in both the House and Senate. "On this issue, the only dysfunction you see these days is in the United States -- and, really, just in Washington."

The Republicans appear to be one of the only political parties in control of a legislature in the industrialized world to espouse the contrarian view on climate change.

LETTER SUBMITTED BY REPRESENTATIVE FRANK D. LUCAS

Congress of the United States
Washington, DC 20515

January 14, 2016

Administrator Gina McCarthy
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Office of the Administrator, 1101 A
Washington, DC 20460

Dear Administrator McCarthy,

In 1992, national governments around the world, including the United States, agreed to the United Nations Framework Convention on Climate Change (UNFCCC) as the framework for addressing variations in the global climate. Although there have been subsequent global climate treaties since the UNFCCC entered into force, the U.S. Senate has never ratified any treaty that places legally binding greenhouse gas emissions targets on the United States.

The Paris Protocol was negotiated from November 30 – December 11, 2015, at the 21st annual session of the Conference of Parties (COP 21) of the UNFCCC. The results of COP 21 were non-binding emissions reduction and finance commitments from participating governments. The United States cannot be legally bound to any global agreement that sets emissions targets or financial commitments without treaty ratification by the U.S. Senate.

Reports indicate that the U.S. Environmental Protection Agency (EPA) plans to embed U.S. federal employees in UNFCCC participating countries to monitor progress towards the COP 21 commitments. We respectfully request additional information on this plan to deploy U.S. federal employees to UNFCCC participating countries and pose the following three questions:

1. How many U.S. federal employees will be deployed to UNFCCC participating countries?
2. How long will these employees be deployed?
3. What will the cost of the deployment be to U.S. taxpayers?

We look forward to receiving your response by January 29, 2016.


Sincerely,


Markwayne Mullin
Member of Congress



Tim Murphy
Member of Congress


Congress of the United States
Washington, DC 20515



Marsha Blackburn
Member of Congress


John Shimkus
Member of Congress

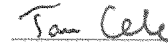

Joe Barton
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