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BUILDING A 100 PERCENT CLEAN ECONOMY: SOLUTIONS FOR ECONOMY-WIDE DEEP DECARBONIZATION

THURSDAY, DECEMBER 5, 2019

House of Representatives,

Subcommittee on Environment and Climate Change,

Committee on Energy and Commerce,

Washington, D.C.

The subcommittee met, pursuant to call, at 10:33 a.m., in Room 2123, Rayburn House Office Building, Hon. Paul Tonko [chairman of the subcommittee] presiding.

Present: Representatives Tonko, Clarke, Peters, Barragan, McEachin, Blunt Rochester, Soto, DeGette, Schakowsky, Matsui, McNerney, Ruiz, Pallone (ex officio), Shimkus, Rodgers, McKinley, Johnson, Long, Flores, Mullin, Carter, Duncan, and Walden (ex officio).

Staff Present: Adam Fischer, Policy Analyst; Jean Fruci, Energy and Environment Policy Advisor; Caitlin Haberman, Professional Staff Member; Rick Kessler, Senior Advisor and Staff Director, Energy and Environment; Mel Peffers, Environment Fellow; Peter

Kielty, Minority General Counsel; Mary Martin, Minority Chief Counsel, Energy and Environment and Climate Change; Brandon Mooney, Minority Deputy Chief Counsel, Energy; Brannon Rains, Minority Legislative Clerk; and Peter Spencer, Minority Senior Professional Staff Member, Environment and Climate Change.

Mr. Tonko. Good morning, everyone. The Subcommittee on Environment and Climate Change will now come to order.

I recognize myself for 5 minutes for the purposes of an opening statement.

For the past several months, the committee has held a series of hearings and stakeholder meetings examining how our Nation can achieve net zero greenhouse gas emissions by mid-century.

Our past hearings have focused on sector-specific issues and solutions. We have examined the industrial, electricity, transportation, and building sectors. Today, we will turn our attention to economywide solutions, a category of policies that can result in emissions reductions from across multiple sectors.

We know, to achieve ambitious climate targets, innovations are needed in technology and policy and in finance to accelerate the clean energy transition and reduce the cost of economywide decarbonization.

These crosscutting policies take many different forms. It can include how the data revolution can promote greater efficiency through digitization. It also covers how access to capital and financing opportunities can support deployment of new and needed technologies and infrastructure.

Low emissions solutions, ranging from energy-efficient appliances to electric buses, are commercially available and pay for themselves over time, but the upfront cost can be a barrier. Having financing options available can accelerate widespread adoption of these solutions.

Another potentially powerful policy is carbon pricing, which remains a proven

economically efficient method to put us on the lowest cost pathway to achieving major emissions reductions.

Today, the costs of climate pollution are not borne by polluters. In my opinion, that is wrong, fundamentally wrong.

Carbon pricing connects -- or corrects rather a market failure and establishes a long-term price signal to allow each firm to determine how to best manage its assets. While we know market-based policies, like carbon pricing, can be effective, the policy design really matters. We have seen bad programs fail and good ones succeed. And the last decade of experiences from State and foreign governments provides many, many examples of best practices and lessons learned.

Today, millions of Americans are already living under the carbon price -- a carbon price in California and the RGGI states. The sky has not fallen and industry has not crumbled. In fact, those residents are experiencing benefits in terms of public health and new revenue for investments in efficiency and infrastructure programs.

Pricing programs can and should be designed to minimize impacts to consumers, protect low-income households, and preserve the global competitiveness of U.S. energy-intensive trade exposed industries.

They should also provide flexibility for regulated entities to the extent that it does not undermine the integrity of the program or result in harmful, inequitable outcomes.

We know that multidecade climate targets require policy certainty. Congressional action can create predictability and credibility while sending the signals that will be necessary to impact long-term planning and investment decisions.

Despite some of the strengths of these types of policies, we must keep in mind that there is no silver bullet to achieving deep decarbonization. We must embrace a

broad portfolio of solutions and commit to reinvesting revenues from a pricing program to support complementary policies.

Complementary policies that promote R&D, infrastructure deployment, workforce development, community and worker programs, environmental justice and restoration, resilience, and energy efficiency must be part of our efforts. These types of investments will ensure emissions reductions occur quickly, cheaply, and fairly, with the benefits of a cleaner economy reaching every community.

We will also hear about another potential model based on existing environmental statutes that gives State governments greater responsibility and flexibility to direct their climate mitigation efforts and achieve nationally determined goals.

We know States and regions face unique climate challenges. I look forward to exploring how we might be able to translate the cooperative federalism model that has resulted in such significant air, water, and soil pollution reductions over the past four decades into the climate context.

I truly believe many of us share a common goal of putting forward cost-effective solutions that protect low-income consumers, promote U.S. competitiveness and invest in energy innovation and infrastructure while ensuring meaningful emissions reductions.

Designing economywide solutions that fit with effective sector-specific policies will be key to assembling a meaningful comprehensive climate package.

I thank our witnesses for joining us today. We look forward to your input and your perspective and providing the sort of information that we find very important to these discussions. I look forward to your testimony.

With that, I will now recognize Mr. Shimkus, Representative Shimkus, being the ranking member of our Subcommittee on Environment and Climate Change, for 5 minutes for his opening statement.

[The prepared statement of Mr. Tonko follows:]

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Mr. Shimkus. Thank you, Mr. Chairman.

And to my friends, a word of warning. When I was going over the testimony and what we have gone -- you know, the Congress and where we are at today, it was only 8 years ago that we were moving -- trying to move to a cap and trade program and we were moving to national health care under ObamaCare. Done poorly, the results were politically a change in Congress. So it is just the facts that that is what occurred.

So I think for anyone to not focus on the cost of transition, you are going down a dangerous path. As we see what is going on in France with the yellow vests based upon gas prices, what we have just seen in Iran, based upon an increase in gas prices, for anyone to think that consumers are not going to be price conscious in this debate, I would just say a word of warning.

I am particularly touched by Dr. Gattie's testimony, and I would encourage my colleagues to look at the charts in his testimony which highlight really a flat line growth on fossil use and fossil emissions in the developed world and an astronomical increase in the developing countries, especially the Asian-Pacific region.

So a cost burden on us with no international constraint -- the recent announcement by China just yesterday -- will indicate that we will do this for nothing. So that is where -- you know, Ranking Member Walden talks about those issues of resiliency and efficiency and technology and being able to mitigate the changes that are going to occur, whether we are engaged or not.

So we have had a great series of hearings. As I talked to the panel, as I was able to a few minutes beforehand, which, as the chairman has noted, is going to -- been addressing across the spectrum of our energy use, whether it is in the transportation

sector, the manufacturing, the generation, and I applaud him for that, because it is really that holistic approach of looking at the entire economy.

But we should not not look at what is going on in the rest of the world when it impinges upon the fact of derailing a properly developed policy that -- I think I even heard in the opening statement that -- that costs will be increased and the industries that will be charged will pass that along. That is just an economic fact and reality.

So I look forward to the hearing. I know they are all noted panelists, great testimony. We appreciate your time and your effort.

This is a tough issue. The majority has decided to wrap its arms around it and try to address it, and we are trying to not be in their way as we try to get to a point where there can be growth and development while we address the emission debate, not only in this country but across the country -- across the world actually.

So, with that, Mr. Chairman, I am going to submit my statement for the record. This is just off the heart, as you could tell.

And I yield back my time.

[The prepared statement of Mr. Shimkus follows:]

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Mr. Tonko. The gentleman yields back.

And the chair now recognizes Representative Pallone, Chairman Pallone of the full committee, for 5 minutes for his opening statement.

Mr. Pallone. Thank you, Chairman Tonko.

Today's hearing is the seventh hearing in the committee's work to achieve a 100 percent clean economy by 2050. So far, we have examined way to decarbonize specific sectors of the U.S. economy, including the electricity sector, buildings, transportation, and heavy industry. And we also discussed the impact of climate change on frontline communities.

Throughout these hearings, witnesses told us that we need sector-specific solutions for climate action, especially in sectors that are more difficult to decarbonize. But they also repeatedly pointed to the need for an economywide measures to ensure we cut pollution across all sectors. So, today, we will explore those crosscutting mechanisms and the role they should play in addressing the climate crisis.

This hearing couldn't come at a more important time. As we speak, world leaders are meeting in Madrid for the 25th Conference of the Parties to the United Nations Framework Convention on Climate Change, or COP25. President Trump is noticeably absent from the summit. This is the same President who just 1 month ago started the formal process of withdrawing the United States from the Paris Agreement. And if President Trump gets his way, we will be the only country to oppose and abandon the Paris Agreement.

And I had the privilege to travel to COP25 in Madrid with a bicameral congressional delegation, which included Representatives Castor, Peters, and Dingell

from our committee. And on our visit, we reminded world leaders and activists that despite President Trump's retreat from this global crisis, that we are still in. And they made it clear they were grateful that someone was there to represent the United States, because our leadership is so important.

Our continued commitment to the Paris Agreement is more important than ever. New information comes out each week stressing the urgent need for climate action. Just last week, for instance, the United Nations released its annual Emissions Gap Report showing the divergence between current emissions projections and the reductions needed to avoid catastrophic climate change. The report warned that we are on track to miss those targets and not just by an inch, but by a mile.

The Paris Agreement adopted the science-based target of limited warming to 1.5 to 2 degrees Celsius by 2100. The U.N. report, however, warned that we are heading towards 3.9 degrees of warming by the end of the century. So think about that for a moment, that that's almost double the limit needed to avoid the most damaging consequences of climate change.

Not meeting these targets would have devastating consequences. It would lead to increasingly frequent extreme weather events, more damaging wildfires, rapid sea level rise, more persistent flooding and droughts, threats to entire ecosystems and food supplies, and countless other hazards.

Meanwhile, there was a report by the Global Carbon Project released just yesterday that showed that carbon dioxide emissions would hit an all-time high this year. And on Tuesday, the World Meteorological Organization reported that 2019 will be the second or third hottest year ever recorded.

And these are startling trends. But if there is one thing I learned in Madrid, is that

this is not a time for despair. It is time for bold leadership and ambitious action. One of the key reasons that the rest of the world is not meeting these targets is because of a lack of leadership they are seeing right now from the Trump administration. And we heard over and over again that if the United States withdraws and doesn't participate in the future, the other countries are not likely to go along, because U.S. leadership is what most countries look at. And that is why we have to continue to exercise that leadership. And it is also why this committee is hard at working and developing our proposal to reach net zero emissions by 2050. I think this is the consensus from the scientific community on what we have to do to avoid the worst impacts of climate change.

So, today, we are going to hear about options for robust comprehensive and economywide policy solutions to hit that target. We hear about the essential role the Federal Government can play. And, again, if I can go back to the weekend conference, I think that everyone knows that the State and the local governments continue to play a major role and can do a lot of the things that we need to do to reach the target of 2050, but it is not enough. The Federal Government has to get involved.

So, finally, we are going be to hear about how economywide climate action will not only reduce emissions but will also stimulate the economy. By investing in the low- and zero-carbon technologies of the future, the U.S. can become a world leader in clean energy innovation, and I look forward to hearing from our witnesses about that.

And thank you again, Chairman Tonko, and I yield back.

[The prepared statement of Mr. Pallone follows:]

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Mr. Tonko. The gentleman yields back.

The chair now recognizes Representative Walden, the ranking member of the full committee, for 5 minutes for his opening statement, please.

Mr. Walden. Good morning, Mr. Chairman, and to our witnesses, thank you for being here.

I appreciate the work these hearings have been doing to inform our -- your plans for decarbonizing the Nation by 2050. The hearings have provided useful information and necessary context to your plans, and that is helpful. I still hope we will have a hearing on the Green New Deal sometime, since it is talked about by a lot of leaders of the Democratic Party, and we haven't had that hearing in this context, and we should.

We have heard testimony that underscores the essential role of technological innovation and addressing the demand for cleaner energy, transportation, and industrial systems. This echoes the need for bipartisan work to find practical solutions so we can continue to lower emissions and unleash American innovation.

Republicans support realistic steps to reduce emissions and address current and future climate risks. This requires we examine the cost, effectiveness, and economic impacts of solutions proposed to address these risks and that we do not undermine the economic priorities of communities and States around the Nation. We can have a cleaner environment and a strong American economy.

Over past year, we have pointed out that restructuring old top-down -- excuse me -- resurrecting old top-down policies that will hurt American consumers and workers. We have invited our colleagues to work instead on bipartisan policies focused on the bottom-up benefits from incentivizing and deploying innovation that we can move into

law.

In fact, we have a dozen bipartisan measures that we could turn into law that could help reduce emissions and spur jobs and innovations. Hopefully, Mr. Chairman, we will get to work on passing some of those measures soon.

Today's hearing offers two approaches to climate policy. One reflects the majority's preferred approach to impose what we would call costly carbon taxes and old cap and trade regulations and schemes. These are some of the top-down regulatory policies that some of us have been warning about. Not only do these policies severely disrupt the American consumers, but they have no chance of becoming law.

Just read the papers around the world: Top-down energy policies are not working. From the Paris yellow vests protest last year to the riots across Chile, poor and middle class, fueled no doubt by some other resentments, too, rejected increasing transportation costs in violent protests.

Ironically, the Chilean riots caused the International Climate Conference to have to move to Madrid. One can only imagine what will happen if the decarbonization schemes throughout Europe really begin to turn the regulatory screws on consumers as European bureaucrats seek to meet proposed emissions targets in 10 years. And by the way, their record under the Paris accords is not very sterling.

This is not the way to address global emissions. The more realistic approach is to focus on the advanced technologies, mainly developed in the United States, that can meaningfully address emissions where they are increasing the fastest, which are in poorer nations striving for the benefits of advanced energy and industrial system. They actually want electricity. Who knew, right? So let's do it in a more efficient way.

Recent Energy Information Administration data show that fossil energy, even with

the tremendous growth of renewables, will remain a dominant form of energy in developing nations through 2050. This is where the United States can make a difference, providing the innovative fossil and other advanced cleaner technologies to meet this growing demand.

Tackling the emissions where they are growing the fastest represents the broader approach to climate policy that Professor Gattie can speak about this morning.

The deployment of our new nuclear technology to address climate change and to preserve our national security interests is an essential element in any real serious climate policy. This is not only a sensible way to address emissions; it is in keeping with our goals to resurrect our technological leadership in nuclear energy around the world for broader national energy security reasons, much as unleashing the U.S. LNG from our shale revolution restored our ability to counter Russia in energy markets while also driving cleaner technology and fuel switching that has resulted in carbon emissions reduction.

For our part on the Energy and Commerce Committee, we can work together, as we have in the past, to reduce barriers to innovation, to enable the United States to deploy new technologies.

So let's reject taxation and regulation that leads to economic stagnation and pursue practical policies of innovation, conservation, and preparation that can actually drive our economic engines and make realistic headway in curbing emissions from advanced carbon capture to nuclear technology to innovative hydropower.

With that, Mr. Chairman, I would yield to the ranking -- the lead Republican on this.

[The prepared statement of Mr. Walden follows:]

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Mr. Shimkus. Thank you.

The thing I -- you highlighted and I want to highlight also, let's put this in another current technology. Why is Burisma in the news? Why is Ukraine in the news? Because a Russian pipeline goes through Ukraine. They are afraid of extortion by Russia. I do Eastern European issues all the time. This LNG debate is critical. And this -- international security issues cannot be subordinated by anti-oil sentiment for freedom and democracy and rule of law in Eastern Europe.

Thank you.

Mr. Walden. I yield back.

Mr. Tonko. And the gentleman yields back.

The chair would like to remind members that pursuant to committee rules, all members' written opening statements shall be made part of the record.

I will now introduce our witnesses for today's hearing. We welcome them again and thank them for their input.

First, we have Mr. Daniel Esty, director the Center for Environmental Law and Policy and Hillhouse Professor of Environmental Law and Policy at Yale University.

Welcome Mr. Esty.

Dr. Noah Kaufman, research scholar, Center on Global Energy Policy at Columbia University.

Welcome, Dr. Kaufman.

And Mr. David Gattie, associate professor at the College of Engineering, University of Georgia.

We welcome you.

And then Mr. Tim Profeta, director of the Nicholas Institute for Environmental Policies Solutions at Duke University.

And welcome, Mr. Profeta.

So, before we begin, I would like to explain the lighting system. In front of you are 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 remaining. Please begin to wrap up your testimony at that point. The light will turn red when your time has expired.

And at this time, the chair will now recognize Mr. Esty for 5 minutes to provide his opening statement, please.

STATEMENTS OF DANIEL C. ESTY, DIRECTOR, CENTER FOR ENVIRONMENTAL LAW AND POLICY, AND HILLHOUSE PROFESSOR OF ENVIRONMENTAL LAW AND POLICY, YALE UNIVERSITY; NOAH KAUFMAN, PH.D., RESEARCH SCHOLAR, CENTER ON GLOBAL ENERGY POLICY, COLUMBIA UNIVERSITY; DAVID K. GATTIE, PH.D., ASSOCIATE PROFESSOR, COLLEGE OF ENGINEERING, UNIVERSITY OF GEORGIA; AND TIM PROFETA, DIRECTOR, NICHOLAS INSTITUTE FOR ENVIRONMENTAL POLICY SOLUTIONS, DUKE UNIVERSITY.

STATEMENT OF DANIEL C. ESTY

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

Thank you, Ranking Member Shimkus. And thank you all for being here for what I hope will be a conversation that gets into the details of how we take up this critical issue of deep decarbonization but how we do it in a way that addresses not just climate change but the need for a vibrant American economy, for competitiveness, for jobs, and for careful attention to the transition that we need to undertake in the coming decades.

I have spent more than 30 years on this issue going back to time in the late 1980s and early 1990s as a negotiator for climate change on behalf of the U.S. Environmental Protection Agency, more recently as commissioner of Connecticut's Department of Energy and Environmental Protection.

But I do want to take you back just for a moment to 1992 when the Framework Convention on Climate Change was finalized. And I remember being taken aside by the guy who was the secretary general of the 1992 Rio Earth Summit.

And he said to me, "Dan, as you finalize this climate change agreement, remember there is only two possible outcomes: success and real success."

And at the time, I wasn't quite focused on what he was saying. But the point was, when you get 120 Prime Ministers and Presidents together, success is going to be declared. The real test is what occurs over the intervening decades.

And, frankly, we did not see success in a couple of decades after that agreement. And I think the committee, the subcommittee here today, now is doing the right thing of digging into the details of what is the policy framework that can deliver for us a decarbonized future but attentive to these other issues of competitiveness, of jobs, of economic security, and of a just transition that attends to those whose lives and communities will have to evolve as we move forward.

My own experience suggests four things are critical, four issues need to be given careful attention: the incentives for changed behavior, the need to drive innovation as the key pathway to a low-cost and serious decarbonization strategy, the opportunity to bring to bear information technology, and a whole range of breakthroughs in science and knowledge that have occurred since we created our framework of environmental laws in the 1970s and 1980s, and, finally, a need to focus on investment and finance.

My own analysis suggests that the greatest weakness of the 20th century approach to environmental protection was not thinking about where the money would come from to do the things we need to do.

So let me quickly highlight what I think we can do and should do. Incentives are at the heart of what is required for a transition. We have to figure out how to change behavior. And innovation, I think, has to come broadly. We need technology breakthroughs, renewable power in various ways, but we need supporting technologies

as well, better batteries and storage, smart grids, smart homes, smart appliances. And we really need to think about innovation even more broadly: How do we engage the public in innovative ways? What are the policies that we can do that are innovative, and what kind of partnerships will this transition require?

My own view is that we need to put much more time and attention into what I call a 21st century strategy of green lights for innovation. The 20th century approach was red lights, stop signs, don't do this, don't do that, don't pollute. The 21st century has to be signaling to our entrepreneurial class, to our innovators, to our creative spirits where answers are required and to really spur on the changes that we know are needed.

And I think we know how to do that. We do it in part with economywide price signals. My own preference would be for a slowly rising carbon charge beginning at $5 per ton of carbon equivalent and rising $5 per ton per year for 20 years.

The advantage of that is the early low price is not jarring to people that made choices based on prior expectations about energy prices and markets, but the final price of $100 a ton becomes the signal that people pay attention to for all new investments, and it ensures the transition is smooth and can accommodate those whose lives are going to change.

I think second, we have not paid -- or third, we have not paid attention to the opportunities to bring to bear digital advances of the last 20 years. So special effort should be given to thinking about how we do that, including the ideas of benchmarking performance at the national scale, the State scale, the community scale, and the corporate scale, and ensuring that we can scorecard performance, identify leaders, spur on laggards, and find best practices.

Finally, think I think we need innovation in investment and finance. We need

green bonds, green banks, and a whole new set of strategies for innovatively steering money to the investments that need to be made. And I would be happy to answer questions about my own experience helping to set up Connecticut's Green Bank that has done dramatic things in this regard. Thank you very much.

[The prepared statement of Mr. Esty follows:]

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Mr. Tonko. Thank you, Mr. Esty.

Now, we will recognize Dr. Kaufman for 5 minutes, please.

STATEMENT OF NOAH KAUFMAN, PH.D.

Mr. Kaufman. Chairman Tonko, Ranking Member Shimkus, members of the committee, it is an honor to be here. Thank you for the invitation.

To build a clean economy, we need to align the incentives, the producers, consumers, and investors across the entire U.S. economy with the long-term goal of net-zero emissions.

Any economist will tell you that one critical piece of a deep decarbonization strategy is a price on carbon. That is because a carbon price encourages emissions reductions wherever and however they can be achieved at a low cost without needing to know beforehand what those reductions will be. Minimizing the cost of decarbonization means less of a burden on all of us, which should enable faster decarbonization.

Research led by the Center on Global Energy Policy at Columbia University suggests that any of the eight carbon prices proposed to Congress this year would dramatically change the future pathway for U.S. emissions from roughly flat to rapidly declining, far beyond the U.S. commitments to the Paris Agreement.

So putting a price on carbon should be a no-brainer. But how a carbon price is integrated into a broader struck policy strategy will influence its effectiveness and also the public's support. Here are four suggestions.

First, protect those who can't afford to pay more. The payments of the carbon

price can be returned to Americans as carbon dividends. As a general rule of thumb, returning 10 percent of the revenue to the bottom 20 percent of the income distribution can ensure that these households receive more in carbon dividends than they pay in higher prices. If you want to protect more households, simply use a larger portion of the revenue. Under a well-designed carbon price, those who can't afford to pay more don't have to.

Second, keep U.S. businesses on a level playing field with foreign competitors. One of many ways to do this is with a border carbon adjustment which requires importers of carbon intensive products to pay the carbon price and provides rebates to exporters. The United States would be implementing its climate policy on the global marketplace.

Third, improve economic opportunities for communities that are dependent on the coal industry, which is the only U.S. industry likely to experience immediate significant harm from a well-designed climate policy.

Over one-third of U.S. coal production comes from one county. Nearly 90 percent comes from just 50 counties. These communities helped power the American economy for generations, often at the expense of their own well-being. They have earned the support of their country as it transitions away from coal.

Fourth, and finally, surround the carbon price with policies that enable even faster and cheaper emissions reductions, which include efficiency standards that overcome barriers to reduced energy use, funding innovations in low-carbon solutions, and supporting the early stage deployment of these solutions that gives them a fair shot at competing against incumbents like gasoline vehicles and furnaces.

Not every policy will enable faster, cheaper emissions reductions. We may not need to regulate the same emissions that are covered by the carbon price or to subsidize

mature technologies, especially if the carbon price has been designed to be consistent with a desired pathway to net zero emissions.

I want to conclude by applauding the committee for taking on this challenge. A few years ago, I helped to build a deep decarbonization strategy for the United States. So I know that the scope of this problem can be daunting. You have hundreds of decisions to make. You will hear strong and sometimes conflicting opinions about every single one of them.

My advice is don't let this complexity distract you from actions that can really move the needle. Let's establish an incentive to reduce net emissions across the entire economy. Let's support low carbon solutions so that they can compete on a level playing field. Let's protect American families and businesses who can't afford price increases, and let's support coal communities.

With that, I look forward to your questions and comments.

[The prepared statement of Mr. Kaufman follows:]

******** INSERT 1-2 ********

Mr. Tonko. Thank you, Dr. Kaufman.

And, next, we will move to Dr. Gattie. You are recognized, sir, for 5 minutes, please.

STATEMENT OF DAVID K. GATTIE, PH.D.

Mr. Gattie. Thank you, sir.

I want to thank the chairman, the ranking member, and members of the subcommittee for the opportunity to come before you today.

My testimony aligns with the following points: America is facing two national security threats, one around climate change and the other around the U.S. nuclear power enterprise.

Climate change is global in cause and impacts, and as carbon emissions increase globally, those impacts won't stop at U.S. borders simply because we have an aggressive domestic climate policy.

The U.S. economy and its industrial capacity should be leveraged to innovate and deploy low- and zero-carbon technologies in developing economies where carbon emissions are of greatest concern. Nuclear power should be central to U.S. policy, with a strategy to develop advanced reactor technologies for domestic and international deployment, and America must engage in climate issues globally with national security as the overarching objective.

Globally, energy consumption and carbon emissions are increasing, not decreasing. From 2000 to 2018, 90 percent of the increase in carbon emissions originated

in Asian-Pacific countries, predominantly China and India, while emissions in the U.S. declined.

Under the most aggressive carbon policy, eliminating all U.S. emissions would reset global emissions to 2006 levels, meaning if climate change was a threat in 2006 with U.S. emissions, climate change is a threat in 2018 without U.S. emissions.

While exponential growth in nonhydrorenewables is elevating hopes that renewables are closing the gap on fossil fuels, that gap isn't closing; it is expanding. For the past 10 years, over 81 percent of global wind and over 82 percent of global solar were concentrated in countries with substantial fossil fuels, nuclear, and/or hydro built into their economies, meaning traditional energy resources have provided the foundation for renewables to expand.

This recommends a global triage approach with resources and efforts directed toward regions where the issue is acute or emerging. In developing regions, countries are at various stages of economic growth. Therefore, it is necessary to determine which energy technologies can be deployed effectively to sustain low carbon economic development. One such technology is nuclear power.

Early U.S. nuclear policymakers recognized the strategic importance of America's nuclear enterprise. To them, nuclear wasn't just another energy commodity, the fate of which should be dictated by political calculus, popular opinion, or market forces alone. Rather, it was central to America's foreign policy. So their approach was principled and strategic, not populist and transactional. A key objective was to create the world's most advanced nuclear technology base from which mutually beneficial global partnerships could be established within the emerging liberal international order.

The 21st century is undergoing geopolitical shifts, and China and Russia are

leveraging state-owned nuclear enterprises as extensions of the state to establish long-term energy and technology dependencies. If U.S. policy orients our technology trajectory away from nuclear, it will signal to the world that America has set aside its commitment to be a reliable partner in nuclear development, thus opening the door for China and Russia.

Efforts to decarbonize the U.S. economy will require investment. If the return on that investment is only a near-term reduction in U.S. carbon emissions, the U.S. will remain vulnerable to climate change over the long term as global emissions increase.

The U.S. cannot insulate itself from the impacts of global climate change through domestic policies targeting only the U.S. economy. Therefore, U.S. climate policy must be global and strategic, keeping in mind that if the U.S. transitions away from current energy interdependencies, those interdependencies can develop into vulnerabilities open to exploitation by energy-rich and technology-advantaged countries that don't share America's values.

To that end, U.S. policy should focus on developing energy and technology relationships within developing regions, cultivated as international investment opportunities for U.S. industry and coupled to diplomatic efforts of U.S. engagement and goodwill.

Lastly, the national security implications of U.S. nuclear power simply cannot be overstated. While nuclear has proven its value to America, its contributions remain on the horizon as economic development, climate change, and national security converge into a perfect storm of 21st century global challenges that nuclear is capable of addressing.

The U.S. cannot be an energy and climate island. America must engage globally, and it must do so with national security as its overarching objective.

Thank you, and I look forward to your questions.

[The prepared statement of Mr. Gattie follows:]

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Mr. Tonko. Thank you, Dr. Gattie.

And, finally, Mr. Profeta, you are recognized, sir, for 5 minutes, please.

STATEMENT OF TIM PROFETA

Mr. Profeta. Thank you. Thank you, Chairman Tonko, Ranking Member Shimkus. Thank you for the opportunity to testify today.

My name is Tim Profeta, and I direct the Nicholas Institute for Environmental Policy Solutions at Duke University.

Our institute was founded as a nonpartisan resource for decisionmakers like yourselves striving to solve the most pressing environmental challenges of our time, including climate change.

We do not seek to tell policymakers what do to. Rather, we provide economic, scientific, and legal expertise to help policymakers most effectively achieve what they wish to accomplish.

Today's hearing seeks to explore the best means by which to achieve economywide solutions to climate change. The central point of my testimony today is that Congress should consider a model that has been successful -- successfully proven through our Nation's history, the Federal/State partnership.

First, climate change is a challenge like none other. It is perhaps the test of our generation and one of the greatest collective action challenges in history. In the interest of time, I will not discuss the reason for acting in my oral testimony, as I believe the committee has declared an intent to do so. Instead, let me focus on the options for

acting to reduce the amount of greenhouse gases that are released into the atmosphere. Such an effort is the most important step we can take to tackle the climate challenge.

In the absence of Federal actions, many States have been rising to that challenge, working aggressive to reduce their emissions. But the national emissions picture is less encouraging without a Federal climate policy in place. As emissions go down in some States and sectors, they are going up in others. The net effect: we have made insufficient progress towards reductions needed to abate climate change. Nationwide carbon emissions, in fact, rose in 2018, the biggest increase in 8 years.

Now, there are many options for economywide policies, many of which I have worked on over the years. A Federal price on carbon, either set through a cap and trade program or a carbon fee, is an economically effective way to drive investment and innovation. If Congress could muster the political will to pass such a proposal, it may still be the most effective approach for securing nationwide reductions. But those of us that work on climate policy, however, have witnessed the political resistance noted by the ranking member to such a proposal.

Today, I am proposing another way to solve this conundrum. Congress should consider a model that has been successfully proven through our Nation's history, the Federal-State partnership. America can adopt a 50-State climate strategy that supports the vital role of States in cutting emissions, an economywide system that allows the differences -- allows for the differences between the States.

Instead of attempting to sell all concerns about the program's costs and impacts at the Federal level, Congress could determine a national level of reductions needed to achieve our climate goals and then divvy up the goals to the States. State governments would then be empowered to execute plans to reach those goals.

Successful Federal-State partnerships permeate our environmental law, as well as many other areas of government action. I would like to highlight five benefits, if you would take this approach.

First, a Federal/State partnership approach would involve all 50 States in America's pursuit of greenhouse gas reductions, ending the current state of fragmentation. By aligning all States toward common outcomes, overall U.S. emissions could be reduced more quickly and businesses would face more consistent framework across State boundaries, boosting innovation.

Second, a Federal/State climate partnership promotes regional fairness by tailoring action plans to each State's circumstances and strengths.

Third, if any revenues are raised through climate programs, the money would be kept circulating within the State's economy. States can determine best how to use the revenue to reduce emissions, prepare for climate change, and fairly distribute the economic opportunities and costs.

Fourth, a Federal-State climate partnership may be appealing to a wide range of States. States that are already leading on climate change can continue on the paths they have started. Other States get flexibility and Federal assistance to develop and implement their own plans, or they can defer to a simple Federal backstop plan.

Finally, a comprehensive Federal/State climate partnership backed by new legislation in Congress can solve some of the legal questions that arise without it. Many of our States hope to pool their obligations under a plan by creating multi-State programs. But it is unclear whether the Clean Air Act authorities will allow such efforts. Such linkages could be explicitly authorized under new legislation.

In summary, a comprehensive Federal/State partnership could achieve fast and

significant greenhouse gas reductions and might just be able to overcome political stalemate with cooperative solutions.

My written testimony presents a more detailed description of this concept. I thank you for your time today, and I look forward to answering your questions.

[The prepared statement of Mr. Profeta follows:]

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Mr. Tonko. Thank you, Mr. Profeta.

And I thank, again, our panelists for their input here this morning and thank you for what will be interesting dialogue.

Dr. Kaufman, I am of the belief that if we continue to invest in research and infrastructure, the cost of emissions reductions will decrease significantly. But I see very high-cost estimates, some over $1,000 per ton in two or three decades to achieve meaningful reductions in the transportation sector.

Do you have any idea of how high a carbon price needs to be set?

Mr. Kaufman. Thank you for the question.

How high the carbon price needs to be set depends on what your goals are in terms of emissions outcomes, it depends on what policies you are surrounding the carbon price with, and it also depends on, you know, the assumptions you make about the evolution of technologies, you know, gas and oil prices, and a number of other factors.

What our research suggests is that if you want to get on a pathway, say, to the Paris commitments of the United States, a carbon price alone of $25 to $35 a ton would be sufficient. If you doubled those prices, you added in a bunch of complementary policies with them, you could get on a much steeper emissions reduction curve.

Some of these estimates that you describe that suggest hundreds of dollars a ton, typically they assume that the carbon price is doing all the work by itself as opposed to as a part of a broader strategy, and they assume very little advances in innovation. So harder-to-decarbonize sectors don't get any easier over time. I think we can create policies that overcome those challenges.

Mr. Tonko. And I think -- and to your point, as we have seen over the last 10

years, a lot of dynamics of change have occurred, some beyond protected anticipation. So that is encouraging.

What roles do a credible and steady price play to spur innovation and ensure emissions reductions occur more cheaply and quickly than currently estimated?

Mr. Kaufman. Well, we would expect a carbon price to spur innovation in the private sector in a couple different ways.

So, first of all, by just, you know, encouraging a ton of deployment in the near term in low carbon solutions, we start doing more of them, we get better at doing them, right? We have seen that time and time again over the years. So that's one source of innovation.

And then it also puts in place this price signal in the long term that investors see. So they see if I create this low carbon solution, the market share will be there when it is -- when it is created over time.

So, you know, a carbon price isn't sufficient by itself. You still need government role in spurring innovation. But it could be transformative.

Mr. Tonko. And with a goal of 100 percent clean by 2050, I want to be sure our price signal is effective toward ultimate goes. How should environmental certainty be included as part of a carbon pricing program?

Mr. Kaufman. Well, I mean, the carbon -- if you use a carbon tax, for example, you know, you have control over the prices and the cost, and you have less control over the emissions outcomes.

So what you can do and what you see -- what you see in a lot of the proposals in Congress for a carbon taxes are mechanisms that make the tax rates contingent on the emissions outcomes.

All right. So, if we are seeing emissions fall the way you would like to see them, the tax rate continues as originally stipulated in the bill. If you are not seeing the emissions directions that you want, the bill says that the tax rate can increase even higher to achieve those reductions.

Mr. Tonko. And you talk about complementary policies. And I believe almost everyone now agrees that carbon pricing does require complementary policies.

What makes for a good complementary policy that advances the goals of a price?

Mr. Kaufman. Well, you want policies that can lead to even faster and cheaper emissions reductions than the carbon price would achieve on its own. So I think there is a lot of policies that fall into this category. You know, you can think about innovation, which, you know, a lot of my friends here were talking about. You can think about efficiency standards where price signals alone aren't going to be sufficient. You can think about infrastructure, especially in the transportation sector. And also, if we are talking about agriculture and land, you know, these might be areas that the carbon price can't feasibly cover. So you absolutely want to think about complementary policies in those areas also.

Mr. Tonko. And Dr. Gattie, DOE's loan program office has issued a total of up to $12 billion in loan guarantees to support the construction of the Vogel project.

Do you believe the Federal Government has and should continue to play a constructive role in providing financing assistance for innovative technology deployment?

Mr. Gattie. I do.

Mr. Tonko. Thank you.

And, Professor Esty, from your experience, can the public sector help spur innovation in clean energy deployment by providing access to capital and financing

support?

Mr. Esty. Absolutely. And I think we have seen that with the emergence of green banks. And frankly a model that is using limited public money to leverage private capital, and I think that has got to be part of the package that we put forward to address climate change.

Mr. Tonko. Thank you very much.

And, again, I appreciate the panel appearing before the subcommittee today.

The chair now recognizes Representative Shimkus, our subcommittee ranking member, for 5 minutes to ask questions.

Mr. Shimkus. Thank you, Mr. Chairman.

Mr. Profeta, is that your son behind you? Who is that young man? What is his name?

Mr. Profeta. Duncan.

Mr. Shimkus. Hi, Duncan. Welcome to the hearing. We are glad to have you here.

And this is a great panel. Thank you all. It gives a lot of food for thought.

I am going focus on Dr. Gattie on my questions.

You state in your testimony that efforts to decarbonize the U.S. economy will require investment. If the return on that investment is a near-term reduction in U.S. carbon emissions, the U.S. will remain vulnerable to climate change over the long term as global emissions increase.

Would you like to expand on that?

Mr. Gattie. Yes. Thank you for your question, Representative Shimkus.

The U.S. carbon emissions, if -- as I pointed out in my testimony, if we zeroed

those emissions out, there is going to be probably a cost associated with that. If the return on that investment is only a reduction in U.S. emissions, and yet we are still exposed to global carbon emissions -- and again, my point here is this is global climate change; it is not U.S. climate change. As long as the source of the emissions remains unchecked, we are still vulnerable to climate change impacts, regardless of the domestic policy.

Mr. Shimkus. And I see some of your panelists shaking their heads. And I would refer folks to your testimony and these charts. They are just unbelievable, figure 4, 5, 6, 7, and 8. And the last one, figure 9, it actually goes from 2000 to 2018, showing 721 reduction in CO2 emissions per million metric tons versus -- that is the U.S., which is the greatest reduction in CO2, without doing any of this stuff.

Now, you are a climate change believer, and you want us to be engaged, and so I am not trying to spin a story that you are in the denier category.

Mr. Gattie. No. I accept the science on climate change.

Mr. Shimkus. But your position is, if -- we could be doing all of this internal gymnastics for naught if we don't address the Asian-Pacific region and all of these other ones that you have highlighted.

Mr. Gattie. Correct. If we are disengaged from the global community's efforts to reduce carbon, then we are not addressing the cause and the source of those carbon emissions.

Mr. Shimkus. So how can we be engaged? So accepting the premise -- we need to do that -- how do we get engaged?

Mr. Soto. Paris.

Mr. Shimkus. No, Paris failed. So I hear rumblings by my colleagues over here,

and it is my time, and I appreciate that. But you -- in testimony today, Paris is not meeting its agreements or its levels. So let's address the problem.

So how would you say we should be engaged?

Mr. Gattie. So I would start with -- again, these emerging economies, they want a couple of things, and Representative Walden pointed it out. They want electricity. They need electricity. They need reliable and affordable electricity. I have heard testimony before this subcommittee before that those emerging regions will do what is necessary to provide electricity to their economies.

Mr. Shimkus. Regardless of the emissions?

Mr. Gattie. They will worry about the emissions later.

Mr. Shimkus. Correct.

Mr. Gattie. Unless they have a reliable substitute for things like coal and natural gas, they are going to build coal plants. The projections for coal plants -- I think I may have included that. We are still building coal plants throughout the world.

Mr. Shimkus. Yes, sir.

Mr. Gattie. They are not -- they are not going down. They are increasing.

Mr. Shimkus. Let me turn to Mr. Profeta, because I see him shaking his head on some of these answers, but also I want to make sure that his son hears you get grilled in a question. No.

But you're agreeing to some of this. So can you give me your analysis?

Mr. Profeta. First, I think the analysis is that it is a global problem, and there needs to be a global solution. So we need do need to be engaged in the international negotiations.

If Paris is not acceptable to you -- it sounds like Paris wasn't even aggressive

enough to meet those targets. We need to find a way that global emissions are going down.

But U.S. leadership is essential. Every time we have had success in these international courts is because the U.S. has come to the table and found ways, and the U.S. needs to be part of this global solution.

The U.S. is not increasing at the pace of Asia, but it is still about one-sixth of the problem. So we do need to show some leadership there as well in our own domestic emissions if we are going to be able to inspire our colleagues around the world to act as well.

Mr. Shimkus. And, again, I do appreciate -- the testimony has been great. Thank you for being here.

And I yield back my time, Mr. Chairman.

Mr. Tonko. The gentleman yields back.

The chair now recognizes Representative Peters for 5 minutes, please.

Mr. Peters. Thanks, Mr. Chairman.

Thanks to all of the witnesses for being here.

You know, Mr. Tonko is right there is no silver bullet. I was just jotting down all of the things we have to work on. Decarbonizing electricity, which Mr. Gattie addressed, transportation, industry, buildings, agriculture, aviation. We have to deal with the effects of wildfires, which Mr. Walden has been avid on. We have to deal with short-lived climate pollutants: methane, black carbon, hydrofluorocarbons, which aren't necessarily going to be responsive to -- with cheap gas to these price signals by themselves.

We have to develop negative emissions technology, like carbon capture, utilization, and sequestration, and we have to deal with carbon price incentives. So this is

a -- this is a welcome -- a welcome hearing. We have to deal with all of those things.

Mr. Shimkus is right, that this is an international problem. And I would just say -- and I don't mean to be rude, but I just got back from Madrid. People meet on this every year. And I was honored to go, but I will give my seat up to Mr. Shimkus, because we all have to be involved in this. And being the only country not there and saying that it is an international problem just is too incongruous. We have to show up. And this committee has been -- this Congress has been supportive of engaging in the Paris Agreement. We are the only country not in it. So that is obvious to me, and I would love to take you next year to --

Mr. Shimkus. But it wasn't bipartisan. It wasn't bipartisan. We weren't invited.

Mr. Peters. No. Well, that's not true. Actually we --

Mr. Shimkus. No, we weren't invited.

Mr. Peters. Well, we can talk about that later, but -- you should have been invited if you weren't, but I believe you were.

Second, Mr. Shimkus is right, that it should not just be one party. And I hope that we will -- if we are talking about something as -- on the scale of World War II or on the scale of sending someone to the Moon, that can't be a one-party thing.

So I hope that we will take this seriously. There is no dispute about the science here. Everyone understands the target is net neutrality by mid-century. I hope that we can count on Republicans and Democrats to work together on this issue because it really is an existential threat.

The one thing I would agree with Mr. Shimkus on, though, is that there is no benefit economically to us. We know that if we don't do something about climate change, that the world GDP will decrease by 30 percent and that the cost to the American

taxpayers directly will be billions of dollars by the end of 2020 -- '30s. That is from GAO.

So let's get to work on this. And I think that one of the things we are -- the thing you are talking about today, carbon price incentives, is widely understood to be the backbone -- the backbone strategy for this.

Carbon tax, according to The Wall Street Journal's assessment of 40 of the world's most esteemed economists, carbon tax offers the most effective lever to reduce carbon emissions at the scale and speed that is necessary.

I also would just state for my own purposes that you have all come out with different views that -- suggestions that I think -- I am open to any of them. I do think that if it is true that there is eight proposals before Congress now. Any of them would reduce emissions in a dramatic way, as I think Dr. Kaufman said, we should support the one that will pass.

And I am open to -- I am open to a cap and trade. That is what California does. I think that we had some difficulties with that last time. I am open to the clean power plant kind of structure that Mr. Profeta was outlining. That wasn't as popular politically as I thought it might be. I think, you know, if a carbon tax is more directly effective, I think we should support that. And we have Republicans who have cosponsored those two.

So, with the time left, I guess I would ask if maybe, Mr. Esty, you might talk a little bit about how a carbon price is -- how fundamental design choices are made in the economy by a carbon price. Just can you give us a little bit of explanation for people who may not have been studying it as carefully as you?

Mr. Esty. Sure. What a carbon price does is to make sure that people are thinking about the fossil-fuel-emitting activities they undertake and trying to reduce their

emissions. And I think it not only encourages every business, but every family, every industry, to think hard about what they are doing and to try to do things in new and different and better ways from a point of view of decarbonization.

The other thing it does -- and it was really central to my suggestions to the committee here today -- is that it spurs innovation. It means that you have got many, many companies that out there thinking not only about how to reduce their emissions but frankly how to reduce their customers emissions, but frankly how to reduce their customers' emissions and to bring more low-cost technologies and products to the marketplace.

So you set off a spirit of competition to be the best at decarbonizing, and I think it really engages the private sector. And I would say one of the great joys of America is how good we are at innovation with the right policies to drive that process.

Mr. Peters. Right. And so we talk about the polluter pays. I mean, I think one of the things we really fail to understand is that all of us are driving to work, all of us are driving this -- this pollution. We all need an incentive to understand what those choices are, and price is the one that makes the biggest difference.

And so I appreciate you being here, I appreciate all of the testimony, and I look forward to working to land this plane.

And I yield back.

Mr. Tonko. The gentleman yields back.

The chair now recognizes Mr. Carter from Georgia for 5 minutes, please.

Mr. Carter. Thank you, Mr. Chairman, and thank all of you for being here. This is extremely important, and I appreciate it very much.

Professor Gattie, it is good to see you always. Go dawgs. I appreciate you being

here. But -- and I especially appreciate your view, because I share the same view. I am not a climate denier. I believe in climate change. I believe it is real. And I believe we have to address it, and we have to address it on a global scale.

And whenever we talk about that and whenever the panel -- or whenever the members here have been asking questions, everybody has been nodding, yeah. Everybody agrees with that. It is a global problem. And I am not going to get into the Paris Agreement and where we felt like we were having to carry too much of the burden. That is not what I want to get into.

What I do want to get into, though, is that, Dr. Gattie, what you said about the Asia-Pacific region, and specifically what you said that we needed to triage where the problems are, can you kind of elaborate on that for me a little bit?

Mr. Gattie. Thank you for your question. I tried to invoke a medical term here.

Mr. Carter. And I appreciate that very much.

Mr. Gattie. Yeah. It is a good two-syllable word, and it works well. Sounds a little French, so I thought I would put it in the --

Mr. Carter. That is the way we do it in the South.

Mr. Gattie. We try hard.

The point here is if you are in a condition, and there are patients, some are acutely sick, some are getting sick, some are somewhat healing, where do you focus your efforts and your resources? There are several approaches that you take. But you certainly have to evaluate where you allocate your resources and your efforts to have the maximum impact.

My point here with this approach does not disengage the U.S. from engaging in climate solutions. We have to lean in. We are responsible for leaning in. We should

reduce our own emissions.

My proposal here is we look at those regions of the world where the problem is most acute, that we can deploy -- develop and deploy U.S. technologies, and we have all mentioned those this morning. It is carbon capture and storage. It is advanced nuclear reactors, small modulars, and on down the line -- to these countries that are going to burn fossil fuels with us or without us. We need to have a strategy.

If the Paris Agreement had looked at it that way, as a strategic triage effort, rather than a somewhat disaggregated everybody go home and do something individually, I think we would have had a more ecological outcome than perhaps what we are headed towards now where we are not headed in the direction that we need to go.

RPTR WARREN

EDTR SECKMAN

[11:32 a.m.]

Mr. Carter. And I appreciate you saying that because I agree with you. I understand the United States should be the leader, and that's why I tell people all the time I am excited about the opportunities that exist here. The greatest innovators, the greatest scientists in the world are right here in the United States of America. We can solve this. I am convinced of that, and I believe it can be a boom for our economy because if we can send the innovation overseas, I think it would be tremendous for us. So I agree with that.

Now, I want to jump into it right now because, as everyone knows, there are only two nuclear reactors under construction right now. And they are Plant Vogtle in Georgia. So I want to talk about nuclear energy and the role it plays because, you know, when I talk to these groups and we mention nuclear energy, they are, "No, no, no, we can't do that." But nuclear energy is, what, 55 percent of all of our clean energy right now in America?

Mr. Gattie. Right, of the clean energy.

Mr. Carter. Right. So tell me about nuclear energy and tell me, first of all, where you see that and the role it playing in future.

Mr. Gattie. So, again, thank you for question about nuclear. This is the untapped resource that we are not focusing on, in my opinion, at the level that we need to focus on. You will see throughout my testimony, I emphasize the national security implications of this. Nuclear is one of those rare, unique energy resources that is not simply an energy commodity. It, if left to market forces alone and the market force nuclear out of the

market, that would be a national security concern because we would be disengaged from the global nuclear fuel cycle, the global nuclear ecosystem. That is not what our original designers of nuclear power policy envisioned. We are to be engaged and embedded and have other countries essentially entangled in our nuclear culture. So it is an energy commodity, but it is more nuanced than just the technology.

Mr. Carter. Great. Well, I am out of time, but, again, thank you very much, and go Dawgs.

Mr. Gattie. Yes, sir. Go Dawgs. Let's hope they do.

Mr. Tonko. The gentleman yields back.

The chair now recognizes the gentlelady from California, Representative Barrigan, for 5 minutes, please.

Ms. Barrigan. Thank you.

It's critical for communities that are experiencing the deepest effects of climate change to lead conversations on how to mitigate its impacts, not just for one day on a panel which we had in November but every day we are having this conversation. This is important since the first page of our briefing memo says that there is a large agreement among climate policy experts that a price on carbon is needed to reduce greenhouse gas emissions. However, I have received repeated correspondence from environmental justice groups that have real concerns with the carbon tax, absent concrete steps to invest in frontline communities and stop the expansion of fossil fuel infrastructure and extraction that harms communities.

For my constituents, the climate crisis is also a public health crisis. As we move forward, we must ensure all voices are at the table as we weigh climate solutions.

I request unanimous consent to enter into the record a letter into the

congressional -- a letter to the Congressional Progressive Caucus from 33 environmental justice community civil rights and environmental organizations opposing a carbon tax.

Mr. Tonko. Without objection, so ordered.

[The information follows:]

******** COMMITTEE INSERT ********

Ms. Barrigan. I also request unanimous consent to enter into the record a letter sent to the House Select Committee On Climate Crisis by over 250 environmental groups, urging the committee to reject policies that worsen inequalities and prioritize support for communities harmed by the most -- by climate change and pollution.

Mr. Tonko. Without objection, so ordered.

[The information follows:]

******** COMMITTEE INSERT ********

Mr. Shimkus. Chairman, can we -- we are not going to object, but we would like to see them, if we may.

Ms. Barrigan. Sure. I will make them available.

Mr. Profeta, there are as many as 177 natural gas power plants planned or under construction. If built, the emissions from these plants will be locked in well beyond 2050. Which policy would make more -- which would be more effective at preventing this, a carbon tax or a moratorium or new fossil fuel power plants?

Mr. Profeta. Thank you for the question, Congresswoman.

I believe the obvious answer to your question is, if you are looking for effectiveness not to have the plant built, to ban the plants would be the more effective way to ensure it is done rather than use market forces. The appeal of the market force approach is that you don't pick or choose the technology. You actually let the market find the lowest cost reduction.

I also would note that the proposal I brought forward on sort of Federal/State partnership allows the State governments to really look at some of the community affects you are most concerned about within their States and design policies that make sure they address the concerns of your constituents.

Ms. Barragan. Thank you.

Mr. Esty, it was recently reported by the EIA that U.S. oil production reached a record of 12.4 million barrels per day, making us the world's largest oil producer. I am fighting urban oil drilling in my district that contributes to this total. How can the U.S. reconcile being the world's largest oil producer and decarbonize by 2050?

Mr. Esty. I think your question raises the opportunity to put a price on the harm

causing you have identified and I think that is one of the unifying themes that has come out of the panel today is that by making people pay for the harm they cause, in particular by putting a carbon charge in place, you begin to steer people towards other options, and I think this is a very good solution for the kind of issues you are talking about, not only from the point of view of carbon impacts, climate change, but, frankly, for the public health issues as well.

Ms. Barrigan. Mr. Kaufman, do you -- Dr. Kaufman, do you want to chime in on this?

Mr. Kaufman. Well, I would agree with you that investing in frontline communities is massively important and that there is a lot of equity issues that policymakers should consider. I would also encourage you not to lose sight of the first and second order impacts of any strategy that you would put into place to achieve net zero emissions by 2050, and that is going to be massive reduction in not just carbon dioxide emissions but local air pollution. So I think there are important issues about how these benefits are distributed throughout the population, but, you know, there are benefits for all there.

Ms. Barrigan. Great. Thank you.

I yield back.

Mr. Tonko. The gentlelady yields back.

The chair now recognizes Representative Long for 5 minutes, please.

Mr. Long. Thank you, Mr. Chairman.

And, Dr. Gattie, our hearing today is the latest in a series on how our committee could enact policies that will reduce carbon emissions throughout the economy. We all agree that reducing carbon emissions is an important goal to work towards. And if

anyone's ever visited China and Beijing in particular and other cities in China where you literally cannot see across the street, we know how important it is to work towards that goal.

But I am wary of the potential economic and national security impacts that broad-sweeping climate legislation will have for everyday Americans. We have seen across to world how well-intentioned governments are implementing policies to reduce carbon emissions that have faced extreme backlash from citizens. It has been mentioned several times here today when these actions affect cost of goods and services which harm economies and make countries less competitive in the global marketplace.

The policies we work towards in this committee must reflect the global nature of the climate change problem. Having aggressive domestic climate solutions will not have an impact on climate change if the rest of the world continues to increase their own carbon emissions. Action on this committee -- action this committee takes needs to serve as a blueprint for the rest of the world, showing how our climate policies that don't hinder economic growth and threaten national security are attainable and the right way to combat global problems like climate change.

Dr. Gattie, I am a proponent of nuclear power as a producer of clean and consistent carbon-free emissions, and I'd like to say that I recently visited Fukushima, and I am co-chair of the congressional study group on Japan with my buddy, Diana DeGette, on the other side of the aisle, and they have gone through some times with that, of course, and with trying to get back to nuclear energy which, you know, with their locale where they are located, it is pretty much mandatory.

And it is disheartening that the rhetoric from some of the Presidential candidates running right now shows a desire to eliminate our most reliable clean energy source.

Nuclear power can and should be further utilized in America, but the potential for exporting nuclear technology in developing countries can produce a path forward to significant carbon reductions.

Can you expand on the importance of building durable energy technology relationships and how exporting nuclear technology can help the United States accomplish larger goals of combating climate change?

Mr. Gattie. Yes, sir. Thank you for your question.

Energy is essentially the language of geopolitics. Energy relationships are what underpin much of our 21st century just economic flows. Those relationships are going to occur globally. Right now, countries such as Russia and China are building out those infrastructures. China is using their Belt and Road Initiative. And, of course, Russia is looking to build gas pipelines. They just, I think, connected one. It's the Power of Siberia to China.

Those are anchors for long-term geopolitical relationships. When it comes to nuclear, in particular nuclear, that is an 80-year relationship. Whoever is the country developing the technology in those developing regions will be there for 80 years or longer. They have the opportunity to then impress upon that region their own culture norms and standards. They don't necessarily share our American values. If they are authoritarian countries, they are not in it for only the long-term relation. They are in it for dominance. They are in it for the influence. They have a plan. Russia and China in particular with their nuclear and Russia with its gas, they have a strategy, and it is a long-term strategy, and energy underpins that.

We should be responding to give those countries options, the options that our early policymakers directed nuclear policy for the very intention of the U.S. being that

provider of that nuclear power. The national security aspects are the overarching objectives for all the things you just mentioned, Representative Long. Climate change is embedded in that. It just happens to be one of the benefits of nuclear, but still the national security part is the overarching objective.

Mr. Long. You covered several of the things I was going to point out as which is China's hundred projects that are either planned or proposed or everything. So I am out of time. So I appreciate all of you being here today.

And I yield back.

Mr. Tonko. The gentleman yields back.

The chair now recognizes the gentlelady from Delaware, Representative Blunt Rochester, for 5 minutes, please.

Ms. Blunt Rochester. Thank you, Mr. Chairman.

And thank you for your continued leadership in building a 100-percent clean economy. I also would like to thank Mr. Shimkus, our ranking member, and to the witnesses.

One of the things, if anybody is watching this hearing, I hope the big takeaway that they have is something that my colleague, Mr. Carter, talked about, which is the agreement that we have that, number one, climate change is real, that we must address it on a global level, and that the United States must be a leader. If you leave with nothing else, there is agreement on that. Ultimately, we do this for our health. We do this for our security. We do this for our economy, and the goal is to do it in a just way. So be encouraged by that. Part of the process here is to come up with solutions, and this is a solution, some solutions, and I wanted to just share that, before coming to Congress, I had the Congress to serve in State government in Delaware. And at the State level,

partnerships were pivotal. It was just pivotal. So I am really interested in the State/Federal partnership idea to address the climate crisis. And particularly with Delaware being a leader in fighting climate change, I am proud to say that Delaware is a member of both the Regional Greenhouse Gas Initiative, also known as RGGI, and the U.S. Climate Alliance and this year in particular we have seen unprecedented climate action at the State level. I want to make sure that we protect and build on that great work that is being done.

So my question is to you, Mr. Profeta. How can we ensure that a State/Federal partnership builds on the successes of programs like RGGI, rather than duplicating or undermining them?

Mr. Profeta. Thank you, Congresswoman, for the questions.

I think that is the beauty of the idea is that there is so much activity on the State level. The states have developed such leadership on the issue. There is no reason to halt that but actually use that momentum and keep it going forward with sort of a Federal/State partnership. So what the Federal role would be, would be to create a 50-State solution to make sure all States have objectives and goals set by the Federal Government so there is no patchwork between them.

And States like Delaware, States like the RGGI States could continue their program and be -- the one key would be to look at what the leadership States have done or all the States have done, what has been working, and make sure your legislation authorizes that to continue and accelerate.

Ms. Blunt Rochester. Great. Thank you.

And thanks to programs like RGGI, emissions are decreasing in the Northeast. But at the same time, they are increasing in other parts of the country, possibly even

offsetting other regions' gains. Can you explain why States' emissions are going in such directions and how a State/Federal partnership can counteract that?

Mr. Profeta. Well, it is kind of like a balloon. You push down one place, it may come up another place. The emissions can leak to other regions of the country. And this is tradition across a lot of our statutes, but what the Federal Government can do is set objectives that kind of create a level playing field and make sure everybody is moving in the right direction but allow the States to design plans that work for their constituencies, their needs and transitions. So, you know, the Federal Government will create the standards to make sure everybody is going the right direction, but the States will have the discretion to take it there.

Ms. Blunt Rochester. And then I just want to close by piggybacking on Ms. Barragan's questions that we know communities of color, as well as low-income communities, are disproportionately burdened with pollution. And at the same time, these communities tend to spend more of their income for power and heat their homes, while lacking the resources and information to take advantage of solutions like energy efficiency and solar. Some of the traditional ideas for how to decarbonize fail to account for these inequities, and for that reason a comprehensive climate strategy with economywide solutions must ensure that these frontline communities are heard, protected, and prioritized.

In the time that we have, maybe Dr. Kaufman and Mr. Esty, if you can each discuss how we can go about protecting low-income households and other impacted communities and how smart policy design can ensure these protections.

And we only have 30 seconds.

Mr. Esty. I will start for 10, and then we will let -- I think what you have is the

opportunity to spend the revenue that comes from a carbon charge in ways that address the inequities, and I think attending to the communities that are disadvantaged is a starting point, but I would also look at the communities most affected by the transition. So I think a smart transition is critical.

Ms. Blunt Rochester. Mr. Kaufman, 10 seconds.

Mr. Kaufman. Well, let me just agree and say I mentioned in my testimony making sure those who can't afford higher prices don't have to pay them. Making sure that coal communities in particular who would be adversely affected by the policy would be very smart uses of revenue. I think the frontline communities issue is potentially a separate policy objective but no less important.

Ms. Blunt Rochester. I know my time has run out, but I think that is also an area where we can find common ground, that we also have to take care of vulnerable communities that also are impacted by what we do here. So thank you so much.

And I yield back.

Mr. Tonko. The gentlelady yields back.

The chair now recognizes the gentleman from South Carolina, Mr. Duncan, please, for 5 minutes.

Mr. Duncan. Thank you.

Thank you, gentlemen, for being here.

I want to begin by commending the Trump administration and the energy sector for the robust domestic energy production we are seeing now. There is no doubt that energy -- American energy renaissance has strengthened our leadership ton world stage. The failure to seize the abundance of our resources has international implications. In fact, a couple of weeks ago Fiona Hill testified in front of the House Intelligence

Committee that Vladimir Putin saw American fracking as a great threat to Russian interests and that a fracking ban would play into strengthening Putin's hands.

Energy is used as a political weapon by many of our adversaries. We have the opportunity and arguably the moral obligation to export U.S. energy to energy-poor countries around the world to help them reduce their dependence on corrupt state-owned regimes like Vladimir Putin. We have the ability to increase the quality of life for so many people around the world.

If we truly care about the lives of people around the world and impoverished regions, American energy export can help improve their lives by providing electricity to areas that don't have that so they no longer have to cook over wood or coal or dung or whatever substance they use to heat in their homes, cook over; they have the ability with electricity to keep food fresh for longer periods of time. The air quality is much better, the possibility of air conditioning, the possibility of reading to their children at night, but yet the policies I hear put forth and the ideas put forth today would increase electricity costs for American citizens.

And who is hit worse by those costs? And that is the poor folks in our economy because higher electricity fees would eat up more of their already limited income, but yet you want to tax the energy production. You want to tax the manufacturing in this country and redistribute that wealth to help -- I think Mr. Kaufman said -- help those so they don't have to pay the electricity costs, the higher costs. That is just redistribution theology, and it doesn't work.

One added benefit that our export LNG may be cleaner than that that those nations would use otherwise. So climate benefits are connected directly to the energy diplomacy efforts. But what would we do this in this country? We are pushed to sign on

to a Paris climate accord. But we're not holding India, China, and Russia accountable for their air quality emissions.

How about this? Instead of stopping pipelines and LNG export terminals on the West Coast, why not support those so that cleaner-burning, affordable, American-produced natural gas can be exported to areas like India or Southeast Asia or possibly China to help them lower their air-quality emission while supporting a robust American energy economy?

A carbon tax, as you have proposed in your testimony, of a more drastic -- a ban on fracking that some have proposed would completely reverse the trajectory of American energy renaissance. American companies would be less inclined to innovate. Costs would undoubtedly go up for consumers across the economy.

So, Dr. Gattie, we talked a lot about the role of natural gas and our changing generation mix, but we always don't give credit where it is due. Do you agree that our emissions reductions are made possible by hydraulic fracturing and advances in the technology?

Mr. Gattie. In the power sector, yes, sir.

Mr. Duncan. Can you talk a little bit about nuclear power and how that figures into the energy matrix and lowering our carbon footprint?

Because, Mr. Esty, you are from Connecticut? Is that correct?

Mr. Esty. [Nonverbal response.]

Mr. Duncan. Your Governor just decided not to decommission reactors and keep them online. Why? His own words were: We can meet our attainment levels. We can meet our lower carbon footprint by keeping nuclear in the mix. There is a byproduct on nuclear power, and that is nuclear waste that needs to go to a long-term stable storage

facility. This committee has talked about Yucca Mountain. I am not going to go there today, but I support that as a long-term storage facility.

Dr. Gattie, can you talk about nuclear power and how it plays into that, into the lowering carbon footprint matrix?

Mr. Gattie. The way I look at nuclear, it is a long-term investment. It is a long game. It is very different than the way a lot of the markets work now where markets are trending towards short-term marginal profits, looking at natural gas, which I am a natural gas supporter. It has gotten us to where we are in the power sector.

I agree with your point that I would like to see us exporting that LNG to countries where other countries are building pipelines to connect them with their countries, but the nuclear is the long game. We are looking at long-term carbon hedging here for eventually if there is a carbon processor or anything. This is a long game.

Mr. Duncan. I am out of time.

But would you agree that Russia and China and India, Russia and China primarily are exceeding the United States in nuclear technology and development at this point?

Mr. Gattie. Russia and China are. I wouldn't necessarily say India is, but they are on -- they have strategies that we currently lack.

Mr. Duncan. Yeah.

Thank you, Mr. Chairman. I yield back. I appreciate it.

Mr. Tonko. The chairman yields back.

The chair now recognizes the gentleman from Florida, Mr. Soto, for 5 minutes, please.

Mr. Soto. Thank you, Mr. Chairman.

You know, we define American excellence and leadership in climate here in

Congress, not by the terrible energy policies of China and India. So I for one won't be using them as a benchmark but the fact that we need to lead. And we are here because we have our 100 Percent Clean Economy Act to get us to net-neutral carbon output by 2050, and it is an all-of-the-above strategy that includes wind and solar but also includes nuclear and potentially carbon capture.

But I want to focus not on just the cost of action, which we will go into in a little bit but the cost of inaction. Through 2014 to 2018, we spent $13 billion a year annually on disaster relief including in my home State of Florida. Three of the past 6 years, we set records in disaster relief spending, and that is not even getting into the health costs that are facing so many communities of color like where I represent, and then I am forced to go back to a state where we see headlines in Florida today: "Climate change once flooded Florida -- and could again," WLRN.org; "Florida Keys Deliver a Hard Message. As Seas Rise, Some Places Can't Be Saved," New York Times just today.

But if saving the plant for our children and our grandchildren isn't enough, how about 21st century economic dominance? If we have the clean energy revolution here with our partners in Europe, we will dominate the 21st Century economy.

I just want to ask a basic question to Mr. Kaufman. If we developed advanced clean energy technology, do you think China, India, and Russia would buy it?

Mr. Kaufman. If the technology is good, I think they would buy it. I think what my sense is that we have been innovating in energy, you know, for decades, for centuries, and what we have seen is that innovation is important, but it doesn't in itself cause us to use less of anything, right? We use more biomass now than we used to. We use more coal than we used to, even though we are developing these new technologies. So I certainly appreciate the points that we need to develop new technologies. But I think, if

we think that will lead to reduced emissions by itself, then I think we are kidding ourselves.

Mr. Soto. Certainly, which is why we have an all-of-the-above strategy and thank you for that comment.

You know, this comes down to basic property law. You learn it in Property 101, tragedy of the commons. Those of you who are lawyers in the room know that wonderful story. It started back in England and beforehand where people would pollute the commons. It would get worse and worse. There would be health problems. You would have economic collapse unless you regulate the commons. And now we are dealing with the whole world because every ton of carbon that is put in the air is polluting and destroying our plant.

And so, you know, I would like to think that we Democrats are the party of free market, much like our colleagues across the aisle, which is why we are here today, to discuss free market solutions.

I would like to get a show of hands. How many of you would support a cap-and-trade regime to help lower carbon emissions? Raise your hand.

Mr. Esty. Can we ask whether that is our choice?

Mr. Soto. I am going to go into other things. I am going to go into carbon tax next. So we have one, two, three.

How many of you would support a carbon tax as a regime to lower energy costs? Okay. Let's focus on carbon tax because it seems like one that most of you have pushed more than others. It would be great to hear from all three of you who raised your hands. What do you believe the cost of carbon should be set at per ton?

Mr. Esty.

Mr. Esty. I would start with $5 per ton and escalate by $5 per ton per year for 20 years for a $100 a ton end price.

Mr. Soto. Thank you.

Dr. Kaufman, what is the price of carbon per ton to our planet?

Mr. Kaufman. I think if we are in the realm of above starting above, you know, the $20, $30 a ton, it is whatever bill that you can pass in Congress.

Mr. Soto. Mr. Profeta, what do you think it should be?

Mr. Profeta. I raised my hand for other things. So I think you do whatever you can to get expeditious reductions in greenhouse gases.

I would second Noah's standpoint. What is politically feasible in that range that would make -- move the needle?

Mr. Soto. Okay. Thank you.

And, lastly, you know, we are cognizant of the fact there are energy-producing States that would suffer economically as these things happen and that this funding should also be used to help invest into new industries like transitioning to renewable energy equipment manufacturing, building nuclear power plants in some of these areas that will be producing less coal or oil or gas and even establishing wind where appropriate.

I wanted to ask a basic question to Mr. Esty. Do you think we have the ability to transition those economies over to these more renewable energy and nuclear energy opportunities?

Mr. Esty. Absolutely. I think there is a clear possibility of reinvesting some of the revenue generated by an economywide carbon charge and put that into the communities that need to transition.

Mr. Soto. Thank you.

I yield back.

Mr. Tonko. The gentleman yields back.

The chair now recognizes the gentleman from Ohio, Mr. Johnson, Representative Johnson. You have 5 minutes, please.

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

And, Professor Gattie, you know, last Congress this committee discussed the important role that Part 810 plays in U.S. civil nuclear providers' ability to engage with our international allies. During this debate, we heard some concerns that went along the lines of: You know, it is too dangerous for the U.S. to engage in these international markets. Therefore, Russia, China, and others should take the lead in that engagement while we sit on the sidelines. For crying out loud -- and I have heard Secretary Perry even talk about this -- we cannot sit on the sidelines on the commercial nuclear arena because, once China and Russia get their foot in the door with developing countries in putting in commercial nuclear programs, they are in there for, like, a 100 years. I mean, it is a big influence that they wield.

So, in your testimony, you discuss how early U.S. nuclear policymakers recognize the strategic importance of America's nuclear enterprise. So here is my question: What steps can Congress and those within the nuclear industry take to stress the importance of America's international engagement today?

Mr. Gattie. Thank you, Congressman, for that question.

I will propose two general high-altitude. The first one is political, and that is I would encourage the committee to maybe go back and look at the 1956 platforms for both Democrats and Republicans. Both were competing to be the champion for the U.S. Nuclear Enterprise to be the world's premier nuclear base. I would like to see that

brought down to the public's purview for the general public to understand that we have managed this for 70 years and can continue.

Now moving forward, on the broader policy side, a suggestion as to how do we develop a strategy long term. To the point you made, Congressman, China and Russia have strategies. They are state-owned enterprises, serve as extensions of the state. One analogue here is the way DOD kind of looks at its supply complain and manufacturing supply chain. Every few years, they do an industrial-based review. They look at what we need to do to ensure that our defense base and our manufacturing base for the defense is where it needs to be.

I think a similar approach could be taken for our nuclear sector. It is a critical industry. It is a national security industry. I think we should at least, to get our brains wrapped around what our gut is telling us about this national security thing, we really need to do an evaluation or assessment similar to that to look at our manufacturing supply chain and our current status for U.S. Nuclear Enterprise. I think that is something this committee and Congress can engage in and get multiple Federal authorities engaged. It would be the intelligence community, the State Department, the Commerce Department to do a thorough review of where we are, where we are compared with other countries, and what is the strategy for moving forward.

Mr. Johnson. Yeah, I think it is really important. And I agree with you. We have got to get it into the purview of the American people. It has got to be a conversation on the street. And the reason why is because, in countries like China and Russia, public opinion doesn't mean anything to the decisionmakers in those countries. They don't have the system that we have that demands input from the American people and we lawmakers that have to take into consideration the concerns of our people, the people

that sent us here to represent them. It puts us at a disadvantage in terms of tactical moves in that sphere. So I agree with you.

How can we ensure that we are appropriately balancing safety and security within our nuclear export policies while ensuring our domestic industry can successfully compete in these international markets?

Mr. Gattie. So, again, there, Congressman, I would go back to my earlier point about doing a base level industrial review of our entire nuclear sector. Where do we stand on the supply chain? Where do we stand on our fuel purchases? Where are the bottlenecks and constraints currently where we can and cannot purchase fuels? Are we constrained at any point in that supply chain? I am not sure that we comprehensively understand exactly where we are. I think that is something that should be driven by some congressional --

Mr. Johnson. Do we have the right balance between engagement and security? Do you think that -- because, I mean, I don't. Obviously, I don't.

Mr. Gattie. No, sir. No, sir.

Mr. Johnson. Okay. All right.

Mr. Chairman, I yield back.

Mr. Tonko. The gentleman yields back.

The chair now recognizes the gentlelady from Colorado, Representative DeGette, for 5 minutes, please.

Ms. DeGette. Thank you so much, Mr. Chairman.

I have been a member of the Energy and Commerce Committee for many, many years. And I actually sat in on the hearings where my colleagues on the other side of the aisle, despite overwhelming evidence to the contrary, denied that climate change existed.

So I am actually really pleased to see that we have moved now into the realm where everybody agrees that climate change exists and that we need to have a solution, but I am, frankly, very concerned by this implication that, since it is an international problem and since China, India, and other countries, Russia, are not complying, that we should somehow just sit around because I don't know of any time in our Nation's history where we actually sat around waiting for China, India, and Russia to do something.

And so that is why I have been developing legislation. I have been trying to find a bipartisan cosponsor of this legislation that would be a market-based solution, that would help U.S. interests, that would get us to the standards of zero percent carbon emissions by 2050, and that would be an all-of-the-above solutions, so long as they met those standards.

So I want to ask some questions about how a bill like that, which would basically decarbonize electricity and then move towards electrification of everything, how that would help us with this international issue and with the U.S. standards in the international community. Rather than sitting back and waiting for them to do something, let's be the leader and let's benefit economically from it.

So, Dr. Kaufman, I want to start with you. If we put a price on carbon pollution, can that drive innovation in technologies that don't emit carbon?

Mr. Kaufman. It will, yes.

Ms. DeGette. Okay. And do you know exactly what technologies can get us to zero emissions, or do you think we are going have to have innovations along the way in the next 30 years?

Mr. Kaufman. Well, innovation will enable decarbonization to proceed more cost effectively, faster. It is --

Ms. DeGette. Right. But we don't know exactly what that technology is right now, do we?

Mr. Esty, you are shaking your head no.

Mr. Esty. I agree with you. What we really want is to incentivize technology breakthroughs across the board.

Ms. DeGette. Right.

Mr. Esty. And so that is where the carbon price allows you to get all of those different players because we don't know whether it would be wind --

Ms. DeGette. -- or solar or biofuels or tidal power or wave power or anything perhaps not even known.

Ms. DeGette. Right. I mean, you know, my provider, Xcel Energy, they set a zero percent goal by 2050, and they told me: Frankly, we don't know how we are going get there, but we are going innovate, and we are going to get there.

So I want to ask the two of you, Mr. Esty and Dr. Kaufman, if we do develop those technologies -- Mr. Soto asked a little bit about this -- is that going to help us be able to then export our technologies around the world and help them also reduce their carbon imprint?

Mr. Esty. Well, I would argue that the U.S. has always been very good at innovation and that has been the key to our competitiveness over time, and it is quite clear the world is pivoted towards a decarbonized future, and I think we would want to be out front in helping to deliver those solutions not only domestically but internationally.

Ms. DeGette. And it would help our economy, right?

Mr. Esty. Absolutely.

Ms. DeGette. Now, Mr. Profeta, I want to ask you quickly. You talk about building

a program State By State, and I really agree with that. I think every State has their own history in advancing clean industry. In Colorado, I talked about Xcel and what they did. And everybody has their own unique starting points.

So, if I understand correctly, your overarching principles are the pace of progress needs to be proportional to the scale of the problem so that the goals are going to be ambitious. The policy approach needs to be doable, by which you mean bipartisan, and we need to respect the different starting points around the country across different sectors and even within different sectors.

Is that an accurate summary of your views?

Mr. Profeta. That is really well-boiled-down stated principles, yes.

Ms. DeGette. Okay. Now as we create an economywide program step by step which, as you say, can be done in a number of ways, how do we avoid doing that in a patchwork way? How do we have an overall arching solution?

Mr. Profeta. There is two versions of patchwork. One is you have some who are acting, some who don't. So you have sort of leakage into the non-acting state. A 50-state strategy solves that. The second is you have different regulatory regimes in different States, and you may evolve some differences as the State laboratories work, but you can write your legislation to incentivize states to work together, to have all the authorities they need to merge sectors, merge programs, where it's efficient for them to do so.

Ms. DeGette. You mentioned other laws, the Safe Drinking Water Act, Clean Air Act. A lot of laws we have done that way. Is that right?

Mr. Profeta. Exactly. If you look at the Clean Air Act and what we did on the interstate pollution across the Northeast and Midwest, we wrote model rules in programs that would allow the States to work collectively together.

Ms. DeGette. Thank you. Thank you very much to all of you.

Mr. Tonko. The gentlelady yields back.

The chair now recognizes the gentlelady from the State of Washington, Representative Peters -- Rodgers for 5 minutes, please.

Mrs. Rodgers. All right. Very good. Thank you, Mr. Chairman.

And today we are considering policy to us achieve economywide deep decarbonization. Judging from the majority's memo, their proposals seem limited to policies that tax our economy and industrial sectors out of existence and destroy America's global competitiveness and leadership.

In Washington state, people have resoundingly rejected two separate carbon tax initiatives because a tax would put us at a competitive disadvantage. A Federal carbon tax or cap and trade would do the same to America on the global level without allowing to us continue to lead in reducing carbon emissions.

Climate change is a global issue, not just an American issue. It requires a global solution centered around innovation, which has made the United States so successful at reducing emissions. As we look to decrease emissions without destroying our economy, it is crucial that we expand our nuclear energy portfolio. American companies like TerraPower in Bellevue, Washington, have led the world in nuclear technology and innovation, but regulatory restrictions have hurt their ability to deploy new reactors both at home and abroad.

Right now, China and Russia are developing and exporting small modular reactors to underdeveloped countries, expanding their global influence. For America to win the future, we cannot afford to sit and allow this to continue.

Professor Gattie, in your testimony, you mention early efforts by American

policymakers to use America's nuclear energy enterprise strategically around the world. In your opinion, what caused the move away from these policies, and how has that affected our national security and global competitiveness with China and Russia?

Mr. Gattie. Thank you for the question?

I think over time there were a few things that contributed to it. I think we got complacent for one thing. I think we just simply, back in the eighties and nineties, we got complacent in the power sector. I think recently maybe we have gotten a little overconfidence in our natural gas market. We are very -- lots of confidence right now that we have got an abundant supply of natural gas. Of course, what we know is those are -- those have end games to them.

I think there is also a good bit of we have had market deregulation throughout the country. I think that has contributed to some of the current coal -- nuclear fleet being threatened for early closure. There is also just a general fear of waste and proliferation, things that we have always been able to manage here in the U.S. and globally for decades. But maybe one of the underlying reasons, Congresswoman, is that I really believe that we have got a general disconnect -- and I am saying this in reflection of students that I teach. There is a general disconnect of where we are globally right now, what the 21st century is actually like, what our competitors are now compared to what they were in the 20th century.

Russia looks ham-fisted, the USSR does, compared with what China is now. They have a long-game strategy. And nuclear is dead center in that, a long-game strategy to develop advanced reactors, close the nuclear fuel cycle, and implant their nuclear culture in other countries.

President Xi Jinping, he makes no bones about it that it is socialism with Chinese

characteristics. And if the U.S. does not step up and respond, it is going to give the world the impression that socialism with Chinese characteristics is succeeding where capitalism with American characteristics is failing.

This is something -- it is a sad state of affairs when President Eisenhower's "Atoms for Peace" vision is being forwarded by China and Russia and not us. That is -- he would roll over in his grave.

Mrs. Rodgers. Thank you.

So let's talk about, how do we make up the ground? So, in terms of policies to reduce emissions, how would we benefit from Federal policies to demonstrate technologies like advanced nuclear? Is it a problem that the Department of Energy does not currently have a demonstration project for a nuclear technology such as been proposed in the Nuclear Energy Leadership Act?

Mr. Gattie. I think things like NELA, the Nuclear Energy Leadership Act, are good touchstones. I think the overarching concern here is we don't have a strategy for those things to map into. We don't have a long-game purview and vision of what we want our nuclear enterprise to be in the 21st century for 30, 40, and 50 years.

I wish we would stop rejoicing too much in small victories and look at the big picture and setting ourselves up again to be the world's dominant, not a level playing field with China, the dominant nuclear provider in the world.

Mrs. Rodgers. Thank you. Thank you for being here.

And I will yield back.

Mr. Tonko. The gentlelady yields back.

The chair now recognizes the gentlelady from Stanville, Illinois, Representative Schakowsky, for 5 minutes, please.

Ms. Schakowsky. We are in the midst of an existential crisis right now. Last month, over 11,000 scientists from across the globe issued a warning of, quote, untold suffering, unquote -- quote/unquote -- that will be caused by climate change. The warning stated that, quote, scientists have a moral obligation to clearly warn humanity of any catastrophe, catastrophic threat, and to tell it like it is. We declare clearly and unequivocally that planet Earth is facing a climate emergency, end of quote.

While the President ignores the emergency, my State of Illinois -- you have talked somewhat about states -- is leading the way on climate solutions thanks to the work of Governor Pritzker and our House and Senate. During his first week in office, the Governor signed an executive order to join the U.S. Climate Alliance. And since then, the Governor has signed bills that will boost wind energy development in the State and protect communities from coal ash and other pollutants and champion a plan that invests $140 million for renewable energy projects across Illinois.

So, Mr. Profeta, what can -- or maybe the question should be -- can the Federal Government right now learn from States like Illinois?

Mr. Profeta. Yes. In fact, we do work with the State of Illinois and some of the projects we worked at Duke University, and I have been very happy to be engaged with the efforts there.

Illinois is a good example. It is part of -- Chicago is part of the PNJ region, too, which is the electricity grid region, and so it is looking to both take its own actions and figure out how in the electricity market it can make sure that its emissions are not only -- reductions are not only secured in Illinois but across the region, and that is where the Federal Government could help by giving all the States goals and objectives so that they are sort of holding each other to the same standard.

Ms. Schakowsky. Mr. Esty, your statement describes the importance of innovation including the need for, quote, innovation in policy design. Some of my colleagues like to say that, quote, innovation is the key to addressing climate change, but they stop short of calling for policies to actually spur innovation.

So, Mr. Esty and maybe Mr. Profeta as well or mister -- Dr. Kaufman, talking about, if you would agree that innovation doesn't just happen on its own and that it requires strong policy signals to set the Federal level.

Mr. Esty. So I would just say -- and I think it has been a consensus today -- that you want a portfolio of policies to drive clean energy and to create incentives for the innovation that we all are counting upon.

Mr. Profeta. Yeah, I would like to say, yes, you know, the United States is probably one of the greatest engines of innovation in the history of the world. And our capitalist system has really driven people. When they can make money innovating, they tend to do it. So, if we can create policies, however we do it, that drive the innovative engine, this Nation towards those things, we will end up driving the world's transition in the energy system, and that would be across the whole portfolio.

The one thing that is really distinctive, I think, on this panel that I want to make sure and note is every one of the four of us thinks that nuclear power is probably part of the solution set. So it is not something that where I think any of us think that nuclear isn't a significant part of the solution. A good --

Ms. Schakowsky. Let me confirm that. Is that the case? Okay. I know that --

Mr. Profeta. I mean, the chairman said at the outset there is no silver bullet for climate change. It is really silver buckshot. You just have to, like, spray the incentive across the economy and harvest every solution you can possibly have that doesn't make

greenhouse gases.

Ms. Schakowsky. So I want to get do this question of urgency. I spent a lot of time with constituents, especially young constituents who are walking out of classrooms on Friday, trying to come here and create this sense of urgency. Thousands of experts are warning that climate change could mark actually kind of a dead end for humanity.

I am just trying to get from -- well, I guess we are done. I have said my sense of urgency, but I really think that that has to be such a big part of the conversation here that we have to move and we have to move now and the kids that come to me say: Don't talk to me about my bright future; I might not have a future if you don't act.

Mr. Tonko. The gentlelady yields back.

The chair now recognizes the gentlelady from California, Representative Matsui, for 5 minutes, please.

Ms. Matsui. Thank you, Mr. Chairman. I will thank the panel for being with us today.

Over the past 6 months this committee has been focusing on a number of hearings to examine what it will take to achieve 100 percent net zero emissions by 2050, a necessary goal if we are to safeguard our planet and future generations from the devastating effects of climate change.

A central policy to this goal is the idea of some sort of economywide price on carbon. This has already taken place in the EU and parts of Canada and here at home in my home State of California, as well as grouping of nine Northeastern and Mid-Atlantic States, signifying clear support for such initiative.

California's cap-and-trade program, which has been in place since 2014, has demonstrated dual benefits of reducing emissions through its mandated caps but also by

raising revenue through the quarterly allocation auctions which can fund additional emissions reduction and climate mitigation efforts.

Mr. Profeta, you mentioned in your testimony this idea of a FEDERAL/STATE climate partnership in which the Federal Government sets a national level of reductions and States implement unique plans to achieve this.

Additionally, Canada established a Federal pricing -- Federal carbon pricing mechanism that allows provinces and territories the flexibility to develop their own carbon pricing system. The policy allows provinces whose carbon prices meet the Federal standards to maintain their existing mechanisms.

Mr. Profeta, do you think a U.S. carbon pricing system should be structured in a way that provides States the authority and flexibility to develop their own market-based carbon pricing strategies and allows States that have already established carbon pricing mechanisms, like my home State of California, to maintain their existing programs?

Mr. Profeta. Yes, I think the concept that we have been discussing developing would allow the States to determine whatever approach they want to meet the carbon goals, including the preexisting programs.

Ms. Matsui. Okay. As I mentioned, California's cap-and-trade policy has delivered the additional benefit of bringing in millions of dollars of revenue that can go towards additional efforts such as investments in cleaner transportation, energy efficiency upgrades, and reducing air toxics and criteria pollutants. The first year of auctions alone generated more than $525 million in revenue for the State, and to date, 11.8 billion has been generated and deposited into a fund that is used to reduce greenhouse gas emissions. Indeed, my district of Sacramento has benefited from these dollars through programs like low-carbon transportation projects and the Community Air Protection

Program, which prioritizes air quality in frontline communities.

Dr. Kaufman, there seems to be a misconception that carbon prices must be incredibly high to be effective. Based on experience in California and other jurisdictions at home and abroad, how would you respond to that misconception?

Mr. Kaufman. Well, I think what you want to do is exactly what the committee is doing, which is set your long-term target -- and net zero makes a heck of a lot of sense because at the global level climate change will continue until we get to net zero carbon dioxide emissions -- and then you want to work backwards from there and say, what do you want to achieve in the near term to get on that pathway?

And what our research suggests is that, you know, particularly if you, you know, surround a carbon price with a set of complementary policies, a price that is in the $30-, $40-, $50-per-ton range could be incredibly effective at reducing emissions and getting you on that net zero pathway.

Ms. Matsui. Okay. We have made significant strides in deploying renewable energy and increasing efficiency measures. It is clear that our country has a long way to go in transitioning into a clean energy economy.

Dr. Kaufman, given this, do you think it is necessary that a carbon price include a requirement that at least a portion of that money be spent on things like renewable energy, additional emissions reduction efforts, and research and development?

Mr. Kaufman. I would say it depends on what your policy objectives are and what the details of the carbon price itself are. I certainly think that investments are going to be needed. You know, we need -- you know, think about the transportation sector, and if we are going to, you know, over the next few decades switch away from gasoline and diesel vehicles, we need to facilitate this shift so drivers are comfortable doing that. So we need

to get that money from somewhere.

That said, I think, you know, the carbon pricing revenue is just government revenue. Right? So I think policymakers need to come to a consensus on the best way to use that revenue. It is the price signal itself that is going to do the most at reducing emissions.

Ms. Matsui. Right. Absolutely.

Okay. I am already running out of time.

So thank you very much.

Mr. Tonko. The gentlelady yields back.

The chair now recognizes the gentleman from California, Represent Ruiz, for 5 minutes, please.

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

And thank you to all the witnesses here today to discuss the importance of decarbonization. I want to talk about one of the primary options to reduce carbon emissions that we have been talking today, which is putting a price on carbon and how the revenue produced by such a price will be utilized.

Leading into that, I want to help you understand the situation in my district, California's 36th, Eastern Riverside County in the Coachella Valley, San Jacinto Valley, Southern California area and present to you the specific challenges faced by my constituents when it comes to carbon pollution. Separating the Coachella Valley from the Los Angeles Basin is a stretch of mountains. The only break in those mountains is the San Gorgonio Pass. The pass is a gateway for millions of cars and truck traveling on Interstate 10, usually from the ports to Arizona. But it also acts at a wind tunnel, bringing regular intense wind into our community. You might have seen the shots of the windmills

in the movies there in Palm Springs. This air often includes high levels of pollutants and carbon emissions that weren't produced in my district.

According to an analysis done by Northern Arizona University, the Los Angeles County produces 55 percent of all the emissions from the five surrounding counties including San Bernardino, Riverside, Orange, and Ventura Counties. In fact, the carbon pollution from the ports alone matches the total residential and commercial output from all of Riverside County. Just think about that. And as you know, carbon pollution is rarely emitted alone. It is often emitted alongside other harmful elements, such as nitrogen oxide and sulfur.

So, for the majority of the year, these pollutants blow east towards my constituents, and these increased levels of greenhouse gases worsen ozone pollution for which the Coachella Valley has been in non-attainment with the Clean Air Act since 1997. And as an emergency physician, I know all too well what this looks like. It is children with increasing rates of asthma. It is more frequent heat stress among the elderly. It is exacerbated respiratory diseases among those who already struggle with respiratory ailments, and the list goes on and on and on.

It is important to note that, even though my district does not produce the large volumes of carbon pollution, we have taken enormous initiatives when it comes to decarbonization and renewable energy. In fact, my district produces the most renewable energy on Federal land in -- compared to other districts in the entire United States.

The point is that air quality in my district is poor. The majority of air pollution is not created in my district. Yet the people I represent and the people I cared for in the emergency department have the -- bear the health burdens. Furthermore, it is the rural, underserved resource-poor communities in my district and throughout the Nation that

are disproportionately most affected.

So how do we address equity in any cost to carbon emissions so that those who don't produce the pollution, don't live in a big city, but are impacted by the pollution caused there get their fair share of revenues to address the public's health? In my home State of California, the State's cap-and-trade program has provided an important source of revenue for communities struggling with air pollution. In 2018, 39 percent of investments from program venues went to disadvantaged communities. So these are the same communities that are more at risk of being exposed and having the public health risks.

So, Dr. Kaufman, can you speak to how revenues from a national carbon pricing program could help improve air quality at the local level, especially in communities where investment is needed most?

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[12:32 p.m.]

Mr. Kaufman. Right. Well, thank you for the question.

So, again, the revenue, from a carbon pricing program, that is just government revenue, and it can be used to achieve many different important priorities. And I think you are listing one critical priority.

You know, I would point out that, as you correctly noted, it is not the carbon pollution that is causing, you know, the health issues. It is the other pollutants. So we also, you know, should push on the Clean Air Act and other legislation, if needed, to directly address those sources of pollution.

Mr. Ruiz. So what about the concept of a carbon price dividend that is targeted at frontline communities? How do we ensure that those dividends reach the right populations?

Mr. Kaufman. Well, fortunate --

Mr. Ruiz. Suggestions?

Mr. Kaufman. I am sorry? What --

Mr. Ruiz. Any suggestions?

Mr. Kaufman. Just that the carbon price would provide hundreds of billions of dollars a year, if we are talking about sort of a reasonably-priced, you know, program. So you would have a lot of money at your disposal to invest into communities like those, to deal with this issue.

Mr. Ruiz. So we just have to make sure at the back-end, once there is the

revenue, that the equation focuses on carbon cost equity for the communities that need them the most because they suffer the ailments the most.

Thank you.

Mr. Tonko. You are welcome. The gentleman yields back.

The chair now recognizes the gentleman from California, Mr. McNerney, for 5 minutes, please.

Mr. McNerney. I thank the chairman and ranking member. I thank the witnesses this morning.

Mr. Esty, before coming to Congress, I spent my career developing wind energy technology, and that gave me an appreciation for how hard it is to get funding and financing and so on for that technology.

Can you elaborate on how policy can create incentives for capital to flow into developing renewable energy technology?

Mr. Esty. Sure. I think we have talked today about the importance of a price signal attracting both research and development money and also deployment money. And I think we have also mentioned that we want beyond an economywide price signal, the benefit of some more targeted efforts. And in Connecticut, we created a green bank, and that green bank has allowed us to ramp up dramatically the flow of capital into wind energy, solar power, energy efficiency. And I think there is a real opportunity to replicate that at the national level.

Mr. McNerney. Okay. That includes storage, right?

Mr. Esty. Includes storage, includes anything that helps you move towards a decarbonized future. And I think what you get with a green bank is the ability to use limited public money to leverage private capital. And in Connecticut, we are seeing

something approaching $7 of private capital now for every dollar of government money.

Mr. McNerney. Thumbs up.

Mr. Esty. The solar world loves it. The wind world loves it, and the energy efficiency guys benefit as well.

Mr. McNerney. Thank you.

Mr. Gattie, is there a dangerous energy between climate change and the loss of biological diversity?

Mr. Gattie. Yes, sir, there is.

Mr. McNerney. Is there any -- I mean, I think they both feed on each other and aggravate each other's growing concern.

Mr. Gattie. Yes, sir. I agree.

Mr. McNerney. Mr. Kaufman, do you agree?

Mr. Kaufman. I do.

Mr. McNerney. Is there any policy approach that would help decouple those or would help reduce the biological diversity amplification of this problem?

Mr. Kaufman. Well, I think the committee is doing exactly the right thing. What we need to do is sort of halt climate change as quickly as we can. And I think net zero by 2050 is a perfectly reasonable goal because the more temperatures rise, the more those risks and others will build.

Mr. McNerney. Well, do you believe that reducing carbon emissions alone, Dr. Kaufman, will be sufficient to prevent climate catastrophe?

And the reason I ask that is because there is a significant and undefined latency between the time carbon is emitted into the atmosphere and the time that we are starting to see these effects.

So we could be seeing the effects of carbon emitted 10 years ago, we still have 10 years of carbon buildup since then that are going to continue to throttle the climate change.

Mr. Kaufman. That is exactly right. So, you know, at this point, it is not about, you know -- you know, it is not about making sure climate change doesn't exist. It exists already. It is with us -- every tenth of a degree of temperature that it goes up further will make it worse. So it is just a matter of, you know, stabilizing temperatures to minimize those risks.

Mr. McNerney. So, I mean, just reducing carbon emissions alone -- how about if we add in taking carbon out of the atmosphere and sequestering it? With carbon emission reduction, is that going to be enough to prevent catastrophe, in your opinion?

Mr. Kaufman. Well, I think we need to get to net zero emissions. So carbon dioxide emissions -- the sources of emissions as well and, you know, balanced with the sinks, and that is trees, forests, as well as technological options, like direct air capture and storage underground. We need to balance the sources with the sinks, and that is what is going to stabilize temperatures over time.

Mr. McNerney. Do you think we need to move toward climate engineering?

Mr. Kaufman. I think it is worth studying.

Mr. McNerney. The science -- Dr. Gattie?

Mr. Gattie. I wouldn't jump out and say yes, absolutely. That is a -- that connects a lot of issues across States and continents. So there is some -- there is some unintended consequences that could come out of that that we would really need to --

Mr. McNerney. Well, there is unintended consequences of adding carbon to the atmosphere for the last hundred years.

Mr. Gattie. And I agree with us doing everything we can to reduce that. What I wouldn't want to do is anything that may compound that, just unwittingly compound that.

Mr. McNerney. But the science would be -- it would be good to develop the science?

Mr. Gattie. I think we should be looking at it, yes, sir.

Mr. McNerney. Mr. Profeta?

Mr. Profeta. Yes, we should develop the science. We should be looking at everything we can do to minimize the risk.

Mr. McNerney. Thank you. I yield back.

I am the last guy?

Mr. Tonko. You just may be, I believe, looking around.

I believe the -- the list of members that chose to question our panel has been completed.

And before we adjourn, I request unanimous consent to enter the following into the record: We have a letter from Our Children's Trust; a letter from the Portland Cement Association; a letter from Michael Gerard of Columbia Law School and John C. Dernbach of Widener University, Commonwealth Law School; a letter from the Environmental Defense Fund; and then two letters that earlier were referenced that were entered into the record by Representative Barragan.

So, without objection, so ordered.

And, again, we thank our witnesses for sharing all of the information that they have shared here this morning. It is very important and helpful to the goals that we have established as a subcommittee.

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 our witnesses. So I would ask each witness to please respond promptly to any of such questions. And, you may, you know, receive them from our colleagues.

So, at this time, the subcommittee is adjourned. Thank you again.

[Whereupon, at 12:40 p.m., the subcommittee was adjourned.]