WE'LL ALWAYS HAVE PARIS: FILLING THE LEADERSHIP VOID CAUSED BY FEDERAL INACTION ON CLIMATE CHANGE

HEARING

BEFORE THE

SUBCOMMITTEE ON ENVIRONMENT AND CLIMATE CHANGE

OF THE

COMMITTEE ON ENERGY AND COMMERCE

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C O N T E N T S

WITNESSES

SUBMITTED MATERIAL

[1]The information has been retained in committee files and also is available at http://docs.house.gov/meetings/IF/IF18/20190228/108973/HHRG-116-IF18-20190228-SD007.pdf.

WE'LL ALWAYS HAVE PARIS: FILLING THE LEADERSHIP VOID CAUSED BY FEDERAL INACTION ON CLIMATE CHANGE

THURSDAY, FEBRUARY 28, 2019

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON ENVIRONMENT AND CLIMATE CHANGE,
COMMITTEE ON ENERGY AND COMMERCE,
Washington, DC.

The subcommittee met, pursuant to call, at 10:01 a.m., in the John D. Dingell Room 2123, Rayburn House Office Building, Hon. Paul Tonko (chairman of the subcommittee) presiding.

Members present: Representatives Tonko, Clarke, Peters, Barragán, McEachin, Blunt Rochester, DeGette, Schakowsky, Matsui, McNerney, Ruiz, Dingell, Pallone (ex officio), Shimkus (subcommittee ranking member), Rodgers, McKinley, Johnson, Long, Carter, Duncan, and Walden (ex officio).

Staff present: Adam Fischer, Policy Analyst; Jean Fruci, Energy and Environment Policy Advisor; Waverly Gordon, Deputy Chief Counsel; Caitlin Haberman, Professional Staff Member; Rick Kessler, Senior Advisor and Staff Director, Energy and Environment; Brendan Larkin, Policy Coordinator; Dustin J. Maghamfar, Air and Climate Counsel; Mike Bloomquist, Minority Staff Director; Jerry Couri, Minority Deputy Chief Counsel, Environment; Jordan Davis, Minority Senior Advisor; Margaret Tucker Fogarty, Minority Staff Assistant; Peter Kielty, Minority General Counsel; Mary Martin, Minority Chief Counsel, Energy and Environment; Brandon Mooney, Minority Deputy Chief Counsel, Energy; Brannon Rains, Minority Staff Assistant; and Peter Spencer, Minority Senior Professional Staff Member.

Mr. TONKO. The Subcommittee on Environment and Climate Change will now come to order. I recognize myself for 5 minutes for the purpose of an opening statement.

OPENING STATEMENT OF HON. PAUL TONKO, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW YORK

In late 2015, driven by American leadership, the world came together to acknowledge the threat of climate change and make plans for cooperative global efforts in mitigation, adaptation, and finance.

The purpose is to reduce greenhouse gas emissions to limit global temperature increase to well below 2 degrees Celsius. The ingenuity of the Paris Agreement is that it builds from the bottom up. It does not dictate specific reductions or remedies.

Each country sets its own target, submits a Nationally Determined Contribution, or NDC, to achieve those targets, reports on their emissions, and, hopefully, increases their ambition over time.

The United States, for example, committed to reduce its emissions by 26 to 28 percent below 2005 levels by 2025. This achievable commitment was based on a plan that included a number of actions: adopting fuel economy standards for light- and heavy-duty vehicles, cutting carbon pollution from new and existing power plants, reducing methane emissions, addressing building sector efficiency, and developing new alternatives to HFCs.

Today, despite the obvious and growing threat posed by the climate crisis, many of these policies are being delayed or undone by the Trump administration. The Rhodium Group's "Taking Stock 2018" report found that U.S. emissions under current policy are heading toward 12 to 20 percent below 2005 levels in 2025, well short of the U.S. target.

In June of 2017, President Trump announced his intent to withdraw the United States from the Paris Agreement, although it is important to note that this cannot be done formally until November of 2020.

Still, as time goes by, I know that many of his supporters, possibly including some in this room, will come to regret this decision. President Trump may not understand the importance of international climate cooperation, but thousands of others, including States, cities, businesses, and universities have stepped up and said, "We are still in."

If you add them all up, these non-Federal actors would have the third largest economy in the world. And their commitments are not just lip service. They are taking tangible steps and filling America's leadership void through organizations such as the United States Climate Alliance and the Climate Mayors coalition.

Last year, California even organized the Global Climate Action Summit with world leaders and garnered a new round of commitments.

To support these efforts, the climate organization America's Pledge has sought to compile and quantify subnational actions. According to their "Fulfilling America's Pledge" report, these actions could meet about two-thirds of what is needed for America's commitment.

While these efforts are keeping our targets within reach, they are not enough. More must be done. We need Federal policies and we need real leadership.

While President Trump has pulled America's seat at the table, other countries, including China and India, continue to write the international rules on emissions monitoring, reporting, and transparency, and work towards achieving their NDCs.

I have heard some spurious arguments from Members in the past about the Paris Agreement and the commitments of other countries. But people must understand what we give up by walking away.

If those Members do not trust these other countries, that is an important reason to stay in and fight for stronger reporting and transparency rules. And if Members really want other countries to

set bolder targets, the United States should not set such a poor example and hurt our credibility.

At our last hearing, I was pleased to hear a new bipartisan consensus around the realities of climate change. America's NDC is a voluntary, nonbinding commitment. If anyone thinks it is too difficult to achieve, they should say so and push for a different target.

But if we agree that climate change is a problem, there is no reason to support the President's withdrawal. Our subcommittee members also seem to agree that energy innovation is an important part of any climate solution.

In this vein, I want to remind my colleagues of the announcement that coincided with Paris under the banner of "Mission Innovation." Twenty countries committed to doubling their clean energy R&D investment over 5 years, which will be bolstered by private sector commitments.

I hope we can expect those calling for more innovation to also support that initiative. Global problems require global cooperation. We accept this when it comes to countless security, health, and economic issues, and we know that climate change impacts all of these areas, and more.

We cannot hide from the mantle and the accompanying responsibility of being the greatest nation on Earth. The United States must lead. Others will be guided by our example.

I said in our first climate hearing that we are behind, but it is not too late. We are still in Paris and there is still time to reach America's 2025 target.

But that takes Congress getting serious. It means pushing back on administration actions that take us in the wrong direction and it means putting forward new policies that will accelerate clean-energy deployment and reduce climate pollution.

Thank you all for being here this morning. I look forward to hearing from our witnesses. Before we introduce them, I will recognize Mr. Shimkus, our Republican leader on the Subcommittee on Environment and Climate Change, for 5 minutes with his opening statement.

Welcome.

[The prepared statement of Mr. Tonko follows:]

PREPARED STATEMENT OF HON. PAUL TONKO

In late 2015, driven by American leadership, the world came together to acknowledge the threat of climate change and make plans for cooperative, global efforts in mitigation, adaptation, and finance. The purpose is to reduce greenhouse gas emissions to limit global temperature increase to well below 2 degrees Celsius.

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And their commitments are not just lip service. They are taking tangible steps and filling America's leadership void through organizations such as the U.S. Climate Alliance and the Climate Mayors coalition. Last year, California even organized the Global Climate Action Summit with world leaders and garnered a new round of commitments.

To support these efforts, the climate organization America's Pledge has sought to compile and quantify subnational actions. According to their "Fulfilling America's Pledge" report, these actions could meet about two-thirds of what is needed for America's commitment. While these efforts are keeping our targets within reach, they are not enough. More must be done. We need Federal policies and real leadership.

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But people must understand what we give up by walking away.

If those Members do not trust these other countries, that is an important reason to stay in and fight for stronger reporting and transparency rules.

And if Members really want other countries to set bolder targets, the U.S. should not set such a poor example and hurt our credibility.

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And it means putting forward new policies that will accelerate clean energy deployment and reduce climate pollution.

Thank you all for being here this morning. I look forward to hearing from our witnesses.

OPENING STATEMENT OF HON. JOHN SHIMKUS, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF ILLINOIS

Mr. SHIMKUS. Thank you, Mr. Chairman. I think a useful purpose of the hearing this morning will be to learn more about the

technologies and actions that are expected to accelerate the reduction of U.S. carbon dioxide emissions.

I am not sure all of these actions will be viable or cost effective. I am also not sure that all these actions will be in the best interests of the United States, especially if they end up putting us in an economic or strategic disadvantage to our global competitors.

But it is important to gather this information for the committee's future consideration. Another purpose of this hearing, as you have indicated, is to examine the importance of the United States staying in the Paris Agreement, which President Obama formally accepted in late 2016, from which President Trump announced less than 10 months later in June 2017 that the United States would withdraw under the terms of the agreement.

Fair points may be made about what the Paris Agreement represents in terms of a broad-based international cooperation, but that is not really the issue here.

The issue is how the Obama administration made expensive commitments that would bind U.S. action without broad-based support from congressional policymakers. The commitments, the financial pledges, and the costly burdens from implementing regulations that will be needed to meet our obligations were not submitted to or approved by Congress.

Without that national political buy-in on such a complicated policy that would affect all sectors of the U.S. economy and people's daily lives, it is no wonder the new administration would change course.

The consumer cost and competitive harm the commitments pose to the Nation deserve close and careful attention and approval from policymakers. And this is not a U.S. problem alone. While other developed nations may be, quote, unquote, "staying in" the agreement so far, they are not actually following through on their promises.

The Climate Action Tracker, a European consortium of research organizations, found that nations' commitments will not meet the actual goals in the Paris Agreement, and the Washington Post reported on this research last October. Most major nations are making few if any efforts to meet their goals.

The European Climate Action Network, another think tank, reported last summer that all European Union countries are off target. No single country in Europe is performing sufficiently to meet the Paris Agreement goals and those that have been making the most progress on their promises did not make any large commitments in the first place.

At the same time, we have the United Nations Gap Report released this past November which assessed the situation and reported that all these countries will have at least to triple their efforts to meet the Paris Agreement's basic goals, if not increase their goals fivefold to meet the more stringent temperature targets. I am not sure that is going to go so well. In France, we have witnessed the Paris riots, which were sparked over government's climate-related proposal to increase gasoline taxes on the rural French.

In Germany, according to news reports last week, a climate law to get the nation back on track with its Paris emission goals by 2030 has been threatening to break up the coalition government in

Germany. Germany, of course, has turned away from nuclear energy and increased coal production as well as emissions over the past 5 years.

Finally, as we discussed in our hearing three weeks ago, there is a developing—there is the developing world, which is participating in this agreement but will produce almost all the growth in future carbon dioxide emissions as billions of people understandably seek access to affordable energy.

The plain fact here is goals of the international climate agreements, which are to move towards lower-emitting systems in energy, transportation, industry, agriculture are not going to work unless there is sufficient affordable technology to deploy on a massive scale.

You cannot get there in a meaningful way with wind and solar without undermining industrial capacity and economic well-being.

So I will continue to say, Mr. Chairman, when it comes to addressing climate change let us take action. But let us be smart and pragmatic about it. We should focus on realistic solutions to prepare for the future and on policies that work for the American people.

[The prepared statement of Mr. Shimkus follows:]

PREPARED STATEMENT OF HON. JOHN SHIMKUS

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Without that national political buy-in on such a complicated policy that would affect all sectors of the U.S. economy, and people's daily lives, it is no wonder a new administration would change course. The consumer costs and competitive harm the commitments posed to the Nation, deserved close and careful attention and approval from policy makers.

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So I will continue to say: Mr. Chairman, when it comes to addressing climate change, let's take action, but let's be smart and pragmatic about it. We should focus on realistic solutions to prepare for the future, and on policies that work for the American public.

Mr. SHIMKUS. And with that, Mr. Chairman, I yield back the balance of my time.

Mr. TONKO. Thank you, Mr. Leader, and the gentleman yields back.

The Chair now recognizes Mr. Pallone, chairman of the full committee, for 5 minutes for his opening statement.

Mr. Pallone?

OPENING STATEMENT OF HON. FRANK PALLONE, JR., A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW JERSEY

Mr. PALLONE. Thank you. Thank you, Mr. Chairman.

I am not sure I want to criticize Mr. Shimkus because he is probably more of an ally on this than many on the other side of the aisle. But I do want to take—I do take somewhat offense, John, to the fact that when you talk about these other countries that are—that continue to adhere or want to adhere to the Paris Agreement, at least they are trying.

I mean, sure, it is true that, you know, Macron tries something and he gets resistance. Sure, it is true that the chancellor in Germany tries something and they meet resistance. I am not arguing that. I think we all know that. We read the news.

But at least they are saying that the Paris Agreement as a goal makes sense and that they would like to try to reach those goals. The reason that I am so critical and will continue to be of our President is because he says the opposite. He says, "I don't want to meet the goals. I want to withdraw from the Paris Agreement."

He is not making any attempt to move forward to address climate change. In fact, he is moving in the opposite direction. The initiatives like the Clean Power Plan and the fuel efficiency standards that were put in place under President Obama he wants to scrap.

So I think it is a little disingenuous, I guess, to criticize other countries that are trying to meet the Paris goals and leaders that

are trying to meet the Paris goals. Sure, they are going to—you know, they are going to have a hard time. There are going to be those that push back. They are going to have pitfalls. But they are at least trying.

The problem here is that our President is saying the opposite. He said, I don't want to do that—I don't care. You know, I am going to move in the opposite direction.

And I think that is what is really bad is just abrogation of American leadership that goes along with saying you are going to withdraw from the Paris Agreement.

But in any case, I know I am criticizing you but I don't mean to do it too hard because you are probably the best friend we have.

Anyway, I wanted to thank Chairman Tonko for scheduling this hearing as the committee continues to discuss the growing crisis of climate change and the ways that we can combat it.

For the last 2 years, President Trump, his administration, and Republicans here in Congress have repeatedly pushed actions and policies that would only make the crisis worse.

We are here today to discuss one of these actions. President Trump's decision to pull out of the Paris Agreement is unjustified and dangerously shortsighted. It abdicates U.S. leadership on global climate action—an issue where America has always been a leader—and breaks our promise to all nations who joined the historic agreement.

I believe the Trump administration's retreat puts the health and safety of our communities at great risk and seriously jeopardizes our future security. It also puts our economic future at great risk as the world embarks on a major transition to a low-carbon economy.

President Trump now wants to pull us out of that agreement. The Paris Agreement—an agreement reached by nearly 200 nations—was an important unified stand in the fight against our changing climate.

It sets a strong foundation for action that will accelerate the shift to a clean-energy economy and puts us on the path to a safer healthier planet for generations to come.

It is also our best hope of mobilizing the global action needed to avoid catastrophic changes to our environment and the Paris Agreement represents a significant departure from past efforts to secure international cooperation on climate change. It allows each nation to design its own emission reduction strategy that is best suited to the unique circumstances of its society and economy.

Importantly, the Paris Agreement applies to all parties to the Convention, including India and China. It also includes critical transparency and accountability measures to ensure countries are meeting their emissions reduction goals and have the flexibility to make any necessary adjustments to stay on track.

The Obama administration's plan to meet the goals of this agreement were reasonable, achievable, and balanced. It provided a framework in reducing U.S. emissions while also growing our economy.

More energy-efficient appliances, buildings, and vehicles result in lower costs for consumers and keep our manufacturing industries

competitive globally, all while lowering emissions of harmful air pollutants.

The plan also calls for controlling methane emissions from the oil and gas sector, which was a long-overdue and sensible step, and so too was curbing carbon emissions from the power sector under the Clean Power Plan.

In fact, the reductions required by the Clean Power Plan were so reasonable that most of the power sector is now meeting them. And, yet, the Trump administration has methodically stalled or rolled back all these initiatives.

The administration's actions reflect a determination to lock in fossil fuel dependence for consumers, reversing meaningful progress and setting the planet on a dangerous course.

The good news is that the rest of world and many States, cities, and businesses here in the United States have rejected the Trump administration's retreat on climate change.

They have declared, "We are still in." They are leading the way to cleaner energy, greater energy efficiency, lower consumer costs, more resilient communities, and new technologies and business.

While each individual contribution by these non-Federal actors may be small, together they add up to significant emission reductions and, just as importantly, their experience lays the foundation for future progress.

I am going to sum up by saying the time for action to avoid the worst effects of climate change is growing short, but at a minimum, the U.S. must fulfill its commitments that we made in the Paris Agreement.

And the Federal Government shouldn't just stand on the sidelines. We have to show we are still committed to the global agreement.

[The prepared statement of Mr. Pallone follows:]

PREPARED STATEMENT OF HON. FRANK PALLONE, JR.

I want to thank Chairman Tonko for scheduling this hearing—as the committee continues to discuss the growing crisis of climate change, and the ways that we can combat it. For the last 2 years President Trump, his administration and Republicans here in Congress have repeatedly pushed actions and policies that would only make the crisis worse.

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While each individual contribution by these non-Federal actors may be small, together they add up to significant emission reductions. And, just as important, their experience lays the foundation for further progress. But make no mistake, meaningful future climate action needs Federal leadership to be successful. We cannot assume State, local, and private-sector initiatives will be enough to effectively limit global temperature increases.

We have the tools and technology to replace fossil fuel dominance with clean energy, but we need to deploy them faster. But, we will also need new technologies and infrastructure to achieve the deeper de-carbonization of the economy that will ensure our long-term safety and prosperity. We have a lot of work to do.

The time for action to avoid the worst effects of climate change is growing short, but we still have time to act. At a minimum, the Unites States must fulfill the commitments we made to the world in the Paris Agreement. The Federal Government simply cannot stand on the sidelines—we must show that we are still committed to this global agreement.

Mr. PALLONE. Thank you, Mr. Chairman.

Mr. TONKO. And Chairman Pallone yields back.

OK. The Chair now recognizes Mr. Walden, Republican leader of the full committee, for 5 minutes for his opening statement.

Mr. Walden?

OPENING STATEMENT OF HON. GREG WALDEN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF OREGON

Mr. WALDEN. Good morning, my friend. Thanks for having this hearing as well. I think it is important to point out a couple of things right out of the gate.

The U.S. is still a part of the Paris Agreements—Paris Accords—and will be until 2020. The Trump administration negotiators were credited recently with helping forge a multinational agreement on how to measure emissions so that all countries that are involved would have some higher level of confidence that each other were actually reducing the emissions they said they were and they got international credit for that.

I think part of what we are after is, again, pursuing an agenda of U.S. innovation, conservation, adaptation, and preparation. We can lead the world in this space and we should. We just don't want to repeat the mistakes that others have made in their laboratory work, if you will, trying to tackle this issue.

They have had riots on the streets in France since November as consumers said the direction France went with the high cost of gasoline was more than they were willing to bear. We need to keep consumers in mind in this discussion.

We are ready to work on developing policies, in fact, I would say, build on the policies that we developed over the last several Congresses in this space to make sure that we have an electric grid that is reliable and secure and has the capacity to be able to feed into renewable energy.

We have been big advocates for battery storage enhancement and, indeed, in my district there is a partnership between NextEra and PGE to have one of the biggest battery storage energy sectors in the United States. It is the biggest, it is the first, and they will link renewable energy into battery storage to help bring more firm baseload power to the grid. That will replace energy now generated from coal.

Our country invests in these national labs that help develop this technology, and there is more work to be done there. You know, we have learned over the years how these policies rapidly transform the Nation's electricity system from a system designed for the economical and reliably dispatch of power to a system focused on meeting Federal emissions caps can have unintended consequences.

This rapid transformation, which Congress opposed, would have driven out major sources of affordable energy, threatened reliability and security, and driven up consumer electricity bills.

To achieve the goals, I think we could all find some common ground along. We also have to make sure that we don't encourage unintended consequences that could affect consumers negatively to the point that they riot in the streets, as they are doing in France, as well as put the grid in peril.

We learned that even with the economically harmful impact of these and other policies targeting the fuels we use and cars we drive, the goals proposed by the Paris Agreement still could not be met.

The policies, according to the administration's own estimates, would get maybe 60 percent of the way there, and I am talking about the Obama administration now.

Even Secretary Kerry noted at the time of the negotiations that, if the United States or even all the developed world cut their CO_2 emissions to zero, it would still not offset the emissions coming from the rest of the world.

So, again, we can be a leader in developing new technologies that we should sell to the rest of the world to reduce their emissions. We have got to be smart about how we do this.

In short, commitments in Paris were made without a clear plan to meet those promises, without a full view of the cost, and certainly not a plan that had broad bipartisan support in Congress.

That is what we would like to see developed here, Mr. Chairman, is a bipartisan plan, going forward. This focus on U.S. commitments to the Paris Agreement is the centerpiece for our Nation's climate policy. It kind of misses the point of what we should focus on if we want to make a difference in global emissions while strengthening the economy.

We should not lock ourselves into a narrow vision of what is possible. We must consider the realities of global energy systems and the need for affordable reliable energy access around the world.

We are fortunate in America to have electrified nearly every home and business in the country. There are many parts of the world that seek electricity for the first time. They will not be denied that. So let us work with them to figure out how to do it in an environmentally sensitive way.

Let us continue to work, as we have done in past Congresses, to reduce barriers to innovation, enable the United States to deploy new technologies to drive economic engines of the future and make realistic headway in curbing emissions from advanced carbon capture to nuclear technology to innovative hydropower solutions.

And we also have to look at things I care passionately about in my district in Oregon. The IPCC report going back to 2007 says sustainable forest management would help. We had 68 million tons of carbon emissions for the fires in California last year alone.

Now, not all those are forests—I get that—but there is a lot of work that has been pointed out we could do to reduce the excess fuel load in our forests that reduce emissions of more than just carbon—the other poisons that go up at the time—if we could come together in a bipartisan way on that.

So, Mr. Chairman, I look forward to working with you as we always do and thank you for having this hearing, and I yield back.

[The prepared statement of Mr. Walden follows:]

PREPARED STATEMENT OF HON. GREG WALDEN

Thank you, Mr. Chairman. I was struck by the title of this hearing. For the past six months Paris has seen continuous protests that began over ill-conceived policies designed to meet obligations under the Paris Agreement. Regular people are taking to the streets to oppose heavy handed regulation and taxation that threatened economic prosperity and cripple their ability to provide for their loved ones. So, I am not sure if the title was intentional but we should remember Paris and the Yellow Vests when debating policies that have real, every day impacts on hard working Americans.

As you know, Republicans are ready and willing to work with you on policies to address climate change risks. We have a growing record of bipartisan legislation in this area that is helping to drive implementation of cleaner technologies-and more can be done. But we should all be wary of resurrecting policies that are economically and technologically unworkable for the American public.

A central theme of today's hearing concerns actions that will help the Nation meet the U.S. commitments in the Paris Agreement under the U.N. Framework Convention on Climate Change. Some of these actions, on their own merits, may be worth additional examination and I look forward to hearing from the witnesses about them.

However, we should not forget the serious questions concerning costs, effectiveness, and feasibility of the U.S. commitments made by the Obama administration under the Paris Agreement 3 years ago.

In a number of committee hearings in the runup to the Paris negotiations, we examined closely the costs and impacts of the Clean Power Plan and related EPA standards that were the central policy for electric sector emissions reductions.

We learned how these policies sought to rapidly transform the Nation's electricity system—from a system designed for the economical and reliable dispatch of power to a system focused on meeting Federal emission caps. This radical transformation, which Congress opposed, would have driven out major sources of affordable energy, threatened reliability and security, and driven up consumer utility bills.

We learned that, even with the economically harmful impact of these and other policies targeting the fuels we use and cars we drive, the goals proposed for the Paris Agreement still could not be met. The policies, according to the administration's own estimates, could get maybe 60 percent of the way there. Even Secretary

of State Kerry noted during the Paris negotiations that if the United States, or even all of the developed world, cut their CO_2 emissions to zero, it would still not offset the emissions coming from the rest of the world.[1]

In short, commitments in Paris were made without a clear plan to meet those promises, without a full view of the costs, and certainly not a plan that had broad bipartisan support of Congress.

This focus on U.S. commitments in the Paris Agreement as a centerpiece of our Nation's climate policy misses the point on what we should focus on if we want to make a difference in global emissions while strengthening our economy.

We should not lock ourselves in to a narrow vision of what is possible. We must consider the realities of global energy systems and the need for affordable, reliable energy access around the world.

Let's continue the work we have been doing in the past few Congresses that will reduce the barriers to innovation and enable the United States to deploy new technologies to drive our economic engines of the future and make realistic headway in curbing emissions, from advanced carbon capture to nuclear technology to innovative hydropower.

We must also improve forest management to reduce the risk of catastrophic wildfires that choke communities in Oregon with smoke and fill our atmosphere with untold pollutants. Better managing our forests reduces the risk of these catastrophic fires and the toxic emissions they put into the atmosphere. The Intergovernmental Panel on Climate Change found that sustainably managing our forests will create the longest sustained carbon mitigation benefit. Congress should follow the science on forest management.

As we've said before, we are ready to begin the process of finding commonsense, bipartisan solutions to climate change. Instead of extreme agendas like the Green New Deal or looking backwards to unworkable policies that increase energy costs, limit innovation, and stifle economic growth, we should focus on the proven success demonstrated in the tremendous economical, security, and environmental benefits created through America's energy innovation over the past decade.

We want America's innovators to continue to develop the next technologies that will improve the environment and create jobs here at home. We want a healthy environment for our children, and future generations. We want our constituents and all Americans to have jobs and the opportunity to provide for their families. These are not mutually exclusive principles, and they are embedded in our approach to confronting climate risks. Let us work on them together.

Mr. TONKO. Thank you, and the Republican leader yields back.

As Chair, I remind Members that, pursuant to committee rules, all Members' written opening statements shall be made part of the record.

Now we welcome the witnesses to this subcommittee hearing. I thank them for taking the time and sharing their intellect with us.

Let me introduce our panel. First, we have Ms. Carla Frisch, principal with the Rocky Mountain Institute; then Mr. Samuel Thornstrom—Thernstrom, I am sorry—chief executive officer of the Energy and Innovation Reform Project; Mr. Nathan Hultman, director of the Center for Global Sustainability, associate professor at the University of Maryland School of Public Policy; and Mr. Andrew Light, distinguished senior fellow, World Resources Institute.

We thank, again, all of our witnesses for joining us today. We look forward to your testimony and thank you for sharing time with the subcommittee.

At this time, I will now recognize each witness for 5 minutes to provide his or her opening statement. Before we begin, I would like

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[1] Secretary Kerry stated: "The fact is, even if every single American biked to work or carpooled to school, and used only solar panels to power their homes—if we each planted a dozen trees—if we somehow eliminated all of our domestic greenhouse gas emissions—guess what? That still wouldn't be enough to offset the carbon pollution coming from the rest of the world. If all industrialized nations went down to zero emissions, it wouldn't be enough—not when more than 65 percent of the world's carbon pollution comes from the developing world. No matter how much half the world does to clean up its act—if similar steps aren't taken by the rest of the world, the Earth still has a problem."

to explain the lighting system. In front of our witnesses is a series of lights.

The light will initially be green at the start of your opening statement. The light will turn yellow when you have 1 minute left. Please begin to wrap up your testimony at that point and the light will turn red when your time has expired.

So we will begin with Ms. Frisch. You are recognized for 5 minutes, and welcome.

STATEMENTS OF CARLA FRISCH, PRINCIPAL, ROCKY MOUNTAIN INSTITUTE; SAMUEL THERNSTROM, FOUNDER AND CHIEF EXECUTIVE OFFICER, ENERGY INNOVATION REFORM PROJECT; NATHAN E. HULTMAN, PH.D., DIRECTOR, CENTER FOR GLOBAL SUSTAINABILITY, SCHOOL OF PUBLIC POLICY, UNIVERSITY OF MARYLAND; ANDREW LIGHT, PH.D., DISTINGUISHED SENIOR FELLOW, WORLD RESOURCE INSTITUTE

STATEMENT OF CARLA FRISCH

Ms. FRISCH. Thank you, Chairman Tonko, Ranking Member Shimkus, and members of the subcommittee for inviting me to testify and for your leadership in focusing on climate change.

I am a principal at the nonprofit nonpartisan Rocky Mountain Institute, where we work on market-based low-carbon solutions.

Cities, States, and businesses and others have been working to address climate and the environment for decades. But in the past 2 years, they have scaled up their efforts and come together more formally and, in part, that connects back to the announcement of the intent to leave the Paris Agreement.

Within 72 hours from that announcement, a very diverse coalition of over 1,200 States, cities, businesses, universities, counties, Tribes, faith-based organizations, hospitals, and others came together, and today that coalition is more than 3,600 members.

Their leaders have committed to reduce their emissions, not only because it is good for the climate but because it advances the interests of their citizens, their consumers, and their shareholders.

Are these commitments meaningful? America's Pledge set out to find that out. Rocky Mountain Institute worked on analysis which found that given existing commitments, the U.S. is, roughly, two-thirds of the way towards meeting the original commitment in Paris and broader engagement has the potential to put us within striking distance of the Paris Agreement.

That means scaling high-impact near-term climate strategies. But even since we published the report progress has been made. In the last three weeks alone, five gigawatts of coal retirements have been announced, and also in the electricity space more than 100 companies, including many Fortune 500 companies, have committed to 100 percent renewable energy and they are following through on those commitments and taking advantage of the lower technology costs of solar and wind, which continue to fall. Cities are doing that, too.

That clean electricity is powering clean electric transportation. Late last year, we passed the 1 million electric vehicles sold mark in the U.S. and sales have grown since then, and one-third of our public buses are on track to become emissions-free, which could sig-

nificantly improve health and air quality and also reduce costs for transit authorities, and that in part is driven by lower battery costs, as Ranking Member Walden mentioned.

That clean electricity is also powering homes and businesses. Using electricity to heat our homes and water is more efficient than using natural gas and burning that natural gas directly on site.

It improves indoor air quality and it reduces greenhouse gas emissions. And acknowledging that potential, New York State has required their electric utilities achieve a portion of their energy efficiency savings through deployment of efficient electric heat pumps.

So if we continue to scale and focus on these two priorities, rapidly cleaning up electricity production and using that clean electricity in our homes, businesses, and transportation systems, we could address up to 70 percent of U.S. greenhouse gas emissions.

And the Nation's rural electric co-ops have taken notice of that, and they are moving forward to focus on cost-effective beneficial electrification. States that have taken climate actions like these find that they are benefitting their economies and strengthening their community.

Through the bipartisan U.S. Climate Alliance 21 Governors have come together to lead on climate change including many recently elected Governors. Their climate policies have attracted billions in investment and have helped support more than 1.6 million clean-energy and energy-efficiency jobs.

Together, coalitions like these are demonstrating in real time how to deliver cost-effective climate action from the ground up.

Despite this tremendous progress, we need faster action. To avoid the worst impacts of climate change and get back on track for IPCC, we need action from all levels of government and participation from civil society.

It is not possible to solve the climate crisis without State, city, and business action. It is also not possible to solve the climate crisis without strong and sustained Federal policy.

The good news is we don't have to start from scratch at the Federal level. Federal reengagement can build on the great momentum and hard work that States, cities, and businesses have underway.

We have to have both to ensure that America continues to set the standard for international leadership.

[The prepared statement of Ms. Frisch follows:]

TESTIMONY OF CARLA FRISCH
PRINCIPAL, ROCKY MOUNTAIN INSTITUTE

U.S. HOUSE OF REPRESENTATIVES
ENERGY AND COMMERCE COMMITTEE
ENVIRONMENT AND CLIMATE CHANGE SUBCOMMITTEE

Hearing entitled "We'll Always Have Paris: Filling the Leadership Void Caused by Federal Inaction on Climate Change"

February 28, 2019

Thank you Chairman Tonko, Ranking Member Shimkus, and Members of the Subcommittee for inviting me to testify and for your leadership in focusing on climate change. I am a Principal at Rocky Mountain Institute, a non-profit dedicated to transforming global energy use to create a clean, prosperous, and secure low-carbon future. I am also a co-author of the recent 4th National Climate Assessment. In the February 6th hearing you heard about the need for urgent action to mitigate climate change, and I would echo these findings. Cities, states, and businesses across the United States are aware of that urgency and have been taking action.

Cities, states, businesses, and others have been working on climate and the environment for decades. But over the past two years, they have scaled up their efforts and connected in a more formal way. In part, this stems back to the announcement of the intent to leave the Paris Agreement.[1] The announcement left many of our international partners and many Americans with a sense of anxiety and with questions: Is the United States still working to address climate change? And, are those efforts meaningful? The first answer came in the form of a diverse coalition launched the day after the announcement: We Are Still In. Within 72 hours, the coalition had over 1,200 members. We Are Still In is now made up of more than 3,600 states, cities, counties, tribes, businesses, investors, universities, faith-based organizations, hospital networks, and cultural institutions. Their leaders have committed to reduce their emissions, not only because it is good for the climate but because it advances the interests of their citizens, customers, and shareholders.[2] The diversity of actors who have come together around climate change is striking. This is not about politics; it is about the financial bottom line and the health of communities from Columbia, South Carolina to Pittsburgh, Pennsylvania.

Are these commitments meaningful? America's Pledge, an effort led by former Mayor Michael Bloomberg and former Governor Jerry Brown set out to find the answer.[3] Rocky Mountain Institute helped prepare Fulfilling America's Pledge, a report which details a first-of-its-kind, bottom-up quantification of real economy activities to reduce emissions.[4] The analysis found

[1] https://www.whitehouse.gov/briefings-statements/statement-president-trump-paris-climate-accord/
[2] https://www.wearestillin.com/
[3] https://www.americaspledgeonclimate.com/
[4] https://www.americaspledgeonclimate.com/fulfilling-americas-pledge/

that full implementation of commitments already made by states, cities, and businesses would drive U.S. emissions roughly two-thirds of the way to the original U.S. target. Broader engagement and leadership by states, cities, and businesses aimed at decarbonizing our power supply, electrifying buildings, industry, and transportation, improving efficiency, constraining non-CO_2 emissions such as methane and hydrofluorocarbons, and bolstering our carbon sinks has the potential to put us within striking distance of the Paris pledge. This requires rapidly scaling ambitious climate action strategies that deliver high impact in the near term. Luckily, these newly formed coalitions of states, cities, and businesses are working to deliver on this potential and have made progress even since the report was published.

For example, cities, states, and businesses are working to reduce greenhouse gas emissions from electricity production by phasing out coal generation and accelerating deployment of renewable energy. In the last three weeks alone, 5 GW of coal retirements have been announced. More than 100 companies, including many Fortune 500 companies, have committed to 100% renewable energy, and they are following through on those commitments.[5] Importantly this shift toward renewables is based on economics. Cities, states, and businesses are making these investments to take advantage of technology innovation and the resulting lower costs of solar and wind, which continue to fall.

That clean electricity is powering electric transportation. Late last year, we passed the one million electric vehicles sold mark in the United States, and sales have grown since then.[6] Recent analysis shows that city, county, and state commitments put one third of U.S. public buses on a path to be emissions free, which would improve air quality for residents while reducing operating costs for transit authorities.[7] Seneca, South Carolina already has an all-electric bus fleet. This shift to electric is in part driven by lower battery costs, which continue to fall.

That clean electricity is also powering homes and businesses. Using electricity to heat and cool space, heat water, and cook is more efficient than burning natural gas on site, improves indoor air quality, and reduces greenhouse gas emissions. [8,9,10] Acknowledging this potential, New York State established a requirement that utilities achieve a portion of their required energy efficiency savings through deployment of electric heat pumps. [11] Building electrification, including heat pumps, is a key opportunity, especially given recent science findings that methane leaks from the gas system are larger than we previously thought.[12]

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[5] http://there100.org/re100
[6] https://www.anl.gov/es/light-duty-electric-drive-vehicles-monthly-sales-updates
[7] https://www.apta.com/resources/reportsandpublications/Documents/APTA-Transit-Leading-Clean-Technology.pdf
[8] https://www.epri.com/#/pages/product/3002013582/?lang=en-US
[9] http://eta-publications.lbl.gov/sites/default/files/final_pollutant_exposures_from_natural_gas_cooking_burners_a_simulation-based_assessment_for_southern_california.pdf
[10] https://rmi.org/insight/the-economics-of-electrifying-buildings/
[11] http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={B330F932-3BB9-46FA-9223-0E8A408C1928}
[12] https://www.edf.org/climate/methane-studies

If we continue to focus and scale these two priorities: (1) rapidly cleaning up electricity production and (2) using that clean electricity in our homes, businesses, and transportation systems, we could address up to 70% of U.S. greenhouse gas emissions.[13,14] Beneficial electrification can be a simple and cost-effective approach to reducing pollution and providing other benefits to consumers. The nation's rural electric cooperatives are working together to facilitate beneficial electrification.[15]

And the key for unlocking much of this progress is pairing technology with policy. Analysis shows that this pairing of innovation with policy, known as "technology push" paired with "policy pull" has an outsized effect, think 1 + 1 = 3.[16,17] Government or corporate policy can take many forms, as long as it stipulates a clear priority with required follow-through.

States that have moved forward with this combination find climate actions are benefiting their economies and strengthening their communities. Through the bipartisan U.S. Climate Alliance coalition, 21 governors have come together to lead on climate change.[18] Those include the recently elected governors of Illinois, New Mexico, Michigan, and Wisconsin. And in their recent inauguration speeches, at least seven new bipartisan governors addressed climate and energy issues.

States with commitments to climate have reduced their greenhouse gas emissions faster than the rest of the country while growing their economies.[19] U.S. Climate Alliance states are working together to develop product efficiency standards that could save the country millions of dollars. They are working to increase access to affordable, community-based solar and to help new governors take action to protect their people from extreme weather events. Their climate policies have attracted billions in investments and helped support more than 1.6 million clean energy and energy efficiency jobs.

Like states, businesses are helping each other address climate change through the We Mean Business Coalition.[20] Universities are helping each other.[21] Faith-based groups are helping each other. They know reducing emissions is a multi-faceted problem that requires working together. Many of these activities were highlighted at the Global Climate Action Summit in September 2018. More than 100 countries attended, in part to find out what U.S. cities, states,

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[13] https://www.epri.com/#/pages/product/3002013582/?lang=en-US
[14] https://www.nrel.gov/docs/fy17osti/68214.pdf
[15] http://www.beneficialelectrification.com/
[16] https://www.energy.gov/sites/prod/files/2017/01/f34/Energy%20CO2%20Emissions%20Impacts%20of%20Clean%20Energy%20Technology%20Innovation%20and%20Policy.pdf
[17] https://www.energy.gov/policy/initiatives/quadrennial-energy-review-qer
[18] https://www.usclimatealliance.org/
[19] https://www.usclimatealliance.org/
[20] https://www.wemeanbusinesscoalition.org/
[21] https://secondnature.org/

and businesses are doing to address climate change.[22] Other countries have started climate coalitions modeled after U.S. coalitions, for example, the Japan Climate Initiative.[23]

Together these coalitions and others are making formidable progress to reduce pollution. They are demonstrating in real time how to deliver cost-effective climate action from the ground up.

Despite this tremendous progress, we do need faster action. The IPCC Special Report on Global Warming of 1.5°C emphasizes the need to accelerate and, approximately, cut our emissions in half by 2030.[24] U.S. emissions are on downward trend, but avoiding the worst impacts of climate change requires action at a pace and scale that we have rarely achieved before. Addressing climate change requires action from all levels of government and active participation from civil society. Critically, we need ambitious federal leadership – to invest in and scale the clean energy technologies that will allow us to rapidly decarbonize, to accurately price the societal cost of greenhouse gas pollution, and to lead international efforts to address this challenge. While it is not possible to solve the climate crisis without state, city, and business action, it is equally impossible to solve it without strong and sustained federal policies.

The good news is we do not have to start from scratch at the federal level. Federal reengagement can build on the great momentum and hard work states, cities, and businesses have underway. Only by combining subnational and federal ambition can we ensure that America's pledge on climate continues to set the standard for international leadership.

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[22] https://www.globalclimateactionsummit.org/
[23] https://japanclimate.org/english/
[24] https://www.ipcc.ch/sr15/

Mr. TONKO. Thank you, Ms. Frisch.

Next, we will move to Mr. Thernstrom. You are recognized, sir, for 5 minutes.

STATEMENT OF SAMUEL THERNSTROM

Mr. THERNSTROM. I would like to thank the chairman, the ranking member, and members of this subcommittee for the opportunity to speak on behalf of the Energy Innovation Reform Project.

The EIRP promotes public policies to accelerate the development of advanced energy technologies to improve the affordability, reliability, safety, and security of America's energy supplies and our energy economy.

As Mr. Tonko and Mr. Walden both noted, President Trump announced in June 2017 his intent to withdraw the U.S. from Paris, but for procedural reasons the U.S. withdrawal cannot take effect until November of 2020. So we are still in.

Whether one agrees or not with the President's decision, he does have the authority to make it, and I tend to see his decision as a reflection of the challenges in climate policy that Paris tried to paper over. Resolving these challenges should be the focus of our attention, and I think a number of remarks today have already indicated that.

Our central challenge is that effective mitigation depends upon the availability of commercially competitive clean energy technologies more than it requires treaties or other international agreements.

We are making great progress with this challenge, as other witnesses will testify to, but much more remains to be done. If we can develop these technologies, international agreements can constructively contribute to their global dissemination.

If we do not develop them, nations are unlikely to meet commitments made under international agreements and, in fact, many nations are not on track to meet their Paris pledges, suggesting that their ambitions exceed their abilities.

Aspirational international agreements may reflect worthy ambitions. But domestic policy is where the decisive decisions are made. Paris appropriately focused international attention on each nation's domestic actions and that is where a constructive conversation must occur.

Ultimately, the Paris Agreement was unworkable for the U.S. because it was a substitute for, rather than the product of, a domestic political consensus. Indeed, the lack of settled domestic U.S. policy was among the reasons that Paris was an agreement rather than a treaty.

Trying to make domestic policy in Paris rather than in Washington was a mistake, I believe. It circumvented the role of Congress and specifically ignored the importance of implementing legislation and ensuring alignment between America's domestic policy and our international commitments.

America cannot address a complex challenge like climate change without bipartisan agreement on the way forward that is enacted in Federal law.

After climate legislation failed in the Senate in 2009, the Obama administration pursued its domestic policy goal through the Clean

Power Plan which was stayed by the Supreme Court. The Trump administration is seeking to implement an alternative regulation, which will certainly face judicial scrutiny of its own.

This back and forth demonstrates the fragility of policy made through regulations rather than law just as agreements are poor substitutes for treaties.

Now, many climate advocates have despaired of enacting bipartisan legislation and have consequently sought alternatives. At EIRP, we believe that there is no substitute for sound national policy embodied in law and so we work to promote that.

The principal objective of Federal climate legislation should be to promote innovation in a broad portfolio of clean energy-related technologies and ensure their economical use over time.

A focus on accelerating technology innovation in order to drive down the cost of decarbonization while avoiding the zero-sum politics of some popular climate proposals is a necessary first step.

As a complement to innovation policies, clear and durable environmental regulations would also permit innovators and investors to cost effectively modernize America's energy system. I do want to emphasize the importance of getting the relationship between public policy and the private sector right.

This will require a mix of regulatory reforms and public and private investments that must be appropriate to the complexity of the task, not the product of a formulaic or ideological approach.

Also, as my written testimony emphasizes, the decarbonization literature is very clear about the crucial importance of developing a diverse mix of energy technologies and resources rather than taking a narrow path that relies on renewables alone.

Innovation initiatives must be designed to produce clean energy that is both abundant and affordable. If clean energy is too expensive or impractical in other respects, it won't be used broadly or adopted sufficiently rapidly.

Our challenge today is to combat climate change in a manner that strengthens America, our economy, and our international leadership.

At EIRP, we believe that Federal policies to accelerate energy innovation will be essential to pursuing those goals harmoniously.

Thank you all very much for your time.

[The prepared statement of Mr. Thernstrom follows:]

Testimony of Samuel Thernstrom
Chief Executive Officer
Energy Innovation Reform Project

Energy and Commerce Committee
Subcommittee on Environment and Climate Change
House of Representatives

February 28, 2019

I would like to thank the Chairman, the Ranking Member, and members of this subcommittee for the opportunity to speak on behalf of my organization, the Energy Innovation Reform Project, also known as EIRP. Established in 2013, EIRP is a research and advocacy organization, that promotes public policies to accelerate the development of advanced energy technologies to improve the affordability, reliability, safety, and security of America's energy supplies and our energy economy.

I'd like to begin by noting the current status of the Paris Agreement. On June 1, 2017, President Donald Trump announced his intent to withdraw the United States from the Paris Agreement.[1] The agreement, however, stipulates that parties must wait three years after its entry into force to submit formal notification of a withdrawal to the United Nations Secretary General. The withdrawal takes effect only one year later. Since the agreement entered into force on November 4, 2016, the United States cannot present its formal notification until November 4 of this year, at the earliest. America thus will remain a party to the Paris Agreement until at least November 4, 2020.[2]

Whether one agrees or disagrees with the President's stated intent to withdraw from the Paris Agreement, the President has the authority to make such a decision and has the ability to take the United States out of the Paris Agreement during his current term in office. This is a consequence of structuring Paris as an Agreement rather than as a Senate-ratified treaty. Some may seek to persuade President Trump to change course before the administration submits its formal notification of its intent to withdraw or even between that date and an actual U.S.

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[1] "President Trump Announces U.S. Withdrawal From the Paris Climate Accord," White House web site, June 1, 2017, https://www.whitehouse.gov/articles/president-trump-announces-u-s-withdrawal-paris-climate-accord/, accessed February 23, 2019.

[2] For the agreement's text, see "Paris Agreement," United Nations Framework Convention on Climate Change web site, https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_english_.pdf, accessed February 23, 2019. For its entry into force, see "Paris Agreement – Status of Ratification," United Nations Framework Convention on Climate Change web site, https://unfccc.int/process/the-paris-agreement/status-of-ratification, accessed February 23, 2019.

withdrawal. To be clear, while the president has announced his intent, final action awaits the Department of State's notification of our withdrawal in 2020.

Because the Energy Innovation Reform Project is focused on developing practical and effective solutions to America's energy and climate challenges, however, our work is focused on looking forward toward new solutions we see in the offing, rather than backward at the decisions that have been made about the Paris Agreement. That said, we welcome anything that states and localities choose to do on a politically durable and economically sustainable basis.

Our central challenge is that slowing, halting, and ultimately reversing the increases in greenhouse gas concentrations in the Earth's atmosphere depends upon the availability of commercially competitive clean energy-related technologies, more than it requires treaties or other international agreements. If America and other countries develop these technologies sufficiently quickly, international agreements can constructively contribute to their global dissemination. If we and others do not develop these technologies, no international agreement will stop climate change, because nations will not be able to meet the commitments that they make. Indeed, a number of nations are not on track to reach their Intended Nationally Determined Contributions (INDCs), which suggests that their ambitions exceeded their abilities.[3] The Paris approach appropriately focuses our attention on each nation's domestic actions, and that is where a constructive conversation must occur.

The problem for the United States is that the Obama Administration's approach to negotiating and implementing the Paris Agreement could not succeed, since the Agreement was a substitute for, rather than the product of, a domestic political consensus.

The United States cannot participate, much less lead, in international affairs on any long-term policy matter without having settled (or reasonably settled) domestic policy. This did not exist in the climate area at the time that President Barack Obama signed the Paris Agreement, and the lack of settled domestic U.S. policy was among the reasons that Paris was an agreement rather than a treaty.

Trying to make domestic policy in Paris rather than Washington was a mistake—it circumvented the role of the Congress and specifically ignored the importance of implementing legislation in ensuring alignment between America's domestic policy and international commitments, whether binding or voluntary. As a result, the Obama Administration made commitments that America was not yet prepared to keep. Other witnesses have described how states, localities, and private actors have been able to meet self-defined targets based on the Obama

[3] "Few Countries are meeting the Paris climate goals. Here are the ones that are." Amanda Erickson, *The Washington Post*, October 11, 2018, https://www.washingtonpost.com/world/2018/10/11/few-countries-are-meeting-paris-climate-goals-here-are-ones-that-are/?utm_term=.f7cb49db562b, accessed February 26, 2019.

Administration's INDC under the Paris Agreement. Federal politics and policy had not—and still has not—reached that level of consensus.

Perhaps more importantly, we should emphasize that neither the Obama Administration's approach nor our current policies can successfully address climate change. America cannot address a significant, complex, long-term domestic policy challenge like climate change without bipartisan agreement on a way forward that is enacted in federal law.

After climate legislation failed to clear the Senate in 2009, the Obama administration pursued its domestic policy goals through Clean Air Act regulations via its Clean Power Plan. The Supreme Court halted implementation of the plan amid questions about the Environmental Protection Agency's authority. The Trump Administration is currently seeking to replace the Clean Power Plan with an alternative rule, which will certainly face judicial scrutiny of its own.

This recent history demonstrates the fragility of policy made through regulations rather than law. And it demonstrates the ultimate importance of the Congress, which our Constitution's drafters placed at the center of the American political system. Many climate advocates have despaired of enacting bipartisan legislation, and have consequently sought alternatives; at EIRP, we believe there is no substitute for sound national policy, and so we work to promote that.

As a practical matter, America cannot address its own energy and climate policy challenges, or the broader global problem of climate change, without genuinely bipartisan legislation. From our perspective at EIRP, the principal objective of that legislation should be to promote energy innovation in a broad portfolio of technologies that can simultaneously produce low- and zero-carbon energy from a diverse portfolio of fuels, generate prosperity, and strengthen America's international competitiveness.

I want to stress all three of these objectives—low and zero-carbon energy, prosperity, and competitiveness—because all three matter. Fighting climate change is an important policy goal, but it does not stand in isolation, and I do not believe that a policy that aspires to curtail emissions despite imposing unacceptable costs can succeed, either as environmental or energy policy. Success requires an integration of these values, not the elevation of one over the others, and that is the focus of EIRP's work.

Fortunately, while many differences of opinion and perception remain, we believe that an effective, bipartisan approach to energy innovation and greenhouse gas emissions reductions is certainly possible. A focus on accelerating innovation in a wide range of clean energy technologies in order to drive down the cost of decarbonization while avoiding the zero-sum politics of some popular climate proposals is, we believe, a necessary first step. In complement with innovation policies, clarity and durability in our environmental regulations will also permit

innovators and investors to make cost-effective investments in modernization of America's energy systems.

Today's hearing is not the right place for an extended examination of domestic policy options, but I do want to emphasize the importance of getting the relationship between public policy and private sector innovators and investors right. This will require a mix of regulatory reforms and public and private investments that must be appropriate to the complexity of the task, not the product of a formulaic or ideological approach.

EIRP believes that moving to a decarbonized energy system will require the development and use of a broad range of innovative energy technologies, including carbon capture, utilization and storage, advanced nuclear, and wind and solar and other renewable and efficiency technologies, among others. A recent review, which I contributed to, of thirty academic studies of deep decarbonization published since 2014 demonstrates that deep reductions in CO2 emissions are best achieved through a diverse mix of resources, and that relying entirely or predominantly on intermittent resources such as wind and solar significantly increases the cost and technical difficulty of achieving deep decarbonization. I have appended this literature review for reference.[4]

This brings me to the goal of generating prosperity. Prosperity is important for several reasons. Our nation's founders said that one of their core objectives was "to promote the general welfare." They wanted Americans to have better lives, just as all of us here do. I believe that technology innovation, environmental protection, and sound energy policy can profoundly contribute to our Nation's prosperity—if properly structured.

Prosperity allows us to do more as a nation in pursuing political, economic and social priorities in this and other areas. Pursuing energy innovation in ways that build prosperity provides us with the capacity to do even more innovation. It is a self-reinforcing process. Approaches to innovation that aren't sustainable over time, or that undermine the conditions needed for economic growth, will fail to deliver the enduring results that we need. If clean energy is too expensive, or impractical in other respects, it won't be sufficiently abundant to be used broadly or adopted rapidly. Because energy touches almost every aspect of modern life, constraining or reducing access to energy has far-reaching consequences.

Prosperity is also a foundational element of America's international leadership. Our economic success has established America's free market as a model that others have sought to emulate, while also generating the national wealth that has made our military power possible. This

[4] See "Getting to Zero Carbon Emissions in the Electric Power Sector," Jesse D. Jenkins, Max Luke, and Samuel Thernstrom, Joule, volume 2, issue 12, December 19, 2018, https://doi.org/10.1016/j.joule.2018.11.013, accessed February 26, 2019.

combination of economic success and military power has enabled the United States to work with its allies and partners to establish a generally favorable and stable international order.

Strengthening America's international competitiveness is increasingly important as the international order evolves and as global economic competition intensifies. At a time when the United States faces growing challenges from China and Russia, as well as other nations, maintaining and improving the many ingredients of U.S. competitiveness, including relatively affordable domestic energy prices and leadership in energy innovation, will be critical to sustaining U.S. leadership of an international system that privileges our interests and values. And it is important that the United States participate in the rapidly expanding international market for low-carbon energy.

Our approach to energy innovation and to the broader challenge of climate change could thus have profound implications for not only the Earth's climate in 2100 and beyond, but for the global political and economic systems in 2100 and for America's role in the world of the next century.

Our challenge today is to combat climate change in a manner that strengthens America *and* our international leadership. At EIRP, we believe that federal policies to accelerate energy innovation will be essential in pursuing both goals.

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Mr. TONKO. Thank you, Mr. Thernstrom.

And now we will move to Mr. Hultman. Mr. Hultman, you are recognized for 5 minutes.

Thank you.

STATEMENT OF NATHAN E. HULTMAN

Dr. HULTMAN. Thank you, Chairman Tonko, Ranking Member Shimkus, and members of the subcommittee for inviting me to testify here today on the essential role of subnational actors in an overall comprehensive strategy to set American climate policy on a path toward renewed and reinvigorated leadership.

I am the director of the Center for Global Sustainability at the University of Maryland School of Public Policy and served as a lead author on the recent report, "Fulfilling America's Pledge: How States, Cities, and Businesses Are Leading the United States to a Low-Carbon Future."

It is an honor to share with the committee my perspective on how subnational efforts in our country are driving progress today and laying the groundwork for an effective comprehensive American strategy to address climate and economic issues of fundamental importance to our country.

My message today is in three parts. The first part answers the essential question of what does it all add up to and describes the significant impact resulting from accelerating subnational climate actions in our country.

The second part illustrates how these actions can provide a path to comprehensive American climate strategy that includes diverse subnational actors as a basis to support and enhance additional progress through new Federal action.

The third part underscores how subnational American leadership combined with a reinvigorated Federal engagement can catalyze global action to accelerate our ability to respond effectively to the climate crisis.

In recent years, coalitions of subnational actors have formed to enhance their own communities' interest in climate action. These coalitions represent well over half the U.S. population of over 173 million people and nearly 60 percent of U.S. GDP and they are globally significant, representing the equivalent of the world's third largest economy and the world's fourth largest greenhouse gas emitter.

A key question, however, is whether these actions from these groups will make a difference. The answer is yes. Our study estimates that existing commitments from subnational actors are already making a significant impact with additional near-term reductions possible.

Without these subnational actions, we estimate that U.S. emissions would grow slightly between now and 2025 and it is in this context that the contribution from subnational actors today is so important, turning that potential 3 percent growth in emissions from today into a 17 percent reduction below 2005 levels by 2025.

And more is possible. Using the tools available to them today, States, cities, and businesses could drive U.S. emissions close to but not quite reaching the U.S.-Paris target to, roughly, 24 percent below 2005 levels by 2025. Such actions could include more rapid

expansion of renewables, reductions in methane leakage, increased building energy efficiency, accelerated coal power retirements, land sector policies, and a variety of other approaches across sectors.

And, indeed, many of these actors are already stepping up to do more, particularly after the recently mid-term elections.

So existing commitments are extraordinarily helpful, making a real and meaningful difference today during a period of Federal inaction. Nevertheless, even additional subnational commitments will likely not be sufficient to get us fully on track towards a long-term trajectory consistent with science-driven climate goals if this work of subnational actors to implement more ambitious climate actions does provide a basis for accelerating economy wide climate action in the future.

For example, subnational actions could potentially deliver accelerating emissions reductions across the U.S. economy, increasing our decarbonization rate from, roughly, 1.6 percent per year before 2025 to, roughly, 2.1 percent per year thereafter.

This rate is close to the, roughly, 2.3 percent annually needed to be consistent with long-term climate goals. But the key currently missing boost to this activity would be broad engagement by the U.S. Federal Government.

In this way, subnational actions are laying the groundwork today for faster action under an essential comprehensive approach that integrates the significant policy authorities across our Federal system.

Subnational action can also impact climate outcomes by influencing the international community. In climate change, U.S. global leadership matters. We are the world's second largest emitter and what we do here in many ways sets the tone for the level of climate action globally and this, in turn, can raise the chances of our global success in addressing this immediate and growing challenge.

The fact that American subnational actors are still making significant progress in reducing our own emissions is an important signal to other countries that the U.S. is still remaining engaged and delivering real change.

In summary, we have seen a groundswell of climate action over recent years with leadership from all corners of America. In doing so, these States, cities, businesses, and others have also helped create the conditions for a strong Federal answer to their own climate leadership.

Thank you.

[The prepared statement of Dr. Hultman follows:]

Testimony of Prof. Nathan E. Hultman

Director, Center for Global Sustainability

School of Public Policy, University of Maryland

U.S. House of Representatives

Energy and Commerce Committee

Environment and Climate Change Subcommittee

Hearing entitled "We'll always have Paris:

Filling the Leadership Void Caused by Federal Inaction on Climate Change"

February 28, 2019

Thank you, Chairman Tonko, Ranking Member Shimkus, and Members of the Subcommittee for inviting me to testify here today on the essential role of subnational actors in an overall comprehensive strategy to set American climate policy on a path toward renewed and reinvigorated leadership. I am Director of the Center for Global Sustainability at the University of Maryland School of Public Policy, and served as a lead author on the recent report *Fulfilling America's Pledge: How States, Cities, and Businesses are Leading the United States to a Low-Carbon Future.*[1] It is an honor to share with the committee my perspective on how the diversity of sub-national efforts in our country is driving progress today and laying the groundwork for an effective, comprehensive American strategy to address climate and economic issues of fundamental importance to our country.

My message today is in three parts:

1. The first part answers the essential question of "what does it all add up to?" and describes the *significant impact resulting from accelerating subnational climate actions* in our country.
2. The second part illustrates how these actions can provide a path to a *comprehensive American climate strategy* that includes diverse subnational actors as a basis to support and enhance additional progress through new Federal action.
3. The third part underscores how subnational American leadership, combined with a reinvigorated Federal engagement, can *catalyze global action*—in other words, how we have the opportunity to pioneer new models that fuse subnational with national action, leveraging American leadership to inspire higher levels of climate action across the world.

[1] America's Pledge Initiative on Climate, "Fulfilling America's Pledge: How States, Cities, and Business Are Leading the United States to a Low-Carbon Future" (2018). The full Report (168 pp.), Executive Summary (24 pp.), and Technical Appendix (88 pp.) are available at https://www.americaspledgeonclimate.com/fulfilling-americas-pledge/

Overall, I argue that despite the challenges to action apparent today, the extraordinary changes we are seeing across the U.S. economy—driven by these many actors stepping up to answer the urgent need—underscores that we can effectively respond to climate change as a country if we harness this momentum and build quickly on it.

1. **What does it all add up to? The significant and growing impact of subnational actions on U.S. emissions**

In recent years, coalitions of subnational actors[2] in the United States have formed to reflect and enhance their own communities' or constituencies' interest in climate action. Notably, the current U.S. Administration's announcement of its intent to withdraw from the Paris Agreement generated the fast-growing We Are Still In (WASI) coalition—which now numbers over 3,600 states, cities, businesses, communities of faith, tribal groups, universities, cultural institutions and more.[3] Other coalitions of mayors, states, and universities have also emerged, such as the U.S. Climate Alliance[4] of states, which after the recent elections now numbers 21 governors of both parties. Taken as a group, these coalitions represent well over half of the U.S. population (173 million people) and nearly 60% of U.S. GDP ($11.4 trillion). And these coalitions are globally significant, representing the equivalent of the world's third largest economy and the world's fourth largest greenhouse gas emitter (Figure 1).

While the number of actors is large and their overall economic and emissions footprint is significant, a key question is whether the actions from these groups and leaders will make a difference. In other words, "What does it all add up to?" Here it is important to remind ourselves that that our constitutionally based, Federal political system in the United States devolves some policymaking authorities to different levels of government, and that's the case for some areas affecting climate and energy policies as well. For example, states have considerable scope to affect emissions outcomes through energy policies such as renewable energy targets and building energy efficiency codes, and municipalities also have considerable scope through regional planning and local transportation policies. In addition to this diverse Federal policy space, our free market economy and open political system enables significant decisionmaking authority to companies and other organizations; businesses, for example, can decide to procure renewable electricity or more efficient transportation fleets.[5] Our *Fulfilling America's Pledge* study estimates that, by utilizing these policy and decision opportunities, existing commitments from subnational actors are already making a significant impact, with additional near-term reductions possible.

To understand what that impact is, it's useful first to set a few baseline points for comparison. One common point of reference is the size of U.S. economy-wide greenhouse gas emissions—including CO_2, methane, HFCs, nitrous oxide, and others—which was about 6,500 million tonnes

[2] There is no universally agreed terminology for the diverse group of states, cities, businesses, etc. that are taking climate action. Some partially overlapping terms in current use include "sub-national actors", "non-Party actors", "non-state actors", "real economy actors", and "non-federal actors". To reflect the framing of this hearing, I use the term "sub-national actors" in this document, noting that some of the actors who have made commitments or are taking action may not fit perfectly in this category (for example, multi-national corporations).

[3] Further details of the We Are Still coalition are available at https://www.wearestillin.com.

[4] Further details of the U.S. Climate Alliance are available at https://www.usclimatealliance.org.

[5] As one example, RE100 is a global coalition of major companies committed to 100% renewable power. Further details are at http://there100.org.

of CO_2 equivalent (Figure 2) in 2005. Emissions in that year are the baseline against which many current goals are set, including the U.S. Nationally Determined Contribution, otherwise known as our Paris climate target, which sought to reduce U.S. emissions by 26-28% below that 2005 level by 2025. A combination of factors subsequently helped drive emissions down between 2005 and 2016, including Federal energy efficiency, vehicle fuel economy, R&D investment, and electricity sector policies; but that drop also reflects the impacts from earlier subnational policies, market forces, and consumer choices.

But absent future policy drivers, looking forward from today, market forces and consumer choices will not be enough to keep U.S. emissions on a downward trajectory, and would fall far short of a pathway consistent with longer term decarbonization trajectories needed to address climate change. As one reference point, absent other drivers, an estimated 18% growth in GDP to 2025, combined estimates for population growth, would result in emissions growth of approximately 3% to 2025, to roughly 6,000 million tonnes of CO_2 equivalent.

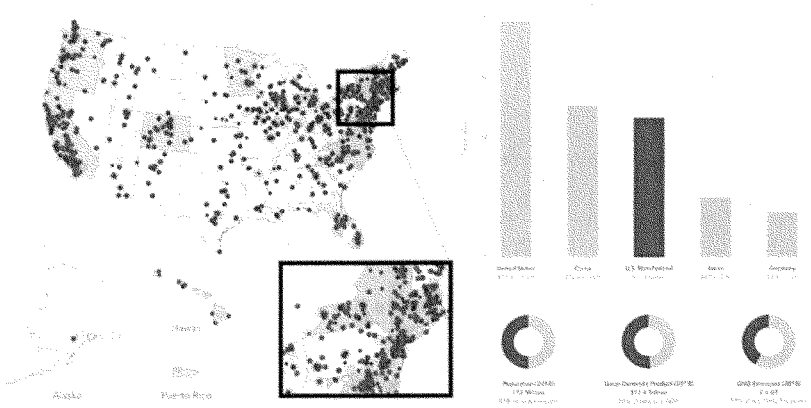

Figure 1. Coalitions of subnational actors committing to climate actions in their own jurisdictions have emerged and expanded rapidly in recent years. (Left) Representation of states, cities, businesses, communities of faith, tribal groups, and others making commitments to climate goals is broad and expanding across the United States, particularly after the mid-term elections. (Right) These coalitions are globally significant. Were they a country, they would constitute the world's third largest economy and fourth largest emitter. Source: *Fulfilling America's Pledge*.

It's in this context that the contribution from subnational actors today is so important. Without Federal action, they are the major remaining drivers for continued reductions in U.S. emissions, and the impact is significant: existing commitments from subnational actors in the United States—those that are already on the books today—are estimated to turn that 3% growth in emissions into a 17% reduction below 2005 levels by 2025, roughly 2/3 of the way to our Paris target.

And while they are in that sense extraordinarily helpful, those existing commitments alone are nevertheless not sufficient to get the United States fully back on track towards a long-term trajectory consistent with science-driven climate goals, such as keeping global temperature increase to well below 2 degrees C. And because of this, many of these actors are expanding their policies and stepping up to do more. This includes new leadership entering after the mid-term elections that has already pledged to take more action on climate in their regions and states, and more broadly includes the growing awareness and engagement across the country.

We estimate that using the tools available to them in the near term, states, cities, and businesses over the next couple of years could actually drive U.S. emissions close to (though not quite reaching) the U.S. Paris target for 2025. Such actions could include more rapid expansion of renewables, reductions in methane leakage, accelerated coal power retirements, and a variety of other approaches across sectors. Our estimate is that this broader engagement, within realistic constraints, could reduce emissions by more than 24 percent below 2005 levels by 2025 — within striking distance of the Paris target.

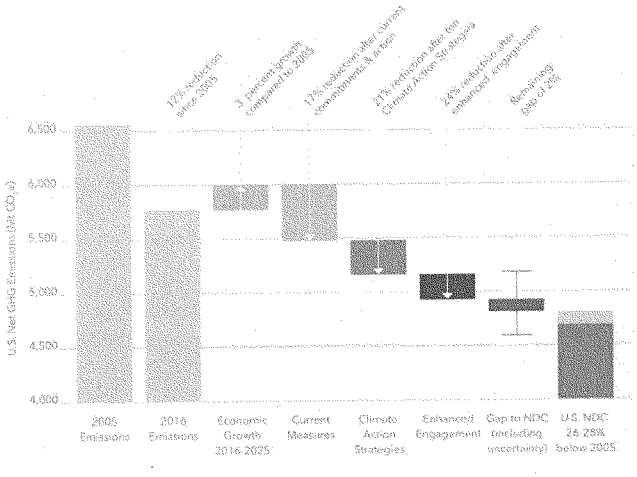

Figure 2. What does it add up to: Estimates of U.S. economy-wide emissions reductions show a significant impact from existing and potential new subnational climate actions. Current measures (gold) are estimated to deliver reductions of around 17% below 2005 levels by 2025. Additional near-term, high-impact Climate Action Strategies (blue) could increase reductions to 21% below 2005 levels by 2025. Expanding the number of actions and broadening participation consistent with recent trends could deliver reductions of up to 24% below 2005 levels by 2025 (purple). The U.S. Nationally Determined Contribution (NDC) under the Paris Agreement is shown for reference, at 26-28% below 2005 levels by 2025. Note: New Federal action is not estimated in this set of scenarios but would have the ability to drive additional reductions to 2025 and beyond. Source: *Fulfilling America's Pledge*.

2. A comprehensive American climate strategy: Building the groundwork for Federal action

Estimates of the impact of subnational actions are helpful not only in giving a sense of the numbers or the scale of the opportunity, but also in providing three general insights about the role that subnational action is playing today and can play in a future, comprehensive American climate strategy:

- First, subnational actions are making a real and meaningful difference today during a period of Federal inaction;
- Second, while maximizing these opportunities over the coming few years can deliver a significant amount of additional emissions reductions, even that would not be not independently sufficient to deliver reductions at the rate that will ultimately be necessary to meet long-term climate goals;
- Third, and essentially, the work of subnational actors to implement more ambitious climate actions provides a basis for accelerating economy-wide climate action in the future.

The *Fulfilling America's Pledge* study estimates that subnational actions can deliver accelerating emissions reductions across the U.S. economy: Compared to the recent rate of reductions of 1.1% per year, we estimate roughly 1.6% per year between 2016–2025; and after 2025, the rate accelerates further to roughly 2.1% per year. This rate is close to the roughly 2.3% annually needed to bring the U.S. to deep decarbonization by midcentury[6] (Figure 3) to be consistent with long-term climate goals. The key, currently missing element here will be broad engagement by the U.S. Federal government, via both the Congressional and Executive branches.

Notably, even though it is not on its own sufficient, the work that subnational actors have been driving energetically over recent years was always going to be a necessary part of any comprehensive American climate strategy and would have needed to happen at the levels we are now seeing at some point soon, and in this sense we are ahead of many other countries in the breadth of engagement at the subnational level. Subnational actions are therefore not only helping to deliver real reductions. They are laying groundwork for faster action later, under an essential, comprehensive approach that includes the significant policy authorities of the U.S. Federal government.

[6] United States of America, *United States Strategy for Deep Decarbonization*. Available at https://unfccc.int/files/focus/long-term_strategies/application/pdf/mid_century_strategy_report-final_red.pdf

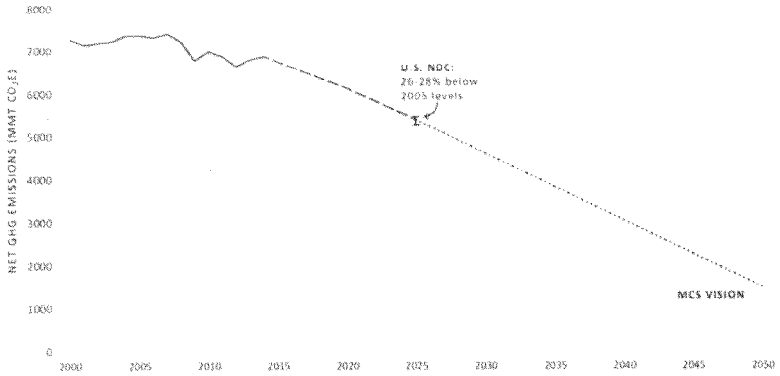

Figure 3. Long term vision for the U.S. emissions trajectory consistent with climate goals of limiting global temperature increase to 2°C or below. Solid line shows historical U.S. emissions to 2015; dashed line shows pathway to the U.S. Nationally Determined Contribution under the Paris Agreement, and dotted line shows a linear pathway to deep decarbonization by mid-century. Achieving this pathway would require a roughly 2.3% reduction annually. While this is greater than subnational actors alone can deliver, importantly, their actions can drive decarbonization of 1.6%-2.1% per year upon which Federal actions can build. Source: *United States Mid-Century Strategy for Deep Decarbonization*.

3. Catalyzing ambition: A model for accelerating global action

In addition to reducing emissions and building the groundwork for future action, there is a third way in which the work being done in the United States has the potential to impact climate outcomes, and that is through influencing international actions. This next year will see the beginning of a major movement by countries around the world to reassess their own national levels of ambition in light of the science as well as their own progress. It will also represent an opportunity for countries to integrate the increasing amount of non-state, subnational, and regional collaborative action happening in their own jurisdictions to enable them to scope a higher level of ambition.

This action is happening globally, just as in the United States. A recent UNEP Emissions Gap report[7] estimates that more than 7,000 cities from 133 countries, 245 regions from 42 countries, and 6,000 companies with at least $36 trillion in revenue have pledged action on climate. And while there is no global study that carries out estimates of impact directly comparable to those presented earlier for the United States, another recent study[8] estimated that by 2030,

[7] UNEP (2018). The Emissions Gap Report 2018. United Nations Environment Programme, Nairobi. Available at: http://wedocs.unep.org/bitstream/handle/20.500.11822/26895/EGR2018_FullReport_EN.pdf

[8] Data Driven Yale, NewClimate Institute, PBL 2018: Global climate action of regions, states and businesses. Research report published by Data Driven Yale, NewClimate Institute, PBL Netherlands Environmental Assessment Agency, prepared by project team of Angel Hsu, Amy Weinfurter,

subnational or regional commitments to climate action could reduce global emissions by 1,500 to 2,200 million tonnes of CO_2 equivalent per year compared to what would be achieved through existing national policies (Figure 4).

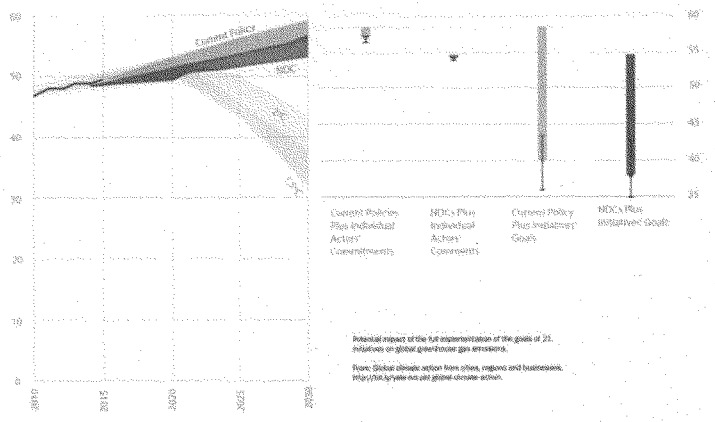

Figure 4. Estimates of additional global impact from subnational and non-Federal/non-state actors demonstrate the significant reductions that could result from collaborative actions and initiatives across countries. Source: Data Driven Yale, NewClimate Institute, Netherlands Environmental Assessment Agency (PBL).

In this context, subnational action in the United States has importance for the international community in at least two ways. First, the fact that American subnational actors are still making significant progress in reducing our own emissions is an important signal to countries that the U.S. is still remaining engaged and delivering real change, despite the lack of Federal engagement. Our subnational actors are demonstrating American leadership through the substantial extent of continuing climate action for the global community.

In this area, U.S. global leadership matters. We are the world's second largest emitter and arguably the country looked to most for leadership in the context of the international approach to climate change. What we do here in many ways sets the tone for the level of climate action globally, and this in turn can lower—or raise—the chances of success in addressing this immediate and growing challenge. And while there is no direct substitute for national leadership, the recent subnational actions we are discussing today do in fact support other countries' ambition by demonstrating that the U.S. is both delivering reductions now and as a result is more

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Andrew Feierman, Yihao Xie, Zhi Yi Yeo, Katharina Lütkehermöller, Takeshi Kuramochi, Swithin Lui, Niklas Höhne, Mark Roelfsema. Available at http://bit.ly/yale-nci-pbl-glob- al-climate-action.

likely to be able to re-establish a rapid path toward deeper decarbonization. Second, the scale of the climate challenge will require a broad adaptation of the model of diversified climate action across all governance levels and economic sectors that we have seen blossom in the United States in recent years. Our own experience here, innovating on new policies and institutional approaches, can provide a testbed for others looking to engage more broadly across their jurisdictions and national situations.

In summary, we have seen a rapid groundswell of climate action over recent years, with leadership from all corners of America—including governors and state legislatures, mayors and city councils, counties, businesses and investors, communities of faith, tribal leaders, universities, health care organizations, cultural institutions, and private citizens. Even without the Federal government, they have outlined steps that they see as beneficial for their constituencies, having evaluated the benefits that action can bring in the form of economic transformation and reducing risks to their communities, and have chosen to take steps to move toward a cleaner future. These actions are already making a difference today; they will generate benefits in the near term; and they will likely accelerate as momentum for action grows. In doing so, they have also helped create the conditions for strong Federal answer to their own climate leadership.

Mr. TONKO. Thank you, Mr. Hultman.

And now to conclude, Mr. Light, you are recognized for 5 minutes.

Thank you.

STATEMENT OF ANDREW LIGHT

Dr. LIGHT. Thank you, Chairman Tonko, Ranking Member Shimkus, and the members of the subcommittee for inviting me to testify.

I am Andrew Light from the World Resources Institute and also from George Mason University. I will address the international implications and limits of U.S. non-Federal action on climate change.

I previously served at the Department of State as one of the senior officials working on the creation of the Paris Agreement on climate change. I am going to touch on four points summarized from my written testimony.

One, the Paris Agreement remains essential for international cooperation on climate change. Two, other countries continue to take ambitious steps to reduce their emissions. Three, efforts by non-Federal actors have been embraced internationally. However, fourth, reengagement by the Federal Government is a geopolitical necessity.

First, let us start with Paris. While President Trump has announced his intention to withdraw from the agreement, over 190 countries are still actively working to implement the agreement's goals.

And I agree with your characterization, Chairman Tonko. These targets were all done in-country. They were nationally determined. They were not negotiated in Paris. They were not determined by the Paris Agreement. That is very important.

Paris is a success because part—because the first set of commitments under it achieved higher than expected ambition, significantly improving projections of temperature savings over prior estimates.

Moreover, parties are expected to make continual pledges of increasing ambition over time to put the temperature goals of the agreement within reach.

Second, the agreement fulfills a long-sought goal of the last three presidential administrations, both Republican and Democratic, of creating a set of common rules for all parties on reporting transparency and review of their progress on meeting their targets regardless of their development status.

So what about progress in other countries? I am going to focus here on China and India because concerns about them were raised in recent hearings before this subcommittee.

Both will need to do more. But under Paris, they are demonstrating ample domestic ambition. China is leading the world in renewable energy investment, committing to spend over $360 billion through 2020, which is expected to create 13 million new jobs.

China launched a national emissions trading system for its power sector, which will eventually become the largest in the world. In 2017, the government halted or delayed over 150 coal plants.

China remains the world's largest emitter of carbon dioxide but committed under Paris to peak emissions by 2030 at the latest and experts argue that they could easily peak as early as 2025.

India's Paris targets include a goal of 40 percent electricity generation from nonfossil sources by 2030. Prior to setting these target, Prime Minister Modi increased the previous government's solar energy goal by himself by five times to 100 gigawatts by 2022, adding 75 gigawatts of wind, biomass, and small hydro, creating an estimated 330,000 new jobs.

The number of planned coal plants has plummeted, shrinking by a quarter in the first half of 2018. What about the international impact of U.S. subnational action, which we have heard about so far?

The groundswell of activity in the U.S. has been widely embraced. German Chancellor Angela Merkel commented that it emphasizes the support for the climate agreement across large parts of the United States.

It is also spurring similar subnational coalitions abroad, including in Japan. States have also increased their bilateral programs. California initiated programs to work with China on developing renewable energy and cooperating on zero-emissions vehicles, energy storage, and grid modernization while the U.S. stayed on the sidelines.

But there are limits to subnational action that require Federal reengagement. Here are three reasons.

First, U.S. Federal leadership is absolutely necessary as States and cities don't have a seat at the table in international negotiations. Active participation is essential to ensure that the Paris Agreement maintains elements that we value, including maintaining the integrity of the currently agreed-upon rules.

Secondly, States and cities do not have the capacity to help prepare our strategic partners abroad for climate risks threatening their safety which, in turn, threatens the American people.

Make no mistake—climate-related security risks are happening right now and they are getting worse. This conclusion was unequivocal in last month's worldwide threat assessment of the U.S. intelligence community.

Third, States and cities can't put sufficient pressure on larger countries to embrace climate smart foreign development. Take, for example, China's massive Belt and Road infrastructure project worth $6 trillion that include 70 countries on three continents.

It is, roughly, 46 times as large as the Marshall Plan. Despite their domestic progress at home, from 2014 to 2017 93 percent of energy investments by China's Silk Road Fund and 95 percent of foreign energy investment by China's state-owned enterprises were in fossil fuels.

The U.S. is not challenging China, given President Trump's commitment to fossil fuels. No other countries can exert pressure on China. This gap requires Federal reengagement in Paris and in broader international climate efforts.

Let me close with a few suggestions to what Congress can do to get the U.S. back into the international climate arena.

First, pass a resolution to support the Paris Agreement that also explicitly supports current subnational action.

Second, double funding for clean energy and carbon removal RD&D to catch up with China and make sure the money that you have allocated is being spent.

And finally, for fiscal year 2019 you increase bilateral environmental assistance to $776 million from $400 million. These funds should be spent to help prepare countries for climate change so that we can work together to create a safer and more resilient world.

Thank you. I look forward to your questions.

[The prepared statement of Dr. Light follows:]

TESTIMONY OF ANDREW LIGHT, Ph.D.

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U.S. HOUSE OF REPRESENTATIVES, ENERGY AND COMMERCE COMMITTEE

SUBCOMMITTEE ON ENVIRONMENT AND CLIMATE CHANGE:

HEARING ENTITLED, "WE'LL ALWAYS HAVE PARIS:

SUBNATIONAL RESPONSES TO FEDERAL INACTION ON CLIMATE CHANGE"

FEBRUARY 28, 2019

Introduction

My name is Andrew Light, and I am a Distinguished Senior Fellow in the Global Climate Program at the World Resources Institute (WRI) and University Professor at George Mason University. WRI is a non-profit, non-partisan environmental think tank 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 across the globe to provide information, tools and analysis to address problems like climate change, the degradation of ecosystems and their capacity to provide for human well-being. George Mason University is Virginia's largest public research university, committed to creating a more just, free, and prosperous world. I also bring to the committee my expertise as a practitioner of international climate policy and diplomacy. From 2013-2016 I served as Senior Advisor and India Counselor to the U.S. Special Envoy on Climate Change, and as

a staff member of the Secretary of State's Office of Policy Planning in the U.S. Department of State, working at the heart of the U.S. government's efforts to create the Paris Agreement on Climate Change.

Summary

The main themes of this testimony are as follows:

1. The Paris Agreement remains essential to international efforts to mitigate greenhouse gas emissions. However, greater ambition will be needed from all parties in order to achieve the temperature stabilization goals of the Paris Agreement and prevent the worst harms of projected climate change.
2. Other countries continue to take steps to promote sustainable development and reduce their emissions, including for example China and India. Both countries are motivated in part by domestic conditions such as poor air quality, in addition to the economic and other benefits of mitigating global climate change.
3. In the absence of federal action in the US, an array of more than 3500 subnational actors such as states, cities, businesses and universities have stepped up to the plate, committing to fulfill the U.S.'s pledge under the Paris Agreement to reduce emissions 26-28% below 2005 levels by 2025. This includes individual actions of states such as California, Maryland, Illinois and New York, and coalitions of non-federal actors such as We Are Still In and the U.S. Climate Alliance.
4. However, there is much that these actors cannot achieve on their own, and thus re-engagement at the federal level will be essential to fulfill the goals of the Paris Agreement. To avoid the worst impacts of climate change, the U.S. needs to lead by example in order to encourage other countries to increase their ambition on mitigation and adaptation as well. Subnational actors cannot replace the diplomatic influence of the U.S. government, nor should they be expected to; on the contrary, the current absence of U.S. leadership on climate change greatly increases the risk of global failure to adequately address this critical issue.

Current State of the Paris Agreement on Climate Change

Four years ago in Paris, the world came together and succeeded at producing the first ever global agreement that would limit greenhouse gas emissions in a meaningful way. It was also the first time that an agreement involving specific commitments on emissions was struck that did not put the burden of action entirely on developed countries, but has requirements for all parties, including all major emitters, to take ambitious action. At one point, only two countries, Syria and Nicaragua, were holdouts

in not signing the Agreement, and both have since formally joined it.[1] Despite the U.S. announcement of an intention to withdraw, over 190 countries around the world are now actively working to implement policies to achieve the goals of the Paris Agreement. At the last two G20 summits, leaders of all countries other than the United States stated that Paris Agreement is "irreversible." With President Trump's announced intention to withdraw from Paris in June of 2017, the United States has now isolated itself from the rest of the world, both with respect to finding global solutions to the problem, but also increasingly losing out to other countries on the tremendous markets that have been created as other countries move to fulfill their commitments under the Paris Agreement.

The Paris Agreement was a giant step in the right direction. For the first time in the decades of attempts to create a viable global climate agreement, parties representing over 96 percent of global greenhouse gas emissions have made commitments (technically, Nationally Determined Contributions, or NDCs) to reduce their emissions.[2] In contrast, the Kyoto Protocol's emissions obligations only had the participation of Parties representing 25 percent of global emissions, and this number shrank to under 20 percent over time. This is simply not sufficient participation to avoid dangerous levels of warming even if these parties had substantial ambition. While the initial pledges put forward by the parties to the Paris Agreement are not sufficient to meet the goal of keeping global temperature rise to 2 degrees Celsius (3.6 degrees Fahrenheit) over pre-industrial levels, let alone 1.5 degrees Celsius, the level beyond which the most recent Intergovernmental Panel on Climate Change (IPCC) report warns that dangerous impacts would increase significantly, it nonetheless sets up a system where parties are expected to make continual pledges of increasing ambition over time.[3] Initial analysis by Climate Action Tracker on the Paris commitments suggested that if all parties achieved their first targets, then temperature stabilization in the range of 2.4-2.7 degrees Celsius could be achieved by the end of the century, an improvement over previous policies by some parties that could have achieved stabilization in the range of 3.3-3.9 degrees Celsius. More recent analysis suggests a stabilization range closer to 3 degrees Celsius from the Paris Agreement, in part due to the current rollback of mitigation policies by the United States.[4] Again though, the Paris Agreement was not designed to be a static deal, but rather to encourage an ambition loop by which countries would set targets, gather data and report on their progress, and then set stronger targets every five years. This kind of scaling of ambition is necessary if we hope to keep global temperature rise to a safe level. The abrupt absence of the United States'

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[1] https://www.bbc.com/news/world-middle-east-41904650
[2] http://cait.wri.org/
[3] https://www.ipcc.ch/wp-signup.php?new=www.ipcc.ch
[4] https://climateactiontracker.org/publications/warming-projections-global-update-dec-2018/

leadership – especially given the pivotal role we played in creating this agreement – will make this task much more difficult than it would be otherwise and, as I will argue below, could embolden opponents of climate action in other countries.

Progress in China and India

Because concerns have been raised in recent hearings before this sub-committee about the level of progress demonstrated by other large countries, particularly China and India, it is worth looking at the current status of their commitments under Paris. Both of these countries were singled out by President Trump in his Rose Garden speech as countries that were not required to do much under the Paris Agreement, and that would continue to build many new coal plants while, he claimed, we are forced to close those in the U.S.[5] While it is true that both China and India still have much progress to make in mitigating their emissions, they are taking major steps to do so, and have strong domestic incentives to make the transition to clean energy.

Since President Trump's announcement of his intention to withdraw the U.S. from the Paris Agreement, China has taken on a more prominent role on the international stage in combating climate change. President Xi Jinping has said that China is now in the "driver's seat" when it comes to addressing greenhouse gas emissions, and has repeatedly discussed his vision for the creation of an "ecological civilization."[6] China is currently leading the world in renewable energy investment, having committed to spending over $360 billion on renewable energy through 2020, which is expected to create roughly 13 million new jobs.[7] China recently launched a national emissions trading system for its power sector, which is now the largest carbon market in the world and will eventually be scaled up to cover its entire economy.[8] In 2017, the Chinese government halted or delayed over 150 coal plants throughout the country in response to overcapacity concerns.[9] Recently, China also unveiled its New Energy Vehicle (NEV) mandate, which calls for 4.6 million NEVs (expected to be predominantly electric vehicles) on the road by 2020, and the phase out of the internal combustion engine by 2040.[10] Given

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[5] https://www.whitehouse.gov/briefings-statements/statement-president-trump-paris-climate-accord/
[6] https://qz.com/1105119/watch-what-xi-jinpings-19th-chinese-communist-party-congress-work-report-said-on-climate-change/
[7] https://www.wri.org/blog/2017/01/china-s-decline-coal-consumption-drives-global-slowdown-emissions
[8] https://qz.com/1159667/china-is-launching-the-worlds-largest-carbon-market/
[9] https://unearthed.greenpeace.org/2017/10/11/china-halts-150-coal-fired-power-plants/
[10] https://www.wri.org/blog/2018/12/how-china-raised-stakes-electric-vehicles

that the automobile market in China is the largest in the world, this move will likely reshape the entire global auto industry.[11]

Nonetheless, China remains the world's largest emitter of carbon dioxide, and its emissions were projected to have increased by 4.7 percent last year, after a minor uptick in 2017 following three years of stabilization.[12] (This followed a global trend which included an increase in 2018 of U.S. emissions as well.) However, it is important to note that China's initial commitment under the Paris Agreement requires it to peak its emissions by 2030 at the latest, and to make efforts to peak earlier if possible. In his Rose Garden speech announcing his intention to withdraw from Paris, President Trump seized on this, arguing that China "can do whatever they want for 13 years." But although its emissions increased in the past several years, experts have argued that its emissions could easily peak as early as 2025, five years earlier than its commitment.[13] The Alliance of Pioneer Peaking Cities, a group of 23 cities and provinces in China, has also committed to peaking its emissions early.[14] China has also already achieved its pre-Paris 2020 target to reduce the carbon intensity of its economy by 45 percent. In fact, due to its progress thus far, a Chinese government think tank, the National Center for Climate Change Strategy and International Cooperation (NCSC), recently recommended to the national government that it has "the potential and conditions for improving" its current commitments under Paris.[15] Finally, it is important to note that although its emissions have increased significantly in the past two decades, as of 2014 China's per capita emissions were still only 8.5 tons of carbon dioxide equivalent (tCO2e), while the United States' per capita emissions were 19.8 tCO2e, more than twice as high.[16] China will not be able to reverse course overnight, but it has already begun the process of decarbonizing its economy.

There are several reasons why China has continued to take action to address its domestic emissions despite the U.S. retreat under the Trump administration. Most importantly, it faces an air pollution crisis: over a million people die prematurely in China every year due to elevated levels of air pollutants.[17] This has the potential to create political unrest, which the Chinese government has a

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[11] https://www.bloomberg.com/opinion/articles/2018-10-14/china-s-car-market-is-maturing-not-crashing
[12] https://www.nytimes.com/2018/12/05/climate/greenhouse-gas-emissions-2018.html
[13] https://www.tandfonline.com/doi/full/10.1080/14693062.2016.1156515#aHR0cDovL3d3dy50YW5kZm9ubGluZS5jb20vZG9pL3BkZi8xMC4xMDgwLzE0NjkzMDYyLjIwMTYuMTE1NjUxNT9uZWVkQWNjZXNzPXRydWVAQEAw
[14] https://www.wri.org/blog/2016/06/23-chinese-cities-commit-peak-carbon-emissions-2030
[15] https://www.climatechangenews.com/2018/06/06/china-consider-increasing-paris-climate-pledge-2020-government-thinktank/
[16] https://www.climatewatchdata.org/
[17] http://www.wpro.who.int/china/mediacentre/releases/2018/20180502-WHO-Issues-Latest-Global-Air-Quality-Report/en/

strong interest in preventing. A study from the Chinese University of Hong Kong also calculated that air pollution-related impacts cost the Chinese economy 267 billion yuan, or $38 billion USD each year, in the form of premature deaths and lost productivity.[18] Furthermore, pursuing clean energy development creates jobs, brings the country greater energy security, and will lessen the damage to the Chinese economy caused by sea level rise and desertification as a result of changes in the climate. Thus, it is in China's own interest to reduce its domestic carbon emissions, regardless of what any other country is doing. There are other causes for concern coming out of China however, that require a strong U.S. nation-wide response. I will come back to those at the end.

India is another example of a large developing country that is still industrializing, but increasingly making strides to do so sustainably. While its total emissions climbed an estimated 6.3 percent in 2018, most of this growth was in order to provide electricity to people who had previously lacked access to reliable power. India's total emissions remain much lower than those of the United States (India makes up 7 percent of global emissions, while the United States accounts for 15 percent) and its per capita emissions are still very low, at only 2.5 tCO2e per person as of 2014.[19]

The main approach in India for reducing emissions is by pursuing very ambitious targets for the deployment of renewable energy, especially solar power. For its Paris commitment, India set a goal of 40 percent electricity generation from non-fossil fuel sources by the year 2030, as well as a reduction in its economy's carbon intensity of 33-35 percent by 2030.[20] According to the UN's annual Emissions Gap Report, India is on track to meet these targets.[21] In the near term, even prior to setting their target under Paris, Prime Minister Modi established an ambitious target to install 100 gigawatts (GW) of solar energy, 60 GW of wind power, and an additional 15 GW of biomass and small hydro by the year 2022, creating an estimated 330,000 new jobs in the process.[22] The solar target alone is the largest single-sector target of its kind in the world. India energy watchers in the U.S. were skeptical of the feasibility of these targets when they were originally announced, but now India is making excellent progress on delivering these targets. The country's growth in renewable energy over just the last five years has been

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[18] https://www.scmp.com/news/china/science/article/2166542/air-pollution-killing-1-million-people-and-costing-chinese

[19] https://www.climatewatchdata.org/

[20] https://www.climatewatchdata.org/ndcs/country/IND

[21] https://www.wri.org/blog/2018/11/5-things-you-need-know-about-un-emissions-gap-report

[22] https://www.nrdc.org/sites/default/files/greening-india-workforce.pdf

staggering. The costs of renewable energy in India have fallen 50 percent in the past two years.[23] Its solar energy capacity increased eightfold from 2014 to 2018 (2.63 GW to 22 GW), and its wind power capacity increased from 21 GW to 34 GW over the same period. This brings its total renewable energy capacity to 70 GW.[24] India is performing so well that it is now aiming to reach 227 GW of renewable capacity by 2022 by also adding floating solar and off-shore wind to the package.[25] For context, this is nearly double current U.S. levels of wind and solar capacity.[26] Meanwhile, the number of planned coal plants has plummeted, shrinking by a quarter in the first half of 2018.[27]

India, like China, is driven by domestic incentives to keep its greenhouse gas emissions in check. The most important is that India's air pollution levels have become a domestic crisis. Air pollution caused roughly 1.24 million deaths in India in 2017 alone.[28] The WHO also estimates that 11 of the 12 cities with the highest levels of particulate matter pollution in the world are in India.[29] A 2014 analysis showed that declines in agricultural productivity as a result of poor air quality caused losses of crops that could have otherwise fed 94 million people.[30] India is also seeking to provide electricity to over 30 million homes that are still without power, and ensuring that energy access is reliable for all its citizens.[31] It also stands to benefit economically from being a leader in the solar energy industry, and will achieve greater energy security in the process. Because of India pushing forward with this transition, it is projected to be on track to achieve part of its Paris target of 40 percent non-fossil-based power capacity by 2030.

Success in Completing the Rules for the Paris Agreement

In his remarks at the White House when he announced his intention to withdraw, President Trump stated within the same sentence that the Paris Agreement was "nonbinding," but also that it would impose "draconian financial and economic burdens" on our country.[32] Those two statements are

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[23] https://data.bloomberglp.com/professional/sites/24/2017/11/BNEF_Accelerating-Indias-Clean-Energy-Transition_Nov-2017.pdf

[24] https://www.businesstoday.in/sectors/energy/india-renewable-energy-target-227-gw-solar-wind-government/story/278594.html

[25] https://economictimes.indiatimes.com/industry/energy/power/india-will-add-225-gw-renewable-energy-project-capacity-by-2022-r-k-singh/articleshow/64461995.cms?from=mdr

[26] https://www.eia.gov/outlooks/aeo/pdf/aeo2019.pdf

[27] http://ieefa.org/india-coal-plant-cancellations-are-coming-faster-than-expected/

[28] https://www.thelancet.com/action/showPdf?pii=S2542-5196%2818%2930261-4

[29] https://www.vox.com/2018/5/8/17316978/india-pollution-levels-air-delhi-health

[30] https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2014GL060930

[31] https://www.bloomberg.com/news/articles/2018-04-26/india-nears-power-success-but-millions-are-still-in-the-dark

[32] https://www.vox.com/energy-and-environment/2017/6/2/15727984/deceptions-trump-paris-speech

inherently contradictory, and only the former is true. But the details of how the Paris Agreement will be implemented will have a tremendous effect on global mitigation and adaptation efforts. At the last Conference of the Parties to the UN Framework Convention on Climate Change (COP24) in Katowice, Poland this past December, the Parties to the Paris Agreement adopted a set of guidelines for implementing the agreement, including how countries will be expected to report their emissions data, potentially enhance their existing NDC targets by 2020, and conduct a Global Stocktake on overall progress towards meeting the targets under Paris in 2023. In particular, the rules on monitoring, transparency, reporting, and review of emissions inventories as well as progress toward achieving each Parties' commitments, established a common set of requirements for both developed and developing countries. This is an outcome for a climate agreement sought by the Clinton, George W. Bush, and Obama administrations. It was achieved in part by cooperation between the U.S. and Chinese delegations, which continued to co-facilitate a working group on this topic.[33] This will ensure that going forward, we can be confident in emissions estimates and know for certain which countries are doing their fair share if we choose to re-engage with the Paris Agreement. But maintaining the stability of this outcome will be threatened once the U.S. leaves the Paris Agreement, and is no longer able to block attempts to slip back into a system with different sets of rules for different kinds of parties.

Subnational Engagement in International Climate Action

Fortunately, American engagement in climate change mitigation efforts did not end with President Trump's announcement of his intention to withdraw from Paris. As should be clear from the other testimony presented to the subcommittee today, multiple coalitions of non-federal actors, including We Are Still In (WASI), today representing over 3,500 entities across the country, [34] and the U.S. Climate Alliance, comprised of 21 governors from states representing over half of the U.S. population,[35] have continued to take actions to work towards achieving the U.S. emissions reduction pledge under Paris.[36]

Almost immediately following President Trump's announcement on Paris, these leaders have made an effort to showcase their actions on the international stage, demonstrating to the rest of the world that much of the United States will move forward on this issue with or without the federal

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[33] https://www.wri.org/blog/2018/12/cop24-climate-change-package-brings-paris-agreement-life
[34] https://www.wearestillin.com/
[35] https://www.usclimatealliance.org/
[36] https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/United%20States%20of%20America%20First/U.S.A.%20First%20NDC%20Submission.pdf

government. This groundswell of support has come as a relief to global leaders, with German Chancellor Angela Merkel commenting on the formation of America's Pledge, "I want to warmly welcome this step as it emphasizes the support for the climate agreement across large parts of the U.S. regardless of the decision of President Trump to withdraw."[37] In Japan, political and private sector leaders turned their praise into action, when a group of over 100 companies, private organizations, and local governments launched the Japan Climate Initiative. The group, which includes the likes of the Tokyo Metropolitan Government and Panasonic, is modeled after We Are Still In and intends to work with them.[38]

In response to President Trump's announcement, the state of California emerged as an early leader in promoting subnational climate action abroad. California's then-governor Jerry Brown traveled to China, where he signed an agreement with China's Ministry of Science and Technology to work together on efforts to reduce emissions by developing renewable energy. The agreement also involved cooperation on the development of other low-carbon technologies, including zero-emission vehicles, energy storage, grid modernization and low-carbon urban development. Brown also signed agreements on technology development with officials from the provinces of Jiangsu and Sichuan, which have a combined population of greater than 160 million.[39] These agreements built on existing memoranda of understanding that the state had signed with China in 2009 and 2013, with Jiangsu province[40] and China's National Development and Reform Commission respectively.[41] Brown was also part of a delegation of non-federal leaders, including Washington state's Governor Jay Inslee and former mayor of New York City Mike Bloomberg, who traveled to the 2017 Conference of the Parties to the UN Convention on Climate Change in Bonn, Germany to demonstrate the non-federal commitment in the U.S. to the Paris Agreement.[42] The pavilion organized by these parties at Bonn to showcase their efforts to fulfill the U.S. pledge under Paris was actually larger than most other G20 countries.

Governor Brown's office also organized the Global Climate Action Summit (GCAS) in September 2018, a forum for subnational actors to showcase their mitigation efforts and secure more ambitious

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[37] https://www.handelsblatt.com/today/politics/problem-coal-merkel-swipes-at-trump-on-climate/23573034.html?ticket=ST-4077897-c2XherI7EBoCM9dhtkLi-ap5

[38] https://www.japantimes.co.jp/news/2018/07/06/national/science-health/100-firms-local-governments-private-groups-japan-unite-climate-change/#.XHA1Q-hKiUk

[39] https://www.theguardian.com/us-news/2017/jun/07/china-and-california-sign-deal-to-work-on-climate-change-without-trump

[40] https://www.nrdc.org/experts/barbara-finamore/california-and-jiangsu-province-sign-agreement-cooperation-climate-policies

[41] https://www.ef.org/blog/china-california-sign-climate-mou/

[42] https://www.nytimes.com/2017/11/11/climate/un-climate-talks-bonn.html

commitments.[43] Outcomes from the summit included a commitment from the U.S. Climate Alliance member states to work together on carbon sequestration efforts,[44] three states (Connecticut, Maryland, and New York) joining California in announcing pledges to phase down the use of super-polluting hydrofluorocarbons (HFCs),[45] and four states (Connecticut, Hawaii, Minnesota, and New York) joining the Powering Past Coal Alliance, which pledges to fully phase out the use of coal-fired power plants for electricity generation.[46] The Global Climate Action Summit also showcased the actions of subnational actors from countries around the world. Subnational leaders from 103 countries made over 500 commitments,[47] including a commitment from Mahindra & Mahindra, a leading Indian technology and vehicle manufacturing company, to achieve carbon neutrality by the year 2040,[48] as well as several commitments from individual Indian states.[49]

Limits to Subnational Action

Despite the impressive subnational showings and commitments at the UN climate talks, the Global Climate Action Summit and elsewhere, there are clear limits to U.S. subnational action. These entities can't replace all U.S. federal action, they can't replace American global leadership to ensure that the Paris Agreement is a success by helping other countries to meet their targets, and subnational actors can't take the steps necessary to ensure that the U.S. is secure from global security threats that are increasingly catalyzed by climate change.

First, subnational actors will not be able to make the deep emissions cuts needed in the U.S. all on their own. A report released at the Global Climate Action Summit, *Fulfilling America's Pledge*, quantifies the impact of subnational climate actions using analysis from WRI, University of Maryland, Rocky Mountain Institute, and others. The research found that existing commitments by U.S. cities, states, and the private sector, when combined with federal policies that are still in effect, would reduce U.S. emissions by about two-thirds of what is needed to meet the U.S. pledge to reduce emissions 26-28 percent below 2005 levels by 2025.[50] Further action and ambition by subnational actors, so that a

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[43] https://www.globalclimateactionsummit.org/about-the-summit/
[44] https://www.usclimatealliance.org/nwlchallenge/
[45] https://insideclimatenews.org/news/10092018/new-york-ban-hfcs-potent-greenhouse-gas-climate-pollutant-cooling-refrigeration
[46] https://www.globalclimateactionsummit.org/powering-past-coal-alliance/
[47] https://www.globalclimateactionsummit.org/summit-outcomes/
[48] https://economictimes.indiatimes.com/industry/auto/auto-news/mahindra-mahindra-to-go-carbon-neutral-by-2040/articleshow/65807562.cms
[49] https://www.nrdc.org/stories/tracking-climate-commitments-global-climate-action-summit
[50] https://www.bbhub.io/dotorg/sites/28/2018/09/Fulfilling-Americas-Pledge-2018.pdf

broader swath of them take even greater advantage of current economic and technical potential, could reduce emissions in that time frame by 24 percent, almost reaching the target. Other countries quite reasonably worry though that goals like these can be achieved given concerns about the stability of U.S. subnational action over time, especially in smaller states, without some level of federal cooperation and support.

Second, without federal policies, it will be difficult for subnational actors to promote the structural changes in the U.S. economy that are needed to promote deep decarbonization over the long term. For the world to achieve our long-term climate stabilization goals, it is not enough for the U.S. to marginally bring down its emissions over the next few years. Instead, we must aim for a more ambitious target like achieving net-zero emission by mid-century. There will be ample economic benefits with this transition, as has already been demonstrated in those states supporting a clean energy transition, so we must ensure that the benefits of the transition to a climate-smart economy are equally distributed across the country. Federal leadership is needed to make this happen, and to make certain workers in fossil-intensive industries benefit from a just and more sustainable transition within their own industries or to other industries.

Third, U.S. federal leadership is especially necessary in global climate negotiations because states, cities and businesses can't participate directly in international climate change negotiations. They do not have a vote in these negotiations, so they won't have a seat at the table with member Parties. Active American participation in the UNFCCC Conference of the Parties each year is essential to ensure that the Paris Agreement maintains the elements that are beneficial to U.S. interests. This includes making sure there is no backsliding into some form of "bifurcation" where different groups of countries operate with different rules on accountability based on their self-defined development status. President Trump's decision to withdraw from the agreement has already increased distrust between developing and developed countries. For example, the insistence of the U.S. at last year's climate talks to block "welcoming" the IPCC report on the potential to achieve climate stabilization at 1.5 Celsius, and the consequences of doing so – a move that was supported by Russia and Saudi Arabia – caused significant disruptions in the negotiations and for a time threatened consensus on much more impactful parts of the negotiations. Since the process of withdrawing the U.S. from the Paris Agreement will not be complete until November 2020, the U.S. still has a seat at the negotiating table. However, it already has diminished influence due to its intention to withdraw and will lose that influence entirely if it fully exits the agreement.

Fourth, because this is a global problem that requires global solutions, we need to work with other countries to encourage them to achieve their own targets and make increasingly ambitious commitments over time. Unfortunately, President Trump's position has provided a convenient excuse in some countries to possibly pull back from the Paris Agreement, or water down their current commitments. Former Australian Prime Minister Tony Abbott urged his successor Malcolm Turnbull to follow Donald Trump's lead and cancel the commitments Australia had made under Paris, signed by Abbott himself saying, "Absent America, my government would not have signed up to the Paris treaty, certainly not with the current target."[51] In the months following President Trump's announcement, President Erdogan of Turkey said that the U.S. decision to pull out of Paris means Turkey is less inclined to ratify the deal in parliament.[52] And President Jair Bolsonaro of Brazil regularly flirted with the idea of pulling his country out of Paris during the last campaign, openly praising President Trump's decision to leave.[53] While he has apparently reversed himself, he has, according to analysis in The Washington Post, regularly, "railed against the country's 'excessive' policing of its rural areas and forests. He floated the idea of combining the country's agriculture and environment ministries, which critics worry would enfeeble environmental protections."[54] While international pressure for these countries to remain committed to Paris is strong, the point here is that American subnational actors are not in a position to forcefully answer such criticisms when the stance of the U.S. federal government so dramatically contravenes them.

Finally, we also need to help to prepare our strategic partners abroad for the changes that are occurring now lest we risk both their safety and the safety of the American people. Subnational actors do not have the capacity or resources to work with our strategic partners in developing countries who are experiencing climate-driven risks. Even our wealthiest states aren't in the business of enhancing capacity in developing countries so that they are less vulnerable to how climate change can exacerbate already fragile political conditions, which this month's Worldwide Threat Assessment of the U.S. Intelligence Committee unequivocally stated is a clear concern: "global environmental and ecological

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[51] https://www.smh.com.au/politics/federal/follow-donald-trump-on-climate-tony-abbott-urges-pm-20180703-p4zpah.html

[52] https://www.reuters.com/article/us-g20-climatechange-turkey/erdogan-says-u-s-stance-stalls-turkish-ratification-of-paris-climate-deal-idUSKBN19T11R

[53] https://www.theguardian.com/environment/2018/oct/09/brazils-bolsonaro-would-unleash-a-war-on-the-environment

[54] https://www.washingtonpost.com/world/2018/10/19/how-brazils-bolsonaro-threatens-planet/?utm_term=.3f5d48bc58fe

degradation, as well as climate change, are likely to fuel competition for resources, economic distress and social discontent through 2019 and beyond."[55] Subnational actors can't stand in for the U.S. federal government to assure our allies in strategically critical parts of the world that they will have a friend and ally as they face increasingly difficult climate vulnerabilities, either slow-onset events like sea level rise, or increasingly intense storms, floods, and droughts. With the U.S. effectively absent from global efforts to make the world more resilient, other countries, as I will turn to at the end of this testimony, will step in and become more influential.

Federal Inaction Threatens U.S. Business Interests

There are further economic consequences to lack of federal leadership. The 2018 report of the Global Commission on the Economy and Climate estimates that a world-wide transition to a low-carbon, sustainable growth path "could deliver a direct economic gain of U.S. $26 trillion through to 2030 compared to business-as-usual."[56] This is clearly something that we should be competing with other countries on. Subnational actors, including U.S. businesses alone however cannot do this, and moreover are limited in their ability to protect the overall U.S. economy from the disruptions of international trade that are already happening with climate change. An important message from the National Climate Assessment delivered to Congress last year is that "The impacts of climate change, variability, and extreme events outside the United States are affecting and are virtually certain to increasingly affect U.S. trade and economy, including import and export prices and businesses with overseas operations and supply chains."[57]

U.S. businesses are deeply interlinked with international supply chains. They will face challenges as extreme weather and climate change increasingly impact international manufacturing, storage, and transportation infrastructure. Climate change is also likely to lead to large changes in the availability and prices of many commodities and agricultural goods, impacting U.S. businesses abroad and U.S. trade. As an illustrative example, the 2011 flooding in Thailand reverberated around the world to negatively affect U.S. business interests. Western Digital, a U.S.-based company that produces 60 percent of its hard drives in Thailand, had to slow down shipments and experienced $199 million in losses. Global hard drive prices temporarily doubled, affecting more U.S. companies like Apple, HP, and Dell. In addition, the flooding forced Ford to halt vehicle production in Thailand, and Honda had to

[55] https://www.dni.gov/files/ODNI/documents/2019-ATA-SFR---SSCI.pdf
[56] https://newclimateeconomy.report/2018/executive-summary/
[57] https://nca2018.globalchange.gov/chapter/16/

decrease its vehicle production in the United States and Canada.[58] Federal leadership is the only way America can respond to these kinds of economic threats in a coordinated and comprehensive way.

While subnational actors have some tools to promote U.S. business interests related to climate mitigation and adaptation abroad, U.S. companies still suffer when our national government is perceived as not cooperating with the rest of the world on this critical problem. The Paris Agreement expands the international market for innovative sustainable technologies by committing all countries to reduce emissions. The International Finance Corporation found that the commitments under the Paris Agreement by developing countries alone represent $23 trillion in investment opportunities in emerging markets by 2030.[59] U.S. businesses need to be a part of that market. The U.S. retreat from the agreement puts their reputations on the line, which is why so many U.S. companies are eager to announce their continued support for it. Sixty-nine of the Fortune 500 companies publicly supported the Paris Agreement before President Trump announced his intention to withdraw, including the four biggest in the country: Walmart, ExxonMobil, Apple, and Berkshire Hathaway.[60] In 2017, 26 companies took out an advertisement urging President Trump to stay in the Paris Agreement, including Apple, Levi, Mars, and Tiffany & Co. Their argument was that the Paris Agreement strengthens competitiveness – it "reduces the risk of competitive imbalances for U.S. companies because it requires action by all countries and ensures a more balanced global effort." U.S. companies want to get ahead of the curve on low-carbon innovation, buoyed by the certainty that the U.S. government will remain committed to climate action like the rest of the world, including the other markets they work in.

At the same time, we need federal leadership to make sure that all parts of the United States benefit from the job creation that comes along with building up clean energy sectors and improving infrastructure for climate resilience. Already, 3.2 million Americans are employed in wind, solar, energy efficiency, and other clean energy jobs, according to the 2018 U.S. Energy and Employment Report.[61] This is about three times the number of jobs in fossil fuels. The two fastest growing jobs in the country are solar photovoltaic installers and wind turbines service technicians, according to the Bureau of Labor Statistics.[62] About 1 in every 6 construction jobs in the country is connected to energy

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[58] https://nca2018.globalchange.gov/chapter/16/

[59] https://www.ifc.org/wps/wcm/connect/news_ext_content/ifc_external_corporate_site/news+and+events/news/new+ifc+report+points+to+%2423+trillion+of+climate-smart+investment+opportunities+in+emerging+markets+by+2030

[60] https://www.eenews.net/assets/2017/05/26/document_daily_02.pdf

[61] https://www.usenergyjobs.org/

[62] https://www.bls.gov/emp/tables/fastest-growing-occupations.htm

efficiency.[63] A quarter of the jobs in the automobile industry are related to fuel efficiency or alternative fuel vehicles.[64] We do not want to stop this progress while the rest of the world economy is still going forward. Without federal support for innovative research and development, even the states and cities that want to act on climate will eventually find it hard to keep up. The uncertainty over whether the U.S. will stay in, leave, or come back to the agreement will make it difficult for the businesses to make long-term investments.

When President Trump announced his intention to withdraw from the Paris Agreement, he cited a misleading report that said the U.S. commitment to the Paris Agreement would hurt the economy. This claim is based on a highly unrealistic and unnecessarily expensive pathway to achieve the U.S. emissions targets. It also assumes that clean energy innovation slows down, which is very unlikely to be the case.[65] In contrast, the private sector largely considers 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 found that "extreme weather events" and "failure of climate-change mitigation and adaptation" were respectively the number one and number two risks in terms of likelihood. They were the number two and number three risks in terms of impact, behind only weapons of mass destruction (which were rated extremely low on likelihood).[66]

American Leadership is a Geopolitical Necessity on Climate Change

Former Secretary of State Madeleine Albright once called the United States the "indispensable nation," referring to its ability to provide global leadership and security.[67] This applies equally well to its position in global efforts to address climate change. A lack of U.S. participation was one of the key factors that doomed the Kyoto Protocol, and conversely, U.S. leadership, along with China, was essential to achieve the Paris Agreement, creating a race to the top for ambition in many countries' commitments under the

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[63] https://www.nrdc.org/experts/lara-ettenson/good-news-good-jobs-clean-energy-outpaces-fossil-fuels
[64] https://www.nrdc.org/experts/lara-ettenson/good-news-good-jobs-clean-energy-outpaces-fossil-fuels
[65] https://www.wri.org/blog/2017/04/us-chamber-commerces-energy-institute-misleads-climate-action-costs-3-things-know. In fact, NERA objected to the use of their study in justifying this announcement: "Use of results from this analysis as estimates of the impact of the Paris Agreement alone mischaracterizes the purpose of NERA's analysis, which was to explore the challenges of achieving reductions from US industrial sectors over a longer term. Selective use of results from a single implementation scenario and a single year compounds the mischaracterization." https://www.nera.com/news-events/press-releases/2017/nera-economic-consultings-study-of-us-emissions-reduction-polici.html
[66] http://www3.weforum.org/docs/WEF_Global_Risks_Report_2019.pdf
[67] https://1997-2001.state.gov/statements/1998/980219a.html

agreement. With the U.S. retreat from the international community, our ability to put pressure on other countries to deliver on commitments and increase ambition has disappeared. We see the global effects of the leadership gap we have created in the inability of any party to rein in China's financing of fossil fuel-intensive infrastructure around the globe. Only full re-engagement in the Paris Agreement, and global efforts to address climate change, by the U.S. government can remedy this issue.

Though there have been positive developments in China in recent years as was documented above, it can and should be doing more to lessen its overall contribution to global climate change, including in other countries. It has made great strides in its effort to lessen its pollution at home, but China continues to finance many coal projects in developing countries. Of particular concern is its Belt and Road Initiative, a massive infrastructure project worth a cumulative $6 trillion USD that includes 70 countries throughout Southeast Asia, Africa, and Europe. If the cost reaches this estimated level, it will be roughly forty-six times as large as the Marshall Plan, through which the U.S. spent $130 billion in today's dollars on rebuilding Europe after the Second World War.[68] The project is intended to promote China's economic interests throughout these regions through the construction of a series of ports, highways, and railways. However, if not done with an emphasis on low-carbon development, this has the potential to lock in future greenhouse gas emissions for many decades. While China has taken initial steps to incorporate sustainability into investment decisions, the majority of investments in Belt and Road infrastructure projects thus far have not been consistent with the goals of the Paris Agreement. From 2014 to 2017, 91 percent of all energy-sector syndicated loans in which the major Chinese development banks participated were in fossil fuel projects. Over the same timeframe, 93 percent of investments in energy by the Silk Road Fund and 95 percent of foreign energy investments by Chinese state-owned enterprises were in fossil fuels.[69]

Toward the end of the Obama administration, the United States attempted to engage with China on this issue, but was not able to extract a commitment from the Chinese to curtail its foreign investment in fossil fuel projects before President Obama left office.[70] Since then, unsurprisingly, the U.S. has shown no interest in challenging China on this issue, given President Trump's commitment to expanding fossil fuel production in the U.S., and no other country has been able to exert pressure on China to reduce its international coal financing. The result of this lack of oversight is that China gets to have the best of both worlds. It can take action domestically and be seen as a global leader on climate

[68] https://www.newyorker.com/magazine/2018/01/08/making-china-great-again
[69] https://www.wri.org/publication/moving-green-belt-and-road-initiative-from-words-to-actions
[70] https://obamawhitehouse.archives.gov/the-press-office/2016/03/31/us-china-joint-presidential-statement-climate-change

change, while still exporting fossil-intensive technology to other countries without regard for their NDC targets. China benefits from the global influence it gains through development assistance, but due to a lack of U.S. engagement, they are not currently ensuring that this development is sustainable.

How Congress Can Take Action

Despite the groundswell of subnational action taking place over the past few years, it is clear that action at the federal level will still be indispensable if we are to adequately reduce our greenhouse gas emissions and encourage similar action abroad. There are a number of measures that Congress could pursue in order to revive mitigation efforts at the federal level. You are currently engaged in a discussion of many of them. While it is outside the scope of this testimony, more innovative programs and incentives such as the 45Q tax credit are needed to create a needed boost for those non-federal actors in the U.S. who are still moving forward. Expansion of R&D programs to more areas that we now understand as essential to achieving our global climate stabilization goals, such as carbon removal technologies, is essential.[71] However, among those specific to the Paris Agreement, and the global regime that has been launched to make Paris a success, include:

1. **Pass a resolution expressing the commitment of Congress to the Paris Agreement:** The first step that Congress should take is to pass a resolution, similar to the one introduced by Reps Jared Huffman (D-CA), Don Beyer (D-VA), and Brian Fitzpatrick (R-PA),[72] expressing Congress's opposition to withdrawing from the Paris Agreement and its commitment to fulfill its goals. This resolution should also express support for the subnational action that has grown over the past two years to fill the void at the federal level and pledge to support it. Congress can send a powerful message to the administration that the United States should not be the only country to turn its back on the global effort to combat climate change.
2. **Double funding to Department of Energy (DOE) clean energy research, development, and deployment:** By stabilizing increased funding levels and expanding loan programs, Congress can catalyze U.S. efforts to keep up with China, which is currently lapping the U.S. in positioning for the 21st-century energy marketplace. China invests 20 percent of its R&D budget in energy technologies, while we invest just two percent. It shows. China has sprinted ahead in the race for clean energy superiority, last year nearly doubling our investment in clean energy

[71] https://www.wri.org/blog/2018/12/wanted-325-million-federal-rd-jumpstart-carbon-removal
[72] https://www.congress.gov/bill/116th-congress/house-concurrent-resolution/15?q=%7B%22search%22%3A%5B%22paris+agreement%22%5D%7D&s=1&r=1

technologies.[73] In the midst of all this, $600 million in congressionally-approved funds for such transformative DOE bodies as ARPA-E and the Office of Energy Efficiency and Renewable Energy is, for some reason, going unspent.[74] Congress should use its oversight authority to ensure that the administration spends these funds as intended.

3. **Ensure that the international assistance funds that you have allocated are well spent.** The recently passed funding bill for FY 2019 includes $776 million in bilateral allocations for environmental programs, a nearly $400 million increase compared to FY 2018. It is not at all clear though how much of this would go to climate-related assistance out of USAID or the State Department.[75] Whatever doubts remain in the executive branch about the reality of climate change, many of our most important strategic allies in volatile parts of the world see this as an existential threat that must be addressed. As mentioned above, our own intelligence community agrees. Ideology should not interfere with the best use of these funds. This money should be tracked and accounted for, with guidance from this congress to make sure it goes to programs that face up to the reality of climate change, and the good that can come to all of us from working together to create a more resilient world.

Conclusion

As members of this committee on both sides of the aisle have argued, we need strong commitments from every country in the world in order to see major reductions in global greenhouse gas emissions. This is exactly why participation in the Paris Agreement is of the utmost importance. U.S. subnational actors are currently bearing the burden of U.S. participation in the global climate change regime. But without the United States leading by example, other countries may slip, arguing that they should not be expected to do more if the U.S. is not fully engaged. The United States has been the deciding factor in the success or failure of past global efforts to reduce greenhouse gas emissions, and this will continue to be the case. Throughout American history, we have never run from the most pressing and challenging issues of the time. While our current president has turned his back on our closest allies and retreated from our role as an international leader, the next generation of Americans is expecting on us to step back into the international arena and lead the global fight against climate change as soon as possible.

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[73] https://about.bnef.com/blog/clean-energy-investment-exceeded-300-billion-2018/

[74] https://www.nrdc.org/media/2018/181210

[75] https://www.wri.org/blog/2019/02/us-climate-finance-improves-2019-budget-theres-still-long-way-go

Mr. TONKO. Thank you, Mr. Light.

We now have concluded with opening statements and now move to Member questions. Each Member will have 5 minutes to ask questions of our witnesses, and I will start by recognizing myself for 5 minutes.

Many of my colleagues will want to discuss subnational commitments, but I would like to start with some basics of the agreement.

Dr. Light, I just want to clearly state what I believe I heard you say in your just-delivered statement. Do you agree that the United States and all other parties to the agreement made voluntary mitigation contributions?

Dr. LIGHT. Yes, sir.

Mr. TONKO. So with that being said, when President Trump talks about imposing draconian burdens on our country, is that a fair criticism of the agreement itself?

Dr. LIGHT. It is absolutely false, sir. I was at the table when the agreement was being negotiated. There were no draconian burdens that were put on the United States or any other country.

Mr. TONKO. So then this is not a U.N. mandate that undermines our sovereignty?

Dr. LIGHT. Not at all.

Mr. TONKO. Our mitigation commitment was submitted based on existing and planned United States policy. Is that correct?

Dr. LIGHT. Yes, sir.

Mr. TONKO. And, Dr. Light, one of the biggest achievements of the agreement is the inclusion of large developing nations such as China and India. Can you explain their commitments and how they were brought to the table?

Dr. LIGHT. Well, I think I sort of gave you a little bit of an overview of what China and India are doing right now and we can talk about, you know, what's going on in terms of emissions recently with those countries and the United States.

But how they were brought to the table was a very interesting story. The United States and China had historically been the biggest adversaries in this process.

So if you go back decades to the original creation of the framework convention in 1992, it was just an incredible fight between large blocks of countries, mostly developed countries on the one side, developing countries on the other side.

The developing countries said, you caused the problem, essentially applying a kind of "polluter pays" mentality. It is your responsibility to solve it. We shouldn't be required to do anything.

But that is just not viable, as Representative Walden said. You can't reduce emissions sufficiently only on the backs of developed countries because the bulk of emissions now are from developing countries. We tried with different measures to move forward on this. But we could never get sufficient participation from these other countries to move forward.

The Kyoto Protocol, for example, only had the participation in terms of obligations to reduce emissions from less than 20 percent of emissions globally from the countries that had to reduce their emissions.

The Paris Agreement—the countries that are committed to the Paris Agreement now, until the U.S. leaves, covers 96 percent of

global emissions. We worked with China behind the scenes for over a year to make sure that we could bring them to the table, that we would only stand next to them, as President Obama did in November of 2014, with President Xi in Beijing—we would only stand with them and while they were announcing the top lines of their target if we thought their target was respectable, and they did the same with us. And that created a race to the top that brought countries along.

India is another story. Prime Minister Modi has long been a climate champion, and what we did is we took—looked at his domestic desire to try to move his country forward on a more sustainable path. By himself he increased his own renewable energy targets and then we worked with the Indian government to make sure that their platform could be used to advance other research and innovation programs that they wanted to create.

Mr. TONKO. Thank you for highlighting that.

Because these countries are in a different stage in their development their time line may be longer than ours. But it is clear that they are committed to taking action and pursuing more sustainable development.

How is China working forward? Are they still on track to peak with its emissions around 2030?

Dr. LIGHT. That—no, sir. I believe they are actually going to peak quite earlier than that. I mean, all estimate evidence to date is that they will peak earlier.

They did have a 3 percent uptick in their emissions as far as we can tell in 2018. The U.S. emissions also went up 3.4 percent in the same time period.

But there is lots of explanations for this having to do with some stimulus in the Chinese economy—for example, a huge boom in construction to try to create more apartments for people, which are—20 percent of them are actually going empty right now.

So there have been things like that that have moved along. But if you look at the scale of Chinese emissions, it really precipitously goes down as we get closer to the creation of the Paris Agreement because that is when international pressure is there. That is when the Chinese are starting to recognize that they have a geopolitical advantage by becoming leaders on this issue. The small countries—small island states—are just as worried about China as they are worried about the emissions coming from the United States. All those emissions are going to cause sea level rise. They are going to harm them.

And so what we have seen is the Chinese respond to that. But, as I said at the end of my testimony, there is a worry here that the Chinese could still move forward with respect to building out coal facilities in other countries unless someone tries to pull them back to the table. No other country can do that other than the United States.

Mr. TONKO. Thank you.

Are there any other common misconceptions about the agreement that you would like to clarify in a relative few questions?

Dr. LIGHT. Sure. One thing, and that is this. I have heard—I understand the criticism that the current pledges under the Paris Agreement—right now that parties are behind. They don't—aren't

sufficient to meet the 2 degrees Celsius goal, let alone the goal of the agreement to try to even get lower—get lower temperature response like 1.5 degrees.

We have to keep in mind that Paris was created as a process. It is not just one shot, you make your pledge, and we are done and we see how good we do.

It sets up a process so that parties have to come back to the table at regular intervals to make regular new commitments of increased ambition. That is going to be what is going to help us to close the gap that some of you have articulated in your opening statements.

Mr. TONKO. Thank you. Thank you, Dr. Light.

I now recognize Leader Shimkus for 5 minutes to ask questions.

Mr. SHIMKUS. Thank you, Mr. Chairman. Thank you all for being here.

Mr. Light, I appreciate your passion and, Mr. Hultman, I am a believer in subnational activities. We are federalists, especially on this side, and we believe in local control, local government, and we want to keep encouraging those who want to go in a direction.

But let me ask this question: What is—first of all, it can be a short response—what is more binding, a treaty or an agreement?

Ms. Frisch?

A treaty. Constitutionally, it is really, there's no—Mr. Thernstrom?

Mr. THERNSTROM. A treaty.

Mr. SHIMKUS. Treaty.

Mr. Hultman?

Dr. HULTMAN. Both a treaty and agreement have authority under international law, and the Paris Agreement is something that we can use to accomplish the goals——

Mr. SHIMKUS. OK. But for us and our Constitution and our government, which is more binding? Which has political buy-in? Which is vetted by the legislative branch?

Dr. HULTMAN. The Paris Agreement was formulated under the U.N. Framework Convention on Climate Change, which is——

Mr. SHIMKUS. OK. Let me—I just taught high school government and history. I mean, I don't profess to be an expert on the Constitution, but only a treaty gets voted on by the legislative branch, and not even the House—the Senate.

Mr. Light, would you agree with that?

Dr. LIGHT. That is true, sir. But——

Mr. SHIMKUS. Well, let me ask——

Dr. LIGHT [continuing]. Depends on——

Mr. SHIMKUS [continuing]. Let me just ask—let me ask you this question: Why didn't the Obama administration submit this as a treaty?

Dr. LIGHT. Because it was not a treaty. Because it was an agreement under the treaty that we had already agreed to that passed with unanimous support in the Senate, Republicans and Democrats—the U.N. Framework Convention on Climate Change. This was an agreement under that treaty that the Senate had already ratified.

Mr. SHIMKUS. So, Mr. Thernstrom, you heard—in your testimony you highlight the need for a national buy-in, and maybe through

the subnational groups you are going to build that consensus, and we may be there.

There was actual shifting since this last time we had this debate, and I think you can hear that on our side. Why is it important for this decision to be vetted by a legislative body?

Mr. THERNSTROM. As other witnesses have testified today, the subnational actors certainly can take action in many respects, but they have also all called upon the Federal Government to use its resources, which are much greater than those of subnational actors, in a coordinated fashion and, obviously, we lack a political consensus in this country to produce a Federal policy on clean energy innovation and climate-related emissions.

And so, if we could reach that consensus—and I think this committee is obviously the place to have that conversation—I think everyone at the table here would agree that Federal action—I think that is what I have heard from all witnesses, is that Federal action could be much more effective than the State and local action, and it is, obviously, that political process that you are speaking of that would enable coordinated and ambitious Federal action, and I hope that we can get there.

Mr. SHIMKUS. And we have this fight and this debate in our committee all the time. Can a Federal agency do this? Do they need more legislative language? How do you impart it? How do you have the force of law?

So other than going through the legislative process and binding us to the votes that we cast, we are going to be whipsawed back and forth by administrations here and there and we will not have a consistent national policy for the decades. And I think we all agree.

I mean, if you look at the Climate Action Tracker, which I used in my opening statement, even going to the Paris Accords now you are plateauing.

Talk about—and my time is almost out so I only have a minute left—Mr. Thernstrom, done poorly with all the different aspects of energy use in this country, how could that affect jobs and the economy and the cost?

Mr. THERNSTROM. As my testimony, especially my written testimony, indicates, I think climate protection is a very important value for myself and for many Americans, most Americans even.

But I think balancing climate concerns with the other values in this space such as protecting, you know, affordable energy sources for consumers is critical both to achieving the political consensus that we have been calling for in this exchange but also for the technologies to actually reach the level of economic competitiveness that would allow them to scale successfully into global markets and be used in developing nations.

So I think keeping costs of clean low is crucial to both political consensus, to durability of policy over the years, as you suggest, and to acceptance within the global marketplace, which is key to environmental performance.

Mr. SHIMKUS. My time has expired. Thank you, Mr. Chairman.

Mr. TONKO. Thank you, Mr. Shimkus.

The House has called for at least three votes. The time estimate for that is about 40 minutes. So what we are going to do is move

to Chairman Pallone for his questioning for 5 minutes. Then we will take a recess to go vote and we will come back after that, 15 minutes after the last vote is called.

So Chairman Pallone?

Mr. PALLONE. Thank you. I had some questions to ask Mr. Hultman, but Mr. Shimkus keeps making me veer from my questions.

I just think this——

Mr. SHIMKUS. It is working.

Mr. PALLONE. I don't mean to be so critical, Mr. Thernstrom, but I just—this whole argument about treaties versus agreements, look, the bottom line is it is very obvious that the Paris Agreement sets up, as I think Mr. Light said, essentially a voluntary process where the, you know, parties are going to meet from time to time to see what they can accomplish and, you know, I don't—I don't understand why in the world the President felt it was necessary or suggesting to withdraw to this process that is, you know, essentially voluntary and, you know, my point is that President Trump is the outlier here.

I haven't heard anyone on the Republican side—maybe I shouldn't bring it up but I haven't heard any of them say they think we should have withdrawn from the Paris Agreement.

To me, Trump is the outlier. He just wants to send a signal that somehow we are not going to be part of this and move in the opposite direction on climate change, which is probably contrary to almost everybody in this room, regardless of being a Democrat or Republican.

I mean, even his own daughter I remember at the time was, like, you know, pleading with him, don't withdraw—this is a voluntary agreement. I mean, I don't even know if anybody in the White House agreed with him. Certainly, his family didn't.

So, you know, all this discussion about, you know, treaties versus agreements I just—I just think it's, you know, largely irrelevant. I don't mean to be disrespectful but I just think that he was trying to send a signal that I am not going to move on climate change—I don't believe that climate change is an issue and I am going to try to kill everything we have done under Obama to lead in that direction.

And he is an outlier. We should just recognize. Unfortunately, he is the President. Let me ask Mr. Hultman, you know, it is interesting that it is almost the opposite. You know, Mr. Shimkus talked about, you know, France and other countries that, you know, where the leaders are trying to move forward and they are getting resistance.

I almost feel, based on what Ms. Frisch said, it is the opposite here. Our leader is trying to move backward and the business community and the grassroots are saying, no, don't do that. It is sort of interesting in a way.

But what I wanted to ask you, Mr. Hultman, is this whole issue with the—you know, with—well, you call them the subnational or non-Federal actors. What is it that we can do to make it easier for these subnational actors to take meaningful action and live up to our Paris commitments? You sort of suggested that they are—at some point they are going to have their own limitations.

Is there something we could do maybe on a bipartisan basis to make it easier for them to continue in that vein? Or what kind of challenges will they face because of Federal inaction?

Dr. HULTMAN. There are a few things that I think can be done now at the Federal level. And let me just pick up on your previous comment that, yes, we are seeing this leadership and I think this actually is an element that ties together some of the comments that we have heard today from you all, that we are building through this substantial, you know, set of leadership across party lines in some cases some ideas and some strategies for reducing emissions. We are——

Mr. PALLONE. By the way, I have a lot of Republican mayors and county legislators. There isn't a single one of them that agrees with the President on Paris. Not one.

Dr. HULTMAN. And in many cases, as Carla also mentioned, that a lot of these actors are doing these in response to demands from their constituencies and being responsive and trying to lead in the ways that they see being valuable for their—for their organizations, for their jurisdictions.

So we are seeing what I would argue we had to do anyway in this country. We had to anyway leverage all of these levels of government, leverage all of the leadership.

Think about what is going to work and not work in our various kinds of situations and build from the ground up a strategy that we can use then, stitched together at the Federal level.

Mr. PALLONE. Is there anything—because we are going to run out of time——

Dr. HULTMAN. Yes.

Mr. PALLONE [continuing]. Is there anything that we can do to make it easier for them or challenges they are going to face because of what we——

Dr. HULTMAN. I think it is important to make sure that those States and cities which want to be leading and out ahead, that from the Federal level we allow them to do so. I think that is sort of first and foremost—do no harm. I would highlight the State of California in particular, which is trying to move forward on some of its regulatory actions.

Also, to make sure that we are as somebody—I think Andrew mentioned—spending out the funds that have been allocated to those jurisdictions—for example, weatherization efficiency. That is helpful for low-income people, it is helpful for building the basis for future reductions.

Mr. PALLONE. I know we are running out of time but, Mr. Chairman, is there something Mr. Light wanted to say?

Dr. LIGHT. Thank you, sir. I just wanted to go back to one thing you said at the top on the voluntary nature of the Paris Agreement. Absolutely correct.

It is important to remember, though, that the rules on transparency, on accountability, those are binding.

Mr. PALLONE. OK.

Dr. LIGHT. That is the interesting combination we set here. This is why this is not just a vacuous agreement and it doesn't have force like a treaty.

Now, you know, Mr. Thernstrom said that innovation is the key and treaties are not as important. I agree innovation is totally important. But the important thing is that we need to know whether other countries are actually fulfilling the pledges that they are making publicly.

The only way we know that is if we actually have the rules that we have agreed to under Paris that put developing and developed countries on the same terrain of accountability.

Mr. TONKO. So we need to go vote. We will stand in recess and return 15 minutes after the last vote is called.

With that, we are in recess.

[Recess.]

Mr. TONKO. We have our witnesses back at the table. We have our next Member who chooses to question the witnesses here. So I call the subcommittee back to order.

And now we will recognize the Republican leader of the full committee, Mr. Walden, for 5 minutes.

Mr. WALDEN. Thank you, Mr. Chairman. Thank you, Mr. Chairman.

Mr. TONKO. You are welcome.

Mr. WALDEN. And thanks to our witnesses for returning. Sorry. When we have these votes on the floor, they are just part of our constitutional responsibility as well.

So there has been some discussion this morning, I know, about treaties versus agreements in the context of the Paris Accords, and Mr. Thernstrom stated in his written testimony, and I agree and I quote, "The Paris Agreement could not succeed since the agreement was a substitute for rather than the product of a domestic political consensus," which I think is a really important point.

The role of the Congress should not be circumvented in addressing such sweeping policies that impact so many aspects of our daily lives, from our utility bills to what we pay at the pump to the livelihoods of American citizens.

And that is what I hope and I trust with our chairman that we will be able to build here as a consensus—bipartisan consensus. That is how big things get done. This is a big thing that needs to get done.

Mr. Thernstrom, last November, Bill Gates was quoted at a Stanford Precourt Institute for Energy event as saying, and I quote, "The 'climate is easy to solve' group is our biggest problem." "The 'climate is easy to solve' group is our biggest problem." He said this in context of people who assume that we have the current tools to address climate change and should be able to do so rather easily.

Do you agree that this is not an easy problem to solve—that we do not currently have all the technologies needed to solve it?

Mr. THERNSTROM. I very strongly agree with that, Mr. Walden, and I think that the—consequently, as I said in my statement earlier, I think the core focus of Federal policy should be on driving energy technology innovation.

I do think that, obviously, as I said, we have made great improvements——

Mr. WALDEN. Right.

Mr. THERNSTROM [continuing]. In performance of clean energy technologies. Prices are coming down and we see that in the mar-

ketplace. There is a lot of adoption of those technologies, as many witnesses here has testified. So I celebrate those accomplishments.

But, clearly, if the technology was where we needed it to be today——

Mr. WALDEN. We would be done.

Mr. THERNSTROM [continuing]. We would be done. We wouldn't need policy. And so I think all of the analysis that I have seen suggests that we can make improvements today but to get to where we need to be in the energy sector we need significant innovation.

And even the utilities that I am aware of that are most forward leaning on this—that have made the most ambitious commitments to action all understand that this question is not just about using today's technologies. It is about getting to better ones and there is an important role for public policy in that as well as for the private sector.

Mr. WALDEN. I was in a meeting yesterday with some leaders from one of the world's largest oil companies and I asked them the same sort of question about innovation in their space, especially as it relates to methane capture and carbon capture and sequestration.

And they started to tell me about some of the cutting-edge technologies they are investing in to see what they can get done, and that is where I think, as Americans, we are unique in the construct that we believe in—the entrepreneurial spirit.

We believe in that innovation. We believe in that a couple of guys in a garage in San Jose that do some weird stuff and end up with a company named Apple or, in my context, a guy with a waffle iron that developed a little shoe we know now as Nike.

You know, and I have great confidence we can do that here, and from a positive standpoint. In fact, the study you submitted in your testimony says that a bet exclusively on today's apparent winners—solar, wind, and battery storage—should be a mistake. Why do you think that?

Mr. THERNSTROM. So the point of that—the point of that study is to say that we can see—as I have said, I applaud the success of renewable energy technologies in improving their performance in recent years.

Mr. WALDEN. Right.

Mr. THERNSTROM. But if you think about the question of how you get to a clean energy system as a whole—not just to have some incremental progress—all the analyses that I have seen agree that having a diverse mix of fuel sources within the energy system is really crucial to getting to—to maintaining low cost as we reach for higher levels of decarbonization. So——

Mr. WALDEN. And should advanced nuclear be part of that mix? Does it have to be?

Mr. THERNSTROM. Absolutely. My organization is a strong believer in investing in the full portfolio of technologies, very much believe that advanced nuclear is part of that, advanced carbon capture as well and many renewable technologies. So we see value, as I say, in that full portfolio.

Mr. WALDEN. And, I assume, hydropower?

Mr. THERNSTROM. Absolutely.

Mr. WALDEN. We have studies from our own agencies saying we can increase hydropower dramatically. Now, there are some price points here, too. It is one thing to say you can do it. It is another to say the market would accept that higher price in some of these facilities. But we know that is carbon neutral.

Mr. THERNSTROM. That is correct, sir. I know some advocates are working very hard on figuring out how we can get more productivity out of our existing hydropower resources and things like that and I certainly applaud those efforts.

Mr. WALDEN. My time is expiring. I know we have focused kind of on energy in this discussion. We need to do this on manufacturing, what we can do to capture carbon. I have heard of technologies that are being developed where you could sort of drop powder in and—elementary level here—and it would surround the molecules and pull it out, the carbon is taken out. It would be fascinating to be able to get in that discussion.

If we are going to add all these electric vehicles—I drive a hybrid on both coasts—but, you know, that is going to be a drain on the energy grid but it can also be a big storage battery. I mean, I have heard of that discussion.

So anyway, I appreciate all our witnesses here today. Sorry I have to come and go but, Mr. Chairman, thank you for your indulgence and I yield back.

Mr. TONKO. OK. The gentleman yields back, and can I just please encourage the witnesses to speak into the mic so that we can all record well and hear well.

So with that, the Chair now recognizes the gentleman from Virginia, Mr. McEachin, for 5 minutes.

Mr. MCEACHIN. Thank you, Mr. Chairman, and let me begin by thanking you for calling this hearing and all of our witnesses for sharing your expertise.

I also want to acknowledge my friends and constituents back home who have worked hard to show that whatever the Trump administration may say or do about the Paris Agreement, Virginia is still in.

I know many others up here can say the same things about their communities, their citizens and their friends back home. Part of our job is to ensure that those folks are not alone, to give them a Federal Government that supports and further builds on their work instead of ignoring it or trying to thwart it.

I have tried to do my part. In the last Congress, I was proud to introduce a bill that would have forced the Trump administration to acknowledge over and over that the U.S. withdrawal from the Paris Agreement is disastrously out of step with the choice that all of our partners and allies around the world are making.

So I think this hearing is a very important step and I hope it helps to lay the groundwork for some of the concrete policy changes we desperately need.

And with that, Mr. Light, I would like to ask you the following. Some of my friends across the aisle oppose aggressive climate action because they say the challenges we face are bigger than our one country—we cannot solve them alone.

I actually agree with that point. Other countries need to pull their weight. But the outcome—collective action—is exactly what the Paris Agreement was meant to achieve.

Can you explain how the imperative to influence other countries makes climate action at the Federal level an absolute necessity?

Dr. LIGHT. Thank you, Representative McEachin, and I just want to say I appreciate your leadership on the Paris climate act on transportation and a host of other issues for helping the country and helping the district and State.

I think that the—you know, that one of the things that has been coming out here, and Representative Walden just mentioned it, is sort of this idea that we shouldn't have moved forward with Paris because there wasn't a bill that came out of Congress to support the U.S. position.

And I think that this is wrong for a number of reasons that you have just touched on.

So, first of all, President Obama did ask the Congress at least three times in State of the Union speeches to bring forward legislation so that he would have a commitment that he could use to take and build a commitment under Paris.

We didn't get a law come out of Congress. But climate change is moving on. The urgency was still there. The United States had to act. The United States can't solve the problem alone. But we are not going to be able to get the buy-in from other countries unless the United States is there to move them along, and I gave several examples of that in my testimony.

Secondly, we are losing the competitiveness race to China and other countries. If you just take—the ISC had a study that just looked at the pledges from developing countries alone under Paris. That created a $23 trillion market in transformations, in energy, and infrastructure abroad.

The United States has to compete with that and if we are not part of Paris, if we are not part of these coalitions, we are going to lose the race and other countries are going to gobble up those markets and gobble up the jobs from that.

And so that is where you need the United States there to cooperate and bring other countries along and also not to suffer by appearing to be dragging everyone behind, which is what we are doing now.

Mr. MCEACHIN. Thank you for that.

Ms. Frisch, did I say that close? OK. You know, we always talk about the States are laboratories for democracies—for democracy. And you have stated that States with commitments to climate have reduced their greenhouse emissions faster than the rest of the country while growing their economies.

What have the last 2 years taught us about the economic feasibility of large-scale action?

Ms. FRISCH. And thank you for that question.

The initial States in the U.S. Climate Alliance not only found that they were able to reduce their emissions faster than the rest of the country but their economies grew faster than the rest of the country. They are making commitments to reduce emissions that also have all kinds of cobenefits like jobs and technology.

And on the technology front, you mentioned the costs coming down. We have seen that trend just continue to go and go, and even one of the leaders of the second largest utility in the U.S. said recently that by the early 2020s, which is not that far from now, renewables plus storage—building that new will be cheaper than continuing to operate existing coal and existing nuclear.

So we have seen that trend over the past years and can look forward to that in the future.

Mr. MCEACHIN. Thank you.

Mr. Hultman, I am sorry. I just have a little bit of time left. But can you explain what you mean when you say why the experiences of State and local actors have actually helped ease the way for systematic Federal action?

Dr. HULTMAN. Sure, and very briefly, Federal action can fill in some of the gaps where city, State, and business action can't, and we have a Federal system. There are different policy levers that each level of government has.

What those city, States, and businesses are doing today is, first of all, building out more efficiency and more renewables in their contexts. That allows the Federal Government to take that and build on it and, similarly, it helps drive down costs of those technologies.

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

Mr. TONKO. The gentleman yields back.

The Chair now recognizes the gentlelady from Washington State. Representative McMorris Rodgers, is recognized for 5 minutes.

Mrs. RODGERS. Thank you, Mr. Chairman, and thank you, Ranking Member. I appreciate everyone being here and sharing your thoughts on the issues impacting our environment.

Clearly, the climate is changing and global industrial activity is a contributing factor. I believe that we must play a role in reducing carbon emissions and being good stewards of our natural resources. Part of why I have fought for the advancement of clean energy resources like hydropower, nuclear energy, biomass, hydrogen fuel cells.

It is also why I have long advocated for active forest management and reforms that we need to reduce the risk of catastrophic fires like the ones that we experience regularly in the West, and these decimate our carbon-capturing forests and emit toxic smoke into the atmosphere.

I believe that these and other realistic market-based solutions that incentivize use and investment in clean energy resources are the answer, not the big government proposals that harm our economy and force the American people to bear unreasonable burdens.

Mr. Thernstrom, as you may know, I am a strong proponent of hydropower as a piece of the comprehensive clean energy program that we need. My home State of Washington is a large producer of clean renewable reliable hydropower and I have supported efforts to advance this clean energy both nationally and internationally, I believe, that we should be doing.

With the role that Washington State plays in hydropower energy production and the overall role that hydropower plays in the

United States, I just wanted to get your thoughts on how hydropower can grow as a power resource on the international level.

You note in your papers that there may be geological limits to current expansion of hydropower but you see promising technological advances that would increase its usefulness as a clean baseload power source.

I just wanted you to discuss that a little bit further and also hear what you think the United States needs to do to remain a prominent player in the hydropower arena internationally.

Mr. THERNSTROM. Thank you very much for that question, Congresswoman, and I should say at first that I don't actually consider myself an expert on hydropower. So take my answers for what they are worth. I study it in the context of innovation and clean energy technologies, broadly.

I do believe that hydropower has a very important role to play in this, particularly because it is a renewable resource—energy resource—that is also firm, that it is dispatchable mostly when you need it.

Obviously, weather conditions can affect the status of reservoirs and dams and therefore the ability to dispatch that power indefinitely.

But, fundamentally, hydropower can be considered a firm resource and therefore plays a crucial role in a reliable low-cost clean energy system. So I applaud the role of hydropower.

The question is, of course, how much more can we get out of our hydropower resources. There are limitations on the geography for where new hydropower can be developed and, obviously, there are questions of community opposition in some places.

I know many environmental advocates are interested in how we can get more power out of existing resources that we have, so without building new dams, repower those and get more productivity out of that, and I certainly think that is a very strong place to start with that question.

Mrs. RODGERS. Thank you. You may be aware that last year this committee passed legislation to expedite the 2-year licensing process for pumped storage hydropower. As we are focusing on innovation I think we should also be focusing on identifying the regulatory barriers to implementing advanced technologies. What role do you see regulatory reform playing in serving our efforts to speed up clean technology deployment?

Mr. THERNSTROM. Again, thank you for that excellent question. I do think that there are many instances in the hydropower space and within—with many of these other technologies where existing regulatory structures are an impediment to the adoption and rapid use of these technologies—that we can make them—we can make it easier for businesses, for utilities, for States that want to be leaders on this to actually move forward with that by looking at the regulatory barriers that we have now.

I applaud that hydro bill. I think we see similar efforts in other areas with other technologies to try to make it easier to build advanced nuclear reactors, to test new fuel cycles, to build carbon capture, to move carbon dioxide through pipelines and inject it underground.

Across the suite of technologies we see there are regulatory barriers to the adoption of clean energy that I think this Congress should be looking at and trying to lower in every instance.

Mrs. RODGERS. Yes. Only 3 percent of the dams actually produce hydroelectricity in America, and we could double that without building a new dam. But, unfortunately, it takes 10 years on average to relicense one of those dams. So there is more to be done.

Thank you very much.

Mr. THERNSTROM. Thank you.

Mr. TONKO. The gentlelady yields back.

The Chair now recognizes the gentleman from California, Representative McNerney, for 5 minutes.

Mr. MCNERNEY. I want to thank the Chair and I thank the witnesses this morning.

Mr. Light, Mr. Latta, my colleague, and I cochair the Grid Innovation Caucus, and I am committed to modernizing the grid to keep up with the demands that the electoral system is going to be seeing in the future.

What do you think needs to be done to educate the ratepayers and the PUCs and the policymakers and the consumers about having utilities adopt this technology?

Dr. LIGHT. Well, I think this is an excellent example of where—again, I am all in favor of doing work on RD&D, on innovative technologies, on battery storage, on, you know, small nuclear.

We need to—this is an all of the above—all forms of clean energy have to be deployed to meet these larger targets. That is an excellent example of where we have got a problem right now that we solve. We can't move forward on those until we do grid modernization.

Mr. MCNERNEY. And we have to educate the different stakeholders.

Dr. LIGHT. And we have—and we are going to have to——

Exactly. We have to educate the stakeholders that there is a market out there to be had. This transition is better for them. It avoids longer-term risks.

It also, at the end of the day, will lower their electricity rates and this requires programs out there—not draconian regulations of any sort but programs out there that help people to understand the opportunities before them.

Mr. MCNERNEY. And investments as well.

Mr. Thernstrom, thanks for coming in this morning. And I appreciate your comments about the need for innovation.

What Federal policy do you—what Federal policy do we need to encourage the adoption or—and acceleration of clean energy technology? What Federal policies are we going to need?

Mr. THERNSTROM. Well, obviously, there isn't a simple answer to that question. It is a complex range of things. As you know from our previous conversations, sir, I believe in a mix of policies that could be knitted together in one coherent package.

But, broadly speaking, I think it is important to have technology push—that is, investments in innovation in the full suite of technology spaces—renewables, efficiency, carbon capture, nuclear, hydro.

Across the board, we need to invest in advancing those technologies. I do think in the long run there needs to be demand pull as well. We need to know what the rules of the road are going to be in the power sector.

We have a state of flux, let us say, in what the regulatory requirements will be and I think this committee is the place to think about what the long-term rules of the road will be for the power——

Mr. MCNERNEY. It sounds like you are advocating for consistent long-term policy.

Mr. THERNSTROM. That is right. I do think——

Mr. MCNERNEY. And I think everybody here would agree with that. So——

Mr. THERNSTROM. I think that is crucial that——

Mr. MCNERNEY. But, I mean, the problem is getting a bipartisan agreement on that. So it is going to take pain on both sides if we are going to get there.

And we are—OK. Enough said.

Mr. THERNSTROM. Well, I agree with you on that point, sir.

Mr. MCNERNEY. Mr. Hultman, I am working on legislation to improve our understanding of stratospheric composition and aerosol interactions.

Now, would this research be helpful in establishing a baseline of current conditions that is needed before any NGO engineering deployment could be considered?

Dr. HULTMAN. Thank you for the question, and I want to distinguish two pieces of this question.

One is that in the broad science of climate change we definitely know enough to take actions today of the kind we have been talking about I think that are being taken both at the subnational level and maybe bringing some of those ideas to the Federal.

That said, there are some significant uncertainties about how human interference or human contribution to a geoengineering approach to climate change would actually work, and this was highlighted in the National Research Council report of a couple of years ago that really called for some necessary investments in understanding the scientific elements of a geoengineering strategy. So the short answer is yes.

Mr. MCNERNEY. Well, that was the only answer.

Thanks. Anybody can answer this one. In order to address climate change we are going to have to move rapidly in reducing our carbon emissions and removing carbon from the atmosphere.

What are the most promising technologies right now that we have out there to do that? Whoever wants to take that question.

Ms. FRISCH. I think the most promising technologies that we have out there are the ones that can help prevent emitting that carbon dioxide into the atmosphere in the first place.

So those are ready to go and being deployed in those spaces. But as the other panelists have said, we have to bring every single technology to bear on the solution—to bear on this problem to be able to get on track and reduce emissions as quickly as we need to.

Mr. MCNERNEY. I saw an article—I think it was in the New York Times—about a promising technology in Switzerland to remove car-

bon cheaply. I mean, there must be some really good technology out there that we need to look into and encourage.

Ms. FRISCH. Right. I read that article, too, and I think the key there was that it is in the R&D phases and the costs need to come down. So we should definitely be encouraging that while we are deploying the technology that we already have.

Mr. MCNERNEY. Right.

Mr. THERNSTROM. If I may, I would just agree with Ms. Frisch that I think halting emissions from existing sources first and developing, say, carbon capture technologies that would facilitate the development of carbon removal in the long term, that is the pathway we need to take.

Mr. MCNERNEY. All right. Thank you.

Mr. Chairman, I yield back.

Mr. TONKO. The gentleman yields back.

The Chair now recognizes the gentleman from West Virginia, Representative McKinley, for 5 minutes.

Mr. MCKINLEY. Thank you, Mr. Chairman.

And this subject is long overdue to having a conversation on this because there—obviously, there are storm clouds on the horizon.

Around the world there is still a voracious appetite for the use of fossil fuels and they are predicted by the next few years that the global increase—its consumption of fossil fuels by up to 16 percent.

So the idea of how we are going to deal with that issue is complex. America could very well lead the way and we have in decarbonizing and lowering our emissions—CO_2 emissions down to 16, 18 percent—21 percent by some standards.

But yet China and India have markedly a continued increase. So what is it, the number of—China is up 290 percent in this decade, and India 235 percent.

So the thing that I am perplexed about is that we can go about—American continuing to lead and make our reductions where—again, up to 20 percent. We have already begun complying with the Kyoto and the Paris Accord by making reductions.

But the rest of the world isn't, and so as a result, we are going to be the ones that suffer with this. We are still going to have—across the globe you are going to have climate change. We are still going to see the oceans rise, temperatures again increase.

Miami is going to be under water and all that—we have done everything. We have complied totally with it. So the thing that bothers me the most about this is that we are asking people, other nations of the world, to implement reductions in their emissions but we are not giving them the tools to do it. There is no technology that is economically feasible out there right now.

So the fact that, Mr. Thernstrom, we have been working together, quite frankly, so with all disclosure here to try to figure out what is a solution to give—empower these other countries to implement something that is cost effective and because if we don't and they continue to burn fossil fuels, we are still going to have a water problem.

We are still going to have droughts. We are still going to have severe weather all around the globe. Maybe not in America but around the world is going to suffer.

So I think if we—if the primary cause is how we capture carbon, I think we need to have the innovation and we have to move it up first. Do the innovation first.

Show that what the technology, and then we can export it to the rest of the world and make it so that it is affordable for them to do it because they are still going to use carbon.

We—I think we have the responsibility to lead the way in doing this. But let us make sure that we don't put the reverse in—we don't put a hammer approach. Let us use the innovation first and then go to implement the policies then to follow back with that.

So if they don't have the—Mr. Thernstrom, if we don't have the technology yet, what are you suggesting? What now—what could we do? I know last year we passed 45Q to be able—that was a major step to show how we might be able to do that to develop that in carbon capture.

What are—what are some of the thoughts that you would have how we might do the innovation first? Unfortunately, we lost one of our Members here that I know has an interest in innovation.

But give me a little bit more on your spin.

Mr. THERNSTROM. Thank you, sir, and thank you for your leadership on this question. I guess I would start my answer to that question by you ended, with 45Q as an example of both what I think can be done that is constructively but also what more needs to be done.

So full disclosure, I was up here advocating for 45Q passage for almost more years that I can remember—I think it was seven or eight. I think 45Q was a very important step forward.

At the same time, we are actually seeing very few projects are being built so far because of 45Q, although I still have high hopes that more will come.

The reason for that is that 45Q is one lever within a very complex energy system. And so what I keep saying to you and others is that, if we want big outcomes from big energy systems, we need big inputs.

And that is why I think it is important for the members of this committee to come together around some consensus about what policy proposals would be.

As you know, another theme of mine is that the innovation needs of different technology families are distinct. So my answer to you is what we need to do for fossil decarbonization is different than what we need to do to advance nuclear and that is different from what we need to do for solar.

And I would encourage you and other members of this committee to look at the specific needs of those technologies, have policy responses that are tailored to them but which are comprehensive and ambitious rather than just these one-off small ball type approaches. That is how we will get to big outcomes in the energy system that we all——

Mr. MCNERNEY. Thank you. My time has expired. I yield back.

Mr. TONKO. The gentleman yields back.

The Chair now recognizes the gentlelady from the State of Delaware, Representative Blunt Rochester, for 5 minutes.

Ms. BLUNT ROCHESTER. Thank you, Mr. Chairman, and thank you so much to the panel.

I am very happy to be joining you here at this hearing because as I jumped out of the room for a minute I had to meet with students, our Delaware Civil Air Patrol Cadets, and I thought about the significance of this conversation and how important it is not just to my State and our country but to the planet.

And I want to start by saying I am pleased to say that my home State of Delaware wasted no time joining the U.S. Climate Alliance and I believe it is encouraging to see so many local governments and communities stepping up to act on climate change.

Local officials are on the front lines of protecting our communities. But they need that Federal support. And I am concerned that a piecemeal approach may create an uneven playing field where some communities may take meaningful steps and look out for their most disadvantaged citizens while others may not.

And, as you know, climate change is already affecting communities across the United States and those communities will only intensify over time.

So I would love it if you could talk a little bit, Mr. Hultman and Ms. Frisch, have you seen any successful examples of local climate action addressing the unique challenges faced by disadvantaged communities? And what lessons can be learned at the Federal level from those case studies, again, examples of local climate action in disadvantaged communities?

Dr. HULTMAN. So I will give two quick examples, and I think Ms. Frisch probably has some others because she has been working in—across different kinds of technologies in this space.

But, very briefly, there are two areas that I would look at and this does tap into our conversation about the simultaneity of deploying new technology but also doing innovation with, you know, as necessary.

A third thing that we can imagine as part of that is jobs and economy, and I think that, for example, there has been a lot of new work, as we are talking about students and sort of new training, in looking at, for example, solar and wind installers, right. Like, that is an area where you can, with some technical training, you know, people can actually learn the toolkit.

They can take sort of construction skills and apply it and be able to move forward with a career in this new and exciting—new and exciting area.

A second area that is also quite useful, which has often partnerships across Federal, State, and local government is thinking about efficiency in weatherization and those are things that save everybody money and are particularly valuable for those populations that are lower income.

And also, you know, there are a lot of benefits too in terms of emissions, but primarily they are also helpful to the people who live in those spaces.

Ms. BLUNT ROCHESTER. Thank you.

Ms. Frisch?

Ms. FRISCH. Thank you for the question, and two additional examples are in clean electricity production and clean public transportation that can significantly reduce air emissions, which cause all kinds of problems like asthma and can actually reduce the length of people's lives.

And one of the great things about the subnational action that you mentioned with cities, States, and businesses is that it is inherently local and those people's voices are coming to the table and they will talk with their policy makers and make policies that really work for them in those communities.

And I think what we are learning from that is the lesson we've always known that it is good to be reminded of—that it really is about bringing people together. And for climate action in the U.S., I mean, let's face it, the way we often do Federal policy the Federal Government lags behind public opinion and we are seeing this wave of public opinion about climate ready to go and it is crashing on us now.

So we are happy that you and members of the subcommittee are really taking this seriously.

Ms. BLUNT ROCHESTER. Thank you.

Mr. Light, my next question is for you and it is based on the testimony that you gave. You had a statistic that really jumped out at me that China is investing ten times more than the United States in research and development.

Can you talk about the potential consequences of that discrepancy in funding? I actually lived in China for 4 years and I saw it first-hand. So if you could talk a little bit about that.

Dr. LIGHT. It means that they are going to win the markets that have been created by the Paris Agreement. I mean, we can talk about, you know, whether the United States should have moved forward and the status of our pledge and whether agreement versus treaty and all that kind of stuff.

And in the meantime, China and the EU, Canada, other countries, are jumping ahead and grabbing the markets that were created by the fact the rest of the world is worried about climate change, they want to do something, and the prices are plummeting so it actually is affordable for them to move to solar power and other things.

Otherwise, the prime minister of India would not be moving full force into this. If it was too expensive he wouldn't do it.

Ms. BLUNT ROCHESTER. Thank you so much.

I also wanted to ask a question about the impact of the $600 million going unspent that you talked about in your testimony. Can you briefly—ten seconds.

Dr. LIGHT. Sure. You all have allocated—the last Congress—put money into ARPA–E—into the Bureau of Energy Efficiency and Research. NRDC has a very interesting analysis of this that is linked to in my testimony. That money is not being spent. It is not going forward there and I think that this is something where oversight from this committee is directly appropriate to make sure that money goes out the door and it goes in programs that are not driven by ideology—that are driven by where is the place that we can put money in the near term that is going to get us the biggest bang in terms of something we can put out there and compete with these other countries that are already way ahead of us.

Ms. BLUNT ROCHESTER. Thank you so much. I yield back.

Mr. TONKO. The gentlelady yields back.

The Chair now recognizes the representative from the State of New York—Brooklyn, Yvette Clarke, for 5 minutes.

Ms. CLARKE. Thank you so much, Mr. Chairman, and I thank our panelists for really lending your expertise to us today as we grapple with this issue.

I represent Brooklyn, as our chairman introduced me, where in 2012 we saw the impact of climate change first hand when Superstorm Sandy devastated my district and, going forward, will only get worse.

I brought with me a map showing how sea level rise is an existential threat to New York City. Right there. And I wanted to talk about the flooded areas on the map are real communities.

We are talking about inundation of homes in communities like Gerritson Beach and Sheepshead Bay and all of our subway lines, quite frankly.

As the President claims, there is a national emergency on the southern border, he is ignoring what I believe is a national emergency in his own back yard and in the absence of Federal leadership, what should cities like mine be doing to increase our climate resiliency and prepare for the impact of sea level rise? And I would like to extend that the entire panel.

Ms. FRISCH. Thank you for that question, and New York has been a leader in working on resilience, particularly after Superstorm Sandy and making some of the infrastructure, raising it up so it is above sea level rise in the planning.

And that is a lesson that many communities across the U.S. are taking is that they need to evaluate what are those vulnerabilities and make a plan to address those vulnerabilities.

Ms. CLARKE. Does anyone else want to answer?

Dr. HULTMAN. I mean, you know, community resilience is something everybody wants, and I think that is something that is a point of agreement across a lot of different kinds of communities and leaders in those communities.

There are steps that can be taken today in a diversity of kinds of communities, and New York—I think I will echo Ms. Frisch's comment—has been leading in thinking about integrating, for example, first response with kind of weather understanding and how to kind of integrate those different ways to think about near-term action to respond to natural hazards or disasters.

But that also has to be coupled with a longer-term planning process that does involve different kinds of stakeholders in that—in those community groups.

And looking at New York's example, looking at other places around the country as different places, we talked a lot about emissions today and responding to climate through emissions. So I appreciate your comment about thinking of climate as a much broader set of issues affecting us today.

Those same studies of city, State, and business actions that are happening on emissions we can also see a lot of the same things happening on resilience, and I think this is a moment where we can use those experiments, we can use those understandings that are developing to better inform policy.

Ms. BLUNT ROCHESTER. It is an emerging industry that has to look at climate change holistically and I think that looking at this from a piecemeal perspective disadvantages us tremendously. So opponents of climate change legislation argue that the cost of sort

of building out a green economy is simply too high. But they ignore the cost of inaction.

You talked about raising homes. It is extremely expensive to have to retrofit old housing stock in order to raise them, and just to address the whole resiliency issue.

How do we put a price tag on the damage sea level rise will continue to inflict on communities like mine?

Dr. LIGHT. So I think that the National Climate Assessment just submitted to Congress this last past fall and I was—I worked on the national climate assessment on the chapter on mitigation. Look at that. I think the price figures are already there.

So in the higher emission scenarios, you are looking at sea level rise threatening a trillion dollars of assets both public and private in the United States.

If that is not enough to motivate something to be put into the next infrastructure bill, which is, we hope, coming down the pike, I am not exactly sure what is.

And in terms of what New York City needs to do and other cities like that, I would sort of say investment in natural infrastructure. We have known this from Superstorm Sandy. We have known this.

The most effective way and the most cost effective way and the way that you can actually get lots of jobs created in your districts is by having people enhance natural infrastructure and not only just trying to build sea walls which are always going to be based on difficult propositions in the future.

I think the more that Congress can do to make it possible for States to form cross-border alliances to achieve those kinds of things, because sea level rise is not going to respect the State boundaries, the better you are going to see a good outcome.

Ms. CLARKE. Very well. My time has run out. I have several other questions but this is to be continued and I thank you once again for all of your insight and expertise today.

I yield back, Mr. Chairman.

Mr. TONKO. The gentlelady yields back.

The Chair now recognizes the gentlelady from Illinois, Representative Schakowsky, for 5 minutes.

Ms. SCHAKOWSKY. Thank you very much, Mr. Chairman and panel. I am sorry that I missed most of it—not all of it—and I really appreciate all of your participation.

So, first, I want to make a few remarks dealing with innovation. It seems to me that saying that we should focus on innovation rather than ambitious Federal or international climate goals is a false choice.

Over the past several decades, we have seen industry claim time and time again that various Federal rules and standards are overly burdensome—and maybe sometimes that is the case—but that they will put American companies out of business.

The auto industry told us that, quote, "We just do not have the technology to comply," end quote, with tailpipe standards, for example. We heard that requirements for reformulation of gasoline would result in, quote, "major supply disruptions," unquote.

But these claims were not proven true and, in fact, history has shown that strong Federal regulation and goals actually help drive further innovation.

The Clean Air Act is a perfect example of that. It used regulatory standards to drive technology, technological innovation, and pollution controls.

The act recognizes that usually costs that—that it usually costs less to dump pollution for free than to clean it up. So businesses generally don't control pollution absent requirements.

Once an air pollution standard is in place, American industry gets to work and meets the challenge, and along the way we develop more effective and less expensive pollution control technologies.

Not only is our air cleaner, we also export the technology, it seems to me, that having to meet certain standards helps us develop the technologies that we can export around the world.

So not only is our air cleaner, we have seen that happen over and over again. So I would really like any of you who want to comment on the balance of regulation and technology, and I would be interested if anyone on this panel actually believes that regulation in and of itself drives down innovation.

And so I would love to hear about that. Anyone, go ahead. I only have 2 minutes.

Dr. HULTMAN. Thank you for the question. I will try to keep mine brief so if the others want to chime in they are free.

Your comment about not being a choice between deployment today and innovation I think is absolutely correct. I also agree that your phrasing of thinking about what policy driving the deployment of technology is an absolutely essential part which Mr. Thernstrom even referred to, of pulling technologies into the market, and many times we need that impetus to drive down or drive the technology deployment, which therefore drives down the technology costs.

And I will want to kind of return to one point that has been made in a couple of ways. But we have seen—we are in the middle of a revolution in energy costs right now—the costs for solar and wind and, frankly, other technologies have dropped precipitously over the last decade. Even in the last 7 or 8 years we have seen, you know, solar costs drop by something like 70-plus percent.

So those costs are dropping and they are dropping not least because innovation is happening but also that there has been deployment across a multitude of States, cities, businesses and, frankly, other countries.

Ms. FRISCH. Thank you for the many participants from Illinois and we are still a coalition.

So to answer your question, analysis has shown that technology push plus from the policy pull including the regulations that you are talking about can actually get us further than either of the two. So think of one plus one equals three.

You have to have both you only get so far with the technology push. You have to have the policy pull to move along.

So as far as the Federal role, there is really an important role to make the priority clear so then the market can follow and get the progress and the benefits that you are talking about.

Ms. SCHAKOWSKY. I think, clearly, and predictability is really important but it seems to me, I know we are talking about—oops, we will discuss it later offline.

Ms. FRISCH. Would love to.

Ms. SCHAKOWSKY. Thank you. I yield back.

Mr. TONKO. I believe Mr. Light had a quick comment to make.

Dr. LIGHT. Very quick. Very concrete example.

The conversation we were just having about 45Q that Mr. McKinley started was a great example of where—we have got a regulation. The incentive has created through 45Q—that is supposed to help the technology like direct air capture go from this exploratory phase, way too expensive to be deployable to get something there.

But the price is not there. And so but if you combine the innovation side on direct air capture with 45Q and then you put it in a State like California which has got a carbon market, so you got policy innovation, then you are talking about combined price that stars to make a technology like that feasible and profitable.

That is the way they all three work together. The idea that, you know, we have got to sort of choose one path or another is just false.

Mr. TONKO. Thank you very much. I believe that concludes all the Members who were choosing to be recognized.

I again thank the panel for their participation today and enduring the recess that required our absence for votes.

I now request unanimous consent to enter the following into the record: a report entitled "Getting to Zero Carbon Emissions in the Electric Power Sector" by Jesse Jenkins; the report entitled "Tracking Progress of the 2020 Climate Turning Point" by the World Resources Institute, the executive summary of the report entitled "Fulfilling America's Pledge: How States, Cities, and Businesses Are Leading the United States to a Low-Carbon Future" by America's Pledge; the first United States Nationally Determined Contribution to the Paris Agreement; a letter from the U.S. Chamber of Commerce; the text of the Paris Agreement; and President Trump's statement on the administration's intended withdrawal from the agreement.[1]

And so request unanimous consent there.

Without objection, so ordered. And, again, thank you to our panel. I remind Members that, pursuant to committee rules, they have 10 business days by which to submit additional questions for the record to be answered by the witnesses who have appeared.

I ask each of our witnesses to please respond promptly to any such questions that you may receive.

And at this time, the subcommittee is adjourned.

[Whereupon, at 12:56 p.m., the committee was adjourned.]

[Material submitted for inclusion in the record follows:]

[1] The World Resources Institute report has been retained in committee files and also is available at http://docs.house.gov/meetings/IF/IF18/20190228/108973/HHRG-116-IF18-20190228-SD007.pdf.

PREPARED STATEMENT OF HON. DEBBIE DINGELL

Thank you, Chairman Tonko and Ranking Member Shimkus, for holding this important hearing today to discuss the urgent threat from climate change we all face and the Federal inaction from this administration that puts us all at risk.

We know sea levels are rising.

We know average temperatures are warming.

We know ice is disappearing at alarming rates.

And we know extreme weather is intensifying and becoming more frequent—from stronger hurricanes to colder winters. We have seen this firsthand across the Midwest and Michigan with the bitter cold polar vortex this year.

The international community recognizes climate change as the generation threat that it is and multiple scientific reports have called on the need to act over the next decade to mitigate serious harms to our economy, environment, and way of life.

The Fourth National Climate Assessment—prepared for the President and by scientists across 13 government agencies—makes it clear:

Earth's climate is now changing faster than at any point in the history of modern civilization.

And yet, this administration choses to do nothing.

Since the administration withdrew the United States from the Paris Agreement, cities and States, like Ann Arbor and Michigan, have been forced to rise up in the absence of needed Federal leadership on the world's stage.

I am encouraged and inspired to see cities, States, and businesses acting, but the will of one city, one county, one State, or even one country will not be enough to meet the challenge ahead.

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Joule

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COMMENTARY

Getting to Zero Carbon Emissions in the Electric Power Sector

Jesse D. Jenkins,[1,*] Max Luke,[2] and Samuel Thernstrom[3]

Jesse D. Jenkins is a postdoctoral Environmental Fellow at the Harvard Kennedy School and the Harvard University Center for the Environment. His research harnesses methods from operations research, power systems engineering, and applied economics to improve regulation, policy, and practice in the rapidly evolving electricity sector. He earned a PhD in Engineering Systems (2018) and an SM in Technology & Policy (2014) at the Massachusetts Institute of Technology, where he was also a researcher at the MIT Energy Initiative and a lead author of the *Utility of the Future* study.

Max Luke is a consultant in the energy practice at NERA Economic Consulting where he specializes in economic, regulatory, and legal implications of emerging trends in the electric power sector. He has worked on projects related to network regulation, electricity tariff design, electricity market design, and the impact of emerging technologies on utility business models. He earned an SM in Technology & Policy (2016) at the Massachusetts Institute of Technology, where he was also a researcher at the MIT Energy Initiative and a contributor to the *Utility of the Future* study.

Samuel Thernstrom is Executive Director of the Energy Innovation Reform Project, a nonprofit organization that promotes the development of advanced energy technologies and practices that will improve the affordability, reliability, safety, and security of American energy supplies and our energy economy. He is also a senior fellow at the Center for the National Interest.

The electric power sector is widely expected to be the linchpin of efforts to reduce greenhouse gas (GHG) emissions. Virtually all credible pathways to climate stabilization entail twin challenges for the electricity sector: cutting emissions nearly to zero (or even net negative emissions) by mid-century, while expanding to electrify and consequently decarbonize a much greater share of global energy use.[1,2] In light of this fact, a flurry of recent studies has outlined and explored pathways to "deep decarbonization" of the power sector, defined here as an 80%–100% reduction in carbon dioxide (CO_2) emissions from current levels. Here we review and distill insights from 40 such studies published since the most recent Intergovernmental Panel on Climate Change review in 2014 (summarized in Table 1).

Despite differing methods, scopes, and research questions, several consistent insights emerge from this literature. The studies collectively outline and evaluate two overall paths to decarbonize electricity: one that relies primarily (or even entirely) on variable renewable energy sources (chiefly wind and solar power) supported by energy storage, greater flexibility from electricity demand, and continent-scale expansion of transmission grids; and a second path that relies on a wider range of low-carbon resources including wind and solar as well as "firm" resources such as nuclear, geothermal, biomass, and fossil fuels with carbon capture and storage (CCS) (see Sepulveda et al. in the November 2018 issue of this journal[3]).

Whichever path is taken, we find strong agreement in the literature that reaching near-zero emissions is much more challenging—and requires a different set of low-carbon resources—than comparatively modest emissions reductions (e.g., CO_2 reductions of 50%–70%). This is chiefly because more modest goals can readily employ natural gas-fired power plants as firm resources. Pushing to near-zero emissions requires replacing the vast majority of fossil fueled power plants or equipping them with CCS.

Given the long-lived nature of power sector capital equipment and long gestation period for R&D efforts, it is critical to examine the distinct challenges inherent to deep decarbonization today; a policy of "muddling through" is unlikely to produce optimal outcomes. The literature outlines potentially feasible decarbonization solutions, but also clarifies several challenges that must be overcome along each path to a zero-carbon electricity system. In light of these challenges, and the considerable technological uncertainty facing us today, we conclude that a strategy that seeks to improve and expand the portfolio of available low-carbon resources, rather than restrict it, offers a greater likelihood of affordably achieving deep decarbonization.

Failing to Affordably Decarbonize Electricity Could Imperil Global Climate Efforts

Studies considering economy-wide GHG reduction goals consistently envision the power sector cutting emissions further and faster than other sectors of the economy, achieving close to zero (or net negative) emissions in 2050.[2] Because electricity is technically easier and less costly to decarbonize than other sectors,[4] economy-wide studies rely upon expanded generation of carbon-free electricity to meet greater shares of energy demand for heating, industry, and transportation. Across global decarbonization

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Table 1. Review of Electricity Deep Decarbonization Studies

	Authors	Year	Title	Publication	Geographic Scope	Sectors	Methodology	Strictest CO_2 Limit	Firm Resources Considered (Selected in Lowest CO_2 Cases)	Long-Duration Storage	Transmission	Flexible Demand
1	Akashi et al.	2014	Halving global CO2 emissions by 2050 without depending on nuclear and CCS	*Climatic Change*	Global	W	I	50% below 2010 economy-wide (~80% in electricity sector)	bio, bio CCS, coal, coal CCS, gas, gas CCS, nuc, oil, oil CCS	N	N	N
2	Amorim et al.	2014	Electricity decarbonization pathways for 2050 in Portugal: a TIMES (The Integrated MARKAL-EFOM System) based approach in closed versus open systems modeling	*Energy*	Portugal	E	O	zero CO_2	coal, gas, res. hydro (existing), oil, bio	N	L	N
3	Becker et al.	2014	Features of a fully renewable US electricity system: optimized mixes of wind and solar PV and transmission grid extensions	*Energy*	Continental USA	E	O, S	zero CO_2	none	Y	Y	Y
4	Bibas and Méjean	2014	Potential and limitations of bioenergy for low carbon transitions	*Climatic Change*	Global	W	I	98% below business as usual in 2050, 99.3% in 2100	bio CCS, coal, coal CCS, gas, gas CCS, nuc, oil	N	N	N
5	Boston and Thomas	2015	Managing flexibility while decarbonizing the GB electricity system	The Energy Research Partnership	UK	E	O, S	~80% below 1990 (65g CO_2/kWh)	bio (existing), coal CCS, gas (existing), gas CCS, nuc	S	S	S
6	Brick and Thernstrom	2016	Renewables and decarbonization: Studies of California, Wisconsin and Germany	*The Electricity Journal*	California, Wisconsin, and Germany	E	S	80% renewable portfolio standard	gas CCS, nuc	N	N	N

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Table 1. Continued

	Authors	Year	Title	Publication	Geographic Scope	Sectors	Methodology	Strictest CO_2 Limit	Firm Resources Considered (Selected in Lowest CO_2 Cases)	Long-Duration Storage	Transmission	Flexible Demand
7	Brown et al.	2018	Synergies of sector coupling and transmission reinforcement in a cost-optimized, highly renewable European energy system	*Energy*	Europe	E, T, H	O	95% below 1990	gas, res. hydro (existing)	Y	Y	Y
8	Connolly and Mathiesen	2014	A technical and economic analysis of one potential pathway to a 100% renewable energy system	*Int. Sustainable Energy Planning and Management*	Ireland	E, T, H	S	net zero CO_2 (renewables only, including biofuels)	bio, CHP	Y	N	Y
9	Connolly et al.	2016	Smart Energy Europe: The technical and economic impact of one potential 100% renewable energy scenario for the European Union	*Renewable and Sustainable Energy Reviews*	EU-28	E, T, H	S	net zero CO_2 (renewables only, including biofuels)	bio, CHP	Y	N	Y
10	de Sisternes et al.	2016	The value of energy storage in decarbonizing the electricity sector	*Applied Energy*	Texas ERCOT-like system	E	O	90% below 2016	gas, nuc	N	N	N
11	Després et al.	2016	Storage as a flexibility option in power systems with high shares of VRE sources: a POLES-based analysis	*Energy Economics*	EU-28, Norway and Switzerland	E	O	~80% below 1990 (EU 2°C policy)	bio, coal (CCS, gas, gas CCS, res. hydro (existing), nuc, oil	N	N	Y

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Table 1. Continued

	Authors	Year	Title	Publication	Geographic Scope	Section	Methodology	Strictest CO_2 Limit	Firm Resources Considered (Selected in Lowest CO_2 Cases)	Long Duration Storage	Transmission	Flexible Demand
12	Elliston et al.	2014	Comparing least cost scenarios for 100% renewable electricity with low emission fossil fuel scenarios in the Australian National Electricity Market	*Renewable Energy*	Australia National Energy Market (NEM)	E	S	net zero CO_2 (renewables only, including biofuels)	bio, coal, coal CCS, gas, gas CCS, res. hydro (existing)	N	L	N
13	Fernandes and Ferreira	2014	Renewable energy scenarios in the Portuguese electricity system	*Energy*	Portugal	E	S	net zero CO_2 (renewables only, including biofuels)	bio, res. hydro (existing), CHP	Y	Y	N
14	Frew et al.	2016	Flexibility mechanisms and pathways to a highly renewable US electricity future	*Energy*	Continental USA	E	O	zero CO_2 (100% renewable portfolio standard)	geo., res. hydro (existing)	Y	Y	Y
15	Heal	2016	What would it take to reduce US greenhouse gas emissions 80% by 2050?	National Bureau of Economic Research	USA	E	A	80% below 2005	bio, coal, gas, geo, hydro, nuc, oil	N	Y	N
16	Heuberger et al.	2017	A systems approach to quantifying the value of power generation and energy storage technologies in future electricity networks	*Computers & Chemical Engineering*	UK	E	O	zero CO_2	coal CCS, gas, gas CCS, nuc	N	L	N
17	Heuberger et al.	2017	Power capacity expansion planning considering endogenous technology cost learning	*Applied Energy*	UK	E	O	80% below 1990	bio CCS, coal CCS, gas, gas CCS, nuc	N	L	N

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Table 1. Continued

	Authors	Year	Title	Publication	Geographic Scope	Sectors	Methodology	Strictest CO_2 Limit	Firm Resources Considered (Selected in Lowest CO_2 Cases)	Long Duration Storage	Transmission	Flexible Demand
18	Jacobson et al.	2014	A roadmap for repowering California for all purposes with wind, water, and sunlight	*Energy*	California	W	S	zero CO_2	geo, res. hydro (existing)	Y	Y	Y
19	Jacobson et al.	2015	100% clean and renewable wind, water, and sunlight (WWS) all-sector energy roadmaps for the 50 United States	*Energy & Environmental Science*	USA	W	S	zero CO_2	geo, res. hydro (existing)	Y	Y	Y
20	Jacobson et al.	2015	Low-cost solution to the grid reliability problem with 100% penetration of intermittent wind, water, and solar for all purposes	*PNAS*	Continental USA	W	S	zero CO_2	geo, res. hydro (existing)	Y	Y	Y
21	Kim et al.	2014	Nuclear energy response in the EMF27 study	*Climatic Change*	Global	W	R	~80%–100% below 2000 (450 ppm CO_2e)	multiple models with different firm resource options and choices regarding storage, transmission, and flexible demand. In all 18 models, nuc was selected in most stringent decarbonization scenarios			
22	Knorr et al.	2014	Kombikraftwerk 2	German Federal Ministry for the Environment	Germany	E	S	Net zero CO_2 (renewables only, including biofuels)	bio, geo, res. hydro	Y	Y	Y
23	Koelbl et al.	2014	Uncertainty in carbon capture and storage (CCS) deployment projections: a cross-model comparison exercise	*Climatic Change*	Global	W	R	~80%–100% below 2000 (450 ppm CO_2e)	multiple models with different firm resource options and choices regarding storage, transmission, and flexible demand. In all 18 models, a combination of coal CCS and gas CCS was selected in most stringent decarbonization scenarios			

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Table 1. Continued

	Authors	Year	Title	Publication	Geographic Scope	Sectors	Methodology	Strictest CO_2 Limit	Firm Resources Considered (Selected in Lowest CO_2 Cases)	Long-Duration Storage	Transmission	Flexible Demand
24	Kriey et al.[1]	2014	Getting from here to there – energy technology transformation pathways in the EMF27 scenarios	*Climatic Change*	Global	W	R	~80%–100% below 2000 (450 ppm CO_2e)	*multiple models with different firm resource options and choices regarding storage, transmission, and flexible demand; Bio, coal CCS, and gas CCS are selected in most abundance in lowest cost decarbonization scenarios*			
25	Kriegler et al.[2]	2014	The role of technology for achieving climate policy objectives: overview of the EMF 27 study on global technology and climate policy strategies	*Climatic Change*	Global	W	R	~80%–100% below 2000 (450 ppm CO_2e)	*multiple models with different firm resource options and choices regarding storage, transmission, and flexible demand; Bio, coal CCS, gas CCS, and nuc are selected in most stringent decarbonization scenarios*			
26	Lenzen et al.	2016	Simulating low-carbon electricity supply for Australia	*Applied Energy*	Australia	E	O	net zero CO_2 (renewables only, including biofuels)	*bio, res. hydro (existing)*	N	Y	N
27	MacDonald et al.[10]	2016	Future cost-competitive electricity systems and their impact on US CO_2 emissions	*Nature Climate Change*	Continental USA	E	O	80% below 1990	*gas, res. hydro (existing), nuc. (existing)*	N	Y	N
28	Mai et al.	2014	Envisioning a renewable electricity future for the United States	*Energy*	Continental USA	E	O	80% renewable portfolio standard	*bio, coal, gas, geo, res. hydro (existing), nuc (existing)*	N	Y	Y
29	Mai et al.[7]	2014	Renewable electricity futures for the United States	*IEEE Trans. Sustainable Energy*	Continental USA	E	O	80% renewable portfolio standard	*bio, coal, gas, geo, res. hydro (existing), nuc (existing)*	N	Y	Y
30	Mathiesen et al.	2015	IDA's Energy Vision 2050: a smart energy system strategy for 100%	Aalborg University	Denmark	W	S	net zero CO_2 (renewables only, including biofuels)	*bio, geo*	Y	N	Y

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Table 1. Continued

	Authors	Year	Title	Publication	Geographic Scope	Sectors	Methodology	Strictest CO_2 Limit	Firm Resources Considered (Selected in Lowest CO_2 Cases)	Long-Duration Storage	Transmission	Flexible Demand
			renewable Denmark									
31	Mileva et al.	2016	Power system balancing for deep decarbonization of the electricity sector	*Applied Energy*	US Western Electricity Coordinating Council (WECC)	E	O	85% below 1990	bio, coal, gas, res. hydro (existing), geo, nuc	Y	Y	S
32	Pfeiffmann and Blechinger[38]	2017	How to meet EU GHG emission reduction targets? A model based decarbonization pathway for Europe's electricity supply system until 2050	*Energy Strategy Reviews*	EU-28	E	O	>95% below 2015 (24 Mt CO_2e/yr)	coal, gas, res. hydro (existing), nuc	Y	Y	Y
33	Riesz et al.	2015	Assessing 'gas transition' pathways to low-carbon electricity—an Australian case study	*Applied Energy*	Australia National Energy Market (NEM)	E	O	>80% below 2010	coal, gas, res. hydro (existing)	N	N	N
34	Safaei and Keith	2015	How much bulk energy storage is needed to decarbonize electricity?	*Energy & Environmental Science*	Texas ERCOT-like system	E	O	zero CO_2	dispatchable-zero-carbon source (a proxy for any combination of bio, coal CCS, geo, gas CCS, or nuc), gas	N	N	N
35	Schlachtberger et al.	2017	The benefits of cooperation in a highly renewable European electricity network	*Energy*	Europe	E	O	95% below 1990	gas, res. hydro (existing)	Y	Y	N
36	Schlachtberger et al.[39]	2018	Cost optimal scenarios of a future highly renewable	*Energy*	Europe	E	O	zero CO_2	res. hydro (existing)	Y	Y	N

(Continued on next page)

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Table 1. Continued

	Authors	Year	Title	Publication	Geographic Scope	Sectors	Methodology	Strictest CO_2 Limit	Firm Resources Considered (Selected in Lowest CO_2 Cases)	Long-Duration Storage	Transmission	Flexible Demand
			European electricity system									
37	Sepulveda, et al.[37]	2018	The role of firm low-carbon resources in deep decarbonization of electricity generation	*Joule*	New England, Texas	E	O	zero CO_2	*bio*, gas CCS, *nuc*	S	S	S
38	Strbac et al.	2016	Developing an optimal electricity generation mix for the UK 2050 future	*Energy*	UK	E	O	~zero CO_2 (1.9 gr/kWh)	bio, bio CCS, coal, coal CCS, gas, gas CCS, ren, hydro (existing), *nuc*	N	N	N
39	White House	2016	United States mid-century strategy for deep decarbonization	United States White House	USA	W	R	≥80% below 2005	bio, bio CCS, coal, coal CCS, gas, gas CCS, geo, *nuc*	N	Y	Y
40	Williams et al.	2014	Pathways to deep decarbonization in the United States	Sustainable Development Solutions Network	USA	W	S	80% below 1990 (<1,080 $MtCO_2e/yr$)	bio, coal, coal CCS, gas, gas CCS, geo, *nuc*	N	N	N

Sectors: E, electricity; T, transport; I, industry; H, heat; W, economy-wide; Methodologies: O, techno-economic cost optimization; I, integrated climate-economic-energy cost optimization; S, scenario-based simulation; A, accounting-based; R, review or inter-model comparison; Long-duration storage, transmission, flexible demand: N, not in any cases; Y, yes in all cases; S, in some sensitivity cases; L, limited interconnection with neighboring region only. To be included in our review, studies had to be published in English and feature one or more scenarios in which the electricity sector reduced CO_2 emissions by more than 80% below contemporary levels. While this review focuses on the electricity sector, we also included a subset of 15 multi-sector or economy-wide studies in order to survey insights regarding the role of the electricity sector within broader mitigation efforts. This is not an exhaustive catalog of all research on this topic, but spans a wide range of studies and is intended to be broad enough to capture the critical insights from recent research.

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scenarios produced by 18 modeling groups, for example, electricity demand increases 20%–120% by 2050 (median estimate of 52%) and 120%–440% by 2100; electricity supplies 25%–45% of total energy demand by mid-century and as much as 70% by 2100.[1] In the United States, electricity use could increase 60%–110% by 2050 as electricity (and fuels produced from electricity, e.g., hydrogen) expand from around 20% of final energy demand at present to more than 50% by 2050.[5]

In short, scholars agree that the electricity sector must not only decarbonize but also steadily increase its end-use market share through mid-century and beyond. It follows that a failure to deeply decarbonize the power sector would imperil climate mitigation efforts across the broader economy. At the same time, costly routes to decarbonization that substantially increase the price of electricity would make low-carbon electricity a less attractive substitute for oil, natural gas, and coal in transportation, heating, and industry. Finding feasible and affordable routes to decarbonize the power sector thus takes on outsized importance in global climate mitigation efforts.

Renewables May Drive Decarbonization, but Challenges Increase Sharply as Variable Renewable Energy Penetration Approaches 100%

Multiple studies indicate that achieving deep decarbonization primarily or even exclusively with variable renewable energy (VRE) sources may be technically possible. Despite a diversity of contexts and analytical methods, these studies also exhibit a high degree of agreement on several key features of VRE-centric power systems that must fall into place for this decarbonization pathway to be feasible and affordable. Most of these features arise from the need to manage the variable nature of wind and solar power, which are the predominant renewable energy sources in most studies because they offer the most abundant resource potential. Importantly, challenges associated with the variability of wind and solar increase nonlinearly as the share of energy from these sources rises. As a result, issues that may be manageable at more modest penetration levels can quickly become significant barriers as VRE shares approach 100% of generation.[6]

Continent-Scale Transmission Expansion

First, in order to smooth renewable energy variation across wider regions, high-VRE scenarios routinely entail a continent-scale expansion of long-distance transmission capacity. To reach 80% renewable electricity in the United States (with only 50% from wind and solar), for example, a National Renewable Energy Laboratory study proposes a 56%–105% increase in long-distance transmission capacity.[7] Other studies envision tens of thousands of miles of new high-voltage direct-current transmission linking all regions in the United States, while two renewables-focused studies for the European Union see interconnection capacity between EU nations expanding 4- to 9-fold by 2050.[8,9] The necessary long-distance transmission capacity reported in these studies typically does not include the additional transmission lines needed *within* each region to access renewable energy sites. As transmission makes up a relatively small share of the cost of delivered electricity in most regions, even a large-scale transmission buildout may have modest impacts on total system costs.[10] However, grid expansion of this magnitude would need to overcome persistent challenges related to siting and cost allocation that frequently prevent (or severely delay) planned transmission infrastructure.

Flexible Demand

In most of the populated regions of the world, the availability of wind and solar energy varies substantially not just on a daily cycle but over weekly, monthly, and seasonal periods. As a result most scenarios highly reliant on wind and solar assume that sources of electricity consumption will become much more flexible and responsive to power system needs in the future. To varying degrees, these scenarios envision reshaping demand to match variable supply, rather than shaping supply to match variable demand, as is commonplace in all power systems today. Electrification of transportation, heating, and industry will increase demand for electricity, as discussed above, but some of these new sources of demand could also become flexible resources that help manage power systems. For example, electric vehicles must be ready when drivers need them, but they are parked most of the time. Smart controls could modulate charging rates (or return power to the grid) to help balance supply and demand while lowering costs for vehicle owners. Thermal inertia in buildings and water tanks can also shift the timing of heating and cooling to some extent without affecting occupancy comfort.[11] The demand flexibility considered in these studies typically helps address daily fluctuations in wind and solar output, rather than multi-week and seasonal resource deficits; the ability and willingness of businesses or households to curtail demand for multi-day periods, weeks, or months are as yet untested.

Inefficient Utilization Requires Very-Low-Cost Wind and Solar to Make Overcapacity Economical

Due to their intrinsic variability, relying on very high shares of wind or solar to achieve deep decarbonization involves overbuilding total installed capacity (relative to peak demand) to produce sufficient energy during periods when available wind or solar output is well below average (Figure 1). As a corollary, during periods of the year when

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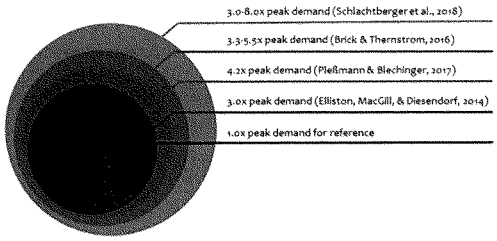

Figure 1. Total Installed Generation and Storage Capacity in Selected High-Renewables Scenarios

wind or solar is abundant, available electricity production exceeds total demand in these scenarios. This excess generation must either be curtailed (wasted) or stored for later use. While overgeneration and curtailment are manageable at lower penetration levels, the challenge increases significantly as VRE supply reaches high levels. For example, one study finds that curtailment is negligible if the share of renewables is held to 60% or below, but rises nonlinearly at higher penetrations (Figure 2). At 100% renewables, curtailment wastes enough energy (in this study) to meet at least 40% of current annual United States electricity demand, even after assuming continent-scale transmission expansion, flexible demand (in the form of controllable electric vehicle [EV] charging), and widespread deployment of battery energy storage.

Overbuilding capacity and wasting a large fraction of available energy to curtailment results in low utilization rates for wind and solar capacity, especially the marginal capacity installed to reach greater than 80% energy shares. As such, total system costs also rise nonlinearly as renewable energy shares increase toward 100% (Figure 2). To counteract this escalation in total costs and keep VRE-dominant routes to electricity decarbonization affordable, capital costs for wind and solar must therefore fall much further than in scenarios where they share the market with a mix of other low-carbon resources.

Either "Firm" Generation or "Seasonal" Storage Is Needed to Ensure Reliability in Wind- and Solar-Dominated Scenarios

While overgeneration arises during periods of abundant supply, periods of scarce wind or solar production are the flip side of the variability challenge. Prolonged periods of calm wind speeds lasting days or weeks during winter months with low solar insolation are particularly challenging for VRE-dominated systems. These sustained lulls in available wind and solar output are too long to bridge with shorter-duration batteries or flexible demand.

Power systems with high VRE shares consequently require sufficient capacity from reliable electricity sources that can sustain output in any season and for long periods (weeks or longer). This "firm" capacity[3] is often provided by augmenting wind and solar with dispatchable generation—e.g., natural gas plants, geothermal, hydropower with large reservoirs, nuclear power, or bioenergy. In high-VRE scenarios, however, these firm resources suffer from a lower utilization rate than they do in more balanced scenarios. This means that resources with low capital costs and high variable costs (e.g., bioenergy, hydrogen, or natural gas fueled power plants) are economically better suited to pair with high wind and solar shares.

Other studies partially or fully replace firm generation with one or more energy storage media capable of sustained output over weeks or longer and suited to low annual utilization rates. No such energy storage options exist at large scale today. Even at $100 per kWh of installed energy capacity (less than a third of today's costs), enough Li-ion batteries to store one week of United States electricity use would cost more than $7 trillion, or nearly 19 years of total United States electricity expenditures. Scenarios that eschew firm generation therefore must rely upon one or more long-term energy storage technologies with an order-of-magnitude lower cost per kWh, including thermal energy storage, production of hydrogen from electrolysis and storage in underground salt caverns or pressurized tanks, or conversion of electrolytic hydrogen to methane. Considerable uncertainty remains about the real-world cost, timing, and scalability of these storage options.

Firm Low-Carbon Resources Can Lower Decarbonization Costs

Most of the challenges associated with very high shares of wind or solar energy can be avoided by adopting a more balanced portfolio of resources. Across decarbonization scenarios that harness variable renewables alongside firm low-carbon generation resources—including nuclear power, coal or natural gas plants with CCS, and greater shares of firm renewable resources such as bioenergy or geothermal power plants—total installed capacity is more closely sized to peak demand, all resources enjoy higher asset utilization, and substantial curtailment of renewable energy output is avoided. None

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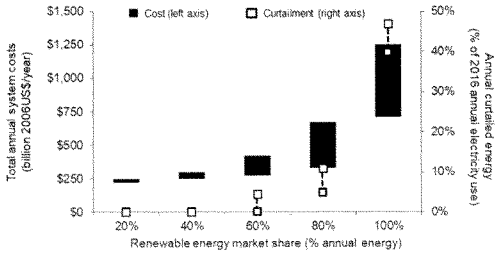

Figure 2. Nonlinear Increases in Total Annual Electricity System Cost and Curtailed Wind and Solar Energy as Renewable Energy Share Increases

Graphic is authors' with data from Frew et al. (2016), see Table 1 for full citation. Low cost and curtailment correspond to "Agg. PEV" scenario (with continent-wide transmission, flexible EV charging) and high cost and curtailment correspond to "Indep. PEV" scenario (limited transmission, flexible EV charging). Curtailment is converted to percentage of 2016 annual electricity use based on *U.S. EIA, Electric Power Annual*, Table 2.2: "Sales and Direct Use of Electricity to Ultimate Customers."

of these scenarios require the long-duration "seasonal" storage technologies discussed above. Moreover, while all scenarios benefit from cost-effective demand flexibility and transmission expansion, these features have less impact on the cost of decarbonization in more technology-diversified scenarios.

Twenty of the studies surveyed employ techno-economic optimization or integrated assessment modeling techniques to find the most affordable path to deep decarbonization and considered one or more scalable, firm low-carbon resources (beyond geothermal energy and existing reservoir hydropower, which are severely constrained in most models due to available sites suitable for expansion). Notably, all of these studies include a substantial share of firm low-carbon generation in their lowest cost resource portfolio (see Table 1). In other words, firm low-carbon resources are a consistent feature of the most affordable pathways to deep decarbonization of electricity.

However, all currently available firm low-carbon energy sources face challenges that may impede adoption at the scale or pace desired for climate stabilization.[12] Worldwide, deployment of new nuclear power is barely keeping pace with retirement of aging reactors, while high-profile cost overruns and bankruptcies have plagued nuclear construction in the United States and Europe. Carbon-capture technologies continue to make progress at the demonstration scale, but commercial deployment remains nearly nonexistent. Furthermore, while solid biomass use is rapidly increasing, driven particularly by renewable energy policies in Europe, researchers have raised serious questions about the net life-cycle greenhouse gas benefits of biomass from both managed forests and dedicated energy crops. Reservoir hydropower systems are mature, but new construction is geographically limited and entails substantial environmental impact, including the release of methane.[13] Conventional geothermal energy technologies are constrained to locations with ideal geological conditions, while enhanced or engineered geothermal systems, which could unlock widespread resource potential, are pre-commercial.

Expanding and Improving the Low-Carbon Electricity Portfolio Increases Chances of Affordable Decarbonization

Given the challenges now facing available firm low-carbon resources, it is tempting for policymakers, socially conscious businesses, and research efforts to bet exclusively on today's apparent winners: solar photovoltaics (PV), wind, and battery energy storage. That would be a mistake.

As this review indicates, several obstacles must be overcome to cost-effectively decarbonize electricity regardless of whether wind and solar are expected to deliver the vast majority of electricity or we pursue a more diverse portfolio of resources. We cannot assume that public opposition and siting challenges for new, continent-spanning transmission networks can be overcome; that flexible demand will be unlocked at sufficient scale; that wind and solar PV will continue deep and sustained cost declines; or that order-of-magnitude cheaper "seasonal" storage technologies will become widely scalable. Any one of these things may well happen, but it is far less likely all will be simultaneously achieved.

Assume hypothetically that each of these four key outcomes (grid expansion, flexible demand, very-low-cost wind and solar, and seasonal storage) has the same odds as rolling a dice and not coming up with a 1. Despite this five-out-of-six chance for each individual outcome, the joint probability of all four occurring (0.833^4) would be just 48%—effectively a coin flip.

Given the high stakes, it would be prudent to expand and improve a wide set of clean energy resources, each of which may fill the critical niche for firm, low-carbon power should other technologies falter. For example, nuclear power, CCS, bioenergy, and enhanced geothermal energy each have the ability to fill the firm role in

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a low-cost, low-carbon portfolio. Assume that each resource has only a 50% probability of becoming affordable and scalable within the next two decades. If all four options are pursued, however, the odds that *at least* one succeeds ($1–0.5^4$) would be 94%. A strategy that supported the development of all low-carbon options, both firm and variable, would raise the chance of success of at least one affordable pathway to decarbonize electricity to 97% (using the hypothetical odds given above).

These examples are purely illustrative, but the logic is critical. Eschewing the development of firm low-carbon technologies because they face challenges today would amount to betting the planet on the assumption that *all* of the conditions needed for an affordable wind and solar-centered path to decarbonize electricity will fall into place. Supporting an expanded and diversified portfolio of clean energy options that can substitute for one another hedges the risk of technology failure and substantially improves the chances of achieving a zero-carbon energy system.

Obstacles remain along any path to zero-carbon electricity, and the true probabilities of success are unknowable. It is therefore vitally important that decision makers identify and pursue prudent strategies to improve the odds of feasible and cost-effective decarbonization.

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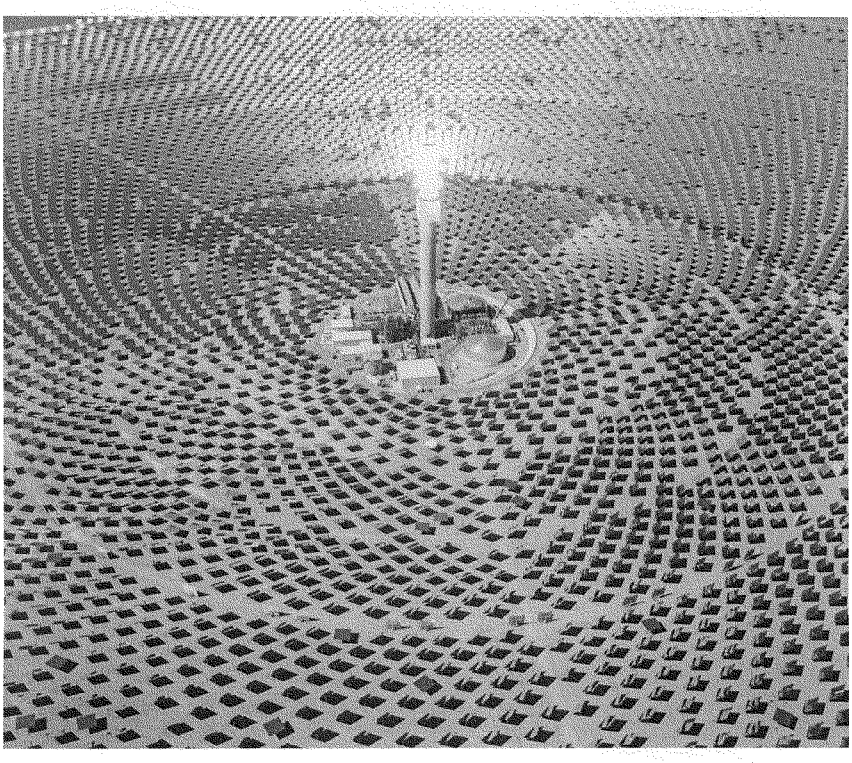
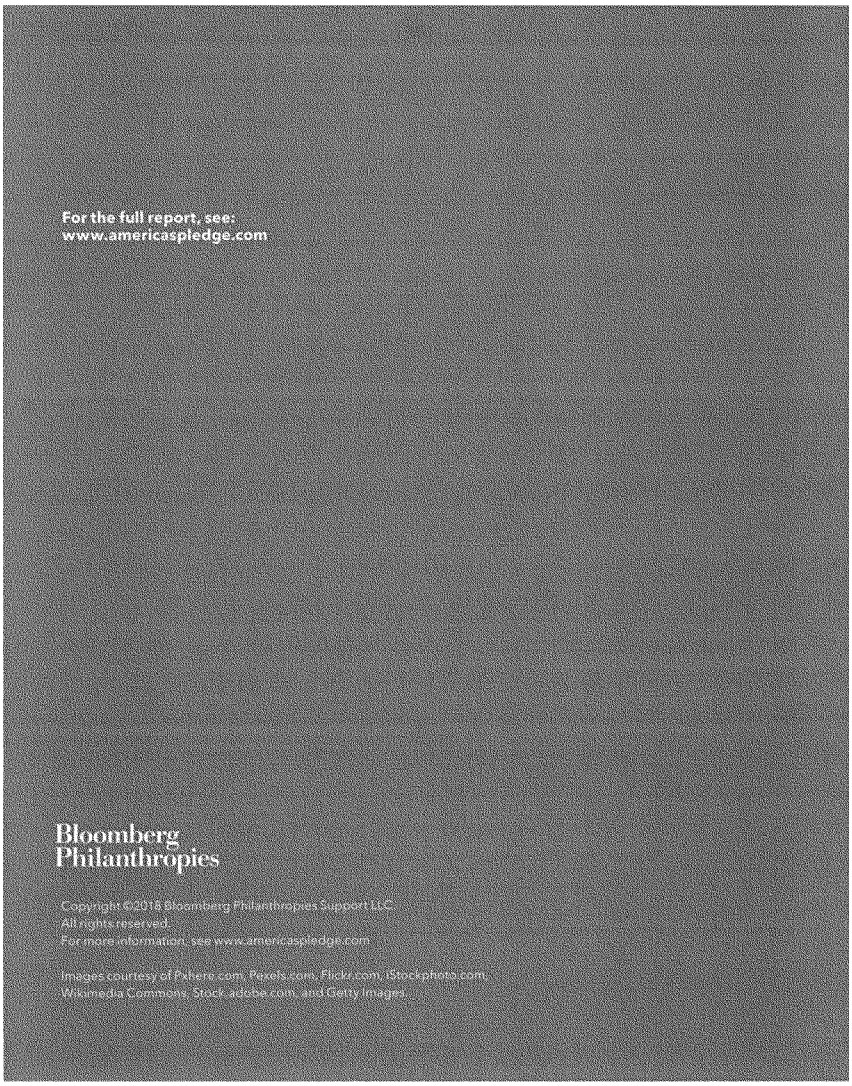
FULFILLING AMERICA'S PLEDGE

How States, Cities, and Businesses Are Leading the United States to a Low-Carbon Future



Executive Summary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About America's Pledge

When President Donald Trump announced his intention to withdraw the United States from the Paris Agreement in June 2017, the response from across the country was swift and significant. An unprecedented coalition of U.S. states, cities, businesses, universities, and other organizations spoke out in continued support for America's climate pledge to the world.

Coalitions backing the Paris Agreement, including the notable "We Are Still In" network, have since doubled in size, with over 3,000 signatories. States, cities, and businesses all over the United States are continuing to lead by adopting greenhouse gas (GHG) emissions reduction targets and other policies to deliver emissions reductions.

In July 2017, former New York City Mayor and United Nations Secretary-General's Special Envoy for Climate Action Michael R. Bloomberg and California Governor Edmund G. Brown, Jr., launched an initiative, known as America's Pledge, to analyze, catalyze, and showcase climate action leadership by U.S. governors, mayors, business leaders, and others. Five months later, at the 23rd Conference of the Parties to the United Nations Framework Convention on Climate Change (COP-23), Michael Bloomberg and Governor Brown published a comprehensive survey of U.S. climate action led by such real economy actors. This first report estimated that real economy actors representing more than half the U.S. economy—whose economic activity is equivalent to that of the third-largest country in the world—were actively engaged in fulfilling the Paris Agreement and had demonstrated their potential to drive decarbonization swiftly and effectively.

This report, *Fulfilling America's Pledge*, builds on our 2017 report and provides the most comprehensive assessment to date of how U.S. states, cities, businesses, and others (often referenced within this report as "real economy actors") are embracing new economic opportunities and technologies to implement climate targets and deliver emissions reductions within their own jurisdictions and operations under their own authority. This report includes an assessment of the impact of their existing commitments on the overall U.S. emissions trajectory, and provides a concise roadmap of 10 broad opportunities for action that together can lay the groundwork for even deeper emissions reductions from the real economy. This report also provides an internationally applicable toolkit to help policymakers and other stakeholders understand how real economy actors can drive more ambitious climate outcomes and serve as implementing partners in the context of other national governments' nationally determined contributions (NDCs) under the Paris Agreement.

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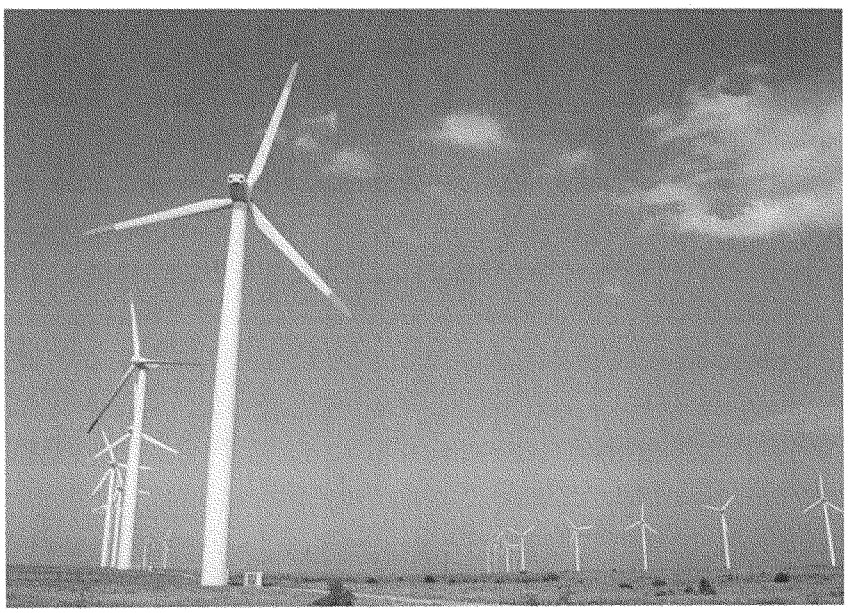

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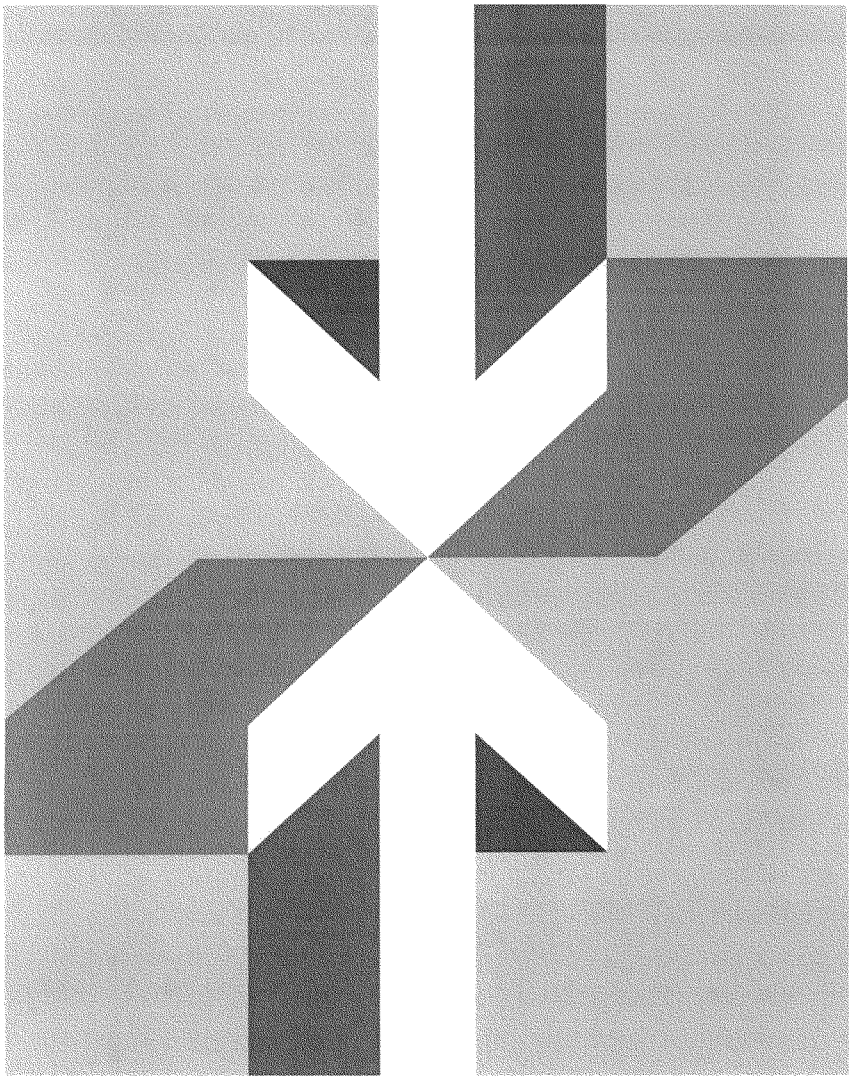


Executive Summary

KEY POINTS IN THIS REPORT

1. Implementing the vision of the Paris Agreement calls for broad, rapid, and significant engagement across all parts of society in order to reap the benefits of a low-carbon, climate-resilient future fueled by clean jobs and economic growth. In the United States, cities, states, and businesses, and other real economy actors have embraced this future—helping drive better outcomes for their own citizens and business operations. Although their efforts are driven in part by necessity, in light of the lack of national-level leadership on climate change, these real economy actors have embraced action for the benefit of their own constituents and stakeholders while helping bend the emissions curve downward.

2. Today, we are almost halfway to the original U.S. target under the Paris Agreement of 26-28 percent below 2005 levels by 2025. Across the country, real economy actors have established policies and commitments which, as they are implemented, will drive continued substantial progress towards the Paris pledge.

3. Current federal and real economy commitments, combined with market forces, will drive U.S. emissions to 17 percent below 2005 levels by 2025, roughly two-thirds of the way to the original U.S. target.

4. This report presents a roadmap for 10 *Climate Action Strategies* that are high-impact, near-term, and readily available for implementation by cities, states, businesses, and other actors. This analysis estimates that fully implementing these measures could drive emissions down further, to 21 percent below 2005 levels by 2025.

5. But "readily available" cannot be our limit. Broader engagement and mobilization of motivated cities, states, and businesses can both serve their immediate short-term priorities and enable continued American leadership on climate. It is vital for real economy actors to identify and drive climate reforms that benefit their constituents and stakeholders.

6. Broader engagement of this real economy coalition, within realistic legal and political limits, has the potential to reduce emissions by more than 24 percent below 2005 levels by 2025. This would be within striking distance of the Paris pledge, making the 26 percent threshold achievable shortly thereafter.

7. As we move onward from the Paris pledge, this momentum in turn sets the stage for more rapid decarbonization in the 2025-2030 period. This analysis demonstrates that essential deep decarbonization (80 percent or more by 2050) can be led by the bottom-up efforts of real economy actors—but only with deep collaboration and engagement.

In 2015, the world came together in Paris to forge the first truly global climate agreement: a robust, long-term framework designed to reduce GHG pollution in order to hold global temperature increases to well below 2 degrees Celsius and prevent "dangerous anthropogenic interference with the climate system."[1]

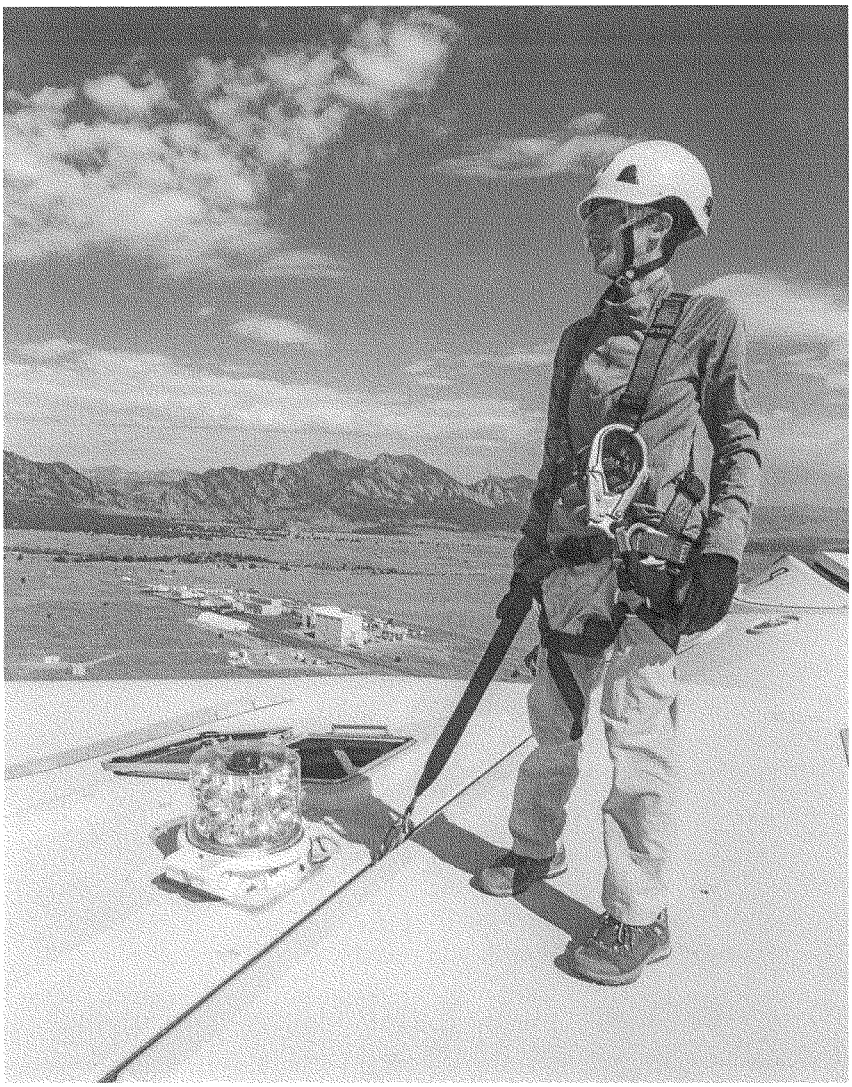
The Paris Agreement entered into force in record time, and with one notable exception, the United States, national leaders in all countries of the world have continued to support the Paris Agreement's goals and approach. The reasons are clear: the risks of climate change to human health and ecosystems are too great, and the benefits of embracing clean energy innovations for well-being, jobs, and economic growth are many. Such action demands full partnership and deep collaboration between national governments and the full range of stakeholders and entities that they represent on the international stage: states, cities, businesses, universities, and communities. It is these *real economy actors* whose decisions shape greenhouse gas (GHG) emissions, drive innovation, and determine the speed of the global energy transition. And nowhere is this kind of decentralized climate leadership currently more important than in the United States.

This report refers to the many U.S. entities taking action on climate change outside the federal government as **real economy actors.**

This term covers a diverse set of such actors, including cities, states, businesses, investors, counties, regional associations, faith institutions, and universities. The term 'real economy actor' is derived from economic governance literature.[2]

Though the meaning can shift in different contexts, it is utilized in this report to differentiate their actions from the current actions of the federal government. In other reports and in the context of the Paris Agreement and the United Nations Framework Convention on Climate Change (UNFCCC), such groups are sometimes called "non-state actors," "sub-national actors," or "non-Party stakeholders."

Photo by Dennis Schroeder / NREL



Three scenarios in this report build out this ladder of ambition:

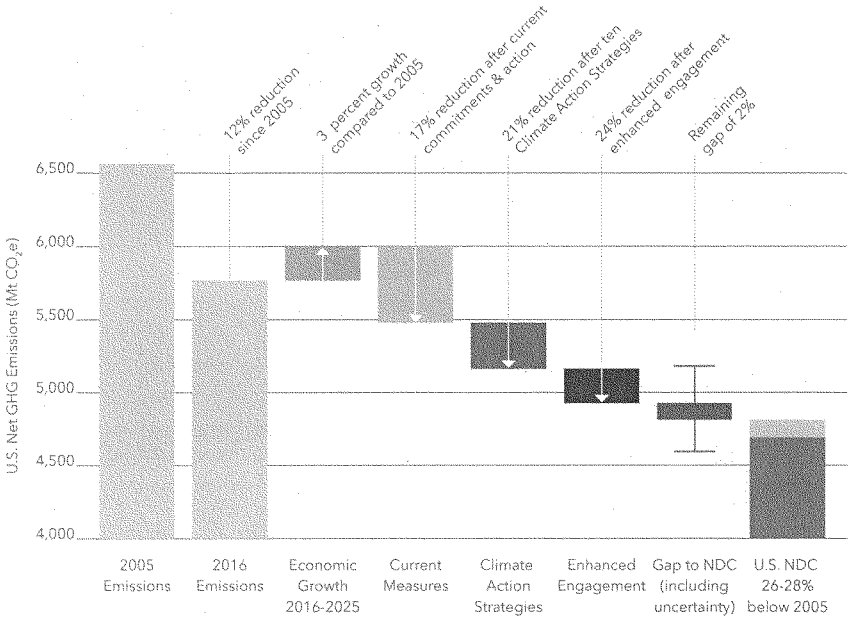
- First, the *Current Measures* scenario estimates the extent to which existing state, city, and business commitments and policies are likely to reduce emissions;
- Second, an extensive consultation and analysis process identified a discrete set of 10 high-impact, near-term, and readily available opportunities, and estimated their potential to reduce emissions via the *Climate Action Strategies* scenario; and
- Third, the *Enhanced Engagement* scenario models what might be possible if an even broader set of ambitious undertakings by states, cities, and businesses were implemented across the economy.

Importantly, even the most ambitious scenario modeled here focuses on what can plausibly be achieved through state, city, and business actions, prior to federal reengagement, taking into consideration limitations, including legal barriers to scaling specific policies and the political unwillingness of local government in certain regions of the United States to take up climate policies.

Photo by Werner Slocum / NREL

The basis for this analysis is an innovative modeling approach developed specifically for the America's Pledge initiative. It integrates a well-established top-down, economy-wide integrated assessment model (the Global Change Assessment Model for the United States of America, or GCAM-USA) with a new, bottom-up aggregation tool developed specifically for this effort to fully and accurately account for the GHG abatement impact of state, city, and business climate action (the Aggregation Tool for modeling Historic and Enhanced Non-Federal Actions, or ATHENA). GCAM-USA is the same economy-wide modeling tool employed by the U.S. federal government in projecting emissions for its Mid-Century Strategy (MCS) report to the UNFCCC.

Figure ES-1: State, City, and Business Actions can Significantly Cut U.S. Emissions in 2025 and Accelerate Momentum for Long-term Decarbonization



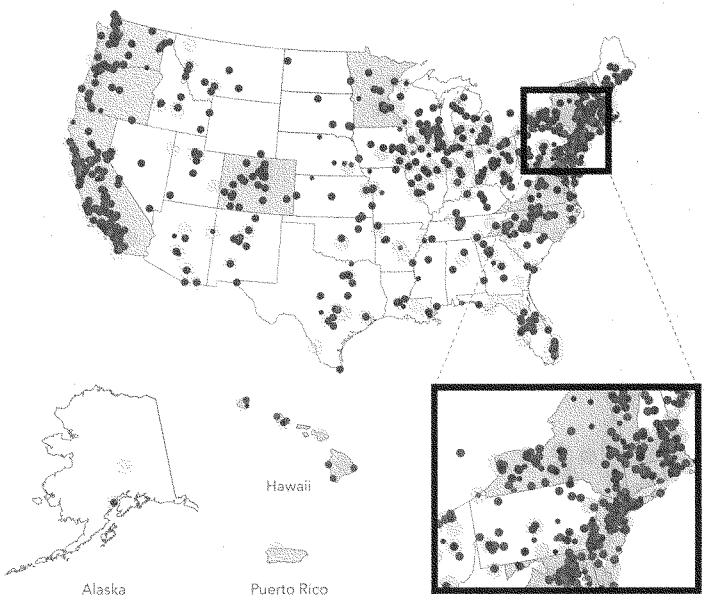
Climate Action Strategies:

- #1: Double down on renewable energy targets
- #2: Accelerate the retirement of coal power
- #3: Encourage residential and commercial building efficiency retrofits
- #4: Electrify building energy use
- #5: Accelerate electric vehicle (EV) adoption
- #6: Phase down super-polluting hydrofluorocarbons (HFCs)
- #7: Stop methane leaks at the wellhead
- #8: Reduce methane leaks in cities
- #9: Develop regional strategies for carbon sequestration on natural and working lands
- #10: Form state coalitions for carbon pricing

Source: Historical emissions data is from the U.S. EPA "Inventory of GHG Emissions and Sinks: 1990-2016"; projected emissions based on modeling from the America's Pledge research team

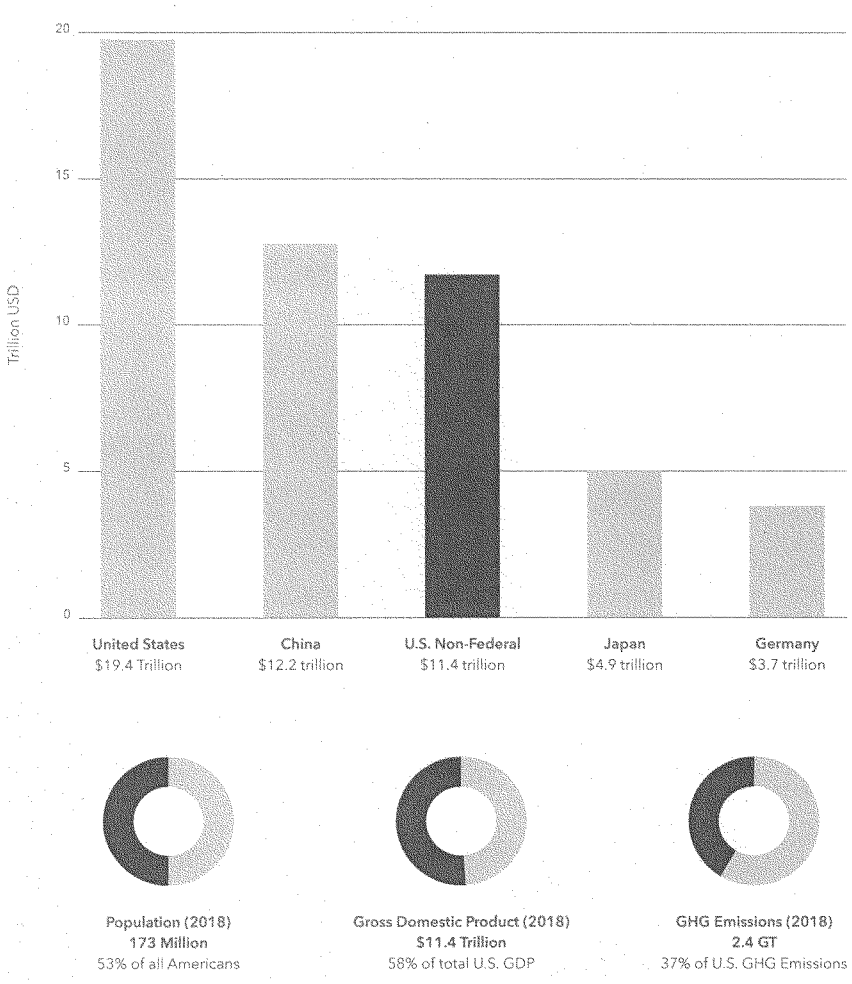
Current Efforts by States, Cities, and Businesses Are Yielding Significant Results

In the year since the Trump Administration announced its intent to withdraw from the Paris Agreement, over 3,000 real economy actors have pledged their support for the Paris Agreement and commitment to continued action on climate change by joining the "We Are Still In" declaration and participating in other networks such as the U.S. Climate Alliance and the Climate Mayors. The economic activity of this "coalition of the willing" is significant, equivalent to that of the third-largest country in the world (Figure ES-2). Specifically, the U.S. states, cities, businesses, and other leaders of the real economy that remain committed to the Paris Agreement represent over half of the U.S. population (173 million people), over half of the American economy ($11.4 trillion), and over 35 percent of nationwide GHG emissions.



States (17) Cities, Counties and Tribes (540) Businesses and Investors (1,914) Faith-Based and Cultural Organizations (253) Higher Education (343)

Figure ES-2: U.S. States, Cities, and Businesses Supporting the Paris Agreement Make Up a Large and Growing Footprint



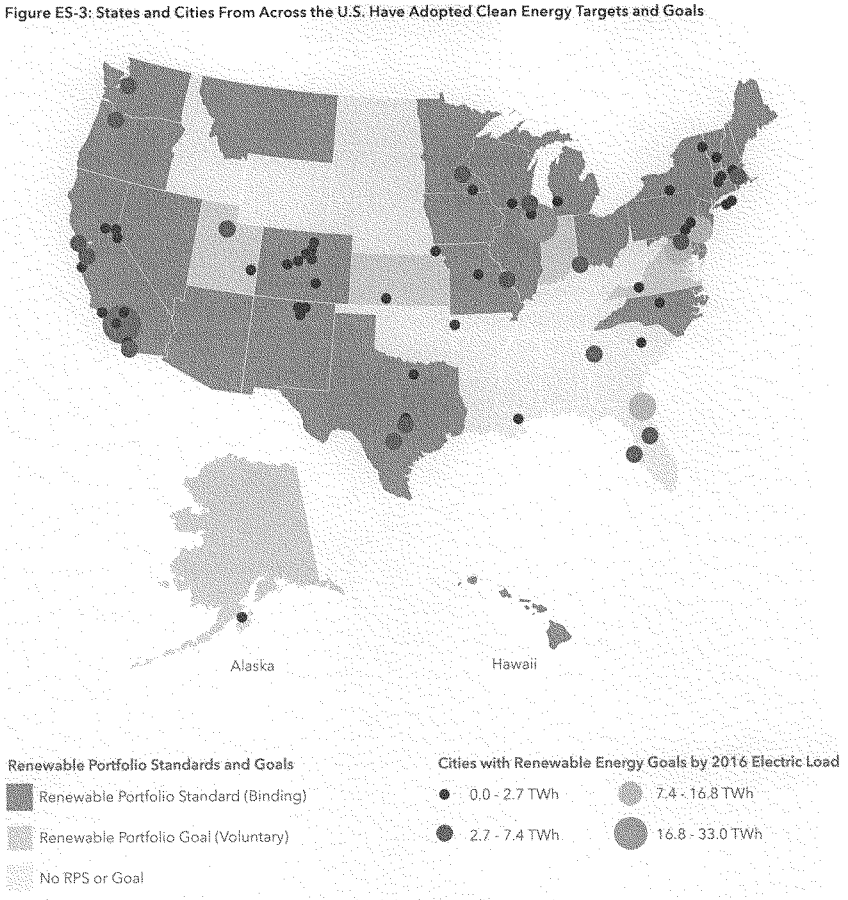
Note: Coalitions represented in the map include: We Are Still In, U.S. Climate Alliance, and Climate Mayors. Information presented on the map was based on available data as of August 2018. The coalitions represented are dynamic and the data will change over time.

U.S. real economy actors are already cutting emissions and scaling clean energy, not just to address climate change but to help create economic opportunities and jobs, and to deliver immediate benefits to public health. This report provides an updated survey of sector-specific actions across all 50 states, the largest 285 cities (with populations above 100,000), and a wide number of businesses in order to assess the impact of climate actions. Among the key findings:

- States, cities, and counties with GHG emissions reduction targets already on the books could cut annual emissions by 500 million metric tons of carbon dioxide equivalent (Mt CO_2e) from business-as-usual levels by 2025 if they are fully implemented;
- State, city, and business clean energy procurement policies (e.g. renewable portfolio standards) should increase demand for non-hydroelectric renewable generation to 500 terawatt-hours (TWh) by 2025 - enough to power 56 million homes for a year (Figure ES-3);
- Energy efficiency policies enacted by states, cities, and utilities could result in annual energy savings of over 200 TWh per year by 2025;
- Implementation of zero-emissions vehicles (ZEVs) mandates would lead to having 4 million new ZEVs on the road by 2025;
- State and city commitments to sustainable transportation networks could cut annual vehicle miles traveled by 36 billion miles, compared with business-as-usual projections by 2025;
- State, city, and business initiatives to cut hydrofluorocarbon (HFC) emissions could reduce these emissions by 6 percent from 2015 levels by 2025; and
- Policies and corporate actions designed to address fugitive methane leaks from oil and gas operations could cut national emissions by 17 percent by 2025, relative to 2005 levels.

Photo by Robert Beadle

Figure ES-3: States and Cities From Across the U.S. Have Adopted Clean Energy Targets and Goals



Source: American Council for an Energy-Efficient Economy; Lawrence Berkeley National Laboratory; World Resources Institute

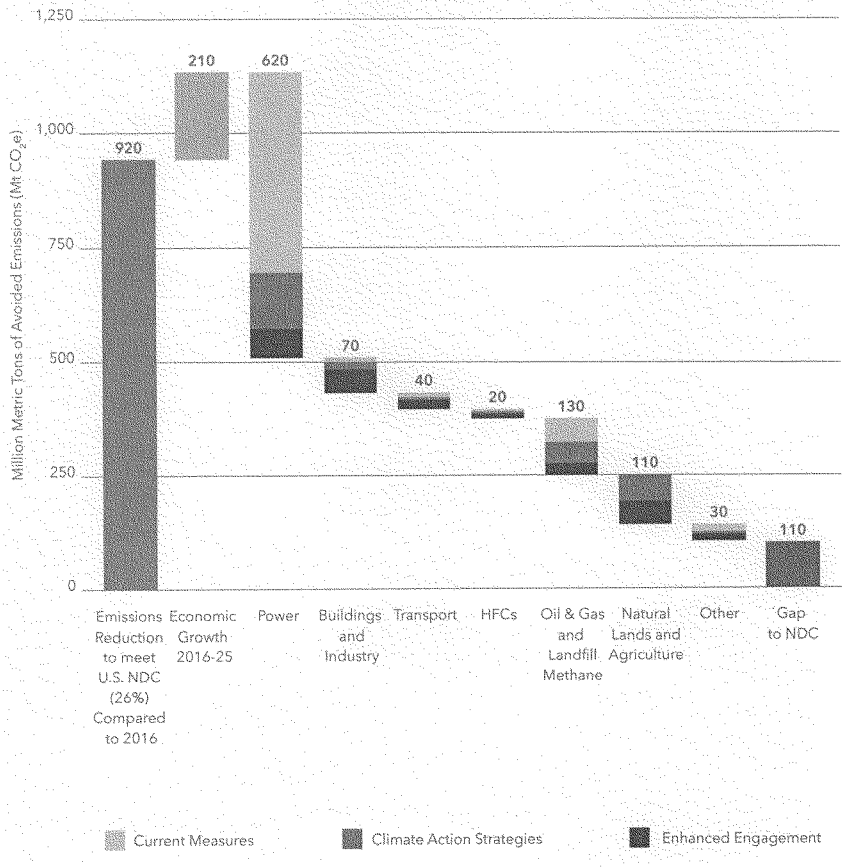
This kind of decentralized, bottom-up climate action is already delivering results. In 2017, U.S. energy-related carbon dioxide emissions fell to their lowest levels in 25 years. Despite the Trump Administration's stated pro-coal policies, announced coal plant retirements are occurring at a faster rate than ever before. Since June 1, 2017, the United States has added enough renewable energy to power more than 3 million homes for a year. States accounting for 35 percent of the U.S. economy are expected to have a price on GHG pollution by the end of this year. And more than 70 U.S. companies have announced emissions reduction targets in line with the Paris Agreement.

A Bottom-Up Opportunity Agenda for the Real Economy

Looking forward, we project that current policies and existing pledges from real economy actors, along with market forces and technology change (our *Current Measures* scenario), will deliver economy-wide emissions reductions of 17 percent below 2005 levels by 2025, even accounting for economic and population growth—taking the nation two-thirds of the way to its Paris pledge. This report goes on to build out a detailed picture of potential future actions that could go well beyond decarbonization commitments currently on the books. Such actions include a broad suite of emissions reduction opportunities spanning most major economic sectors and greenhouse gases—including electricity, transportation, buildings, oil and gas methane, natural and working lands, and hydrofluorocarbons (see Figure ES-4). We present potential sectoral impacts as a range of real-world outcomes with the 10 *Climate Action Strategies* at the accessible end and the full *Enhanced Engagement* potential at the more ambitious end. The 10 strategies were selected because they each represent significant opportunities to achieve impact by 2025 through collaborative action that can most easily begin by 2020 (see details of the 10 *Climate Action Strategies* on page 25). Moving from the low to the high end potential requires both recruiting new cities, states, and businesses to undertake commitments defined in the *Climate Action Strategies*, and expanding the range of actions by already committed real economy actors using the levers of change described in this report.

Broader engagement of this real economy coalition, within realistic legal and political limits, has the potential to reduce U.S. emissions by more than 490 additional Mt CO_2e to 24 percent below 2005 levels by 2025 (with a range of uncertainty of 20 to 30 percent). This would be within striking distance of the Paris pledge, making the 26 percent threshold achievable shortly thereafter. Moreover, such action would drive an even faster rate of economy-wide decarbonization between 2025 and 2030.

Figure ES-4: Achieving Full Potential Entails Actions Across All Major Economic Sectors and GHG Gases (Mt CO_2e in 2025)



Source: America's Pledge modeling results

Table ES-1: Key Climate Action Levers and Associated Potential

Sector	2005 Emissions ($MtCO_2e$)[1]	Change in Sector Emissions in 2016 relative 2005 ($MtCO_2e$)[2]	Percent Change in Sectoral Emissions 2016 Compared to 2005[3]	Scenario	Change in Sector Emissions in 2025 by Scenario($Mt\ CO_2e$)[4]	Total Feasible In-Sector Emissions Reductions 2005-25 as % of 2005[5]
Power	2,439	-593	-24%	Current	-440	-50%
				Strategies	-120	
				Enhanced	-60	
				Total	-620	
Buildings	1,696	-160	-9%	Current	-10	-14%
				Strategies	-10	
				Enhanced	-50	
				Total	-70	
Transportation	1,904	-99	-5%	Current	-10	-7%
				Strategies	-10	
				Enhanced	-20	
				Total	-40	
HFCs	103	+56	+54%	Current	-5	+35%
				Strategies	-5	
				Enhanced	-10	
				Total	-20	

For additional details on all sector assumptions and associated values for modeled emissions reductions in 2025, please see the Technical Appendix.

Oil & Gas and Landfill Methane[7]	469	-20	-4%	Current	-50	-32%
				Strategies	-50	
				Enhanced	-30	
				Total	-130	
Natural & Working Lands and Agricultural Emissions[8]	-211	+57	+26%	Current	0	-25%
				Strategies	-60	
				Enhanced	-50	
				Total	-110	
Total Net GHG Emissions[9]	6,589	-795	-12%	Current	-530	-24%
				Strategies	-250	
				Enhanced	-240	
				Economic Growth[9]	+210	
				Total	-810	

Notes:

1. Sector emissions based on 2016 U.S. EPA GHG inventory estimates. Some small sectors are omitted and therefore sum does not add to total net GHG emissions. As some sectors are estimated and calculated, values may differ slightly from EPA GHG inventory.
2. Change in sector emissions between 2005 and 2016 calculated based on 2016 U.S. EPA GHG inventory estimates.
3. Percent sectoral emissions reductions between 2005 and 2016 as % of 2005 sectoral emissions (based on 2016 U.S. EPA GHG inventory)
4. Total sector emissions reductions across three scenarios modeled by America's Pledge relative to a 2025 reference scenario.
5. Total feasible in-sector emissions reductions quantified as the total emissions reductions between 2005 and 2016 (based on U.S. EPA GHG inventory) and modeled emissions reduction between 2017 and 2025 (based on America's Pledge analysis), compared to the 2005 baseline.
6. Direct emissions from residential, commercial and industrial sectors. Does not include indirect emissions associated with electricity consumption which is included in power sector. Does not include industrial-related methane and HFCs included in other sectors.
7. GCAM assumes significant growth in methane emissions between 2005 and 2025. While total emissions grow, actions taken by real economy actors has the potential to cut emissions by over 30% against below 2005 levels. Agricultural methane included in Natural and Working Lands
8. Net change in emissions inclusive of land-sector sink and agricultural emissions. Both land-sector sink diminished in magnitude and agricultural emissions increased between 2005 and 2016, resulting in net increase in emissions of 26%.
9. Total GHG emission increases by 210 Mt CO_2e in the GCAM reference scenario from 2016 to 2025. Emission reductions are measured relative to this scenario.

The Ten Climate Action Strategies

#1: DOUBLE DOWN ON RENEWABLE ENERGY TARGETS

Ratcheting up renewable energy targets at a time of plummeting solar and wind costs and rapid evolution of business model solutions could achieve a major portion of the overall potential within the electricity sector. State, city, and business renewable energy commitments embodied in this strategy could readily lead to the deployment of an additional 130 TWh of total renewable energy beyond current policies and commitments by 2025—taking the U.S. to 990 TWh of renewable energy annually, up from 600 TWh in 2016.

#2: ACCELERATE THE RETIREMENT OF COAL POWER

States, cities, and businesses can accelerate the transition from fossil fuels to clean energy and shape the evolution of the electricity grid by insisting on the retirement of coal plants that are no longer competitive, fail to meet public health standards, or violate community clean energy goals. Working together, states, cities, businesses, advocates, and other stakeholders can speed this transition and ensure that 94 gigawatts (almost 30 percent) of the 2005 U.S. coal fleet has retired by 2025.

#3: ENCOURAGE RESIDENTIAL AND COMMERCIAL BUILDING EFFICIENCY RETROFITS

Cities can collaborate with the real estate industry, utilities, and state regulators to develop and implement ambitious building energy efficiency programs and policies. Cities can accelerate building retrofits by implementing a tested suite of approaches, including energy disclosure ordinances, requirements for building upgrades at key trigger points, and scaling retrofit incentive programs. Doubling the number of cities with energy efficiency targets and associated implementation mechanisms would result in an additional savings of 13 TWh per year by 2025 compared with what is modeled under our *Current Measures* scenario, enough electricity to power 1.5 million homes for a year.

Photo by Dennis Schroeder / NREL

#4: ELECTRIFY BUILDING ENERGY USE

States, cities, and utilities can collaborate to electrify building energy use. This would begin the transition away from the 500 million tons of carbon dioxide pollution that comes from burning fossil fuels inside U.S. homes and businesses each year. Targeting collaborative action by states, cities, utilities, and industry organizations in the Northeast and Midwest regions, where electrification retrofits are most cost-effective today, could deliver a 2025 impact of over 800 tera Btu of total savings (enough energy to power 25 million homes for a year) and a significant start in the transition away from fossil fuels.

#5: ACCELERATE ELECTRIC VEHICLE (EV) ADOPTION

States, cities, corporate fleet owners, utilities, vehicle manufacturers, transportation network companies, and other private-sector innovators have the power to substantially increase the rate of EV deployment, particularly when they work together. Collaborative action can lift uptake of EVs in the United States such that an estimated 8.4 million EVs will be on the road by 2025, more than doubling the 4 million EVs anticipated to be sold under current policies and conditions.

#6: PHASE DOWN SUPER-POLLUTING HYDROFLUOROCARBONS (HFCS)

Expanding the California Significant New Alternatives Policy (SNAP) program to include HFC aerosols, replicating this program in a broader subset of states that includes all 16 current members (and Puerto Rico) of the U.S. Climate Alliance, and broadening EPA's GreenChill program could reduce HFC emissions by an additional 5 percent beyond current policies by 2025.

#7: STOP METHANE LEAKS AT THE WELLHEAD

States, supported by industry and environmental groups, can put in place important regulations and/or permitting programs to manage methane emissions from oil and gas facilities. Setting standards and implementing innovative detection technologies in seven states considering new or updated actions to address methane emissions could reduce national emissions from this source as much as 23 percent below 2005 levels by 2025.

#8: REDUCE METHANE LEAKS IN CITIES

Cities, utilities, and commercial service providers can work with urban gas distribution utilities in key states to develop and implement plans to use advanced leak detection and data analytics to identify and abate the largest leaks from municipal natural gas distribution systems. Using innovative, data-driven approaches to identify and prioritize the repair of the top 20 percent of leaks in the eight states with the highest leakage, we estimate that coordinated action by states, cities, and businesses in a subset of U.S. states with leak-prone urban infrastructure could cut nationwide distribution system emissions by 30 percent by 2025.

#9: DEVELOP REGIONAL STRATEGIES FOR CARBON SEQUESTRATION ON NATURAL AND WORKING LANDS

States and businesses, nurtured with support from coalitions of philanthropies and NGOs, can spark regional initiatives for enhanced carbon sequestration on natural and working lands. Through collaborative action in U.S. Climate Alliance states and other states, real economy actors can reduce emissions by 60 Mt CO_2e by 2025.

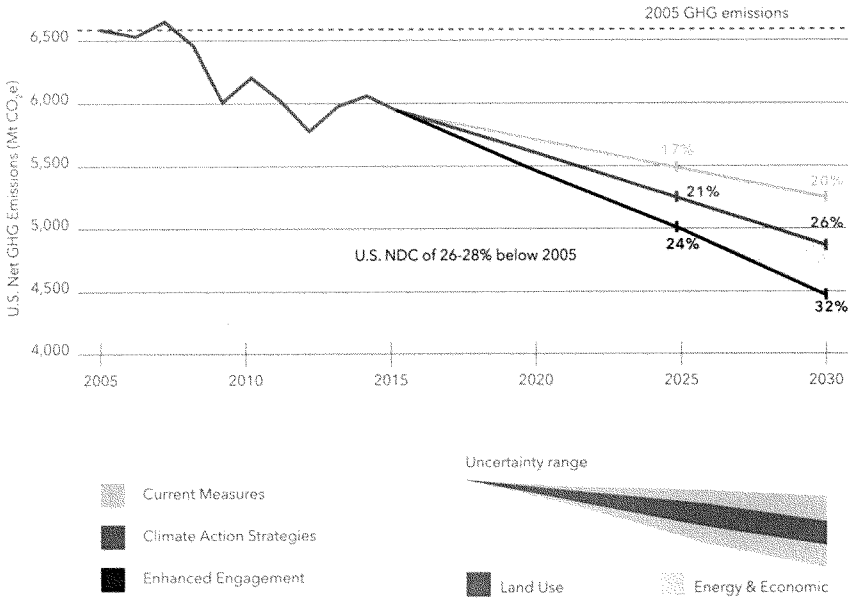
#10: FORM STATE COALITIONS FOR CARBON PRICING

Real economy actors can establish economy-wide limits on carbon pollution in geographically diverse states, using emissions targets consistent with the near- and long-term reductions necessary to achieve the goals of the Paris Agreement. Today eight states have mandatory economy-wide GHG targets, and another eight states and the District of Columbia have aspirational GHG targets (e.g., set by executive order). If these states put into place a limit on carbon pollution consistent with U.S. targets under the Paris Agreement and implement appropriate sector-specific programs and policies, the United States could reduce energy-related CO_2 emissions economy-wide by more than 350 Mt CO_2e by 2025. Note that many of the sector-specific emission reductions identified in the first nine strategies are vital components in the ability of these states to meet their economy-wide targets.

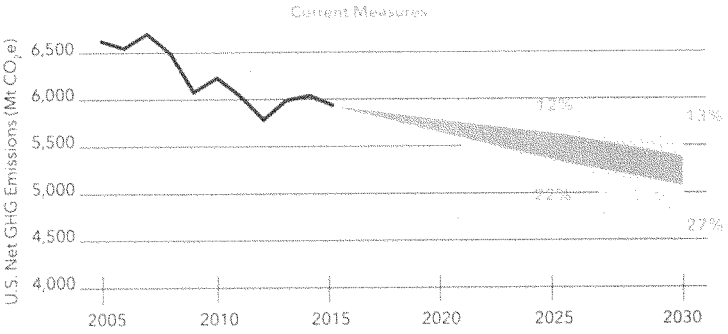
Pathways to America's Low-Carbon Future

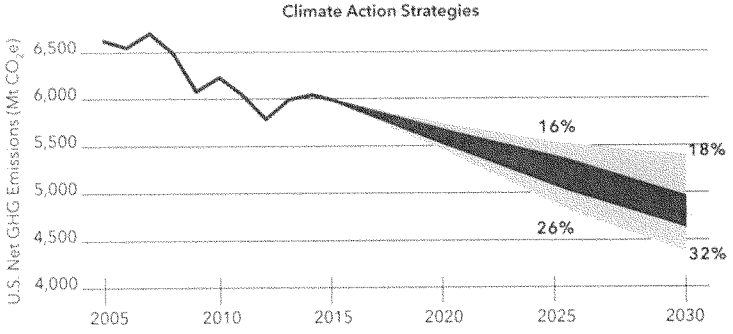
Figure ES-5 shows the modeled evolution of U.S. emissions between 2005 and 2030, illustrating both the potential of real economy impact by 2025, and the even more significant emissions reductions such action will trigger in the critical period between 2025 and 2030. This graph presents a central estimate as well as a range of potential outcomes flowing from uncertainty in key variables, specifically economic growth, energy prices , and land use changes.

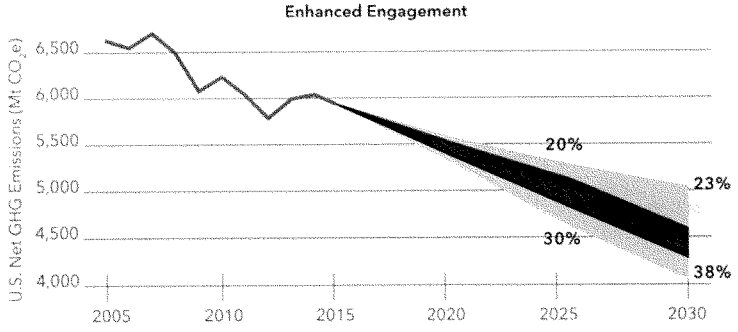
Figure ES-5: Progress Toward Near-and Long-term Climate Goals Varies Across the Three Scenarios (Mt CO_2e)



Source: America's Pledge modeling results


U.S. Net GHG Emissions (Mt CO_2e)
6,500
6,000
5,500
5,000
4,500
4,000
2005
2010
2015
2020
2025
2030
27%


Climate Action Strategies
U.S. Net GHG Emissions (Mt CO_2e)
6,500
6,000
5,500
5,000
4,500
4,000
2005
2010
2015
2020
2025
2030
16%
18%
26%
32%


Enhanced Engagement
U.S. Net GHG Emissions (Mt CO_2e)
6,500
6,000
5,500
5,000
4,500
4,000
2005
2010
2015
2020
2025
2030
20%
23%
30%
38%

This result is compatible with the emissions projections presented by the Obama Administration to the global community in its 2016 Biennial Report to the UNFCCC. Those projections demonstrate that the U.S. target for 2025 is a stretch goal, but is achievable with concerted effort. However, whereas the Obama Administration's 2025 projections assumed continued, and indeed enhanced, federal engagement in the period from 2017 through 2025, our analysis demonstrates that during the current hiatus in federal leadership, real economy actors are substantially maintaining, and can fully maintain, the momentum of the nation's decarbonization trajectory for 2025 and beyond.

The annual rate of decarbonization in the *Enhanced Engagement* scenario is 1.6 percent between 2016 and 2025, accelerating to 2.1 percent for 2025-30. This is substantially higher than the actual 1.1 percent rate for the period 2005-16. The post-2025 trajectory approaches the rate of decarbonization needed to hit 80 percent below 2005 levels by 2050 (2.3 percent).[2] The acceleration we model after 2025 is attributed to the fact that several sectors of the economy—transportation and buildings, for example—have long lead times for capital turnover. Policies put in place between now and 2025 will deliver the bulk of their emissions reduction benefits only after 2025, and will continue to have an effect after 2030 as buildings, fleets, industrial processes, and other infrastructure are modernized.

Fulfilling America's Pledge

This analysis demonstrates for the first time that despite federal policy inaction, the United States can get on track to approach its Paris Agreement pledge for 2025 through the concerted effort of real economy actors. Moreover, implementing such actions today can support accelerated reductions beyond 2025, driving even steeper overall U.S. emissions reductions between 2025 and 2030. Federal reengagement undertaken as rapidly as possible will be essential in sustaining and accelerating the needed breadth and depth of emissions reductions across all sectors of the U.S. economy, both to close any remaining gap in 2025 and for long-term decarbonization.

The insights contained in this report about bottom-up climate action potential in the United States may also hold important lessons for the broader international community as policymakers and leaders across society consider how to accelerate and deepen implementation of the Paris Agreement. While national governments and policies were in the spotlight during the run-up to the Paris Agreement in 2015, the focus of international negotiations has now shifted to a more detailed examination of what it will take to formulate and implement increasingly ambitious national climate goals. The case of the United States demonstrates that real economy actors can lead ambitious and sustained commitments to climate action from all levels of government and across the economy.

The results of this analysis are therefore a call to action for the global community as a whole. Achieving the goals of the Paris Agreement has always been recognized as demanding the full participation of and deep collaboration between national governments and their broader societies. This moment presents the opportunity to make that collaboration a reality.

Endnotes

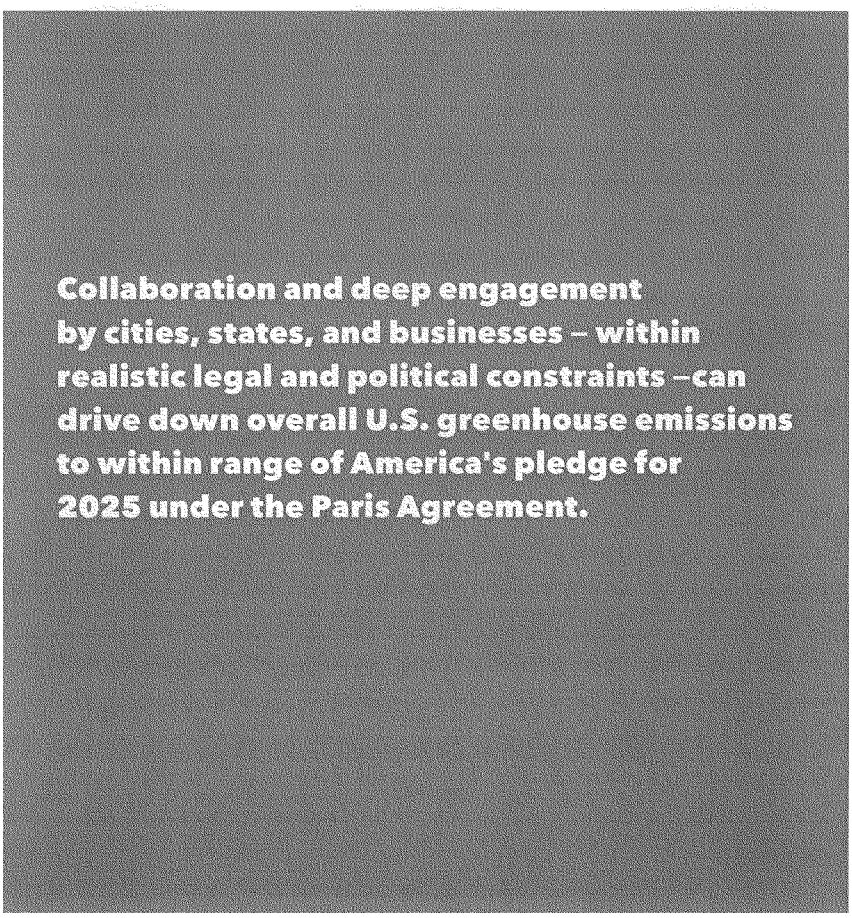
[1] United Nations, "United Nations Framework Convention on Climate Change," Article 2, 1992, https://unfccc.int/resource/docs/convkp/conveng.pdf.

[2] Federico Neiburg and Jane I. Guyer, "The real in the real economy," HAU: Journal of Ethnographic Theory 7, no. 3 (Winter 2017): 261-279. https://doi.org/10.14318/hau7.3.015.

[3] America's Pledge analysis. Simple rate of reduction based on U.S. emissions in 2016 compared to 2005 and an 80 percent reduction by 2050. Emissions data based on the U.S. Environmental Protection Agency, "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 19902016," April 2018, https://www.epa.gov/sites/production/files/2018-01/documents/2018_complete_report.pdf.

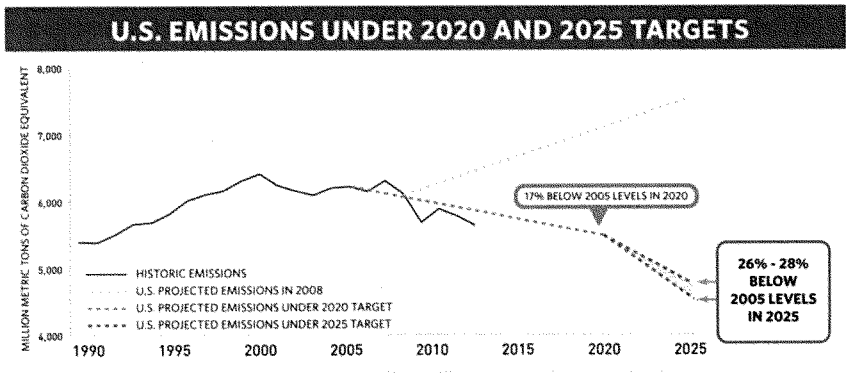
For the full report, see:
www.americaspledge.com

Bloomberg Philanthropies



The United States is pleased to communicate its intended nationally determined contribution, as well as information to facilitate the clarity, transparency, and understanding of the contribution.

The United States is strongly committed to reducing greenhouse gas pollution, thereby contributing to the objective of the Convention. In response to the request in Lima to communicate to the secretariat its intended nationally determined contribution towards achieving the objective of the Convention as set out in its Article 2—the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system—the United States intends to achieve an economy-wide target of reducing its greenhouse gas emissions by 26-28 per cent below its 2005 level in 2025 and to make best efforts to reduce its emissions by 28%.



The target is fair and ambitious. The United States has already undertaken substantial policy action to reduce its emissions, taking the necessary steps to place us on a path to achieve the 2020 target of reducing emissions in the range of 17 percent below the 2005 level in 2020. Additional action to achieve the 2025 target represents a substantial acceleration of the current pace of greenhouse gas emission reductions. Achieving the 2025 target will require a further emission reduction of 9-11% beyond our 2020 target compared to the 2005 baseline and a substantial acceleration of the 2005-2020 annual pace of reduction, to 2.3-2.8 percent per year, or an approximate doubling.

Substantial global emission reductions are needed to keep the global temperature rise below 2 degrees Celsius, and the 2025 target is consistent with a path to deep

decarbonization. This target is consistent with a straight line emission reduction pathway from 2020 to deep, economy-wide emission reductions of 80% or more by 2050. The target is part of a longer range, collective effort to transition to a low-carbon global economy as rapidly as possible.

The target reflects a planning process that examined opportunities under existing regulatory authorities to reduce emissions in 2025 of all greenhouse gases from all sources in every economic sector. A number of existing laws, regulations, and other domestically mandatory measures are relevant to the implementation of the target, which we detail in the information provided.

Party: United States of America

Intended nationally determined contribution
The United States intends to achieve an economy-wide target of reducing its greenhouse gas emissions by 26%-28% below its 2005 level in 2025 and to make best efforts to reduce its emissions by 28%.

****

Information provided in order to facilitate clarity, transparency, and understanding
Scope and coverage: *Gases:* The U.S. target covers all greenhouse gases included in the 2014 Inventory of United States Greenhouse Gas Emissions and Sinks: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3). *Sectors*: The U.S. target covers all IPCC sectors. *Percentage of total greenhouse gas emissions:* The United States intends to account for 100 percent of U.S. greenhouse gas emissions and removals for the base year 2005 as published in the Inventory of United States Greenhouse Gas Emissions and Sinks, on a net-net basis.
Quantifiable information on the reference point, time frames, assumptions and methodological approaches including those for estimating and accounting for anthropogenic greenhouse gas emissions and removals: *Timeframe and reference point:* The U.S. target is for a single year: 2025. The base year against which the target is measured is 2005.

Accounting approach for land sector:

The United States intends to include all categories of emissions by sources and removals by sinks, and all pools and gases, as reported in the Inventory of United States Greenhouse Gas Emissions and Sinks; to account for the land sector using a net-net approach; and to use a "production approach" to account for harvested wood products consistent with IPCC guidance. The United States may also exclude emissions from natural disturbances, consistent with available IPCC guidance.

There are material data collection and methodological challenges to estimating emissions and removals in the land sector. Consistent with IPCC Good Practice, the United States has continued to improve its land sector greenhouse gas reporting, which involves updating its methodologies. The base year and target for the U.S. INDC were established on the basis of the methodologies used for the land sector in the 2014 Inventory of United States Greenhouse Gas Emissions and Sinks and the United States 2014 Biennial Report.

Metric:

The United States intends to use 100-year global warming potential (GWP) values to calculate CO_2 equivalent totals. The United States intends to report emissions totals using Fourth Assessment Report values, and will consider future updates to GWP values from the IPCC.

Use of markets:

At this time, the United States does not intend to utilize international market mechanisms to implement its 2025 target.

Domestic laws, regulations, and measures relevant to implementation:

Several U.S. laws, as well as existing and proposed regulations thereunder, are relevant to the implementation of the U.S. target, including the Clean Air Act (42 U.S.C. §7401 et seq.), the Energy Policy Act (42 U.S.C. §13201 et seq.), and the Energy Independence and Security Act (42 U.S.C. § 17001 et seq.).

Since 2009, the United States has completed the following regulatory actions:

- Under the Clean Air Act, the United States Department of Transportation and the United States Environmental Protection Agency adopted fuel economy standards for light-duty vehicles for model years 2012-2025 and for heavy-duty vehicles for model years 2014-2018.
- Under the Energy Policy Act and the Energy Independence and Security Act, the United States Department of Energy has finalized multiple measures addressing buildings sector emissions including energy conservation standards for 29 categories

of appliances and equipment as well as a building code determination for commercial buildings.

- Under the Clean Air Act, the United States Environmental Protection Agency has approved the use of specific alternatives to high-GWP HFCs in certain applications through the Significant New Alternatives Policy program.

At this time:

- Under the Clean Air Act, the United States Environmental Protection Agency is moving to finalize by summer 2015 regulations to cut carbon pollution from new and existing power plants.
- Under the Clean Air Act, the United States Department of Transportation and the United States Environmental Protection Agency are moving to promulgate post-2018 fuel economy standards for heavy-duty vehicles.
- Under the Clean Air Act, the United States Environmental Protection Agency is developing standards to address methane emissions from landfills and the oil and gas sector.
- Under the Clean Air Act, the United States Environmental Protection Agency is moving to reduce the use and emissions of high-GWP HFCs through the Significant New Alternatives Policy program.
- Under the Energy Policy Act and the Energy Independence and Security Act, the United States Department of Energy is continuing to reduce buildings sector emissions including by promulgating energy conservation standards for a broad range of appliances and equipment, as well as a building code determination for residential buildings.

In addition, since 2008 the United States has reduced greenhouse gas emissions from Federal Government operations by 17 percent and, under Executive Order 13693 issued on March 25th 2015, has set a new target to reduce these emissions 40 percent below 2005 levels by 2025.

Relationship with inventory:

This approach, and the definitions and metrics used, are fully consistent with our greenhouse gas inventory. The United States intends to continue to improve its greenhouse gas inventory over time, and may incorporate these improvements into its intended nationally determined contribution accordingly. Additional information on the greenhouse gas inventory, including calculations, models, data sources, and references can be found here:

www.epa.gov/climatechange/ghgemissions/usinventoryreport.html#about

CHAMBER OF COMMERCE
OF THE
UNITED STATES OF AMERICA

February 27, 2019

The Honorable Frank Pallone
Chairman
Committee on Energy and Commerce
U.S. House of Representatives

The Honorable Greg Walden
Ranking Member
Committee on Energy and Commerce
U.S. House of Representatives

The Honorable Paul Tonko
Chairman
Subcommittee on Environment
and Climate Change
U.S. House of Representatives

The Honorable John Shimkus
Ranking Member
Subcommittee on Environment
and Climate Change
U.S. House of Representatives

Dear Chairman Pallone, Ranking Member Walden, Chairman Tonko, and Ranking Member Shimkus:

We welcome this opportunity to submit this correspondence for the record of the hearing entitled, "We'll Always Have Paris: Filling the Leadership Void Caused by Federal Inaction on Climate Change."

The Chamber takes a great deal of interest in the work of the UN Framework Convention on Climate Change (UNFCCC) and is an official UNFCCC observer. We make several points.

- Global climate change is among the most complex challenges facing governments and the businesses community. The Chamber recognizes that the climate is changing, that humans are contributing to these changes, and that these changes pose risks. The question for businesses and policymakers is how to best manage these risks while still maintaining U.S. global economic leadership.

- Technology and innovation offer common ground for climate solutions. Addressing climate change is primarily a technology challenge. A realistic and resilient climate policy should focus on creating technological solutions that can thrive in global commercial markets. The United States, therefore, should build on its leadership role in advanced, game-changing technologies. The business community will continue to serve as the key driver and incubator for innovation and technology advancement. It is also important to support a vibrant scientific enterprise more broadly.

- 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 non-binding mitigation commitments and to provide financing and technology assistance.

- The binding aspects of the Paris Agreement imply implementing legislation and regulation potentially affect 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 have been undertaken with the input of Congress.

- It is important to distinguish between the Paris Agreement, and the separate U.S. government pledge that accompanied it. The Obama Administration's pledge of a 26% to 28% reduction in total net greenhouse gas (GHG) emissions from the 2005 level by 2025 was completely and the Obama Administration lacked a specific plan to achieve it. This and any future pledges should be developed through consultation with and approval of 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 many other countries pursue "business as usual."

- 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.

Introduction and Background

The Chamber has for years supported international cooperation to address climate change, and there are many aspects of the Paris Agreement that are improvements over previous efforts such as the Kyoto Protocol, particularly its bottom-up vs. top-down approach.[1] The Chamber has, however, expressed reservations about the process by which the Obama Administration committed the United States to the Paris Agreement without Congressional or stakeholder participation or input.

The UNFCCC[2] 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 top climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner."

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[1] See for example: Testimony of Karen A. Harbert U.S. House of Representatives Select Committee on Energy Independence and Global Warming. February 9, 2009. Available at: https://www.globalenergyinstitute.org/testimony-karen-harbert-international-climate-negotiations-house-select-committee.

[2] UN. 1992. "United Nations Framework Convention on Climate Change." Available at: http://unfccc.int/files/essential_background/background_publications_htmlpdf/application/pdf/conveng.pdf.

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.[3]

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 between and among developed, emerging, and developing country Parties. Developing countries assert that since 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.

The principle of common but differentiated responsibilities is on full display in the 1997 Kyoto Protocol,[4] 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 Roadmap[5] 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

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

[4] UNFCCC. 1998. "Kyoto Protocol to the United Nations Framework Convention on Climate Change." Available at: http://unfccc.int/resource/docs/convkp/kpeng.pdf.

[5] 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.

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,[6] 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 way. Instead of agreeing to the Accord, the COP decided to simply "take note" of it.

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.[7]

The Durban Platform for Enhanced Action,[8] 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 nearly 200 countries met at COP-21 in Paris and concluded a new post-2020 climate change deal.[9] 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.

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[6] 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.

[7] 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.

[8] 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.

[9] 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.

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. The recently concluded meeting at COP-24 in Poland completed the "rulebook" that will guide implementation of the Paris Agreement.

A Technology Challenge

The Chamber believes there is much common ground on which all sides of this discussion could meet to craft a practical, flexible, and durable approach to address the challenges presented by climate change.

At its most fundamental level, reducing carbon dioxide emissions from energy is a technology challenge that, as a 2002 article in *Science* famously noted, "cannot be simply regulated away."[10] Neither can it be negotiated away.

Indeed, technology and innovation offer the best solution for managing climate risks and reducing emissions across the United States and the globe. We believe that instead of regulating our way to lower emissions, a realistic, effective, and lasting climate policy should focus on creating innovative technological solutions that can thrive in commercial markets.

The United States should build on its leadership role in advanced, game-changing technologies, such as advanced nuclear, energy storage, and carbon capture and storage/utilization, by supporting a broad-based public and private sector technology portfolio. It is also important to support a vibrant scientific enterprise more broadly. The Chamber will continue to be active in calling for sounds policies and greater resources to accelerate these advancements as much as possible.

The business community will continue to serve as the key incubator for innovation and technology advancement. As new technologies are able to compete on price, reliability, and scalability, the range of politically acceptable and durable policy options will broaden.

Does the Paris Agreement Satisfy the Durban Platform's Call for an Outcome with Legal Force?

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

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[10] M.I. Hoffert *et al.* 2002. "Advanced Technology Paths to Global Climate Stability: Energy for a Greenhouse Planet," *Science* 298. Available at: http://www.sciencemag.org/cgi/content/abstract/298/5595/981?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&fulltext=existing+technologies+can+contribute&searchid=1&FIRSTINDEX=0&resourcetype=HWCIT.

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:

> *Developed country Parties ~~shall~~ should continue taking the lead by undertaking economy-wide absolute emission reduction targets.*[11]

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 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].

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*

[11] The use of the world "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.

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*,[12] 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 obligation to make future commitments that, while not legally binding internationally, would necessarily entail many elements that would be legally binding domestically. Implementing those parts of the agreement obligating Parties to ratchet up of mitigation ambition would certainly involve enacting implementing legislation.

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 Paris Agreement's Article 20 entry-into-force language certainly contemplates "ratification" or its equivalent. In fact, all but a handful of countries Party to the agreement went through a ratification process. The Obama Administration, however, opted for "acceptance," an option chosen by just five other countries. We noted in previous testimony to the House Committee on Science, Space, & Technology that without political backing from the Congress and stakeholders, the Agreement could not result in a politically durable climate policy.

The "acceptance" rather than the ratification of the Paris Agreement also raises issues about how it could be used by future administrations. For example, some legal analysts[13] have argued that the Paris Agreement could be used as a rationale for the Environmental Protection Agency to impose economy-wide GHHG regulations under section 115 of the Clean Air Act,

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

[13] For example, "The success of the recent climate negotiations in Paris provides a strong basis for invoking a powerful tool available to help achieve the country's climate change goals: Section 115 of the Clean Air Act, titled 'International Air Pollution.'" See: Michael Burger (Lead Author). 2016. *Legal Pathways to Reducing Greenhouse Gas Emissions under Section 115 of the Clean Air Act*. Available at: http://wordpress.ei.columbia.edu/climate-change-law/files/2016/06/Burger-et-al.-2016-01-Executive-Summary-Section-115-CAA.pdf.

which covers international air pollution. EPA can employ section 115 if the administrator determines that a foreign country "has given the United States essentially the same rights with respect to the prevention or control of air pollution occurring in that country by this section [*i.e.*, section 115]." Congress must consider whether an agreement that has not been ratified by the Senate and an emissions pledge that has not be endorsed by the Congress constitutes sufficient legal justification for the assertion of broad regulatory authorities by administrative agencies, or is authorizing legislation necessary?

Uneven Paris Pledges Pose Competitiveness Concerns

The pledges under the Paris Agreement are none-binding. How those pledges—many of which are conditioned on financial support or technology transfer or both—are implemented by the Parties will be important part of the "stocktaking" review exercises envisaged by the Agreement.

To date, all but a few countries have submitted NDCs, but their quality, level of ambition, and completeness varies widely.[14] The Obama Administration's U.S. Paris pledge of a 26% to 28% reduction in net GHG emissions from the 2005 level by 2025 was completely unrealistic (as we have shown[15]), and the administration had no plan to achieve it. While the NDCs are separate and distinct from the Paris Agreement, the Obama Administration would have been better served by reaching out to Congress.

To reduce GHG emissions appreciably, developing countries would have to take on meaningful commitments because they will be the source of future emissions growth. The International Energy Agency's (IEA) most recent "current policies" forecast for energy-related carbon dioxide emissions, for example, suggests developing countries will account for more than 100% of global increase—*i.e.*, 10 gigatons of the 9 gigaton global increase—in those emissions between 2017 and 2040 (excluding international bunkers).[16]

Nevertheless, the differentiation between developed and developing countries remains evident in the NDCs, 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). The very large differences in the level of ambition are reflected in the very large differences in potential economic impacts.

An analysis of many NDCs 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

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[14] All of the NDCs cited in this testimony are available at the UNFCCC website here: http://www4.unfccc.int/submissions/NDC/Submission%20Pages/submissions.aspx.

[15] See: S. Eule. 2015. Mind the Gap: The Obama Administration's International Climate Pledge Doesn't Add Up. Available at: https://www.globalenergyinstitute.org/mind-gap-obama-administrations-international-climate-pledge-doesnt-add.

[16] IEA. 2018. *World Energy Outlook 2018*. Available at: http://www.worldenergyoutlook.org/.

usual.[17] Figure 1 shows that under their respective NDCs, the marginal abatement cost for a ton of carbon dioxide, using a least cost approach, would be $0 to $4 in China, India, Ukraine, Turkey, South Africa, and Russia—essentially business as usual—while the cost to meet the Obama Administration's pledge would have been an estimated $85 per ton in 2025 and for Japan a whopping $378 per ton in 2030.

Although the Paris Agreement was supposed to shrink to the developed-developing country divide, that divide still exists and will exist for some time.

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

- China—the world's #1 GHG emitter —pledged to: (1) peak its carbon dioxide emissions at (an unidentified level) "around" 2030; (2) reduce its carbon dioxide emissions intensity (emissions per unit of GDP) 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. Data from the Putting China's 2005 to 2030 emissions intensity pledge in perspective, International Energy Agency (IEA) data[18] show that from 1980 to 2005, the previous 25-year period, China reduced its emissions intensity about 62%, a rate within the range it's proposing for 2005 to 2030. In other words, business as usual.

- 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 jump of at least 65% by 2030. Importantly, India's NDC is conditional on financial and technology assistance that it estimates could run to $2.5 trillion out to 2050. (In the meantime, India announced shortly after Paris that it intends to double domestic coal output over the next five years to fuel economic expansion.

- 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 2015, the country's net GHG emissions were 48% below their 1990 level. This means Russia actually is proposing to *increase* its emissions in 2030 from 700 million to 900 million TCO2 eq. compared to the 2015 level.

Widely different ambitions among the pledges pose significant implications for competitiveness, investment, supply and value chains, and operations and could lead to carbon-leakage in countries with large trade-exposed industries, something governments and businesses will have to navigate.

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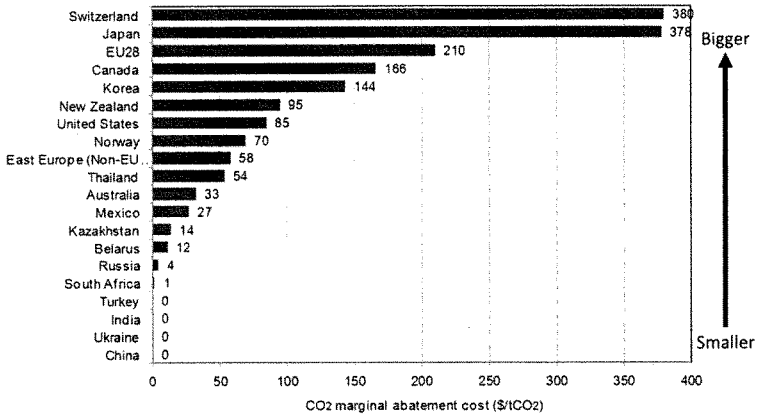
[17] K. Akimoto. 2015 "Measuring Emission Reduction Efforts of the NDCs and the Expected Global Emission Reductions and Economic Impacts." Presentation available at: http://www.majoreconomiesbusinessforum.org/pdfs/KeigoAkimoto_RITE.pdf.

[18] IEA. 2018. *CO2 Emissions From Fuel Combustion Highlights 2018*. Data available at: https://webstore.iea.org/Content/Images/uploaded/CO2%20Highlights%202018.xls.

Figure 1. International Comparison of CO_2 Marginal Abatement Costs (RITE DNE21+ Model)



Source: Kiego Akimoto. 2015. "Measuring Emission Reduction Efforts of the INDCs and the Expected Global Emission Reductions and Economic Impacts." Research Institute of Innovative Technology for the Earth .

In closing, because business and industry will provide most of the investments, technology, and innovation needed to reduce global emissions, the voice of business is critically important as the Parties work to implement the Paris Agreement. America's business community is ready, willing, and able to provide the solutions that will continue to reduce emissions while growing the economy. Our companies and entrepreneurs will continue to lead by bringing innovation, technology, and ingenuity to this challenge, just as they have done with other environmental challenges. With a sensible policy environment that plays to America's strengths and business leadership, we can continue to make our economy cleaner and stronger by leveraging the America's edge in energy, technology, and innovation going forward.

Thank you for considering our perspective. We welcome the opportunity to serve as a resource to the subcommittee, the full committee, and the U.S. House of Representatives as you and your colleagues continue examining this important issue.

Sincerely,

[redacted]

Stephen Eule
Vice President for Climate & Technology,
Global Energy Institute
U.S. Chamber of Commerce

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PARIS AGREEMENT

UNITED NATIONS
2015

PARIS AGREEMENT

The Parties to this Agreement,

Being Parties to the United Nations Framework Convention on Climate Change, hereinafter referred to as "the Convention",

Pursuant to the Durban Platform for Enhanced Action established by decision 1/CP.17 of the Conference of the Parties to the Convention at its seventeenth session,

In pursuit of the objective of the Convention, and being guided by its principles, including the principle of equity and common but differentiated responsibilities and respective capabilities, in the light of different national circumstances,

Recognizing the need for an effective and progressive response to the urgent threat of climate change on the basis of the best available scientific knowledge,

Also recognizing the specific needs and special circumstances of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change, as provided for in the Convention,

Taking full account of the specific needs and special situations of the least developed countries with regard to funding and transfer of technology,

Recognizing that Parties may be affected not only by climate change, but also by the impacts of the measures taken in response to it,

Emphasizing the intrinsic relationship that climate change actions, responses and impacts have with equitable access to sustainable development and eradication of poverty,

Recognizing the fundamental priority of safeguarding food security and ending hunger, and the particular vulnerabilities of food production systems to the adverse impacts of climate change,

Taking into account the imperatives of a just transition of the workforce and the creation of decent work and quality jobs in accordance with nationally defined development priorities,

Acknowledging that climate change is a common concern of humankind, Parties should, when taking action to address climate change, respect, promote and consider their respective obligations on human rights, the right to health, the rights of indigenous peoples, local communities, migrants, children, persons with disabilities and people in vulnerable situations and the right to development, as well as gender equality, empowerment of women and intergenerational equity,

Recognizing the importance of the conservation and enhancement, as appropriate, of sinks and reservoirs of the greenhouse gases referred to in the Convention,

Noting the importance of ensuring the integrity of all ecosystems, including oceans, and the protection of biodiversity, recognized by some cultures as Mother Earth, and noting the importance for some of the concept of "climate justice", when taking action to address climate change,

Affirming the importance of education, training, public awareness, public participation, public access to information and cooperation at all levels on the matters addressed in this Agreement,

Recognizing the importance of the engagements of all levels of government and various actors, in accordance with respective national legislations of Parties, in addressing climate change,

Also recognizing that sustainable lifestyles and sustainable patterns of consumption and production, with developed country Parties taking the lead, play an important role in addressing climate change,

Have agreed as follows:

Article 1

For the purpose of this Agreement, the definitions contained in Article 1 of the Convention shall apply. In addition:

(a) "Convention" means the United Nations Framework Convention on Climate Change, adopted in New York on 9 May 1992;

(b) "Conference of the Parties" means the Conference of the Parties to the Convention;

(c) "Party" means a Party to this Agreement.

Article 2

1. This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:

(a) Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;

(b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production; and

(c) Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.

2. This Agreement will be implemented to reflect equity and the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.

Article 3

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.

Article 4

1. In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties, and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty.

2. 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.

3. 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.

4. Developed country Parties should continue taking the lead by undertaking economy-wide absolute emission reduction targets. Developing country Parties should continue enhancing their mitigation efforts, and are encouraged to move over time towards economy-wide emission reduction or limitation targets in the light of different national circumstances.

5. Support shall be provided to developing country Parties for the implementation of this Article, in accordance with Articles 9, 10 and 11, recognizing that enhanced support for developing country Parties will allow for higher ambition in their actions.

6. The least developed countries and small island developing States may prepare and communicate strategies, plans and actions for low greenhouse gas emissions development reflecting their special circumstances.

7. Mitigation co-benefits resulting from Parties' adaptation actions and/or economic diversification plans can contribute to mitigation outcomes under this Article.

8. In communicating their nationally determined contributions, all Parties shall provide the information necessary for clarity, transparency and understanding 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 this Agreement.

9. 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 this Agreement and be informed by the outcomes of the global stocktake referred to in Article 14.

10. The Conference of the Parties serving as the meeting of the Parties to this Agreement shall consider common time frames for nationally determined contributions at its first session.

11. A Party may at any time adjust its existing nationally determined contribution with a view to enhancing its level of ambition, in accordance with guidance adopted by the Conference of the Parties serving as the meeting of the Parties to this Agreement.

12. Nationally determined contributions communicated by Parties shall be recorded in a public registry maintained by the secretariat.

13. Parties shall account for their nationally determined contributions. In accounting for anthropogenic emissions and removals corresponding to their nationally determined contributions, Parties shall promote environmental integrity, transparency, accuracy, completeness, comparability and consistency, and ensure the avoidance of double counting, in accordance with guidance adopted by the Conference of the Parties serving as the meeting of the Parties to this Agreement.

14. In the context of their nationally determined contributions, when recognizing and implementing mitigation actions with respect to anthropogenic emissions and removals, Parties should take into account, as appropriate, existing methods and guidance under the Convention, in the light of the provisions of paragraph 13 of this Article.

15. Parties shall take into consideration in the implementation of this Agreement the concerns of Parties with economies most affected by the impacts of response measures, particularly developing country Parties.

16. Parties, including regional economic integration organizations and their member States, that have reached an agreement to act jointly under paragraph 2 of this Article shall notify the secretariat of the terms of that agreement, including the emission level allocated to each Party within the relevant time period, when they communicate their nationally determined contributions. The secretariat shall in turn inform the Parties and signatories to the Convention of the terms of that agreement.

17. Each party to such an agreement shall be responsible for its emission level as set out in the agreement referred to in paragraph 16 of this Article in accordance with paragraphs 13 and 14 of this Article and Articles 13 and 15.

18. If Parties acting jointly do so in the framework of, and together with, a regional economic integration organization which is itself a Party to this Agreement, each member State of that regional economic integration organization individually, and together with the regional economic integration organization, shall be responsible for its emission level as set out in the agreement communicated under paragraph 16 of this Article in accordance with paragraphs 13 and 14 of this Article and Articles 13 and 15.

19. All Parties should strive to formulate and communicate long-term low greenhouse gas emission development strategies, mindful of Article 2 taking into account their common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.

Article 5

1. Parties should take action to conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases as referred to in Article 4, paragraph 1 (d), of the Convention, including forests.

2. Parties are encouraged to take action to implement and support, including through results-based payments, the existing framework as set out in related guidance and decisions already agreed under the Convention for: policy approaches and positive incentives for activities relating to reducing emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries; and alternative policy approaches, such as joint mitigation and adaptation approaches for the integral and sustainable management of forests, while reaffirming the importance of incentivizing, as appropriate, non-carbon benefits associated with such approaches.

Article 6

1. Parties recognize that some Parties choose to pursue voluntary cooperation in the implementation of their nationally determined contributions to allow for higher ambition in their mitigation and adaptation actions and to promote sustainable development and environmental integrity.

2. Parties shall, where engaging on a voluntary basis in cooperative approaches that involve the use of internationally transferred mitigation outcomes towards nationally determined contributions, promote sustainable development and ensure environmental integrity and transparency, including in governance, and shall apply robust accounting to ensure, inter alia, the avoidance of double counting, consistent with guidance adopted by the Conference of the Parties serving as the meeting of the Parties to this Agreement.

3. The use of internationally transferred mitigation outcomes to achieve nationally determined contributions under this Agreement shall be voluntary and authorized by participating Parties.

4. A mechanism to contribute to the mitigation of greenhouse gas emissions and support sustainable development is hereby established under the authority and guidance of the Conference of the Parties serving as the meeting of the Parties to this Agreement for use by Parties on a voluntary basis. It shall be supervised by a body designated by the Conference of the Parties serving as the meeting of the Parties to this Agreement, and shall aim:

(a) To promote the mitigation of greenhouse gas emissions while fostering sustainable development;

(b) To incentivize and facilitate participation in the mitigation of greenhouse gas emissions by public and private entities authorized by a Party;

(c) To contribute to the reduction of emission levels in the host Party, which will benefit from mitigation activities resulting in emission reductions that can also be used by another Party to fulfil its nationally determined contribution; and

(d) To deliver an overall mitigation in global emissions.

5. Emission reductions resulting from the mechanism referred to in paragraph 4 of this Article shall not be used to demonstrate achievement of the host Party's nationally determined contribution if used by another Party to demonstrate achievement of its nationally determined contribution.

6. The Conference of the Parties serving as the meeting of the Parties to this Agreement shall ensure that a share of the proceeds from activities under the mechanism referred to in paragraph 4 of this Article is used to cover administrative expenses as well as to assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation.

7. The Conference of the Parties serving as the meeting of the Parties to this Agreement shall adopt rules, modalities and procedures for the mechanism referred to in paragraph 4 of this Article at its first session.

8. Parties recognize the importance of integrated, holistic and balanced non-market approaches being available to Parties to assist in the implementation of their nationally determined contributions, in the context of sustainable development and poverty eradication, in a coordinated and effective manner, including through, inter alia, mitigation, adaptation, finance, technology transfer and capacity-building, as appropriate. These approaches shall aim to:

(a) Promote mitigation and adaptation ambition;

(b) Enhance public and private sector participation in the implementation of nationally determined contributions; and

(c) Enable opportunities for coordination across instruments and relevant institutional arrangements.

9. A framework for non-market approaches to sustainable development is hereby defined to promote the non-market approaches referred to in paragraph 8 of this Article.

Article 7

1. Parties hereby establish the global goal on adaptation 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 referred to in Article 2.

2. Parties recognize that adaptation is a global challenge faced by all with local, subnational, national, regional and international dimensions, and that it is a key component of and makes a contribution to the long-term global response to climate change to protect people, livelihoods and ecosystems, taking into account the urgent and immediate needs of those developing country Parties that are particularly vulnerable to the adverse effects of climate change.

3. The adaptation efforts of developing country Parties shall be recognized, in accordance with the modalities to be adopted by the Conference of the Parties serving as the meeting of the Parties to this Agreement at its first session.

4. Parties recognize that the current need for adaptation is significant and that greater levels of mitigation can reduce the need for additional adaptation efforts, and that greater adaptation needs can involve greater adaptation costs.

5. Parties acknowledge that adaptation action should follow a country-driven, gender-responsive, participatory and fully transparent approach, taking into consideration vulnerable groups, communities and ecosystems, and should be based on and guided by the best available science and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems, with a view to integrating adaptation into relevant socioeconomic and environmental policies and actions, where appropriate.

6. Parties recognize the importance of support for and international cooperation on adaptation efforts and the importance of taking into account the needs of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change.

7. Parties should strengthen their cooperation on enhancing action on adaptation, taking into account the Cancun Adaptation Framework, including with regard to:

(a) Sharing information, good practices, experiences and lessons learned, including, as appropriate, as these relate to science, planning, policies and implementation in relation to adaptation actions;

(b) Strengthening institutional arrangements, including those under the Convention that serve this Agreement, to support the synthesis of relevant information and knowledge, and the provision of technical support and guidance to Parties;

(c) Strengthening scientific knowledge on climate, including research, systematic observation of the climate system and early warning systems, in a manner that informs climate services and supports decision-making;

(d) Assisting developing country Parties in identifying effective adaptation practices, adaptation needs, priorities, support provided and received for adaptation actions and efforts, and challenges and gaps, in a manner consistent with encouraging good practices; and

(e) Improving the effectiveness and durability of adaptation actions.

8. United Nations specialized organizations and agencies are encouraged to support the efforts of Parties to implement the actions referred to in paragraph 7 of this Article, taking into account the provisions of paragraph 5 of this Article.

9. Each Party shall, as appropriate, engage in adaptation planning processes and the implementation of actions, including the development or enhancement of relevant plans, policies and/or contributions, which may include:

(a) The implementation of adaptation actions, undertakings and/or efforts;

(b) The process to formulate and implement national adaptation plans;

(c) The assessment of climate change impacts and vulnerability, with a view to formulating nationally determined prioritized actions, taking into account vulnerable people, places and ecosystems;

(d) Monitoring and evaluating and learning from adaptation plans, policies, programmes and actions; and

(e) Building the resilience of socioeconomic and ecological systems, including through economic diversification and sustainable management of natural resources.

10. Each Party should, as appropriate, submit and update periodically an adaptation communication, which may include its priorities, implementation and support needs, plans and actions, without creating any additional burden for developing country Parties.

11. The adaptation communication referred to in paragraph 10 of this Article shall be, as appropriate, submitted and updated periodically, as a component of or in conjunction with other communications or documents, including a national adaptation plan, a nationally determined contribution as referred to in Article 4, paragraph 2, and/or a national communication.

12. The adaptation communications referred to in paragraph 10 of this Article shall be recorded in a public registry maintained by the secretariat.

13. Continuous and enhanced international support shall be provided to developing country Parties for the implementation of paragraphs 7, 9, 10 and 11 of this Article, in accordance with the provisions of Articles 9, 10 and 11.

14. The global stocktake referred to in Article 14 shall, inter alia:

(a) Recognize adaptation efforts of developing country Parties;

(b) Enhance the implementation of adaptation action taking into account the adaptation communication referred to in paragraph 10 of this Article;

(c) Review the adequacy and effectiveness of adaptation and support provided for adaptation; and

(d) Review the overall progress made in achieving the global goal on adaptation referred to in paragraph 1 of this Article.

Article 8

1. Parties recognize the importance of averting, minimizing and addressing loss and damage associated with the adverse effects of climate change, including extreme weather events and slow onset events, and the role of sustainable development in reducing the risk of loss and damage.

2. The Warsaw International Mechanism for Loss and Damage associated with Climate Change Impacts shall be subject to the authority and guidance of the Conference of the Parties serving as the meeting of the Parties to this Agreement and may be enhanced and strengthened, as determined by the Conference of the Parties serving as the meeting of the Parties to this Agreement.

3. Parties should enhance understanding, action and support, including through the Warsaw International Mechanism, as appropriate, on a cooperative and facilitative basis with respect to loss and damage associated with the adverse effects of climate change.

4. Accordingly, areas of cooperation and facilitation to enhance understanding, action and support may include:

(a) Early warning systems;

(b) Emergency preparedness;

(c) Slow onset events;

(d) Events that may involve irreversible and permanent loss and damage;

(e) Comprehensive risk assessment and management;

(f) Risk insurance facilities, climate risk pooling and other insurance solutions;

(g) Non-economic losses; and

(h) Resilience of communities, livelihoods and ecosystems.

5. The Warsaw International Mechanism shall collaborate with existing bodies and expert groups under the Agreement, as well as relevant organizations and expert bodies outside the Agreement.

Article 9

1. 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.

2. Other Parties are encouraged to provide or continue to provide such support voluntarily.

3. As part of a global effort, 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, including supporting country-driven strategies, and taking into account the needs and priorities of developing country Parties. Such mobilization of climate finance should represent a progression beyond previous efforts.

4. The provision of scaled-up financial resources should aim to achieve a balance between adaptation and mitigation, taking into account country-driven strategies, and the priorities and needs of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change and have significant capacity constraints, such as the least developed countries and small island developing States, considering the need for public and grant-based resources for adaptation.

5. Developed country Parties shall biennially communicate indicative quantitative and qualitative information related to paragraphs 1 and 3 of this Article, as applicable, including, as available, projected levels of public financial resources to be provided to developing country Parties. Other Parties providing resources are encouraged to communicate biennially such information on a voluntary basis.

6. The global stocktake referred to in Article 14 shall take into account the relevant information provided by developed country Parties and/or Agreement bodies on efforts related to climate finance.

7. Developed country Parties shall provide transparent and consistent information on support for developing country Parties provided and mobilized through public interventions biennially in accordance with the modalities, procedures and guidelines to be adopted by the Conference of the Parties serving as the meeting of the Parties to this Agreement, at its first session, as stipulated in Article 13, paragraph 13. Other Parties are encouraged to do so.

8. The Financial Mechanism of the Convention, including its operating entities, shall serve as the financial mechanism of this Agreement.

9. The institutions serving this Agreement, including the operating entities of the Financial Mechanism of the Convention, shall aim to ensure efficient access to financial resources through simplified approval procedures and enhanced readiness support for developing country Parties, in particular for the least developed countries and small island developing States, in the context of their national climate strategies and plans.

Article 10

1. Parties share a long-term vision on the importance of fully realizing technology development and transfer in order to improve resilience to climate change and to reduce greenhouse gas emissions.

2. Parties, noting the importance of technology for the implementation of mitigation and adaptation actions under this Agreement and recognizing existing technology deployment and dissemination efforts, shall strengthen cooperative action on technology development and transfer.

3. The Technology Mechanism established under the Convention shall serve this Agreement.

4. A technology framework is hereby established to provide overarching guidance to the work of the Technology Mechanism in promoting and facilitating enhanced action on technology development and transfer in order to support the implementation of this Agreement, in pursuit of the long-term vision referred to in paragraph 1 of this Article.

5. Accelerating, encouraging and enabling innovation is critical for an effective, long-term global response to climate change and promoting economic growth and sustainable development. Such effort shall be, as appropriate, supported, including by the Technology Mechanism and, through financial means, by the Financial Mechanism of the Convention, for collaborative approaches to research and development, and facilitating access to technology, in particular for early stages of the technology cycle, to developing country Parties.

6. Support, including financial support, shall be provided to developing country Parties for the implementation of this Article, including for strengthening cooperative action on technology development and transfer at different stages of the technology cycle, with a view to achieving a balance between support for mitigation and adaptation. The global stocktake referred to in Article 14 shall take into account available information on efforts related to support on technology development and transfer for developing country Parties.

Article 11

1. Capacity-building under this Agreement should enhance the capacity and ability of developing country Parties, in particular countries with the least capacity, such as the least developed countries, and those that are particularly vulnerable to the adverse effects of climate change, such as small island developing States, to take effective climate change action, including, inter alia, to implement adaptation and mitigation actions, and should facilitate technology development, dissemination and deployment, access to climate finance, relevant aspects of education, training and public awareness, and the transparent, timely and accurate communication of information.

2. Capacity-building should be country-driven, based on and responsive to national needs, and foster country ownership of Parties, in particular, for developing country Parties, including at the national, subnational and local levels. Capacity-building should be guided by lessons learned, including those from capacity-building activities under the Convention, and should be an effective, iterative process that is participatory, cross-cutting and gender-responsive.

3. All Parties should cooperate to enhance the capacity of developing country Parties to implement this Agreement. Developed country Parties should enhance support for capacity-building actions in developing country Parties.

4. All Parties enhancing the capacity of developing country Parties to implement this Agreement, including through regional, bilateral and multilateral approaches, shall regularly communicate on these actions or measures on capacity-building. Developing country Parties should regularly communicate progress made on implementing capacity-building plans, policies, actions or measures to implement this Agreement.

5. Capacity-building activities shall be enhanced through appropriate institutional arrangements to support the implementation of this Agreement, including the appropriate institutional arrangements established under the Convention that serve this Agreement. The Conference of the Parties serving as the meeting of the Parties to this Agreement shall, at its first session, consider and adopt a decision on the initial institutional arrangements for capacity-building.

Article 12

Parties shall cooperate in taking measures, as appropriate, to enhance climate change education, training, public awareness, public participation and public access to information, recognizing the importance of these steps with respect to enhancing actions under this Agreement.

Article 13

1. In order to build mutual trust and confidence and to promote effective implementation, an enhanced transparency framework for action and support, with built-in flexibility which takes into account Parties' different capacities and builds upon collective experience is hereby established.

2. The transparency framework shall provide flexibility in the implementation of the provisions of this Article to those developing country Parties that need it in the light of their capacities. The modalities, procedures and guidelines referred to in paragraph 13 of this Article shall reflect such flexibility.

3. The transparency framework shall build on and enhance the transparency arrangements under the Convention, recognizing the special circumstances of the least developed countries and small island developing States, and be implemented in a facilitative, non-intrusive, non-punitive manner, respectful of national sovereignty, and avoid placing undue burden on Parties.

4. The transparency arrangements under the Convention, including national communications, biennial reports and biennial update reports, international assessment and review and international consultation and analysis, shall form part of the experience drawn upon for the development of the modalities, procedures and guidelines under paragraph 13 of this Article.

5. The purpose of the framework for transparency of action is to provide a clear understanding of climate change action in the light of the objective of the Convention as set out in its Article 2, including clarity and tracking of progress towards achieving Parties' individual nationally determined contributions under Article 4, and Parties' adaptation actions under Article 7, including good practices, priorities, needs and gaps, to inform the global stocktake under Article 14.

6. The purpose of the framework for transparency of support is to provide clarity on support provided and received by relevant individual Parties in the context of climate change actions under Articles 4, 7, 9, 10 and 11, and, to the extent possible, to provide a full overview of aggregate financial support provided, to inform the global stocktake under Article 14.

7. Each Party shall regularly provide the following information:

(a) A national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases, prepared using good practice methodologies accepted by the Intergovernmental Panel on Climate Change and agreed upon by the Conference of the Parties serving as the meeting of the Parties to this Agreement; and

(b) Information necessary to track progress made in implementing and achieving its nationally determined contribution under Article 4.

8. Each Party should also provide information related to climate change impacts and adaptation under Article 7, as appropriate.

9. Developed country Parties shall, and other Parties that provide support should, provide information on financial, technology transfer and capacity-building support provided to developing country Parties under Articles 9, 10 and 11.

10. Developing country Parties should provide information on financial, technology transfer and capacity-building support needed and received under Articles 9, 10 and 11.

11. Information submitted by each Party under paragraphs 7 and 9 of this Article shall undergo a technical expert review, in accordance with decision 1/CP.21. For those developing country Parties that need it in the light of their capacities, the review process shall include assistance in identifying capacity-building needs. In addition, each Party shall participate in a facilitative, multilateral consideration of progress with respect to efforts under Article 9, and its respective implementation and achievement of its nationally determined contribution.

12. The technical expert review under this paragraph shall consist of a consideration of the Party's support provided, as relevant, and its implementation and achievement of its nationally determined contribution. The review shall also identify areas of improvement for the Party, and include a review of the consistency of the information with the modalities, procedures and guidelines referred to in paragraph 13 of this Article, taking into account the flexibility accorded to the Party under paragraph 2 of this Article. The review shall pay particular attention to the respective national capabilities and circumstances of developing country Parties.

13. The Conference of the Parties serving as the meeting of the Parties to this Agreement shall, at its first session, building on experience from the arrangements related to transparency under the Convention, and elaborating on the provisions in this Article, adopt common modalities, procedures and guidelines, as appropriate, for the transparency of action and support.

14. Support shall be provided to developing countries for the implementation of this Article.

15. Support shall also be provided for the building of transparency-related capacity of developing country Parties on a continuous basis.

Article 14

1. The Conference of the Parties serving as the meeting of the Parties to this Agreement shall periodically take stock of the implementation of this Agreement to assess the collective progress towards achieving the purpose of this Agreement and its long-term goals (referred to as the "global stocktake"). It shall do so in a comprehensive and facilitative manner, considering mitigation, adaptation and the

means of implementation and support, and in the light of equity and the best available science.

2. The Conference of the Parties serving as the meeting of the Parties to this Agreement shall undertake its first global stocktake in 2023 and every five years thereafter unless otherwise decided by the Conference of the Parties serving as the meeting of the Parties to this Agreement.

3. The outcome of the global stocktake shall inform Parties in updating and enhancing, in a nationally determined manner, their actions and support in accordance with the relevant provisions of this Agreement, as well as in enhancing international cooperation for climate action.

Article 15

1. A mechanism to facilitate implementation of and promote compliance with the provisions of this Agreement is hereby established.

2. The mechanism referred to in paragraph 1 of this Article shall consist of a committee that shall be expert-based and facilitative in nature and function in a manner that is transparent, non-adversarial and non-punitive. The committee shall pay particular attention to the respective national capabilities and circumstances of Parties.

3. The committee shall operate under the modalities and procedures adopted by the Conference of the Parties serving as the meeting of the Parties to this Agreement at its first session and report annually to the Conference of the Parties serving as the meeting of the Parties to this Agreement.

Article 16

1. The Conference of the Parties, the supreme body of the Convention, shall serve as the meeting of the Parties to this Agreement.

2. Parties to the Convention that are not Parties to this Agreement may participate as observers in the proceedings of any session of the Conference of the Parties serving as the meeting of the Parties to this Agreement. When the Conference of the Parties serves as the meeting of the Parties to this Agreement, decisions under this Agreement shall be taken only by those that are Parties to this Agreement.

3. When the Conference of the Parties serves as the meeting of the Parties to this Agreement, any member of the Bureau of the Conference of the Parties representing a Party to the Convention but, at that time, not a Party to this Agreement, shall be replaced by an additional member to be elected by and from amongst the Parties to this Agreement.

4. The Conference of the Parties serving as the meeting of the Parties to this Agreement shall keep under regular review the implementation of this Agreement and shall make, within its mandate, the decisions necessary to promote its effective implementation. It shall perform the functions assigned to it by this Agreement and shall:

(a) Establish such subsidiary bodies as deemed necessary for the implementation of this Agreement; and

(b) Exercise such other functions as may be required for the implementation of this Agreement.

5. The rules of procedure of the Conference of the Parties and the financial procedures applied under the Convention shall be applied *mutatis mutandis* under this Agreement, except as may be otherwise decided by consensus by the Conference of the Parties serving as the meeting of the Parties to this Agreement.

6. The first session of the Conference of the Parties serving as the meeting of the Parties to this Agreement shall be convened by the secretariat in conjunction with the first session of the Conference of the Parties that is scheduled after the date of entry into force of this Agreement. Subsequent ordinary sessions of the Conference of the Parties serving as the meeting of the Parties to this Agreement shall be held in conjunction with ordinary sessions of the Conference of the Parties, unless otherwise decided by the Conference of the Parties serving as the meeting of the Parties to this Agreement.

7. Extraordinary sessions of the Conference of the Parties serving as the meeting of the Parties to this Agreement shall be held at such other times as may be deemed necessary by the Conference of the Parties serving as the meeting of the Parties to this Agreement or at the written request of any Party, provided that, within six months of the request being communicated to the Parties by the secretariat, it is supported by at least one third of the Parties.

8. The United Nations and its specialized agencies and the International Atomic Energy Agency, as well as any State member thereof or observers thereto not party to the Convention, may be represented at sessions of the Conference of the Parties serving as the meeting of the Parties to this Agreement as observers. Any body or agency, whether national or international, governmental or non-governmental, which is qualified in matters covered by this Agreement and which has informed the secretariat of its wish to be represented at a session of the Conference of the Parties serving as the meeting of the Parties to this Agreement as an observer, may be so admitted unless at least one third of the Parties present object. The admission and participation of observers shall be subject to the rules of procedure referred to in paragraph 5 of this Article.

Article 17

1. The secretariat established by Article 8 of the Convention shall serve as the secretariat of this Agreement.

2. Article 8, paragraph 2, of the Convention on the functions of the secretariat, and Article 8, paragraph 3, of the Convention, on the arrangements made for the functioning of the secretariat, shall apply *mutatis mutandis* to this Agreement. The secretariat shall, in addition, exercise the functions assigned to it under this Agreement and by the Conference of the Parties serving as the meeting of the Parties to this Agreement.

Article 18

1. The Subsidiary Body for Scientific and Technological Advice and the Subsidiary Body for Implementation established by Articles 9 and 10 of the Convention shall serve, respectively, as the Subsidiary Body for Scientific and Technological Advice and the Subsidiary Body for Implementation of this Agreement. The provisions of the Convention relating to the functioning of these two bodies shall apply *mutatis mutandis* to this Agreement. Sessions of the meetings of the Subsidiary Body for Scientific and Technological Advice and the Subsidiary Body for Implementation of this Agreement shall be held in conjunction with the meetings of, respectively, the Subsidiary Body for Scientific and Technological Advice and the Subsidiary Body for Implementation of the Convention.

2. Parties to the Convention that are not Parties to this Agreement may participate as observers in the proceedings of any session of the subsidiary bodies. When the subsidiary bodies serve as the subsidiary bodies of this Agreement, decisions under this Agreement shall be taken only by those that are Parties to this Agreement.

3. When the subsidiary bodies established by Articles 9 and 10 of the Convention exercise their functions with regard to matters concerning this Agreement, any member of the bureaux of those subsidiary bodies representing a Party to the Convention but, at that time, not a Party to this Agreement, shall be replaced by an additional member to be elected by and from amongst the Parties to this Agreement.

Article 19

1. Subsidiary bodies or other institutional arrangements established by or under the Convention, other than those referred to in this Agreement, shall serve this Agreement upon a decision of the Conference of the Parties serving as the meeting of the Parties to this Agreement. The Conference of the Parties serving as the meeting of the Parties to this Agreement shall specify the functions to be exercised by such subsidiary bodies or arrangements.

2. The Conference of the Parties serving as the meeting of the Parties to this Agreement may provide further guidance to such subsidiary bodies and institutional arrangements.

Article 20

1. 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. It shall be open for signature at the United Nations Headquarters in New York from 22 April 2016 to 21 April 2017. Thereafter, this Agreement shall be open for accession from the day following the date on which it is closed for signature. Instruments of ratification, acceptance, approval or accession shall be deposited with the Depositary.

2. Any regional economic integration organization that becomes a Party to this Agreement without any of its member States being a Party shall be bound by all the obligations under this Agreement. In the case of regional economic integration organizations with one or more member States that are Parties to this Agreement,

the organization and its member States shall decide on their respective responsibilities for the performance of their obligations under this Agreement. In such cases, the organization and the member States shall not be entitled to exercise rights under this Agreement concurrently.

3. In their instruments of ratification, acceptance, approval or accession, regional economic integration organizations shall declare the extent of their competence with respect to the matters governed by this Agreement. These organizations shall also inform the Depositary, who shall in turn inform the Parties, of any substantial modification in the extent of their competence.

Article 21

1. This Agreement shall enter into force on the thirtieth day after the date on which at least 55 Parties to the Convention accounting in total for at least an estimated 55 per cent of the total global greenhouse gas emissions have deposited their instruments of ratification, acceptance, approval or accession.

2. Solely for the limited purpose of paragraph 1 of this Article, "total global greenhouse gas emissions" means the most up-to-date amount communicated on or before the date of adoption of this Agreement by the Parties to the Convention.

3. For each State or regional economic integration organization that ratifies, accepts or approves this Agreement or accedes thereto after the conditions set out in paragraph 1 of this Article for entry into force have been fulfilled, this Agreement shall enter into force on the thirtieth day after the date of deposit by such State or regional economic integration organization of its instrument of ratification, acceptance, approval or accession.

4. For the purposes of paragraph 1 of this Article, any instrument deposited by a regional economic integration organization shall not be counted as additional to those deposited by its member States.

Article 22

The provisions of Article 15 of the Convention on the adoption of amendments to the Convention shall apply *mutatis mutandis* to this Agreement.

Article 23

1. The provisions of Article 16 of the Convention on the adoption and amendment of annexes to the Convention shall apply *mutatis mutandis* to this Agreement.

2. Annexes to this Agreement shall form an integral part thereof and, unless otherwise expressly provided for, a reference to this Agreement constitutes at the same time a reference to any annexes thereto. Such annexes shall be restricted to lists, forms and any other material of a descriptive nature that is of a scientific, technical, procedural or administrative character.

Article 24

The provisions of Article 14 of the Convention on settlement of disputes shall apply *mutatis mutandis* to this Agreement.

Article 25

1. Each Party shall have one vote, except as provided for in paragraph 2 of this Article.

2. Regional economic integration organizations, in matters within their competence, shall exercise their right to vote with a number of votes equal to the number of their member States that are Parties to this Agreement. Such an organization shall not exercise its right to vote if any of its member States exercises its right, and vice versa.

Article 26

The Secretary-General of the United Nations shall be the Depositary of this Agreement.

Article 27

No reservations may be made to this Agreement.

Article 28

1. At any time after three years from the date on which this Agreement has entered into force for a Party, that Party may withdraw from this Agreement by giving written notification to the Depositary.

2. Any such withdrawal shall take effect upon expiry of one year from the date of receipt by the Depositary of the notification of withdrawal, or on such later date as may be specified in the notification of withdrawal.

3. Any Party that withdraws from the Convention shall be considered as also having withdrawn from this Agreement.

Article 29

The original of this Agreement, of which the Arabic, Chinese, English, French, Russian and Spanish texts are equally authentic, shall be deposited with the Secretary-General of the United Nations.

DONE at Paris this twelfth day of December two thousand and fifteen.

IN WITNESS WHEREOF, the undersigned, being duly authorized to that effect, have signed this Agreement.

REMARKS

Statement by President Trump on the Paris Climate Accord

ENERGY & ENVIRONMENT

Issued on: **June 1, 2017**

★ ★ ★

Rose Garden

3:32 P.M. EDT

THE PRESIDENT: Thank you very much. (Applause.) Thank you. I would like to begin by addressing the terrorist attack in Manila. We're closely monitoring the situation, and I will continue to give updates if anything happens during this period of time. But it is really very sad as to what's going on throughout the world with terror. Our thoughts and our prayers are with all of those affected.

Before we discuss the Paris Accord, I'd like to begin with an update on our tremendous — absolutely tremendous — economic progress since Election Day on November 8th. The economy is starting to come back, and very, very rapidly. We've added $3.3 trillion in stock market value to our economy, and more than a million private sector jobs.

I have just returned from a trip overseas where we concluded nearly $350 billion of military and economic development for the United States, creating hundreds of thousands of jobs. It was a very, very successful trip, believe me. (Applause.) Thank you. Thank you.

In my meetings at the G7, we have taken historic steps to demand fair and reciprocal trade that gives Americans a level playing field against other nations. We're also working very hard for peace in the Middle East, and perhaps even peace between the Israelis and the Palestinians. Our attacks

on terrorism are greatly stepped up — and you see that, you see it all over — from the previous administration, including getting many other countries to make major contributions to the fight against terror. Big, big contributions are being made by countries that weren't doing so much in the form of contribution.

One by one, we are keeping the promises I made to the American people during my campaign for President — whether it's cutting job-killing regulations; appointing and confirming a tremendous Supreme Court justice; putting in place tough new ethics rules; achieving a record reduction in illegal immigration on our southern border; or bringing jobs, plants, and factories back into the United States at numbers which no one until this point thought even possible. And believe me, we've just begun. The fruits of our labor will be seen very shortly even more so.

On these issues and so many more, we're following through on our commitments. And I don't want anything to get in our way. I am fighting every day for the great people of this country. Therefore, in order to fulfill my solemn duty to protect America and its citizens, the United States will withdraw from the Paris Climate Accord — (applause) — thank you, thank you — but begin negotiations to reenter either the Paris Accord or a really entirely new transaction on terms that are fair to the United States, its businesses, its workers, its people, its taxpayers. So we're getting out. But we will start to negotiate, and we will see if we can make a deal that's fair. And if we can, that's great. And if we can't, that's fine. (Applause.)

As President, I can put no other consideration before the wellbeing of American citizens. The Paris Climate Accord is simply the latest example of Washington entering into an agreement that disadvantages the United States to the exclusive benefit of other countries, leaving American workers — who I love — and taxpayers to absorb the cost in terms of lost jobs, lower wages, shuttered factories, and vastly diminished economic production.

Thus, as of today, the United States will cease all implementation of the non-binding Paris Accord and the draconian financial and economic burdens the agreement imposes on our country. This includes ending the implementation of the nationally determined contribution and, very importantly, the Green Climate Fund which is costing the United States a vast fortune.

Compliance with the terms of the Paris Accord and the onerous energy restrictions it has placed on the United States could cost America as much as 2.7 million lost jobs by 2025 according to the National Economic Research Associates. This includes 440,000 fewer manufacturing jobs — not

what we need — believe me, this is not what we need — including automobile jobs, and the further decimation of vital American industries on which countless communities rely. They rely for so much, and we would be giving them so little.

According to this same study, by 2040, compliance with the commitments put into place by the previous administration would cut production for the following sectors: paper down 12 percent; cement down 23 percent; iron and steel down 38 percent; coal — and I happen to love the coal miners — down 86 percent; natural gas down 31 percent. The cost to the economy at this time would be close to $3 trillion in lost GDP and 6.5 million industrial jobs, while households would have $7,000 less income and, in many cases, much worse than that.

Not only does this deal subject our citizens to harsh economic restrictions, it fails to live up to our environmental ideals. As someone who cares deeply about the environment, which I do, I cannot in good conscience support a deal that punishes the United States — which is what it does — the world's leader in environmental protection, while imposing no meaningful obligations on the world's leading polluters.

For example, under the agreement, China will be able to increase these emissions by a staggering number of years — 13. They can do whatever they want for 13 years. Not us. India makes its participation contingent on receiving billions and billions and billions of dollars in foreign aid from developed countries. There are many other examples. But the bottom line is that the Paris Accord is very unfair, at the highest level, to the United States.

Further, while the current agreement effectively blocks the development of clean coal in America — which it does, and the mines are starting to open up. We're having a big opening in two weeks. Pennsylvania, Ohio, West Virginia, so many places. A big opening of a brand-new mine. It's unheard of. For many, many years, that hasn't happened. They asked me if I'd go. I'm going to try.

China will be allowed to build hundreds of additional coal plants. So we can't build the plants, but they can, according to this agreement. India will be allowed to double its coal production by 2020. Think of it: India can double their coal production. We're supposed to get rid of ours. Even Europe is allowed to continue construction of coal plants.

In short, the agreement doesn't eliminate coal jobs, it just transfers those jobs out of America and the United States, and ships them to foreign countries.

This agreement is less about the climate and more about other countries gaining a financial advantage over the United States. The rest of the world applauded when we signed the Paris Agreement — they went wild; they were so happy — for the simple reason that it put our country, the United States of America, which we all love, at a very, very big economic disadvantage. A cynic would say the obvious reason for economic competitors and their wish to see us remain in the agreement is so that we continue to suffer this self-inflicted major economic wound. We would find it very hard to compete with other countries from other parts of the world.

We have among the most abundant energy reserves on the planet, sufficient to lift millions of America's poorest workers out of poverty. Yet, under this agreement, we are effectively putting these reserves under lock and key, taking away the great wealth of our nation — it's great wealth, it's phenomenal wealth; not so long ago, we had no idea we had such wealth — and leaving millions and millions of families trapped in poverty and joblessness.

The agreement is a massive redistribution of United States wealth to other countries. At 1 percent growth, renewable sources of energy can meet some of our domestic demand, but at 3 or 4 percent growth, which I expect, we need all forms of available American energy, or our country — (applause) — will be at grave risk of brownouts and blackouts, our businesses will come to a halt in many cases, and the American family will suffer the consequences in the form of lost jobs and a very diminished quality of life.

Even if the Paris Agreement were implemented in full, with total compliance from all nations, it is estimated it would only produce a two-tenths of one degree — think of that; this much — Celsius reduction in global temperature by the year 2100. Tiny, tiny amount. In fact, 14 days of carbon emissions from China alone would wipe out the gains from America — and this is an incredible statistic — would totally wipe out the gains from America's expected reductions in the year 2030, after we have had to spend billions and billions of dollars, lost jobs, closed factories, and suffered much higher energy costs for our businesses and for our homes.

As the Wall Street Journal wrote this morning: "The reality is that withdrawing is in America's economic interest and won't matter much to the climate." The United States, under the Trump administration, will continue to be the cleanest and most environmentally friendly country on Earth. We'll be the cleanest. We're going to have the cleanest air. We're going to have the cleanest water. We will be environmentally friendly, but we're not going to put our businesses out of work and we're not going to lose our jobs. We're going to grow; we're going to grow rapidly. (Applause.)

And I think you just read — it just came out minutes ago, the small business report — small businesses as of just now are booming, hiring people. One of the best reports they've seen in many years.

I'm willing to immediately work with Democratic leaders to either negotiate our way back into Paris, under the terms that are fair to the United States and its workers, or to negotiate a new deal that protects our country and its taxpayers. (Applause.)

So if the obstructionists want to get together with me, let's make them non-obstructionists. We will all sit down, and we will get back into the deal. And we'll make it good, and we won't be closing up our factories, and we won't be losing our jobs. And we'll sit down with the Democrats and all of the people that represent either the Paris Accord or something that we can do that's much better than the Paris Accord. And I think the people of our country will be thrilled, and I think then the people of the world will be thrilled. But until we do that, we're out of the agreement.

I will work to ensure that America remains the world's leader on environmental issues, but under a framework that is fair and where the burdens and responsibilities are equally shared among the many nations all around the world.

No responsible leader can put the workers — and the people — of their country at this debilitating and tremendous disadvantage. The fact that the Paris deal hamstrings the United States, while empowering some of the world's top polluting countries, should dispel any doubt as to the real reason why foreign lobbyists wish to keep our magnificent country tied up and bound down by this agreement: It's to give their country an economic edge over the United States. That's not going to happen while I'm President. I'm sorry. (Applause.)

My job as President is to do everything within my power to give America a level playing field and to create the economic, regulatory and tax structures that make America the most prosperous and productive country on Earth, and with the highest standard of living and the highest standard of environmental protection.

Our tax bill is moving along in Congress, and I believe it's doing very well. I think a lot of people will be very pleasantly surprised. The Republicans are working very, very hard. We'd love to have support from the Democrats, but we may have to go it alone. But it's going very well.

The Paris Agreement handicaps the United States economy in order to win praise from the very foreign capitals and global activists that have long sought to gain wealth at our country's expense. They don't put America first. I do, and I always will. (Applause.)

The same nations asking us to stay in the agreement are the countries that have collectively cost America trillions of dollars through tough trade practices and, in many cases, lax contributions to our critical military alliance. You see what's happening. It's pretty obvious to those that want to keep an open mind.

At what point does America get demeaned? At what point do they start laughing at us as a country? We want fair treatment for its citizens, and we want fair treatment for our taxpayers. We don't want other leaders and other countries laughing at us anymore. And they won't be. They won't be.

I was elected to represent the citizens of Pittsburgh, not Paris. (Applause.) I promised I would exit or renegotiate any deal which fails to serve America's interests. Many trade deals will soon be under renegotiation. Very rarely do we have a deal that works for this country, but they'll soon be under renegotiation. The process has begun from day one. But now we're down to business.

Beyond the severe energy restrictions inflicted by the Paris Accord, it includes yet another scheme to redistribute wealth out of the United States through the so-called Green Climate Fund — nice name — which calls for developed countries to send $100 billion to developing countries all on top of America's existing and massive foreign aid payments. So we're going to be paying billions and billions and billions of dollars, and we're already way ahead of anybody else. Many of the other countries haven't spent anything, and many of them will never pay one dime.

The Green Fund would likely obligate the United States to commit potentially tens of billions of dollars of which the United States has already handed over $1 billion — nobody else is even close; most of them haven't even paid anything — including funds raided out of America's budget for the war against terrorism. That's where they came. Believe me, they didn't come from me. They came just before I came into office. Not good. And not good the way they took the money.

In 2015, the United Nation's departing top climate officials reportedly described the $100 billion per year as "peanuts," and stated that "the $100 billion is the tail that wags the dog." In 2015, the Green Climate Fund's executive director reportedly stated that estimated funding needed would increase

to $450 billion per year after 2020. And nobody even knows where the money is going to. Nobody has been able to say, where is it going to?

Of course, the world's top polluters have no affirmative obligations under the Green Fund, which we terminated. America is $20 trillion in debt. Cash-strapped cities cannot hire enough police officers or fix vital infrastructure. Millions of our citizens are out of work. And yet, under the Paris Accord, billions of dollars that ought to be invested right here in America will be sent to the very countries that have taken our factories and our jobs away from us. So think of that.

There are serious legal and constitutional issues as well. Foreign leaders in Europe, Asia, and across the world should not have more to say with respect to the U.S. economy than our own citizens and their elected representatives. Thus, our withdrawal from the agreement represents a reassertion of America's sovereignty. (Applause.) Our Constitution is unique among all the nations of the world, and it is my highest obligation and greatest honor to protect it. And I will.

Staying in the agreement could also pose serious obstacles for the United States as we begin the process of unlocking the restrictions on America's abundant energy reserves, which we have started very strongly. It would once have been unthinkable that an international agreement could prevent the United States from conducting its own domestic economic affairs, but this is the new reality we face if we do not leave the agreement or if we do not negotiate a far better deal.

The risks grow as historically these agreements only tend to become more and more ambitious over time. In other words, the Paris framework is a starting point — as bad as it is — not an end point. And exiting the agreement protects the United States from future intrusions on the United States' sovereignty and massive future legal liability. Believe me, we have massive legal liability if we stay in.

As President, I have one obligation, and that obligation is to the American people. The Paris Accord would undermine our economy, hamstring our workers, weaken our sovereignty, impose unacceptable legal risks, and put us at a permanent disadvantage to the other countries of the world. It is time to exit the Paris Accord — (applause) — and time to pursue a new deal that protects the environment, our companies, our citizens, and our country.

It is time to put Youngstown, Ohio, Detroit, Michigan, and Pittsburgh, Pennsylvania — along with many, many other locations within our great country — before Paris, France. It is time to make

America great again. (Applause.) Thank you. Thank you. Thank you very much.

Thank you very much. Very important. I'd like to ask Scott Pruitt, who most of you know and respect, as I do, just to say a few words.

Scott, please. (Applause.)

ADMINISTRATOR PRUITT: Thank you, Mr. President. Your decision today to exit the Paris Accord reflects your unflinching commitment to put America first.

And by exiting, you're fulfilling yet one more campaign promise to the American people. Please know that I am thankful for your fortitude, your courage, and your steadfastness as you serve and lead our country.

America finally has a leader who answers only to the people — not to the special interests who have had their way for way too long. In everything you do, Mr. President, you're fighting for the forgotten men and women across this country. You're a champion for the hardworking citizens all across this land who just want a government that listens to them and represents their interest.

You have promised to put America First in all that you do, and you've done that in any number of ways — from trade, to national security, to protecting our border, to rightsizing Washington, D.C. And today you've put America first with regard to international agreements and the environment.

This is an historic restoration of American economic independence — one that will benefit the working class, the working poor, and working people of all stripes. With this action, you have declared that the people are rulers of this country once again. And it should be noted that we as a nation do it better than anyone in the world in striking the balance between growing our economy, growing jobs while also being a good steward of our environment.

We owe no apologies to other nations for our environmental stewardship. After all, before the Paris Accord was ever signed, America had reduced its CO2 footprint to levels from the early 1990s. In fact, between the years 2000 and 2014, the United States reduced its carbon emissions by 18-plus percent. And this was accomplished not through government mandate, but accomplished through innovation and technology of the American private sector.

For that reason, Mr. President, you have corrected a view that was paramount in Paris that somehow the United States should penalize its own economy, be apologetic, lead with our chin, while the rest of world does little. Other nations talk a good game; we lead with action — not words. (Applause.)

Our efforts, Mr. President, as you know, should be on exporting our technology, our innovation to nations who seek to reduce their CO2 footprint to learn from us. That should be our focus versus agreeing to unachievable targets that harm our economy and the American people.

Mr. President, it takes courage, it takes commitment to say no to the plaudits of men while doing what's right by the American people. You have that courage, and the American people can take comfort because you have their backs.

Thank you, Mr. President.

END
4:03 P.M. EDT

Ms. Carla Frisch
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Subcommittee on Environment and Climate Change
Hearing on
"We'll Always Have Paris:
Filling the Leadership Void Caused by Federal Inaction on Climate Change"
February 28, 2019

Ms. Carla Frisch, Principal, Rocky Mountain Institute

The Honorable John Shimkus (R-IL)

1. A number of legal scholars have argued that U.S. participation in the Paris Agreement may authorize EPA to pursue a broad range of greenhouse gas regulations under section 115 of the Clean Air Act (CAA). According to a forthcoming Columbia University report entitled *Legal Pathways to Deep Decarbonization in the United States*, these regulations could address industrial carbon emissions, agriculture, and even an economy-wide cap and trade system.

    a. Do you believe the President's formal "acceptance" of the Paris Agreement provides legal justification for regulation under CAA Section 115?

    RESPONSE:
    Formal "acceptance" of the Paris Agreement is essential to show the world that the United States is a leader on climate action. Supporting the Paris Agreement could provide significant economic opportunities. Reducing greenhouse gas emissions requires deployment and further development of clean energy technologies; we should put the U.S. in a position to take the lead on producing and exporting those clean energy technologies.

    Regarding Clean Air Act Section 115, I am not a legal scholar and do not have a view on legal justification for regulation under CAA 115. Legal scholars have suggested multiple approaches for satisfying the reciprocity conditions of CAA 115, for example in this paper:
    http://columbiaclimatelaw.com/files/2016/06/Burger-et-al.-2016-01-Reduce-GHG-Emissions-Under-Section-115-of-CAA.pdf

    b. Does the Rocky Mountain Institute support use of CAA Section 115, under the Paris Agreement, as a means to address greenhouse gas emissions?

    RESPONSE:
    Rocky Mountain Institute does not provide legal perspectives on regulations and does not advocate for particular policies. Rocky Mountain Institute supports use of all available tools to address climate change, including economy-wide greenhouse gas pricing and appropriate use of existing Clean Air Act authorities.

c. If formal "acceptance" of the Paris Agreement does not provide legal justification for CAA section 115, do you believe Senate "ratification" of the Paris Agreement would constitute legal justification for regulation under this section of the Clean Air Act?

RESPONSE:
Rocky Mountain Institute does not provide legal perspectives on regulations and does not advocate for particular policies.

Subcommittee on Environment and Climate Change
Hearing on
"We'll Always Have Paris:
Filling the Leadership Void Caused by Federal Inaction on Climate Change"
February 28, 2019

Mr. Samuel Thernstrom, Founder and Chief Executive Officer
Energy Innovation Reform Project

The Honorable John Shimkus (R-IL)

1. A number of legal scholars have argued that U.S. participation in the Paris Agreement may authorize EPA to pursue a broad range of greenhouse gas regulations under section 115 of the Clean Air Act (CAA). According to a forthcoming Columbia University report entitled *Legal Pathways to Deep Decarbonization in the United States*, these regulations could address industrial carbon emissions, agriculture, and even an economy-wide cap and trade system.

   a. Do you believe the President's formal "acceptance" of the Paris Agreement provides legal justification for regulation under CAA Section 115?

      RESPONSE:

      With respect, this question lies beyond my expertise.

   b. Does the Energy Innovation Reform Project support use of CAA Section 115, under the Paris Agreement, as a means to address greenhouse gas emissions?

      RESPONSE:

      EIRP takes no position on this question, as it is beyond the scope of our mission and expertise.

   c. If formal "acceptance" of the Paris Agreement does not provide legal justification for CAA section 115, do you believe Senate "ratification" of the Paris Agreement would constitute legal justification for regulation under this section of the Clean Air Act?

      RESPONSE:

      I take no position on the question as presented, as it lies beyond my expertise, but I would reiterate a point made in my testimony, that one of the advantages of a

treaty ratification process is that the Administration must submit implementing legislation to the Senate along with the proposed treaty for ratification. This means that the Senate knows what actions must be taken to meet the treaty's obligations, and there would therefore be no need to speculate about the potential application of current Clean Air Act authority; the implementing legislation would presumably establish whatever authority in needed to meet the treaty's obligations.

2. You outline defects in how the Obama Administration approached Climate policy in your testimony. From your understanding the Administration was seeking to implement policies that would transform how we make and deliver power, which would impact our transportation systems, impact our industry.

    a. These involve highly consequential domestic policy decisions, would you agree?

    RESPONSE:

    Yes.

    b. Would you agree that examining these policies requires close attention to the costs, effectiveness, economic effects, including with regards to our competitive posture with the rest of the world?

    RESPONSE:

    Yes.

3. Now take these highly consequential domestic policy decisions and apply them across the world.

    a. Can we reasonably expect other developed nations and developing nations to implement expensive policy decisions that restrict energy access or drive up costs?

    RESPONSE:

    No, we cannot.

    b. How important to solving this climate risk problem is broad based technological development, that the United States can export?

    RESPONSE:

Technology development is the heart of the climate challenge, and should be the primary focus of U.S. climate policy, not an afterthought. Federal climate policies should seek to increase our "decarbonization ability"—that is, accelerate innovation in clean energy-related technologies that would permit decarbonization to occur at very low cost while maintaining significant fuel diversity. This is crucial to a cost-effective transformation of the U.S. power sector, and indispensable to any aspiration to achieve deep emissions reductions on a global scale.

Fortunately, the United States is well positioned to be a global leader in this effort. While many other nations have significant energy research and development capabilities, the United States has a unique combination of R&D abilities with private and governmental investment and other institutional capacities, a generally stable and favorable domestic legal and regulatory environment (with the notable exception of greenhouse gas emissions, where many firms desire greater predictability in federal policy requirements), a large and educated work force, and a large internal market. Few nations can match America's ability to lead in technological development, and U.S. success in developing attractive exportable technologies could contribute importantly to global emissions reduction efforts.

4. Given that the expected emissions growth from developing Asian countries alone would offset a complete decarbonization of the U.S. economy by mid-century, help the United States can provide to these Asian nations would appear to do more for global carbon dioxide reductions than anything we do domestically.

    a. How do we incentivize the private development of technologies that can be deployed affordably in these developing nations?

    RESPONSE:

    This is a complex question that cannot easily be answered in this format, but briefly: The federal government could adopt policies that would accelerate research and development of these technologies—an innovation "push"—as well as policies that would spur their commercialization, "pulling" these emerging technologies from the R&D phase into demonstration and initial market penetration. Combining technology "push" and "pull" policies is especially effective at fostering private sector investment and commercialization, as we see in the history of shale gas development.

    Technology innovation programs should be tailored to the specific needs of individual technologies, rather than adopting a one-size-fits-all federal program of incentives for all emerging technologies. To foster investment in advanced nuclear reactors, for example, it would be helpful to enhance the Nuclear

Regulatory Commission's ability to complete its licensing process quickly, transparently, and cost-effectively. Resolving the status of the proposed nuclear waste repository at Yucca Mountain would also improve the environment for investment in this sector. Encouraging investment in carbon capture, utilization, and sequestration requires an entirely suite of policies, while offshore wind development faces its own set of obstacles.

Broadly speaking, policymakers should consider targeted federal financial support for research, development, demonstration, and early commercialization of these technologies, coupled with regulatory reforms and other measures to foster the growth of markets for these technologies.

b. What would be the role of the United States to lead on this technological development, so that China and other nations purchase our technology?

RESPONSE:

U.S. innovation in energy, including in low and zero-emissions energy technology, will be important in maintaining America's international leadership, generating domestic economic growth, and addressing the global problem of climate change. Indeed, developing affordable, reliable, and safe, low and zero-emissions technologies is the only way that the United States and other countries will be able to eliminate energy-related greenhouse gas emissions. Selling U.S. technologies to public or private entities in other countries, will require: 1) commercially attractive technologies that deliver value proportionate to costs, 2) bilateral or multilateral trade agreements that facilitate trade in energy technologies while securing intellectual property rights, and 3) governments or firms with adequate resources to purchase these products, whether using existing capital reserves, commercial financing, bilateral foreign assistance, or international aid.

With respect to China in particular, the overall state of U.S.-China bilateral relations seems likely to be an important factor that could contribute to—or undermine—American companies' ability to sell energy technologies abroad. Should U.S.-China competition escalate, selling U.S. technology could become more difficult. Developing innovative technologies that are demonstrably superior to Chinese products (and those of other foreign firms) is among the most important steps that the United States can take. That said, China may take steps to protect its domestic electricity generation market and markets for other low and zero-emissions energy technologies, such as in transportation. Meeting global emissions reduction targets without a cooperative U.S.-China relationship would require China to develop and deploy necessary energy technologies at scale either domestically or with the assistance of other foreign partners.

c. There are Intellectual Property and other challenges to our relationships with China and other nations. Would addressing treatment of IP be another area that can offer up paths to increased emissions reductions?

RESPONSE:

As stated in the previous response, securing adequate protection of intellectual property will be a central factor in the success or failure of efforts to deploy low and zero-emissions energy technologies globally. Firms will likely be less willing to sell these technologies into markets that lack appropriate protections.

d. If we cannot reach a solution to protect U.S. IP and other commercial interests, what does that mean for U.S. leadership in technology?

RESPONSE:

Failure in securing needed protections for intellectual property will constrain technology sales and deployment in those markets. If U.S. firms can find enough market opportunities elsewhere, they may nevertheless succeed in establishing global technological leadership. However, if foreign manufacturers steal or otherwise misappropriate U.S. technologies, perhaps with assistance from foreign governments or through their pressure on U.S. firms, this could substantially undermine the ability of American innovators to compete in international markets.

5. How should national security, energy and economic security, and other geopolitical and common defense interests factor into U.S. national decisions relating to climate change policy?

RESPONSE:

Climate change is likely to make severe weather events, droughts, and other extreme conditions more frequent (and more severe) in the coming decades. It is likely that these conditions will contribute—to some degree—to national or regional instability, especially in countries with poor governance and/or limited resources that constrain national governments' abilities to respond to these circumstances. Whether, and how much, this will be seen as affecting U.S. national security interests depends on a number of factors, ranging from the pace and severity of climate change and the vulnerability of less-stable nations to it, to the question of how Americans define our national interests and whether (or to what extent) that definition includes U.S. responsibility for security, stability and prosperity in other countries. The answers to that question of strategic perceptions may change over time, and may vary depending on whether the countries in question are American allies or partners, or are located in areas of strategic significance that affect broader U.S. security and foreign policy objectives. The United States and most of our allies in Europe and East Asia are more likely to have sufficiently effective governance

and necessary financial resources to adapt to climate change—though this may be expensive and could affect their ability to concentrate on other domestic and international priorities. Other nations are not as well-positioned to adapt to a changing climate.

Energy and economic security, as well as broader U.S. economic competitiveness, should be significant considerations in setting climate change policy. Energy innovation can contribute substantially to all three of these objectives. Sustained economic growth will be essential in providing the public and private resources needed to mitigate climate change, to adapt to (and build resiliency to manage) the effects of climate change, and to continue to advance other domestic and international goals at the same time. These factors assume even greater importance when viewed from a geopolitical perspective and in the context of intensifying political, economic and military competition between the United States and China. Only an innovative and prosperous America will be able to maintain domestic unity, prevail in global economic competition with China, and sustain defense spending necessary to advance and defend U.S. national security interests.

As a practical matter, it is also necessary for policymakers and the American public to recognize and accept that changes in the global climate system have already acquired considerable momentum due to previous greenhouse gas emissions. There is tremendous inertia in the global climate system, as well as global energy systems. Temperature changes from historic emissions are still occurring, and will occur for decades to come. Global emissions are unlikely to drop significantly in the near future, and even when they do, the atmospheric concentration of greenhouse gases will not decline, it will stabilize—any warming to that point will be locked in and future warming may continue for some time. From a national security policy perspective, this means that actions to reduce emissions today may limit the effects of climate change decades from now—not over the next year, five years, or decade. This is not an argument for inaction on mitigation; rather, it is a reason to see climate policy as urgent on its own terms but limited in its near-term value as an instrument of national security policy.

Subcommittee on Environment and Climate Change
Hearing on
"We'll Always Have Paris:
Filling the Leadership Void Caused by Federal Inaction on Climate Change"
February 28, 2019

Prof. Nathan Hultman
Director, Center for Global Sustainability
School of Public Policy
University of Maryland

The Honorable John Shimkus (R-IL)

1. A number of legal scholars have argued that U.S. participation in the Paris Agreement may authorize EPA to pursue a broad range of greenhouse gas regulations under section 115 of the Clean Air Act (CAA). According to a forthcoming Columbia University report entitled *Legal Pathways to Deep Decarbonization in the United States*, these regulations could address industrial carbon emissions, agriculture, and even an economy-wide cap and trade system.

    a. Do you believe the President's formal "acceptance" of the Paris Agreement provides legal justification for regulation under CAA Section 115?

    RESPONSE: This question relates to a legal interpretation of the purview and appropriate application of CAA Section 115, and is outside of my area of expertise. Other experts have investigated this question.

    b. If formal "acceptance" of the Paris Agreement does not provide legal justification for CAA section 115, do you believe Senate "ratification" of the Paris Agreement would constitute legal justification for regulation under this section of the Clean Air Act?

    RESPONSE: This question also relates to a legal interpretation of the purview and appropriate application of CAA Section 115, and is outside of my area of expertise. Other experts have investigated this question.

The Honorable Billy Long (R-MO)

1. Figure 1 in your testimony maps the coalition of subnational actors who have committed to climate actions in their own jurisdictions. What strikes me is that these actors are

concentrated in New York, California, and up and down both coasts. The Midwest, including my home state and district of Southwest Missouri, are pretty bare. To me it seems like the policies that have been implemented in New York and California work because they have specific geographic and demographic characteristics that are unlike most of the rest of the country.

a. How would implementing policies like those in California and New York, be viable for my district in rural Missouri?

RESPONSE: Policies and strategies to support economic growth through clean energy and other new technologies can make sense everywhere, and the way they are implemented can absolutely be tailored to the unique needs and opportunities of different places. In fact, in the few months since the release of our report, the groundswell of interest in these policies has continued to grow across America, including in our heartland. The map that you reference has changed too – and now includes Colorado, Nevada, New Mexico, Minnesota, Wisconsin, and Michigan, as well as my own home state of Illinois. And notably, such action is expanding to include members across party lines, including three Republican governors. I very much appreciated the constructive, bipartisan discussion in the hearing I participated in. It remains an opportunity for us to better understand how these policies can be tailored to help deliver economic opportunity even as they get us on track toward a future that is healthier for our people and safer for the climate.

For example, implementing climate policies can support the growth of new energy industries, and increase the country's energy security. These benefits are already manifesting themselves in Missouri and could be strengthened by federal action and action in the Midwest. A recent report by the Clean Energy Trust estimated that Missouri is home to about 55,000 clean energy jobs and is adding new ones at a rate of about 1,500 jobs per year. A majority of these jobs (70.5%) are provided by small businesses with fewer than 20 employees. Your district of Missouri is home to over 6,000 of these clean energy jobs with the majority in the energy efficiency sector. Compared to the roughly 8,000 fossil fuel energy jobs in Missouri state-wide, this sector is a booming opportunity for Missourians and the 7th District.[1] As one specific example, the City of Nixa, Missouri installed a solar farm in 2017 that is projected to save the City $2.5 million over the life of the contract, which means Nixa Utilities can continue to keep rates low for its customers.[2] In addition to providing jobs and helping our transition to a cleaner energy future, this facility and others like it around the state increase the country's domestic energy supply.

Farmers also benefit from climate action policies, like those enacted across the

[1] Clean Energy Trust and Environmental Entrepreneurs (2019). "2019 Clean Jobs Midwest: Missouri". Retrieved from: https://cjm2019test.wpengine.com/wp-content/uploads/2019/04/Missouri_CJM-Exec-Summary-FINAL.pdf
[2] City of Nixa (2017). "Nixa Solar Farm". Retrieved from: https://www.nixa.com/departments/public-works/electric/nixa-solar-farm

country, especially in a state like Missouri with access to excellent wind resources and major original equipment manufacturers. The Missouri Department of Economic Development estimated that the average Missouri farm could bring in $18,000 to $24,000 annually by hosting three to four wind turbines on their land.[3] The Farmers City Wind Farm in Atchison County is another great example of subnational action working for rural communities. The wind farm produces power to cover electricity needs of 33,000 average Missourian homes, is estimated to produce $600,000 to $1 million in annual county tax revenue, contributes approximately $365,000 a year in lease payments to landowners as a stable source of income, and given the small footprint of individual turbines farmers continue to grow soybeans and corn.[4]

These are just a few examples that illuminate some of the real opportunities for finding solutions that work for specific state or district needs. And as we discussed in our hearing, we very much need the creative thinking across America to create a true transition that accelerates our economic opportunity in ways that fit with each location's potential strengths and growth areas.

b. How does electrification of transportation work for farming and for long distance trucking industries, which provide significant employment for my constituents?

RESPONSE: Electrifying commercial vehicles has been a rapidly expanding market and is expected to continue growing for most commercial vehicle applications. McKinsey Energy Insights estimates that the fully-electric truck market share could reach 15 percent of sales by 2030.[5] For agricultural applications there are already options on the market for electric machinery. Similar to passenger electric vehicles, larger applications of electrification offer many of the same benefits such as significantly less maintenance (with far fewer moving parts), less noise, greater control, more efficiency, and potentially increased safety. This area of transportation electrification is a growing area of manufacturing and presents an excellent opportunity for states with traditional manufacturing basis to take the lead in energy innovation.

c. What analysis has been done to show the economic impact of high fuel costs, particularly on rural communities? What are the ripple effects this can cause for the business community in a rural area?

RESPONSE: A recent report by the American Council for an Energy-Efficient Economy (ACEEE) and Energy Efficiency for All looked at "The High Cost of Energy in Rural America" and found that Americans living in rural areas spend a

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[3] Department of Economic Development (n.d.). "Wind Energy". Retrieved from: https://energy.mo.gov/clean-energy/wind

[4] 3Degrees (n.d.) "Farmers City Wind Project". Retrieved from: https://3degreesinc.com/latest/wind-power-farmers-city/

[5] McKinsey (2017). "New reality: electric trucks and their implications on energy demand". Retrieved from: https://www.mckinseyenergyinsights.com/insights/new-reality-electric-trucks-and-their-implications-on-energy-demand/

disproportionally high share of their income on energy bills.[6] A recent analysis by the Union of Concerned Scientists found that rural drivers often have farther to travel to work, shop, and visit a doctor. As a result, they have to repair their vehicles more often and spend more money on gasoline. Using data from the 2017 National Highway Traffic Survey they found that the average rural driver could save $870 per year by choosing an electric vehicle over a conventional sedan because of reduced maintenance costs and lower fuel costs.[7] Additional studies have been done on specific states and areas over the years and the USDA completed a study back in 2011 analyzing the impacts of high energy prices on agriculture and rural economies.[8]

2. I understand you were in the Obama Administration when it was developing its climate action plan and the emissions commitments for the Paris Agreement.

    a. During the development of these emissions' reduction plans, did the Administration publish an economic analysis of the costs and economic impacts of the plans?

    RESPONSE:

    I should first note that it was not my job in the Obama Administration to direct rulemaking, or to conduct or oversee economic analysis of proposed regulatory actions. In addition, I was not part of the Administration during the development of the Climate Action Plan and its associated three-part strategy for reducing emissions at home, building resilience, and leading internationally. As such, I cannot speak directly to those aspects of your question.

    However, there are some basic observations that I can offer in my current capacity. The regulatory actions taken under the previous Administration underwent the standard, long-established procedures for the rulemaking process, which included, where applicable, assessing economic impacts and gathering comments before any final rules were issued. As such, costs and benefits were explicitly assessed and transparently communicated via the appropriate rulemaking procedures. Such benefits may include important elements such as fuel savings for consumers, improved health from cleaner air (e.g. fewer deaths due to heart attacks, fewer asthma attacks for children, fewer lost work days, etc.), reduced impacts from climate change, and other economic benefits. Most if not all

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[6] Ross, L. et. al. (2018). "The High Cost of Energy in Rural America: Household Energy Burdens and Opportunities for Energy Efficiency". Retrieved from: https://aceee.org/sites/default/files/publications/researchreports/u1806.pdf

[7] Union of Concerned Scientists (2018). "Rural Drivers Can Save the Most From Clean Vehicles". Retrieved from: https://blog.ucsusa.org/daniel-gatti/clean-vehicles-save-rural-drivers-money

[8] Sands, Ronald and Paul Westcott (coordinators), J. Michael Price, Jayson Beckman, Ephraim Leibtag, Gary Lucier, William McBride, David McGranahan, Mitch Morehart, Edward Roeger, Glenn Schaible, and Timothy R. Wojan. Impacts of Higher Energy Prices on Agriculture and Rural Economies, ERR-123, U.S. Dept. of Agriculture, Econ. Res. Serv. August 2011.

rulemakings, and all major regulatory actions, were expected to create significant net benefits, as demonstrated by these analyses. Any future regulatory actions would similarly have been subject to detailed and rigorous economic assessment, as well as an opportunity for public comment, before any final rules could be issued.

b. If so, could you supply those for the record? And if such analyses were not published, could you please explain why not?

RESPONSE: Economic analysis for the rulemaking process, when applicable, was published in the Federal Register.

Subcommittee on Environment and Climate Change
Hearing on
"We'll Always Have Paris:
Filling the Leadership Void Caused by Federal Inaction on Climate Change"
February 28, 2019

Mr. Andrew Light, Distinguished Senior Fellow, World Resources Institute and University Professor, George Mason University

The Honorable Frank Pallone, Jr. (D-NJ)

1. How should national security, energy and economic security, and other geopolitical and common defense interests factor into U.S. national decisions relating to climate change policy?

RESPONSE:

We've had over a decade now of official U.S. government reports and testimony from senior Department of Defense and intelligence officials from Republican and Democratic administrations confirming that climate change is an increasingly critical national security threat. This message was perfectly clear in the last *Worldwide Threat Assessment of the U.S. National Intelligence Community* released by National Intelligence Director Coats on January 29, 2019, stating, "Climate hazards such as extreme weather, higher temperatures, droughts, floods, wildfires, storms, sea level rise, soil degradation, and acidifying oceans are intensifying, threatening infrastructure, health, and water and food security. Irreversible damage to ecosystems and habitats will undermine the economic benefits they provide, worsened by air, soil, water, and marine pollution" (p. 23). In other words,

our collective, official, authoritative, and non-biased intelligence community agrees that climate change should factor into our security and defense interests. In broader geopolitical terms, consider only the economic opportunity that has emerged as a result of the creation of the Paris Agreement on climate change in 2015. According to a study from the International Finance Corporation – a member of the World Bank Group – just the commitments for greenhouse gas mitigation under Paris from 21 of the largest emerging economies has created a $23 trillion investment opportunity, primarily in clean energy markets. The countries that step up to support those markets will not only form stronger economic and security ties with those parties but will also grow their own economies. However, I believe that at present, the U.S. administration risks harming our ability to compete in these markets, and thus risks damaging the credibility of U.S. businesses abroad by standing alone in the world in our intention to withdraw from the Paris Agreement. This is a potential enormous loss to the U.S. economy, and our strategic relationship with these other countries who are uniformly concerned about the threat of climate change and understand that they can sustainably grow their economies.

The Honorable John Shimkus (R-IL)

1. When I asked if the Paris Agreement was a treaty, you responded that it was not because it was under the UNFCCC [link to exchange]. The "Kyoto Protocol to the Convention on Climate Change" was also, as its formal title implies, under the UNFCCC. In your opinion, even though the Kyoto Protocol was under the rubric of the UNFCCC, would U.S. participation in the Kyoto Protocol have required Article 2 advice and consent?

   RESPONSE:

I am not a lawyer, so I can only give you my best understanding. Both Kyoto and Paris were agreements adopted under the UNFCCC. But they are very different in content, including, most significantly, that Kyoto included legally binding emissions targets which went beyond the UNFCCC. Although I do not know whether, as a constitutional matter, Kyoto would have required Senate advice and consent, it was the expectation that an agreement of Kyoto's nature and content warranted Senate approval. This was the expectation, at least in part, because the ratification history of the UNFCCC reflected an interest on the part of the Senate in getting to approve a future climate change agreement if, unlike the UNFCCC, it included legally binding targets. (It also reflected a corresponding assurance from the Executive Branch that it expected this would be the case.) To my mind the 1997 Byrd-Hagel Resolution also anticipated what could have emerged as a possible ratification discussion for what would become the Kyoto Protocol. The point I was trying to make during our exchange was that Paris did not include legally binding targets and so did not have the same profile as Kyoto. So, to make the point clearer, it is not only the fact that Paris was adopted under the UNFCCC, but the nature and content of its provisions, including its non-binding nationally determined contributions, that made it amenable to conclusion by the Executive Branch.

2. It was widely reported that, during completion of negotiations on the Paris Agreement, then-Secretary of State John Kerry insisted on a subtle last-minute word change (of "shall" to "should") intended to "Senate proof" the Agreement and help the Obama Administration avoid having to send it to the Senate for its Article 2 advice and consent. According to the UNFCCC, however, all but a handful of countries (the United States among them) have formally ratified the Agreement. Moreover, the UN itself often refers to the Paris Agreement as a treaty, both in formal documents

and in press statements. For example, in response to President Trump's announcement regarding U.S. participation in Paris, the UN stated that "The Paris Agreement remains a historic treaty signed by 195 Parties and ratified by 146 countries plus the European Union."

a. Does President Obama's signing of an acceptance document—which states "**I, Barack Obama, President of the United States of America, having seen and considered the Paris Agreement, done at Paris on December 12, 2015, and signed on behalf of the United States of America on April 22, 2016, do hereby accept the said Agreement and every article and clause thereof on behalf of the United States of America.** Done at Washington this 29th day of August, 2016"— make the Paris Agreement binding on the United States?

RESPONSE:

As a preliminary matter, it is my understanding that the word "treaty" routinely causes confusion, because it has two different meanings – one under international law and the other under U.S. law. Under international law, it refers to an agreement concluded between or among States that is intended to be governed by international law. In the international sense, the Paris Agreement can be considered a treaty even though its formal title does not include the word "treaty." But that does not mean it is a "treaty" under U.S. law that requires Senate ratification. In fact, most "treaties" under international law are not concluded as "treaties" under U.S. law, i.e., they are not approved by the Senate (see the Appendix to this report). So, while I find it imprecise, I understand why some parties, including the UN refer to the Paris Agreement as a "treaty" insofar as they may be

commenting on its status under international law, not on how it is approved under U.S. law in particular.

The United States validly joined the Paris Agreement by "accepting" it. Consistent with Article 20 of the Agreement, each Party decides for itself whether it "accepts," "ratifies," etc. Therefore, the United States is a Party to the Agreement and has commitments in accordance with its terms. However, emissions targets under the Agreement (as included in the nationally determined contributions), are not binding.

b. And if not, please explain why not.

RESPONSE:

Please see my answer in (a) for my explanations as to this question.

c. Would U.S. Senate ratification of the Paris Agreement make the Paris Agreement binding on the United States?

RESPONSE:

My understanding is that the legal character of the Agreement's provisions does not depend upon the manner in which it is joined by the United States. For example, the emissions targets are not legally binding, and that would not change, even if the Senate had approved the Agreement.

3. A number of legal scholars have argued that U.S. participation in the Paris Agreement may authorize EPA to pursue a broad range of greenhouse gas regulations under section 115 of the Clean Air Act (CAA). According to a forthcoming Columbia University report

entitled *Legal Pathways to Deep Decarbonization in the United States*, these regulations could address industrial carbon emissions, agriculture, and even an economy-wide cap and trade system.

a. Do you believe the President's formal "acceptance" of the Paris Agreement provides legal justification for regulation under CAA Section 115?

RESPONSE:

I am not a lawyer and have no view at this time on whether Section 115 can be used to regulate greenhouse gases. In any event, the Paris Agreement is distinct from U.S. law, so any availability of 115 would not be "under" the Paris Agreement.

b. Does the World Resources Institute support use of CAA Section 115, under the Paris Agreement, as a means to address greenhouse gas emissions?

RESPONSE:

WRI does not yet have a position on the use of Section 115 to regulate greenhouse gases.

c. If formal "acceptance" of the Paris Agreement does not provide legal justification for CAA section 115, do you believe Senate "ratification" of the Paris Agreement would constitute legal justification for regulation under this section of the Clean Air Act?

RESPONSE:

Again, it is my understanding that any use of Section 115 to regulate greenhouse gases (which I do not have a view

on at this time) would not be "under" the Paris Agreement, whether the Agreement were "accepted" or "ratified" by the United States.

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