

**21ST CENTURY COMMUNITIES: CAPITALIZING  
ON OPPORTUNITIES IN THE CLEAN ENERGY  
ECONOMY**

---

**HEARING**  
BEFORE THE  
**COMMITTEE ON**  
**BANKING, HOUSING, AND URBAN AFFAIRS**  
**UNITED STATES SENATE**  
**ONE HUNDRED SEVENTEENTH CONGRESS**  
FIRST SESSION  
ON  
EXAMINING THE OPPORTUNITIES THAT CLEAN ENERGY INVESTMENT CAN HELP  
OUR COMMUNITIES AND ECONOMY  
APRIL 22, 2021

Printed for the use of the Committee on Banking, Housing, and Urban Affairs



Available at: <https://www.govinfo.gov/>

U.S. GOVERNMENT PUBLISHING OFFICE

47–912 PDF

WASHINGTON : 2022

COMMITTEE ON BANKING, HOUSING, AND URBAN AFFAIRS

SHERROD BROWN, Ohio, *Chairman*

JACK REED, Rhode Island	PATRICK J. TOOMEY, Pennsylvania
ROBERT MENENDEZ, New Jersey	RICHARD C. SHELBY, Alabama
JON TESTER, Montana	MIKE CRAPO, Idaho
MARK R. WARNER, Virginia	TIM SCOTT, South Carolina
ELIZABETH WARREN, Massachusetts	MIKE ROUNDS, South Dakota
CHRIS VAN HOLLEN, Maryland	THOM TILLIS, North Carolina
CATHERINE CORTEZ MASTO, Nevada	JOHN KENNEDY, Louisiana
TINA SMITH, Minnesota	BILL HAGERTY, Tennessee
KYRSTEN SINEMA, Arizona	CYNTHIA LUMMIS, Wyoming
JON OSSOFF, Georgia	JERRY MORAN, Kansas
RAPHAEL WARNOCK, Georgia	KEVIN CRAMER, North Dakota
	STEVE DAINES, Montana

LAURA SWANSON, *Staff Director*

BRAD GRANTZ, *Republican Staff Director*

ELISHA TUKU, *Chief Counsel*

JOHN RICHARDS, *Counsel*

DAN SULLIVAN, *Republican Chief Counsel*

ALEXANDER LEPORE, *Republican Detail*

CAMERON RICKER, *Chief Clerk*

SHELVIN SIMMONS, *IT Director*

CHARLES J. MOFFAT, *Hearing Clerk*

# C O N T E N T S

THURSDAY, APRIL 22, 2021

	Page
Opening statement of Chairman Brown .....	1
Prepared statement .....	31
Opening statements, comments, or prepared statements of:	
Senator Toomey .....	3
Prepared statement .....	32

## WITNESSES

Ernest Moniz, Chief Executive Officer, Energy Futures Initiative .....	6
Prepared statement .....	34
Responses to written questions of:	
Chairman Brown .....	81
Khalil Shahyd, Senior Policy Advisor, Natural Resources Defense Council .....	8
Prepared statement .....	51
Zoe Lipman, Director, Manufacturing and Advanced Transportation, BlueGreen Alliance .....	10
Prepared statement .....	58
David W. Kreutzer, Senior Economist, Institute for Energy Research .....	11
Prepared statement .....	75
Neal Crabtree, Welder, Pipeliners Local Union .....	13
Prepared statement .....	79

## ADDITIONAL MATERIAL SUPPLIED FOR THE RECORD

Maps submitted by Zoe Lipman, Director, Manufacturing and Advanced Transportation, BlueGreen Alliance .....	83
--	----





## **21ST CENTURY COMMUNITIES: CAPITALIZING ON OPPORTUNITIES IN THE CLEAN ENERGY ECONOMY**

---

**THURSDAY, APRIL 22, 2021**

U.S. SENATE,  
COMMITTEE ON BANKING, HOUSING, AND URBAN AFFAIRS,  
*Washington, DC.*

The Committee met at 10:03 a.m., via Webex, Hon. Sherrod Brown, Chairman of the Committee, presiding.

### **OPENING STATEMENT OF CHAIRMAN SHERROD BROWN**

Chairman BROWN. The Senate Committee on Banking, Housing, and Urban Affairs will come to order.

This hearing is in the virtual format. For those joining remotely, a few reminders.

Once you start speaking, there will be a slight delay before you are displayed on the screen. To minimize background noise, please click the mute button until it is your turn to speak or ask questions.

You should all have one box on your screens labeled "Clock" that will show how much time is remaining. For all Senators, the 5-minute clock still applies.

At 30 seconds remaining, you will hear a bell ring to remind you your time has almost expired. It will ring again at expiration. If there is a tech issue, we will move to the next Senator until it is resolved.

To simplify the speaking order process, Senator Toomey and I have agreed to go by seniority for all Senators for this hearing.

First, I want to take a moment to acknowledge the verdict in Minnesota Tuesday and the tragic shooting the same day in Columbus in my State.

While Tuesday's guilty verdict was the right one, we cannot mistake accountability for justice. True justice would mean Mr. Floyd was still alive today; true justice would not allow another shooting to happen while the verdict was being read.

Ma'Khia Bryant was 16 years old, a daughter, a high school student, a member of our Columbus community. And now another family in our country is in mourning.

This must be a turning point for our country. We must use this moment as a call for continued action to reform our laws and reform a broken justice system that has failed Black Americans over and over.

We have to reform our public safety system so that it protects all of us. And on this Committee, we continue to work to change the ways our society has too often been set up to hold Black and Brown Americans back. As you know, those who have followed this Committee know we have begun to do that and talk about structural racism and wealth inequality in from housing and transit and our banking system.

I agree with my friend and colleague, the Chair of the Congressional Black Caucus from Columbus, Joyce Beatty: This must be the catalyst to trigger actions far beyond today.

Today, on Earth Day, the Banking and Housing Committee returns to the subject of climate change. A few weeks ago we talked about risk. We are Americans. We take on big problems; we develop and manufacture and deploy the technologies of the future.

I come from a coal State. I know the legitimate fears that workers and communities in Appalachian Ohio have. We listen to them.

They live in towns where mining is a core part of their identity. They think of themselves often as “coal towns,” even though coal has not been mined there since at least the Reagan administration.

There is bravery and courage and dedication to family. Imagine going a mile or more underground to do dangerous work in tight, dark, dusty places every single day.

On Monday, my friend Cecil Roberts, the president of the United Mine Workers, showed that same grit when he announced that mine workers see a path to clean energy—path that supports the dignity of his members’ work, that gives them a seat at the table, that finally brings the investment in their communities that they have been promised for decades.

We must show the kind of courage that Cecil Roberts and the mine workers are showing.

We show no respect by selling communities a fantasy of returning to the past. People want truth; they want commitment to help them grow the industries of the future. And I and all of us on this panel want to see American manufacturing thrive, to strengthen American competitiveness, and to give communities the tools they need to be a part of the 21st century clean energy economy.

This is not some far off dream world of science fiction.

We know we can seize these opportunities, because we are already doing it: in the Dry Lake Wind Power Project in Navajo County in Arizona; the Willow solar project 30 minutes northwest of Wasilla, Alaska; zero-emission bus manufacturing in Alabama, South Carolina, and Minnesota; in Kansas, 7,000 megawatts of wind, solar, and battery storage helps power 2 million homes; in Louisiana, where Gulf Island Fabrication built the foundations for the Nation’s first offshore wind project, the Block Island Wind Farm, in Rhode Island.

Nearly 350,000 Americans already work at solar energy jobs; nearly 115,000 workers do the same in wind.

That is only the beginning. Four hundred thousand or more additional Americans could find jobs in solar and wind industries this decade.

This is about the workers in Perrysburg and Lake Township, Ohio, who manufacture First Solar’s highly efficient PV solar panels. It is about the brilliant scientists at the University of Toledo,

making breakthroughs in ultra high-efficiency and thin-film solar cells.

It is about RBI Solar, in Cincinnati, which emerged from the commercial greenhouse business and is now the fastest-growing photovoltaic racking company in North America.

It is about the Stark Area Regional Transit Authority, in Canton, Ohio. SARTA has built one of the largest hydrogen fuel cell bus fleets in the Nation. It lends its buses to help other transit agencies test the deployment of American-made buses that have zero tailpipe emissions.

It is about Emerson, founded in 1890 as an electric fan company, and its 21st century collaboration with the University of Dayton on high-efficiency and sustainable heating, ventilation, and air conditioning technologies.

This country laid 200,000 miles of railroad tracks. We electrified the cities and the countryside. We sent John Glenn into orbit. Our continued embrace of innovation puts into the hand of every cellphone customer a more powerful computer than NASA used for the Apollo program.

Why stop now?

Our predecessors did not say no to Henry Ford because of the buggy whip lobby. We are not going to say no to innovation in the clean energy economy.

These new industries got a big boost at the turn of this century when those George Bush and Rick Perry—noted hippies each—pushed renewable development in Texas.

Texas which now leads the country in electricity from wind power. Next in line—think about this—Iowa, Oklahoma, Kansas, North Dakota—collectively known as the “Saudi Arabia of wind.”

The growth in renewables in those States and across the country provides good-paying jobs, gives farmers and ranchers another source of income, contributing to cleaner air and water, saving people money.

Retrofitting our houses and apartments to make them more energy efficient and resilient means lower utility bills for families every month.

More and more, it is clean energy.

The choice we face is not between keeping our communities frozen in time or putting people to work in new industries.

If we do nothing, change is still coming. Clean energy jobs are the future.

The only question is whether they will be American jobs.

If we fail to invest in clean energy R&D, to retool our factories, and to play a leadership role, other countries will fill the void.

China is already spending billions. So are Germany and Japan.

We need to stop allowing the Chinese Government and its subsidized industries profit off our innovation.

Let us create 21st century communities.

Ranking Member Toomey.

#### **OPENING STATEMENT OF SENATOR PATRICK J. TOOMEY**

Senator TOOMEY. Thank you, Mr. Chairman.

Today I expect we will hear about all kinds of opportunities associated with Green New Deal-type policies. But our discussion really

needs to include the costs of these policies, including the cost of lost American jobs, slower economic growth, increased energy costs, and the waste of billions of taxpayer dollars.

Our discussion should also include the remarkable progress we have made in reducing carbon emissions—ironically enough, using fossil fuels. Let me explain.

U.S. carbon emissions have been falling for years. Not many other countries can say that, but we can. In 2019, U.S. carbon emissions hit their lowest level since 1992 and their lowest per capita level since 1950, and the U.S. led the world in reducing energy-related CO2 emissions. These declines were enabled by America's recent energy renaissance made possible by technology and free markets.

The natural gas boom, especially in places like Pennsylvania, has helped gas to significantly replace coal as the fuel for America's power plants. This has been the primary driver of the declines in carbon emissions, and we made this progress while creating jobs and lowering the cost of energy, thereby enhancing the standard of living of the American people, not going the other way.

Despite all this, some of my colleagues seem determined to impose Green New Deal policies that will cost us jobs on a net basis and stifle the very developments that have allowed us to reduce emissions. Some describe the destruction caused by these policies as an "opportunity" to create new green energy jobs. But they fail to acknowledge the costs they are imposing in the lost jobs and higher energy prices.

I am reminded of French economist Frederic Bastiat's famous 1850s parable of the "broken window." In the parable, someone breaks a shopkeeper's window, so he has to go out and hire a window maker to replace it. Some people think the broken window is a good thing because it "created" a job for the window maker. But Bastiat correctly points out the fallacy in this thinking. As he puts it, "destruction is not profit."

The shopkeeper had to spend money and time to replace his window. If the window had never been broken, that money and time could have gone to more productive uses, like hiring a worker to expand the shopkeeper's business. I feel like some of my colleagues sometimes seem to have forgotten this basic economic principle.

Just as breaking a shopkeeper's window does not somehow create economic gain, neither does destroying traditional sources of energy and replacing it with so-called green energy create economic gain for at least two reasons: One, it is not at all clear that the newly created green jobs are equivalent to and sufficient to replace the lost jobs. And, second, the end result is that society pays more for energy, and that lowers our standard of living. And the consequences of this destruction are not just academic.

The Biden administration has already imposed policies that today are destroying traditional energy jobs. For example, it terminated the construction of the Keystone Pipeline and banned new oil and gas leases on Federal land.

These actions alone will destroy tens of thousands of jobs for Americans. Today we are going to hear from one of them—Neal Crabtree, a union welder who lost his job when Keystone was shut down.

I am also deeply concerned about the Biden administration's apparent efforts to coerce banks to reduce lending to fossil fuel energy companies. This week all the Republicans on this Committee sent a letter to John Kerry warning the Administration not to abuse Government power in this way.

Mr. Kerry has said that the very purpose of President Biden's expected global warming Executive order is to "change the allocation of capital"—in other words, to redirect capital from traditional energy companies to companies deemed to be sufficiently "green."

Now, this effort disturbingly resembles the Obama administration's notorious "Operation Choke Point" scandal, in which regulators attempted to coerce banks into denying services to legal yet politically disfavored businesses.

It is neither practical nor desirable to immediately try to cease fossil fuel production. Fossil fuels represent approximately 80 percent of U.S. energy production and consumption. And abusing Government power to try to achieve that objective will distort capital allocation, raise energy costs for consumers, and slow economic growth.

Finally, Green New Deal job programs have a history of failure. Yet President Biden's infrastructure plan would double down on failed policies of the past. Consider one example: His plan would establish a \$27 billion "National Climate Bank" to provide financing for so-called green investments.

We know that when the Government substitutes its judgment for that of the market, it picks winners and losers based on political favoritism, not business fundamentals. Just look at the 2009 Obama-Biden spending bill. That bill included over \$80 billion in spending, loan guarantees, and tax credits for green energy projects. What were the results of this massive Government program? There was a lot of waste, fraud, and abuse.

Who can forget the infamous case of the solar panel company Solyndra? It went bankrupt and defaulted on a \$535 million loan that had been guaranteed by—you guessed it—Federal taxpayers.

This is what happens when the Government picks winners and losers based on political considerations. As one of today's witnesses, David Kreutzer, will testify, the Biden administration seems determined to repeat these mistakes of the past.

Mr. Chairman, the fact is the climate is changing, and we should be having a vigorous debate about what to do about that. But that debate should honestly acknowledge that if we shift from low-cost, reliable fossil energy to high-cost energy, like wind and solar, there are costs associated. Jobs will be destroyed, and energy prices will go up.

We need to weigh these costs against the perceived potential benefits of a shift, and we should do so in an open, transparent, and accountable way—not through sweeping Executive actions or back-door pressure campaigns to coerce banks to implement the Administration's preferred policies.

Thank you.

Chairman BROWN. Thank you, Senator Toomey, for your comments.

I will introduce today's witnesses. We will hear from five witnesses.

The Honorable Ernest Moniz, president and CEO of Energy Futures Initiative. Dr. Moniz appears today as head of the Energy Futures Initiative, which has for several years been the coauthor of the U.S. Energy and Employment Report. This work he has been doing since he was in this role for which he was perhaps better known, serving as the 13th U.S. Secretary of Energy. His service as Secretary under President Obama was the second tour of duty for Dr. Moniz at DOE. During the Clinton administration, he served as the Under Secretary of Energy, also worked in the White House as Assistant Director of Science in the Office of Science and Technology Policy.

Khalil Shahyd is a senior policy advisor to the Natural Resources Defense Council. As part of NRDC's Healthy People and Thriving Communities Program, Mr. Shahyd focuses on policies and strategies to create just solutions for environmental crises by integrating clean energy with affordable housing and community development. For more than two decades, Mr. Shahyd has worked in community economic justice, organizing, and advocacy in the United States, Mexico, India, and Brazil.

Zoe Lipman is director of manufacturing and advanced transportation for the BlueGreen Alliance. She leads their policy and advocacy work on clean energy manufacturing and advanced vehicles. Earlier she led the National Wildlife Federation's Fuel Economy and Advanced Vehicles Program, previously headed its Midwest Climate Policy Program.

Dr. David Kreutzer is the senior economist for the Institute for Energy Research. Dr. Kreutzer joined IER after a decade as a senior research fellow at Heritage, where he covered labor and trade issues. Prior to Heritage, Dr. Kreutzer taught economics at James Madison and before that at Ohio University in Athens, Ohio.

Mr. Neal Crabtree is a welder in Pipeliners Local Union 798. Mr. Crabtree is a second-generation union welder who has worked in pipeline projects all over the country. He joins us today from Fouke—if I am saying that right—Arkansas. Mr. Crabtree is a regular contributor to Fox News.

Secretary Moniz, as I said, has a commitment that will require him to leave the hearing at 11:45. If we are not finished, we will accommodate any Senators questions that were not able to be asked as questions for the record.

I welcome all of our witnesses and thank them for appearing. We are fortunate to have such a distinguished panel of five experts to discuss the abundant and transformative opportunities available to American workers and communities and companies in the clean energy economy.

Secretary Moniz, please give your opening remarks.

**STATEMENT OF ERNEST MONIZ, CHIEF EXECUTIVE OFFICER,  
ENERGY FUTURES INITIATIVE**

Mr. MONIZ. Thank you, Mr. Chairman, Ranking Member Toomey, and Members of the Committee. I am very pleased to discuss with you today the risks associated with climate change and the opportunities that are presented by addressing them.

The physical, societal, environmental, and financial impacts of global warming, climate change, and extreme weather have become

evident. If we take inflation-corrected billion-dollar extreme weather events as an indicator, the annual average over the last 40 years is 7, over the last 5 years is 16, and in 2020 it was 22. These are data, not opinions. We need to pick up the pace on the clean energy transition that lies at the heart of limiting climate change impacts if we are to not only protect economic growth but, indeed, to prosper in the new energy economy.

The recent events in Texas provide a sad example of the consequences of inaction. The 2021 “Big Chill” consequences could have been mitigated considerably if the elevated climate risk profile had been addressed in State policy and regulation, for example, through requirements on winterization of energy assets and on load-shedding protocols that reflect the electricity-natural gas infrastructure interdependency.

The financial consequences were also considerable. Balance sheets of families, businesses, utilities, and military installations are badly stressed. The largest electric power cooperative in the State has declared bankruptcy, and the last shoe has not dropped on ratepayers, taxpayers, and shareholders. The point here is that we need to lean forward in addressing the realities of climate change and extreme weather.

The good news is that clean energy responses grounded in technology, policy, and business model innovation, which the U.S. excels at, will present economic and environmental opportunity and needed infrastructure renewal.

First, we need decade of supercharged clean energy technology innovation starting now. The portfolio must be all of the above. This includes large-scale CO<sub>2</sub> management, carbon capture utilization and sequestration, and CO<sub>2</sub> removal from the atmosphere and upper ocean layers, advanced nuclear technology, both fission and fusion, long-duration energy storage to underpin the greatly expanded use of wind and solar, low carbon fuels, hydrogen, and more. The full portfolio of clean energy solutions will provide maximum optionality and flexibility to meet regional needs. Indeed, we should be supporting regional innovation initiatives tailored to a region’s resources and needs.

Second, this innovation thrust needs to be paralleled by a focus on infrastructure modernization. Building on a smart electric grid is critical, but we also need CO<sub>2</sub> and hydrogen infrastructures, on-shore infrastructure to support major offshore wind expansion, electrical charging infrastructure in urban, suburban, and rural settings, and more.

Third, all of this provides major quality job growth opportunities. Energy sector job growth pre-COVID was double that of the economy as a whole. The median wage in the energy sector is 34 percent greater than that in the broader economy, with unionized jobs leading the way. Building out the clean energy economy is especially critical as we dig out of the COVID-induced employment hole.

Fourth, we need to develop secure supply chains as we develop the new energy economy. An example is provided by critical minerals and metals that are needed for many clean energy technologies, such as batteries or offshore wind turbines. We need environmentally responsible mining domestically, recycling and substi-

tution by earth-abundant materials, all of which call for innovation. Similarly, we need to rebuild a domestic supply chain for generation for nuclear reactors and for meeting national security needs.

Finally, we note that business has played a major role, even if often overlooked, in moving the needle on decarbonization. More than 300 businesses and investors called on President Biden to announce 50-percent emissions reductions by 2030, and that is what the President has pledged on Earth Day. More than 200 U.S. companies committed to net zero by 2050, including 70 percent of the 30 largest utilities. U.S. automakers committed to an EV transition.

The bottom line is that business is a great leading indicator of how capital will be deployed for business needs looking ahead years and decades. Many of our most successful companies have committed to a deep decarbonization trajectory as making the most business sense. One important direction is that of enhanced climate change risk disclosure which aligns with the strong ESG initiatives of investors such as BlackRock, Vanguard, and State Street. This was called for in the groundbreaking CFTC report last year. Business, Governments, and banks clearly view climate risk internalization as essential for properly informing investment choices by large institutions and individual investors alike.

Mr. Chairman, Ranking Member Toomey, and Members of the Committee, I look forward to your questions. Thank you.

Chairman BROWN. Thank you, Secretary Moniz.

Next is Mr. Shahyd. Welcome.

**STATEMENT OF KHALIL SHAHYD, SENIOR POLICY ADVISOR,  
NATURAL RESOURCES DEFENSE COUNCIL**

Mr. SHAHYD. Good morning, Chair Brown, Ranking Member Toomey, and distinguished Members of the Committee. Thank you for the opportunity to testify today.

I am Khalil Shahyd, a senior policy advisor on equity, environment, and just communities with the Natural Resources Defense Council. NRDC is an international nonprofit organization of scientists, lawyers, and environmental specialists dedicated to protecting health and the environment.

The United States today is confronted by extraordinary and interconnected crises of a global pandemic, economic recession, deep racial injustice, a rapidly destabilizing climate, and threats to the Nation's democratic foundations. Few sessions of Congress have shouldered greater responsibility or had greater opportunity. Many acts of leadership will be necessary to make it through these crises led by comprehensive and sustained Federal investment to recover, rebuild, and lay the foundation for a more just and stable future.

Like most of the economy, clean energy was hit hard by COVID-19. At one point more than 600,000 clean energy workers had filed for unemployment. Energy efficiency jobs saw the biggest drop, declining about 11 percent as workers were prevented from entering homes and offices because of pandemic lockdowns. If the clean energy sector is to be the engine that drives us toward a more equitable and sustainable economy, we must ensure that it recovers and expands to provide the opportunity and livelihoods so many need.



President Biden has committed to increasing the pace of climate action to cut emissions. Housing represents a key element of his strategy. The President wants to cut the carbon footprint of the U.S. building stock in half by 2035. Federal investments in cleaner transportation options, energy efficiency, and clean energy generation, combined with commitments to address racial inequities can deepen our actions against climate change. They can also create a stronger, more resilient economy.

Did you know that most Americans, particularly renters, spend more than half their income on transportation, rent, and home energy costs? The climate crisis and soaring cost of housing are linked, and that is creating extreme burdens for households nationwide, including renters, female heads of households, and the elderly. And these burdens disproportionately challenge the financial stability of African-Americans and other communities of color.

Often, low-income and vulnerable households are left to rely on low-quality housing due to residential segregation, long-term disinvestment, and deferred maintenance of the housing stock. These homes tend to waste energy so that low-income families pay more for energy per square foot than higher-income residents. As a result, nearly one-third of U.S. households struggle to pay utility bills. In fact, about one in five households has been forced to choose between necessities like food and medicine or paying an energy bill.

At the same time, low-income Americans are increasingly reliant on older housing units that leave them more vulnerable to extreme weather disasters like hurricanes, flooding, and wildfires. Unpredictable weather puts vulnerable housing stock at risk, leading to the displacement and destabilization of families and communities. It also increases the likelihood that they will experience—or be trapped in—poverty.

Federal policies must ensure the reduction of emissions and that people can live in healthy, affordable housing.

The Department of Energy's Weatherization Assistance Program is the primary source of Federal investments in home energy retrofits. Every year, WAP's efficiency improvements cut America's climate pollution by 2 million metric tons. But only about 35,000 homes can enroll annually, and many are not serviced due to funding shortfalls. At current levels, WAP will retrofit fewer than 150,000 homes over the next 4 years, even though 40 million are eligible. By providing more funding for WAP and new multifamily retrofit programs, Congress can make a difference.

We need a whole-of-Government approach to addressing the climate crisis and the related challenges that confront us, and that begins with Congress. We need to ensure a functioning social safety net for all Americans. We need to invest in modernizing our Nation's housing stock and our infrastructure, and we need to enhance workforce training and benefits for dislocated workers.

By taking those actions, Congress can transform our economy, grow jobs, and set America on a path of economic success for decades to come.

Mr. Chairman, Ranking Member, I thank you, and I look forward to your questions.

Chairman BROWN. Thank you very much.

Ms. Lipman, you are recognized for 5 minutes.

**STATEMENT OF ZOE LIPMAN, DIRECTOR, MANUFACTURING  
AND ADVANCED TRANSPORTATION, BLUEGREEN ALLIANCE**

Ms. LIPMAN. Thank you, Chairman Brown, Ranking Member Toomey, and distinguished Members of the Committee. My name is Zoe Lipman, and I am director of manufacturing and advanced transportation at the BlueGreen Alliance. On behalf of my organization, our partners, and the millions of members and supporters they represent, I want to thank you for convening this hearing today on the opportunities in the clean energy economy.

The BlueGreen Alliance unites America's largest and most influential labor unions and environmental organizations to solve today's environmental challenges in ways that create and maintain quality jobs and build a stronger, fairer economy. Our partnership is firm in the belief that Americans do not have to choose between good jobs and a clean environment. We can and must have both.

I will focus today on the opportunity to transform basic industry and rebuild American manufacturing to lead in the clean economy, both to meet our climate goals and to power a real and lasting economic recovery that extends to all. It is also critical to our economic security and competitiveness.

These actions are also essential as we work to rebuild from the ongoing COVID-19 health and economic crisis. We went into this pandemic with three ongoing and interconnected crises: economic inequality, racial injustice, and climate change. The pandemic has cast a harsh spotlight on the severe and disproportionate impacts of these crises. It also revealed dangerous gaps in our manufacturing supply chain and the unsafe and unfair conditions still faced by too many workers today.

We stand at a crossroads. Worldwide, our competitors are rushing to capture the manufacturing and job gains in the rapidly emerging global clean economy. Decisions we make now can ensure that the next generation of investments in clean vehicles, energy, and infrastructure are made here in the United States and that those investments result in the kind of good-paying jobs that are out of the grasp of too many Americans.

I will focus on three particular opportunities to deliver these goals.

First, we must act at scale to rebuild and retool American manufacturing, basic industry, and essential supply chains. Expanding, retooling, and converting our factories to build the clean and advanced technology can secure, bring back, and grow jobs in communities across America. Meanwhile, reinvesting to modernize and transform our industrial base can make it the cleanest and most competitive in the world while stemming the flow of offshoring that costs jobs at home while increasing pollution worldwide.

Second, we must execute a comprehensive electric vehicle manufacturing agenda. The auto industry is at the heart of the U.S. manufacturing economy, and it is in the midst of a historic shift. EVs are coming, and investments made over the next 2 years will determine whether the vehicles and technology that goes into them are made here and whether they deliver good family supporting jobs. In States like Tennessee and Ohio, we can see these changes going on in real time. Too often shortsighted policies that put the U.S. behind on technology and aggravate offshoring and outsource-

ing have left workers bearing the cost of technological and market shifts. The workers and communities in manufacturing States across the country are counting on policymakers to get it right this time.

Finally, our roads, bridges, railroads, and transit systems are fundamental to commerce, to daily life, and to access to opportunities. Desperately needed investments in our transportation infrastructure would not only support large numbers of jobs, operating, maintaining, and upgrading these modes of transportation but in manufacturing as well. For example, the parts and materials for bus transit and passenger rail systems are manufactured in every State represented on this Committee, often far from where the vehicles themselves are put into service.

We must invest at levels commensurate with our economic and transportation needs, and across the board we must also sustain and strengthen critical Buy America labor and community benefit standards to ensure we capture the full jobs, equity, and local economic benefits of these investments, and that we are target investments in communities that need it most.

My written testimony delves into each of these issues more deeply and also highlights the policy actions Congress can take today to shape the future and ensure we do not repeat the mistakes of the past.

In closing, making these investments right and making them now will give us the opportunity to lead globally, rebuild good union jobs in manufacturing communities across the Nation that have been struggling, and bolster innovation and production of the clean technology of the future here at home. These actions mean real impacts across America. The time to act is now.

Thank you very much, and I look forward to taking your questions.

Chairman BROWN. Thank you.

Dr. Kreutzer is recognized for 5 minutes. Welcome.

**STATEMENT OF DAVID W. KREUTZER, SENIOR ECONOMIST,  
INSTITUTE FOR ENERGY RESEARCH**

Mr. KREUTZER. Thank you. Chairman Brown, Ranking Member Toomey, and other Senators, I want to thank you very much for giving me this opportunity to address you. I am David Kreutzer, and I am senior economist at the Institute for Energy Research.

We have been here before. We have seen this movie. Twelve years ago, President Obama promised to create 3 million new jobs. As Senator Toomey pointed out, \$80 billion of the \$787 billion stimulus package went toward supposedly creating these green jobs. There were all sorts of high-minded findings, the necessity to get people back to work, we were going to clean this up and do that and the other things, just like we are hearing today. But the reality was much different.

The program to do job training was investigated by the Inspector General at the Department of Labor, and it was found to be a fantastic failure. For instance, more than 20 percent of the certificates given for green job training went to people that had 1 day or less of training. Forty-seven percent of the certificates went to people that had 5 days or fewer of training. The people that administered

these programs could not even document what the outcomes were for 24 to 44 percent of these job training programs. The number of trainees who entered employment was only 40 percent of the target; 38 percent of those who did get jobs through the green job training program had jobs before they went in. So the job training program was supposed to be this great thing. It turned out to be a dud.

The BLS did counts of the green jobs that were created. Remember, there were supposed to be 3 million new green jobs created. In their first report, they found, they said, 3 million jobs in total. Digging down into those shows that it was quite a farce. The second report, a year later, showed 2 million jobs, green jobs. For some reason a year later, maybe they became a little more honest.

If we look at the definitions of what counted as a green job, we find that we have little confidence that even that 2 million was anywhere close. For instance, if we look in the utility sector, the power generation sector, the number of green jobs that were in there in total, 80 percent of those green jobs were in nuclear power. The stimulus package and the \$80 billion from that that went to supposedly creating green jobs in the new green technology did nothing to create those nuclear jobs. There had not been any new nuclear plants for over 30 years at that time.

If we look at the steel industry, which few of us think of as being very green, though very much necessary and a good industry, they counted for 50 percent of the jobs in the steel industry as green.

And, finally, there is a long list and probably the most ridiculous was the Acting Director of the Bureau of Labor Statistics in a hearing in front of Congressman Issa admitted that lobbyists for the oil industry could be counted as a green job since they were educating on environmental issues. So the green job creation was bogus. It did not happen. And the reports were so embarrassing that they were defunded.

They did spend that \$80 billion, though. They did not create the green jobs, but the money went somewhere. Who did it go to? It went to the politically well connected and the economically powerful. In its postmortem on the Solyndra debacle, the *Washington Post* wrote a story. This is a quote: "The Administration, which excluded lobbyists from policymaking positions, gave easy access to venture capitalists with stakes in some of the companies backed by the Administration, the records show. Many of those investors had given to Obama's 2008 campaign. Some took jobs in the Administration and helped manage the clean energy program."

OK. So that disaster had political initiation.

There is another example—there are many, many, but I will just give one. Ivanpah solar thermal power plant in California was given a \$1.6 billion loan guarantee and a \$500 million grant from the Department of Energy. Supposedly, loan guarantees went to companies that could not get financing for economically viable projects, which does not make sense. Here are the partners of Ivanpah: Google, General Electric, Chevron, BP Alternative Energy, Morgan Stanley, Draper Fisher Jurvetson, and on and on. The aggregate market capitalization of those companies that got this loan guarantee and the grant was over \$1 trillion. So the programs went to people that did not need the money for projects that

did not work out. We are going to see that over again here if we continue with a more than doubling down; instead of \$80 billion, we are going to multitrillion-dollar programs.

Thank you very much. I have run out of time. I look forward to your questions.

Chairman BROWN. Thank you.

Mr. Crabtree, welcome to the Committee. You are recognized for 5 minutes.

**STATEMENT OF NEAL CRABTREE, WELDER, PIPELINERS  
LOCAL UNION 798**

Mr. CRABTREE. Thank you, Chairman Brown, Ranking Member Toomey, for the opportunity to testify before you here today.

I live near Texarkana, Arkansas, and I am a member of Pipeliners Local Union 798, and we have more than 7,000 union members nationwide that travel the country developing the pipeline infrastructure, the reliable infrastructure that we enjoy today. Myself, I have been a member for over 25 years now. I live in a rural part of the country and opportunities were kind of limited. So after I served 2 honorable years in the United States Army, this is the career path that I chose.

This time of year is the beginning of pipeline construction season. And just like a lot of the other industries in this country, we were hit hard by COVID last year. We had a lot of projects that were canceled, and we were looking forward to 2021 to get back to work, because right now over 88 percent of my local union members are out of work and they have been for some time now.

Now, myself, I was lucky enough to be involved in the early stages of the Keystone Pipeline construction. We had started working in Nebraska. But, of course, all that ended on January 20th when President Biden decided to revoke the permits. That immediately laid off 1,000 union workers, and it cost thousands more a chance to be employed right now this spring when major construction would have been underway. To have a project of this magnitude canceled, it is having some devastating effects on workers and families and communities all across the rural parts of this country.

We have got members who have been out of work, like I said, for over a year now. They would have benefited from this, and this pipeline would have actually benefited the environment. But our union members are starting to feel like pawns in, I guess you would say, a chess game. We help deliver the low-cost energy that this country enjoys today, and now it seems we are being sacrificed for a green experiment at the taxpayers' expense.

Like I said, in my case I was laid off 3 hours after the President came into office, and I never thought I would live in a country where my own President would put me out of work building a pipeline that was going to transport the same product that is already coming into this country. We are already using this oil. It is already coming by rail cars. There is still a demand for it. And it only made sense to build this pipeline to bring it in safer and doing it in a more environmentally friendly way.

Like I said, the Biden administration, they seem to think that the loss of these jobs are just temporary jobs and the impact is not

that big. But, you know, a lot of people in this country depend on temporary projects to build their career. You do not see a carpenter spending his whole career building the same house. You do not see a lawyer spending his whole career defending the same client. You know, this pipeline was our house to build this year. It was our client. And the effects of canceling, they are going to be far-reaching, not just for the workers, but it is starting to have a negative effect on other projects that deliver the reliable energy that this country needs.

According to Mr. John Kerry, we should just go get jobs in the green energy field. That is a hard thing for me to swallow because doing that, I would be starting over at the bottom. You know, I have spent 25 years developing my skills, and I am compensated accordingly for it. You know, starting over and training to do another job, you will be starting at an entry-level position with entry-level pay, and that is hard for a lot of Americans to handle when you have got mortgage payments, you have got kids to raise, you have got insurance to provide.

You will never hear us complain about a company's right to develop green energy. But I do not believe the Government should be hindering private companies' rights to develop the reliable energy projects that we still need in this country today.

I look forward to taking any questions you might have, and thank you.

Chairman BROWN. Thank you very much, Mr. Crabtree, for your personal testimonial.

I want to start with Dr. Moniz, Secretary Moniz. I want to read something that you said to make sure we heard that. Your testimony: "If we take inflation-corrected billion-dollar extreme weather events as an indicator, the annual average over the last 40 years is 7 events, over the last 5 years is 16, and in 2020 it was 22 events." That surely speaks for itself. As Secretary Moniz said, scientist that he is, he said those are not opinions, those are facts.

My question, Secretary Moniz, I will start with you. Ohio workers have proven over and over they are adaptable. They can make just about anything given the right training and tools. What kind of skills training would someone need to go from a job in the mines or working at a gas well to roles in the clean energy economy? And keep in mind the comments of Mr. Crabtree as you answer this. Can our vocational technical schools and community colleges and union apprenticeship programs teach the skills workers need for these jobs?

Mr. MONIZ. Absolutely, Mr. Chairman. In fact, I think it is important to emphasize and I think the President is emphasizing, number one, create the jobs. The training will be there for those jobs.

Number two, with Mr. Crabtree's skill set in terms of welding, we need to look at this as in the transition there are going to be major infrastructures I mentioned in my testimony. For example, we need CO2 infrastructures. We need hydrogen infrastructures. A lot of those are going to be piped. A lot of those are going to require the same skill sets as oil and gas workers do today.

So we could be looking as to how the necessary transition we are going into can also be focused in ways that create jobs, that draw

upon the current skill sets of our workers, and I would just add particularly our unionized workers, which have set the standard in terms of quality jobs, pay, benefits, and training like apprenticeships, as you mentioned.

Chairman BROWN. Thank you, Mr. Secretary.

Mr. Shahyd, more than 15 million American families are forced to spend at least 10 percent of their income every month on energy bills. What would it mean for these families to get some basic repairs and energy-efficient upgrades to their homes? What tools can we use to help these families bring down these costs? Who would do these repair jobs?

Mr. SHAHYD. Thank you, Mr. Chairman, for that question. Yes, there are millions of jobs available in retrofitting both residential homes and businesses as well, and those jobs cannot be exported. They are not blue State jobs, they are not red State jobs. They are American jobs available all across the country if we just invest smartly in them.

And for an average family, you know, for every dollar that is invested in energy efficiency in a low-income home, \$2 is put back into that family's pocket that can be spent elsewhere in the economy.

There are health benefits in terms of indoor air quality improvements. There are benefits in terms of reduced asthma in children, you know, less time spent in emergency rooms for respiratory illnesses, and other benefits that come from these, in addition to, again, the employment and the economic benefits of investing in these services and what it means for a local economy.

Right now, the Weatherization Program employs just over 8,000 across the country, but as I mentioned, it is poorly, poorly, poorly underfunded. There is not a State in the Union without a backlog, a wait list to get into that program that can extend for years at a time. A fully funded program could employ many more workers across the country, and, again, those jobs exist in every Zip code, in every State, in every city. Anywhere where there is a home, there are eligible properties that need these services.

Chairman BROWN. Thank you very much, Mr. Shahyd.

Ms. Lipman, in the last minute—I started to make it short. This Committee has a tradition of 20 percent of our infrastructure dollars, transportation dollars, go to public transit. I have worked with former Republican Chair Shelby on this Committee to support the deployment of zero-emission buses under our low- or no-emission vehicle program. What would happen if the Feds made a sizable commitment to replacing the 140,000 transit buses and vans on the road with American electric vehicle buses?

Ms. LIPMAN. Sure, as you said, a quick answer, and I submitted some maps. Not only would we see emissions reductions and some cost reductions as well for operators operating systems, but we could support manufacturing jobs across the country. Bus, rail, and transit manufacturing components and vehicle assembly exist in every State represented by this Committee. And often these jobs, manufacturing technology for transit, are taking place hundreds or even thousands of miles from where the vehicles themselves are put into service. So it is a real opportunity to build economic

growth, you know, good jobs and operations and maintenance of these vehicles on the one hand and manufacturing on the other.

I would just say also quickly that the electric vehicle industry, electric vehicle bus industry is an example where we are putting—investing in our existing diesel bus companies to also build electric buses with the same workers on the same line. We want to make sure that we are—there really are two industries that we are transforming, the industries we have today with the maintenance and growth of good family supporting jobs they currently support.

Chairman BROWN. Thank you, Ms. Lipman.

Senator Toomey is recognized for 5 minutes.

Senator TOOMEY. Thank you, Mr. Chairman.

I just want to start by pointing out that, you know, statistics about increasing numbers of high-dollar destruction from weather events over recent decades does not necessarily tell us anything about the frequency or severity of weather events. There is no question that a huge contributing factor has been the increasing concentrations of population and development in areas that previously were relatively undeveloped. So it would be expected that those numbers would go up.

Mr. Crabtree, first of all, I am awfully sorry to hear about this experience that you have been through. Could you share with us some sense of the kind of time and effort that you had to put into developing the skill set that you have in your chosen profession, how long it took and how much effort it took to learn the trade that you have been become proficient in?

Mr. CRABTREE. Yes, sir, Senator. Our industry is like a lot of the other union industries. You usually start off in an apprenticeship, and oftentimes that probably lasts about 5 years, and you spend those 5 years learning the skills. Like myself, I wanted to be a welder. That means, you know, a lot of practicing, a lot of late hours after work trying to learn that skill. And like I said, I have been doing it for 25 years now, and I am still learning more about it every day. I am the kind of person that believes if you stop learning, then you are just missing out on opportunities. But it took that 25 years to get to where I am at today.

You know, if you count my wage and my benefit package through my union, I am somewhere in the neighborhood of \$80 an hour. I do not think even with green training I am going to find an entry-level job in that field that is going to provide me with that kind of income. And I am just one person. There are thousands of oil and gas workers across the country that are going to be in that same boat. And when you are like me, 45 years old, you are almost at the point of life when it is a little too late to be starting over. So I am forced with a difficult situation right now, because like I said, I have still got mortgage payments, I have still got kids to feed.

Senator TOOMEY. Mr. Crabtree, if I heard you correctly, I think you said that 88 percent of the members of your union are out of work right now? Did I get that right?

Mr. CRABTREE. Yes, sir. It is 88 percent, and like I said, this is the time of year—this is construction season, and the Keystone Pipeline would have put thousands of our members to work. But there is more in the country going on than just the Keystone. There



are all kinds of projects. There is one, the PennEast, I believe, right there in your State, is having trouble getting permits that would put some of our workers to work.

Senator TOOMEY. Yeah, permitting obstacles that are created by people who do not want the pipeline to exist have certainly occurred in my neck of the woods. Is that keeping many of your colleagues out of work also?

Mr. CRABTREE. Yes, sir. I have been fortunate enough—in the last 25 years, I have spent a lot of time in your State because of the development of the Marcellus shale. It has provided man-hours for many of our union members, and that is just another project that would put hundreds of thousands of workers—get them off unemployment.

Senator TOOMEY. And make low-cost natural gas more readily available and more broadly available.

Mr. CRABTREE. Yes, sir.

Senator TOOMEY. Let me ask Dr. Kreutzer a question. You criticized and you walked through examples of very problematic cases of waste and abuse in the last time around that the Federal Government launched a huge green energy program. Now, of course, President Biden has suggested this \$27 billion National Climate Bank. Is there any reason to believe that this time it is going to go better, this time the Government is going to figure out how to do this, and they will allocate capital efficiently this time, where it was poorly allocated last time?

Mr. KREUTZER. I do not see any institutional changes that would give us any optimism that it would be better. You know, over and over we see that the big programs help the already wealthy; they help the politically powerful; they help the people that run these programs. You know, in my written testimony I point out that in 1970, six of the twenty wealthiest counties in the United States were in the Midwest and only three were in D.C. area. In 2019, zero of the wealthiest 20 counties in the United States were in the Midwest, and nine of them were in the D.C. area. So we have, you know, the bureaucracy, the wealthy, the politically well connected, they are the ones that benefit from these huge programs, and since this is going to be orders of magnitude bigger, it will be orders of magnitude worse. Thank you.

Senator TOOMEY. Thank you very much.

Thank you, Mr. Chairman.

Chairman BROWN. Thank you, Senator Toomey.

Senator Menendez is recognized for 5 minutes.

Senator MENENDEZ. Thank you, Mr. Chairman. Thank you all for your testimony.

We are making steady progress toward developing one of the first offshore wind projects in Federal waters off the Jersey shore. In late March, the Biden administration announced that it would begin the environmental review process for Orsted's Ocean Wind project, and the company recently partnered with private sector partners and Governor Phil Murphy's administration and the State to break ground on a new \$250 million offshore wind manufacturing facility that will create over 500 jobs.

Last year, the State also announced a first-of-its-kind investment in an offshore wind port and staging area that could lead to 1,500

jobs and \$500 million in economic activity each year. Projects like these seem to me to sit perfectly at the intersection of Federal, State, and private sector cooperation with benefits to our workers and families, public health, and the environment.

So, Ms. Lipman, for years we have seen companies moving manufacturing overseas in search of cheap labor, often paying substandard wages and providing poor working conditions. Your organization represents members of both the labor and environmental community. What does it mean to workers that your members, the members you represent, to have the types of good-paying manufacturing jobs coming home to the U.S.?

Ms. LIPMAN. Thank you, Senator. It is absolutely critical, and it is not just critical to our organization and to the labor and environmental groups that are our partners. But I think it is critical to the workers and communities in every State across the Nation and certainly on this Committee. You mentioned offshore wind. I think it is a great example of both the promise and the challenges we have in getting—you know, bringing these jobs back at scale. As you mentioned, if we look at one of the projects that I am most familiar with, the Block Island project off of Rhode Island, as you said in your example, you know, it also produced hundreds of local jobs, again, for things like experienced welders, electricians, in construction. Similarly, the project labor agreements have ensured that as we put into service these wind turbines, we are building good union jobs, providing those kinds of—you know, the client that Mr. Crabtree mentioned.

But when we look at, for example, the Block Island project, the only part of those wind turbines built in America is part of the foundation. The nacelle comes from France, the tower comes from Spain, and the blades come from Denmark. As we expand this industry, we need exactly the kinds of incentives that we have used in the past but not at the appropriate scale to help ensure we can help companies retool and convert to build the components and the nacelles to make those products.

Senator MENENDEZ. I agree. Thank you. I commend the New Jersey project to you. A lot of that is what we are doing there.

Secretary Moniz, it is good to see you again.

Mr. MONIZ. Good to see you.

Senator MENENDEZ [presiding]. In the Energy Title of the bipartisan end-of-the-year deal that we reached in December, Congress bolstered our fusion energy science programs and created a new pilot program to support demonstration projects that reach certain milestones and move us closer to developing cost-competitive fusion reactors, something I strongly support. The Princeton Plasma Physical Laboratory, run by Princeton University and my State's only national laboratory, is one of the leading laboratories in the country when it comes to fusion research. Can you talk about the need to invest in basic research and new technologies like fusion energy, which has the potential not only to help us with our zero carbon energy needs in the future, but really has the potential to grow our economy and develop the next generation of American energy jobs?

Mr. MONIZ. Absolutely, Senator. If we start with fusion, in fact, let me say flat out there has never been as much innovation in fu-

sion as we have today. Success here may be a lot closer than people think, and it is a game changer. The same statement about game changer, as you imply—and, by the way, Princeton, of course, as you say, is our focal point for that in the lab system. The game-changing aspect applies to many other technologies. For example, we talk a lot about batteries, and that is very, very important, maybe alternative chemistries, but we talk less about the issue of needing not just hours of storage but days and ultimately seasons of storage. Again, completely reinventing the energy system.

So as I said, supercharged innovation in this decade, it is what we do well. We need to do that, and then we need to translate that into creating the domestic industries and jobs and secure supply chains that we need for offshore wind and all of these novel technologies.

Senator MENENDEZ. Well, thank you very much.

The Chair has advised me that Senator Tillis is next, and so I will call upon Senator Tillis.

Senator TILLIS. Thank you, Senator Menendez and Ranking Member Toomey. I am pleased that we are holding this hearing as there are financial climate matters of great importance to discuss for the Banking Committee today and in future hearings. But, specifically, I would like to speak about the recent and continuing actions by John Kerry, President Biden's Special Envoy for Climate, to pressure financial institutions into making extralegal commitments to curtail their lending practices toward legal United States energy businesses. I along with Ranking Member Toomey and 10 other Members of this Committee recently sent a letter to Mr. Kerry urging Mr. Kerry and the Biden administration as a whole to refrain from engaging in attempts to coerce financial institutions into agreeing to a centrally planned U.S. energy policy that unfairly targets legal U.S. energy businesses and, by proxy, their workers.

By Mr. Kerry's own words, President Biden plans to change allocation of capital through the Executive order process by pushing lenders to deny financial services to businesses that do not fall into favor with Mr. Kerry or the Biden administration's energy views. This is wrong. Government coercion of private capital not only is a clear example of the Federal Government unfairly picking winners and losers, but it will also likely result in a top-down, one-size-fits-all policy that does not include the choice of tailoring—or choice or tailoring necessary to meet the needs of a continental-wide country with diverse energy needs.

Mr. Chairman, we had a hearing earlier this week when we were talking about what we can do for rural communities, and we continue to tell them to diversify their base. But these cancellations of pipelines, this attack on natural gas is destroying any opportunity for these rural communities to begin to actually rebuild after a number of setbacks—the COVID pandemic being the most recent among them.

Mr. Crabtree, I am sorry that you are going through what you are. We have heard in some of the testimony today people talking about hundreds of jobs being created for wind projects. I am glad. I am for that. Hundreds of jobs being created for solar projects, I am glad. I am for that. In fact, I led the effort for the solar indus-

try in North Carolina when I was the minority whip. We have got a renewable portfolio standard, and we created thousands of jobs. But I am hearing hundreds of jobs in the face of tens of thousands of jobs lost by the XL Pipeline cancellation, the Atlantic Coast Pipeline cancellation, pipelines in Pennsylvania.

Can you tell me a little bit more—I know you have already spoken some to Senator Toomey, but not only about your fellow union workers, but what about the communities themselves? When you are not working, you are not staying in hotels; you are not buying the food that you normally do. Can you give me a sense of how this has that trickle-down effect on the entire community?

Mr. CRABTREE. A lot of these construction projects, especially power plants, they take place in rural parts of the country with really small towns, so when you have got the construction workers that may come into town and some of these projects lasting 6 to 8 months, some of them even a year, the amount of money that is contributed to these local economies can be life-changing for some of these people, not just the people that are working on the projects, but the amount of money we spend in these communities is life-changing. Then the tax revenue that they lose from these pipelines not being built, it is a huge boost for these local economies.

Senator TILLIS. In your discussions with your colleagues and these discussions about green energy projects, do you think under any scenario over the next 5 or 10 years that these projects could in any way make up for all the lost jobs with what we have seen with the onslaught of traditional energy or particularly natural gas? Can you game it out and just say in a year or two it is all going to come back? I do not see the math adding up.

Mr. CRABTREE. I can give you this example. I see in this new infrastructure bill that there is quite a bit of money allocated to bringing broadband to rural communities. Well, broadband has been around for quite a while now, so I think with these green projects, for them to reach the rural parts of America, you are looking at years or decades. So we are kind of wondering what we are going to do between now and then.

Senator TILLIS. We are probably going to move into a different trade, and probably when we get right-minded about energy policy that is all of the above, we are going to have a labor shortage. Thank you, Mr. Crabtree.

Thank you, Mr. Chair.

[Pause.]

Chairman BROWN [presiding]. Sorry. Senator Cortez Masto from Nevada is recognized for 5 minutes. Sorry for the bit of a break there. I am moving back and forth with other Committees. Thank you, Catherine.

Senator CORTEZ MASTO. I appreciate that. I think we all are. To all of the panel members, we have various hearings going on, so we appreciate your patience. Thank you so much, Mr. Chairman. This is an important discussion this morning.

Let me talk a little bit about the workforce here, because it is our human infrastructure, and I have legislation to strengthen our transportation workforce efforts. It is a bipartisan bill to set up a national public-private partnership to help analyze and market our

in-demand jobs and the pathways to get those jobs, something that has the support of my largest building trades and Chamber of Commerce in Nevada, and I am working on a climate core bill to help prepare Americans in a number of green-minded sectors. So let me open this up to the panel and maybe start with Dr. Moniz.

How do we best ensure that we are safely preparing the workforce to enjoy the benefits of this economic surge in green energy?

Mr. MONIZ. Thank you, Senator. The first thing, I believe, is creating the jobs, which is really, really important. And then I think the training opportunities by unions, by community colleges, and by others will certainly be there. I think, again, the job focus is really important.

If I may just make a slight aside, we heard earlier some statements about the Bureau of Labor Statistics and green jobs. The whole problem is the BLS does not have green job categories except in limited ways. So we found, for example, that there were 2.4 million Americans in energy efficiency jobs, but they are not scored by the BLS. And the reality is it is data that the energy job expansion pre-COVID was double the rate of the economy as a whole. So we have got to focus on this opportunity to really get out of the employment hole caused by COVID, focusing on the energy transition.

Senator CORTEZ MASTO. I appreciate that. And I also heard earlier, Mr. Crabtree, your comments, and I could not agree more. I think coming from Nevada, 14 percent of the people that live in Nevada are organized labor. They are building trades. I agree with you. They have skills, and they do not need to be retrained. We need to transition those skills to the jobs of the future in this new kind of innovation economy with green energy, and I think there is potential for that. Would you agree?

Mr. CRABTREE. I agree, of course, that there is potential for that, especially with some of the younger workers in our industry. But I am concerned, like I said, for, you know, some of the older workers who are at the point of life where it is a little too late to be changing careers.

Senator CORTEZ MASTO. Yeah, no, I absolutely agree, and I think that is why part of our workforce training, what we are trying to develop here is the opportunity to take those skills and apply them to a different type of job, but we are not retraining them because they already have the skills. And I think that is so important for Government, and it is so important for all of us to remember that, yes, they are going to be part of our population, particularly, as I know, in Nevada where we have really some of the highest unemployment because of our hospitality industry and so many have been laid off. But there is the opportunity to retrain. There is the opportunity to give people new skills and a new opportunity for a different type of job. But I think there is also the opportunity to take the skills that they have now and transition those so they are not being retrained, they are not having to learn new skills. They already have them. We have building trades that are just—they already have the skills, so let us give them the opportunity for these new and different types of advanced technology jobs. And that is what I believe we should be focused on here at a Federal level when we are working with the private sector and working with our workforce and bringing them along with it.

So I really appreciate the conversation today. I am going to yield the remainder of my time, but thank you again. This is such an important conversation.

Chairman BROWN. Thank you, Senator Cortez Masto.

I believe Senator Hagerty is next, but his name disappeared from the screen.

Senator HAGERTY. I am here, Senator Brown.

Chairman BROWN. Senator Hagerty, welcome.

Senator HAGERTY. These screens are difficult to manage, as I know. Thank you, Chairman Brown, Ranking Member Toomey, again, for holding this meeting to talk about energy and our economy today. It is also a great opportunity to highlight the hypocrisy of these ESG funds that tout one thing but have no difficulty doing business with the Chinese Communist Party, who are among the worst polluters and violators in the world.

I would also like to highlight the pride that I have in my home State of Tennessee, because I think this is how you get clean energy jobs right. We have done a great job with attracting electronic vehicle manufacturing, electric battery manufacturing. I was just with the team from GM and LG last Friday making a huge jobs announcement, a \$2.3 billion investment in my State for a new battery production facility there.

This is the way to move alongside existing combustion engine jobs. The auto industry hub in our State has been outstanding. And we are adding to our job base, we are adding to our skill base at the same time by bringing electronic vehicle manufacturing capacity onstream. But we are not doing it in the way that we have seen the Biden administration come at our energy policy. What the Biden administration did with the stroke of a pen was kill thousands of solid jobs in the energy industry. They killed the Keystone XL Pipeline. Mr. Crabtree, I am so sorry for the suffering that this has caused you and your family. I think you were fired within hours of that happening here.

We have stopped drilling on Federal lands. We have made ourselves weaker as a Nation from a national security standpoint and from an economic security standpoint, because at a time when we have just achieved energy independence, we suddenly began to move in the wrong direction.

And I appreciate Mr. Moniz's statements about the need to create these new jobs, but what do you tell someone like Mr. Crabtree who has got to be retrained, who is waiting? And, by the way, where are the supply chains today when you think about the new clean energy jobs of the future? I will tell you where those jobs are. They are in China because that is where you have to go to get the majority of the polysilicon panels for solar energy. That is where you have to go to get the majority of the turbines for wind power.

We need to take an all-of-the-above approach, as has been mentioned here, and not do it in a way that devastates complete sectors of our economy while we wait for the future, for the creation of jobs in the future.

I recall back in 2008 and 2009 the promise of green jobs, and that did not materialize. We need to let market forces take hold here rather than try to use Government dictates to produce ahead of market demand. It is happening in my State on a natural basis.

I think Tennessee sets a solid model for how we can move about this. But I hate to see us come in and use the power of Government to distort markets, to impose new requirements ahead of the market's arrival there. I think we can create the right environment, the right incentives just the way we do with Tennessee. But I want to see us develop a very secure supply chain, one that is not dependent on China, before we take these big leaps. I would like to see us make more domestic capacity available and create the incentives for capital investment here in America to do that.

With that said, Mr. Chairman, I would like to yield back my time.

Chairman BROWN. Thank you, Senator Hagerty.

Senator Warren from Massachusetts is recognized for 5 minutes.

Senator WARREN. Thank you, Mr. Chairman.

So the Federal Government is one of the biggest purchasers of goods and services in the entire economy. Last year, we spent about a half trillion dollars for everything from light bulbs and printer cartridges to vehicles and office buildings. Where the Federal Government spends that money has a big impact on our economy, so making good use of taxpayer dollars means purchasing cost-effective products and supporting high-quality American jobs in the process.

We have a tremendous opportunity here to use our Government's enormous purse strings to help jumpstart the green economy and to make our environmental priorities of reducing carbon emissions that help fight climate change.

Dr. Moniz, as Energy Secretary in the Obama administration, you led efforts to leverage new energy technologies to combat climate change, so let me ask you, if the Federal Government bought more American-made, clean, renewable, and emission-free energy products for Federal, State, and local use, would that help to incentivize industries to produce these clean energy products?

Mr. MONIZ. Oh, absolutely, Senator. In fact, what I would really emphasize is that in following that direction, what you are really doing is helping to make a market. And making that market then leads to the virtuous cycle of cost reduction as you learn in the manufacturing sector. And, remember, we still are the largest economy in the world. We can be very, very powerful in developing those markets and then developing not just our own environmental, our own energy transition, but creating also the export capabilities that would come from making those markets.

Senator WARREN. Thank you. Thank you, Dr. Moniz.

Mr. MONIZ. And if I may add, it is in addition to the products that you emphasize, and this goes back to the issues of Mr. Crabtree, as I said, as well. We also need to make the markets in the future technologies like hydrogen, like CO<sub>2</sub> management, which would draw on exactly the skill sets that Mr. Crabtree and his workers would do. So we need to accelerate that as well.

Senator WARREN. That is a powerfully important point. Thank you.

So if our Government commits to buying climate-friendly goods and services, I think what you are saying is that we can leverage its massive purchasing power and our Government supply chain to shift to a clean and sustainable economy. So the Buy Green Act

that I have announced with Congressman Andy Levin does exactly that. It would establish \$1.5 trillion in Federal procurement commitments over the next decade to purchase American-made, clean energy products that we can use at the Federal, State, and local level and for export. These purchases also include something I want to drill down on a bit, and that is electric vehicles.

Our Federal Government has about 645,000 vehicles in its fleet, including over 200,000 Postal Service vehicles. But according to the General Services Administration, less than 1 percent of these vehicles are electric. Buy Green would provide funds to electrify this fleet.

So, Ms. Lipman, let me ask you, would transitioning the Federal vehicle fleet, including the postal vans, to electric vehicles help us meet our climate goal?

Ms. LIPMAN. Well, certainly, as you well know, and everyone on this panel, transportation is currently our largest source of greenhouse gas emissions, and the shift to electric vehicles is a key piece of meeting that—addressing those emissions. And as part of that, for sure, using the—setting the example, the Federal Government setting the example and the market signal to move those large fleets would have a huge benefit.

I would also say that things like the Postal Service, municipal buses, and school buses also operate in local communities, so you have a local health impact, too, of cutting emissions of toxic pollutants. But I would just underscore, as someone else did earlier, that the added benefit of boosting market force, the manufacture of these technologies in America, especially with Buy America and labor standards that would come with those Federal purchases.

Senator WARREN. Well, I appreciate that. You know, a recent poll showed that nearly 70 percent of voters support using Government contracts to prioritize buying American-made clean energy goods like electric vehicles and green building materials. This kind of strong, bipartisan support suggests that our country is ready for us to make big investments to bolster our clean energy economy.

So I appreciate your having this hearing, Mr. Chairman. It is time for us to put smart policies in place to save our planet and to build back greener. Thank you.

Chairman BROWN. Thank you, Senator Warren.

Senator Van Hollen from Maryland is recognized for 5 minutes.

Senator VAN HOLLEN. I thank our witnesses for being here today. Mr. Shahyd, thank you and the NRDC for your good work on clean energy. For years, in fact, for over a decade, we have tried to establish a Federal clean energy financing authority, a Clean Energy Accelerator. It used to go under the name of a “green bank” when we proposed it in the House. Senator Markey and I introduced this as the National Climate Bank. I was very pleased to see that President Biden included \$40 billion to capitalize a Federal Clean Energy Accelerator that could leverage billions and billions more in private capital to address our clean energy infrastructure requirements.

I know you have seen green banks working well in States. Can you talk about why this piece of the American Jobs Plan is important?



Mr. SHAHYD. Yes, thank you, Senator, for that question. The Clean Energy Accelerator works to galvanize private investment because as much as we need Federal investment to quicken the pace, you know, from what we have heard here today, no one disagrees that we must act on climate.

What I have heard is that we disagree on what the pace of that action should be, and the reason why we need, you know, much greater Federal investment is to quicken the pace, but the Federal investment still alone cannot do it. And what the Clean Energy Accelerator will do is to help funnel private investment into these industries to really push these things forward. And we have seen across the country local green banks and the American Green Bank Consortium have already identified an investment need of \$21 billion in local markets. And these banks are flourishing and are in demand in red States and blue States, you know, including States like Florida and Michigan and New York and Hawaii, States like South Carolina, Alaska, Minnesota, and Maine. And expert analysts have found that \$100 billion in Federal capitalization of the accelerator will create nearly 4 million jobs in 4 years and 12 million jobs over the next decade—not hundreds of jobs but millions of jobs over the next decade. And the reason why we need this is because we need to quicken the pace, you know, because workers like Mr. Crabtree—I truly understand where he is coming from. You know, trust me, I too have wondered many times whether or not my country and my President cares about me. I know what that feels like. I am from Louisiana. My entire family works in oil and gas, from the wellhead to the gas station to the corporate office. But, you know, there are many people—we are talking about millions of people that are at risk from flooding, millions of people that are at risk from sea level rise, millions of people that are at risk from extreme weather. And what I ask my family is the same thing that I would ask Mr. Crabtree and other workers. Again, I know what it feels like to wonder if your country cares about you, but we also need you to care about us, and we need to do this together.

I apologize that, you know, we have not yet communicated that or made that understood that we care about all our workers, and we have to do this transformation in a way that supports and sustains both families in the short and in the long term.

Senator VAN HOLLEN. Well, that is right. I mean, look, when it comes to clean energy, we need what has been referred to in the past in a different context an all-of-the-above strategy, direct Federal investment but also leveraging this.

Secretary Moniz, great to see you. A quick question about ARPA-E. We on a bipartisan basis—I teamed up with former Senator Lamar Alexander. We extended the authorization for that, increased the levels. I am pleased to see that is also part of the President's plan. Can you talk about your experience and the role ARPA-E can play in terms of accelerating a clean energy future?

Mr. MONIZ. Well, thank you, Senator, and thank you for your support of ARPA-E and getting that pushed up toward the \$1 billion goal, at least, that was set some years ago. I think that all of the indicators from the ARPA-E had been extremely positive in terms of company creation, et cetera, and now with some author-

ization also to extend beyond the initial phase, I think that the commercialization impacts will be even greater. But I think the basic model that you and others have supported of giving kind of extraordinary authorities to be nimble, to bring in people with fire in their belly for getting technologies out there, has been a great success, and we need more of it.

Senator VAN HOLLEN. Thank you, Mr. Secretary. I thank all of you for being. It is a very important and timely topic.

Thank you, Mr. Chairman.

Chairman BROWN. Thank you, Senator Van Hollen.

Senator Ossoff is recognized for 5 minutes.

Senator OSSOFF. Thank you, Mr. Chairman, and thank you to our panel.

Mr. Kreutzer, you note in your testimony that "Federal funding of private ventures is not at the top of the list" of economic priorities, as far as you are concerned. You note, "Government subsidies . . . work against economic freedom." Those are correct excerpts from your testimony. Correct, sir?

Mr. KREUTZER. I do not recall if it is word for word, but, yeah, sure. Economic freedom does not include Government subsidies.

Senator OSSOFF. You prefer market-based solutions and oppose Federal subsidies. I would ask then, do you oppose the significant multibillion-dollar annual subsidies to the oil and gas industry?

Mr. KREUTZER. Yeah, but—if you measure them correctly, I sure do. Now, what we have seen over and over is that what is called a subsidy to the oil industry is actually a tax credit given to all manufacturers, so broadly defined, and it includes newspapers. It was done in an attempt to simply lower tax rates. So if you pull that out, you find that there is very little in the way of tax subsidies or subsidies of any kind to the oil and gas industry, especially to the major oil companies. There is a tax credit for the small producers. But I am opposed to those unnecessarily. Sure, go ahead.

Senator OSSOFF. I appreciate the detailed answer, and I want to make sure we have it for the record. So you oppose the intangible drilling cost deduction. You would support congressional efforts to repeal the intangible drilling cost deduction?

Mr. KREUTZER. The intangible drilling cost, just like we have for any company that has costs, they get to take them off of their revenues before they pay taxes. So that is just what that is. I do not see why you would want to single out the oil companies so that they cannot deduct their costs before they figure out what their net is to pay taxes. That is how every company does it.

Senator OSSOFF. So you support allowing oil companies to deduct the majority of costs incurred from drilling new wells domestically, that subsidy which has been in Federal statute since around 1916, just to be clear?

Mr. KREUTZER. If the oil companies are paying costs, they should be able to deduct their costs from their revenues to get their net income, which is what every corporation does before they pay tax.

Senator OSSOFF. Thank you, Mr. Kreutzer.

Dr. Moniz, clean energy companies that form successful hubs in particular areas of the State, such as, for example, the constellation of clean energy producers that are emerging in north Georgia, we

have one of the largest photovoltaic production facilities in the Western Hemisphere in Dalton, Georgia. We have being established now one of the largest electric vehicle battery producers in the world in northeast Georgia. How does the formation of economies of scale and the consolidation of clean energy productive capacity in specific regions, such as in Georgia, allow us to attract more investment and develop more economies of scale to grow the clean energy sector regionally across the United States?

Mr. MONIZ. Yes, Senator, we are big advocates for the hub concept because this allows great efficiencies. It also allows more transferability of skills of the workforce when you have a hub. It allows the optimization of infrastructure. Too often, I think, we talk about, you know, continental scale infrastructures which are very, very difficult to build rather than focusing on hubs, many, many hubs in different regions that, again, make that infrastructure challenge, I think, much more manageable. So I would encourage that very, very much in multiple parts of the green energy developments.

Senator OSSOFF. Thank you. And, Ms. Lipman, would you care to comment, please, on how the formation of these hubs and how attracting domestic and foreign direct investment in clean energy productive capacity in the United States can accelerate the transition to clean energy?

Ms. LIPMAN. Actually, I concur with everything that the Secretary just said, and I think not only do we see how critical it is to ensure that we maintain the major assembly facilities—maintain and attract the major assembly facilities to build clean vehicles, batteries, advanced technologies here and build good jobs in them, but those—that we need not only do those, encourage the development of supply chains around them, but we need to actively incentivize the attraction of additional domestic suppliers to serve in these supply chains.

I would also say this is an opportunity to look at how—we talked earlier about transitioning the production of clean technology into our existing plants, and doing this gradually is a great opportunity to also integrate the development of new suppliers or transition of suppliers to serve, to maintain and grow that hub and not lose it as technology changes.

Chairman BROWN. Thank you, Ms. Lipman. Thank you, Senator Ossoff.

Senator Warnock is recognized—and I know that Secretary Moniz is leaving at 11:45. After Senator Warnock takes his 5 minutes, I have one question for you, but we still get you out by quarter to, Mr. Secretary. Senator Warnock is recognized for 5 minutes.

Senator WARNOCK. Thank you so much, Brother Chairman.

President Biden has made greening our transportation infrastructure a top priority to help meet his clean energy goals. That includes green transit, which I look forward to advancing with this Committee, but it also includes investment in clean electric vehicles and electric vehicle charging infrastructure. We have a massive \$2.6 billion electric vehicle battery plant under construction right now in the city of Commerce, GA. This would produce car batteries to help increase the number of electric vehicles, obviously reducing carbon emissions and fighting climate change. On top of

that, this plant would keep Georgia on the cutting edge of a clean energy economy and create at least 2,600 clean energy jobs. That is a win-win for my State.

Secretary Moniz, can you talk about the importance of clean electric vehicle infrastructure in reducing carbon emissions and reducing our reliance on fossil fuels?

Mr. MONIZ. Yes, thank you, Senator Warnock. Also, I would like to congratulate you and Senator Ossoff for forging the settlement that has really supported that important battery manufacturing in Georgia.

In terms of the EV infrastructure, well, I think the first thing to say is that, you know, we have to listen to GM and Ford, we have to look at Tesla's evaluation to know that electrification in transportation is really coming. We have to look at the facts that probably already cost of ownership of an EV and in an internal combustion engine are just about equal, and capital costs are coming down.

We have to look at the fact that we need to build now the infrastructure that will, again, allow the market to be made and to have consumers want to choose those EVs, for one reason because they are great performance vehicles in addition to being clean.

So this all comes together, and I think it is a great example of why our companies want to go there, our people want to go there, and now we need Government policies that are synergistic with those needs.

Senator WARNOCK. Thank you so much, and I was grateful to play a role in helping these companies recognize that they needed to come to a resolution, saving a lot of jobs in Georgia, and what this demonstrates and will demonstrate over time is that the smart thing to do for our environment is also good public policy in terms of workers and the economy. Those things are not mutually exclusive. We need sustainable approaches to our ecology and our economy, and those things are actually connected and increasingly so.

When our schools are fully reopened and kids return to in-person instruction, nearly 25 million American children will be exposed to harmful air pollution each day as they travel to school on buses that, by and large, run on diesel fuel. Children in Georgia and across America should be able to get to and from school each day without breathing polluted air. In fact, innovators—I am proud that one of the innovators helping us to address this problem is Georgia's own Blue Bird Corporation down in Fort Valley, Georgia. It is already leading the way to replace older diesel buses, the kind that you and I went to school on—certainly I did—with cleaner, zero-emission electric buses because they see greening our school bus fleet as an urgent environmental concern and an economic priority.

Ms. Lipman, can you speak to the importance of greening our yellow school buses?

Ms. LIPMAN. For sure. As I think we have touched on a couple times in the hearing, the opportunity to transition our medium- and heavy-duty fleets, especially those where Government can play a role in speeding that deployment, is a real win-win across a whole set of variables. Not only do they cut emissions, not only do they, as you mentioned, you know, improve local air quality and

health, but they help provide a market for precisely the companies that you mentioned earlier that give us the opportunity to bring electric vehicle manufacturing into our existing school bus and bus facilities.

The component manufacturers, Cummins, for example, who make diesel engines and motors, they are also now making electric motors. And these investments, which have been incredibly valuable to communities of schools, are also part of transforming our manufacturing jobs.

Senator WARNOCK. Well, thank you so much, and it is the reason why I was so proud to partner with Senator Padilla to introduce the Clean Commute for Kids Act this week. It will help our students stay safe. It will create good-paying jobs, modernize our country's vital transportation infrastructure. This bill would provide \$25 billion over the next 10 years to help replace these old diesel buses with zero-emission school buses, and I would submit that it needs to be included in any infrastructure bill that we would do in the Congress.

Thank you so much.

Chairman BROWN. Thank you, Senator Warnock.

A last real quick question. I do not think Senator Toomey has anything, so one real quick question, then I will close, for you, Secretary Moniz, to get you out under the wire. In 2018, an explosion at a gas well in Belmont County, Ohio, eastern Ohio, not far from Wheeling, West Virginia—does not like that much different from the State that Mr. Crabtree lives in—resulted in one of the largest methane leaks on record. Across the country, we know billions of gallons of coal ash ponds are on the banks and rivers and upstream from communities. We know the catastrophe that occurs if these ponds fail.

What opportunities, Mr. Secretary, across Appalachia and the rest of the country for good-paying union—and I emphasize “union”—jobs to plug these methane leaks, properly dispose of coal waste, and reclaim the abandoned mine lands?

Mr. MONIZ. Thank you. The issue of capping methane leaks, of course, is very, very critical for us to carry on with natural gas as a very, very important transition. But the opportunities, as you say, for union workers, a massive number of old wells to be properly capped. The ash ponds, we have seen tragedies, of course, with the ash ponds. We need to really move on those.

This will be, frankly, I expect, it will be measured by decade, not by year, in terms of creating all those jobs and getting us the environmental benefits, including in a lot of frontline communities for addressing these legacy assets that are creating now environmental problems. And there will be a lot of union jobs in there, as you say.

Chairman BROWN. Thank you, Secretary Moniz, and thanks very much to all of you.

Secretary Moniz had earlier said building out the clean energy economy is especially critical as we dig out of the COVID-19-induced employment hole. We want to make sure American workers like Mr. Crabtree and his fellow union members go back to work. Nobody in this body has fought for the dignity of work and fought for the union movement more than I have. When I met with President Biden and a number of Senators in his second or third week

on the job, I thanked him for using the word “union.” He walked up to me later and said, “Why would I not?” And I said, “Because I have been in this room before, and I have never heard another President use the word ‘union.’” Understand that. Understand that is my editorial comment.

So if we do what we should do as lawmakers, then there will be plenty of jobs in infrastructure, carrying captured carbon and offshore wind platforms. If we fund energy efficiency upgrades, there will be jobs in every Zip code, making homes safer, healthier, and cheaper to live in. If we invest in manufacturing, as Ms. Lipman discussed, we can make clean energy jobs, bring them back from China. We are changing our trade policy and our tax policy. That was the biggest reason for the outsourcing of jobs to China, if I could, Dr. Kreutzer, and we do that right, we bring these jobs back, we building 21st century communities.

Thanks again to the witnesses.

For Senators who wish to submit questions, those questions are due 1 week from today, Thursday, April 29th. You will get those questions. And to our witnesses, for our Committee rules, we ask that you respond to questions if you possibly can within 45 days from the day you receive them.

So thank you again. This Committee is adjourned.

[Whereupon, at 11:43 a.m., the hearing was adjourned.]

[Prepared statements, responses to written questions, and additional material supplied for the record follow:]

### PREPARED STATEMENT OF CHAIRMAN SHERROD BROWN

First, I want to take a moment to acknowledge the verdict in Minnesota Tuesday, and the tragic shooting that same day, in Columbus in my State.

While Tuesday's guilty verdict was the right one, we cannot mistake accountability for justice. True justice would mean George Floyd was still alive today, and true justice would not allow another shooting to happen while the verdict was being read.

Ma'Khia Bryant was 16 years old. She was a daughter, a high school student, a member of our Columbus and Ohio community. And now another family is in mourning.

This must be a turning point in our country. We must use this moment as a call for continued action to change our laws, and reform a broken justice system that has failed Black Americans over and over.

We have to reform our public safety system so that it protects all of us. And on this Committee, we must continue to work to change all the ways our society has too often been set up to hold Black and Brown Americans back—from housing to transit to our banking system.

I agree with my friend, colleague, and CBC Chair Joyce Beatty: This must be the catalyst to trigger actions far beyond today.

Today, on Earth Day, the Banking and Housing Committee returns to the subject of climate change. A few weeks ago we talked about risk. We're Americans—we take on big problems, and we develop and manufacture and deploy the technologies of the future.

I come from a coal State. I know the legitimate fears that workers and communities in Appalachian Ohio have. We listen to them.

They live in towns where mining is a core part of their identity. They still think of themselves as "coal towns," even though coal hasn't been mined there since at least the Reagan administration.

I also know there's bravery, and courage, and dedication to family. Imagine going a mile or more underground to do dangerous work in tight, dark, dusty places, every single day.

On Monday, Cecil Roberts, the President of the United Mine Workers of America, showed that same grit, when he announced that the mineworkers see a path to clean energy—a path that supports the dignity of his members' work, that gives them a seat at the table, and that finally brings the investment in their communities that they've been promised for decades.

We must show the kind of courage that Cecil Roberts and the United Mineworkers are showing.

We show no respect by selling communities a fantasy of returning to the past. People want the truth, and they want our commitment to help them grow the industries of the future. I want to see American manufacturing thrive, to strengthen American competitiveness, and to give communities the tools they need to be a part of the 21st century clean energy economy.

This isn't some far-off dream world of science fiction.

We know we can seize these opportunities, because we're already doing it in:

- The Dry Lake Wind Power Project in Navajo County, Arizona,
- The Willow solar project about 30 minutes northwest of Wasilla, Alaska,
- Zero-emission bus manufacturing in Alabama, South Carolina, and Minnesota,
- In Kansas, where 7,000 megawatts of wind, solar, and battery storage helps power more than 2 million homes, and
- In Louisiana, where Gulf Island Fabrication built the foundations for the Nation's first offshore wind project—the Block Island Wind Farm, in Rhode Island.

Nearly 350,000 Americans already work at solar energy jobs, and nearly 115,000 workers do the same in wind power.

That's only the beginning. 400,000 or more additional Americans could find jobs in solar and wind industries this decade.

This is about the workers in Perrysburg and Lake Township, Ohio, who manufacture First Solar's highly efficient PV solar panels. It's about the brilliant scientists at the University of Toledo, making breakthroughs in ultra high-efficiency and thin-film solar cells.

It's about RBI Solar, in Cincinnati, which emerged from the commercial greenhouse business and is now the fastest-growing photovoltaic racking company in North America.

It's about the Stark Area Regional Transit Authority, in Canton, Ohio. SARTA has built one of the largest hydrogen fuel cell bus fleets in the Nation, and lends

its buses to help other transit agencies test the deployment of American-made buses that have zero tailpipe emissions.

And it's about Emerson, founded in 1890 as an electric fan company, and its 21st Century collaboration with the University of Dayton on high-efficiency and sustainable heating, ventilation, and air conditioning technologies for residential and commercial use.

This country laid 200,000 miles of railroad tracks. We electrified the cities and the countryside and everywhere in between. We sent John Glenn into orbit. And our continued embrace of innovation put into the hand of every cellphone customer a more powerful computer than NASA used for the Apollo program.

Why would we stop now?

Our predecessors didn't say "No" to Henry Ford because of the buggy whip lobby. And we aren't going to say "No" to innovation in the clean energy economy.

These new industries got a big boost at the turn of this century when those George W. Bush and Rick Perry—noted hippies, both—pushed renewable development in Texas.

Texas which now leads the country in electricity from wind power. Next in line are Iowa, Oklahoma, Kansas, and North Dakota—collectively known as the "Saudi Arabia of wind."

The growth in renewables in those States and across the country is providing good-paying jobs, giving farmers and ranchers another source of income, contributing to cleaner air and water, and saving people money.

Retrofitting our houses and apartments to make them more energy efficient and resilient means lower utility bills for families every month.

Businesses are already investing and innovating because they know it improves their bottom line. Utilities and rural electric co-ops are embracing new technologies not only because their ratepayers are demanding it, but also because their business models dictate using whatever provides reliable electricity at the lowest price.

More and more, that's clean energy.

The choice we face isn't between keeping our communities frozen in time, or putting people to work in new industries.

Even if we do nothing, change is coming. Clean energy jobs are the jobs of the future.

The only question is whether they will be American jobs.

If we fail to invest in clean energy R&D, to retool our factories, and to play a leadership role, other countries will the void.

China is already spending billions on clean energy research and innovation. So are Germany and Japan.

We need to stop allowing the Chinese Government and its subsidized industries profit off our inventions.

Let's create 21st century communities. Let's create more, better-paying jobs in more places, let's bring down people's energy costs, and let's pave the way for another century led by American innovation.

---

#### PREPARED STATEMENT OF SENATOR PATRICK J. TOOMEY

Thank you, Mr. Chairman.

Today, I expect we will hear calls for Green New Deal-type policies. Our discussion needs to include the costs of these policies, including lost American jobs, slow economic growth, increase energy costs, and waste billions of taxpayer dollars.

Our discussion should also include the remarkable progress we've made in reducing carbon emissions—ironically enough, using fossil fuels. Let me explain.

U.S. carbon emissions have been falling for years. In 2019, U.S. carbon emissions hit their lowest level since 1992 and their lowest per capita level since 1950, and the U.S. led the world in reducing energy-related CO2 emissions. These declines have been enabled by America's recent energy renaissance made possible by technology and free markets.

The natural gas boom—in places like Pennsylvania—has helped gas partially replace coal as the fuel for America's power plants. This has been the primary driver of the declines in carbon emissions. We made this progress creating jobs, not destroying them.

Nonetheless, some of my colleagues seem determined to impose Green New Deal policies that will cost us jobs on a net basis and stifle the very developments that have allowed us to reduce emissions. They often describe the destruction caused by these policies as an "opportunity" to create new green energy jobs. But they fail to acknowledge the costs they're imposing in lost jobs and higher energy prices.



I'm reminded of French economist Frederic Bastiat's famous 1850s parable of the "broken window." In the parable, someone breaks a shopkeeper's window, so he must hire a window maker to replace it. Some people think the broken window is a good thing because it "created" a job for the window maker. But Bastiat points out the fallacy in this thinking. As he puts it, "destruction is not profit."

The shopkeeper had to spend money and time to replace his window. If the window had never been broken, that money and time would've gone to more productive uses—like hiring a worker to expand the shopkeeper's business. Some of my colleagues seem to have forgotten this basic economic principle.

Just as breaking a shopkeeper's window doesn't somehow create economic gain, neither does destroying traditional sources of energy and replacing it with so-called green energy create economic gain for two reasons: it would only create new green jobs by destroying traditional energy jobs. In addition, the end result is that society pays more for energy, which lowers our standard of living. And the consequences of this destruction aren't just academic.

The Biden administration has already imposed policies that are destroying traditional energy jobs. For example, it has terminated construction of the Keystone XL pipeline, and banned new oil and gas leases on Federal lands.

These actions alone will destroy tens of thousands of jobs for Americans. Today, we will hear from one of them—Neal Crabtree—a union welder who lost his job when Keystone was shut down.

I'm also deeply concerned about the Biden administration's apparent efforts to coerce banks to stop lending to fossil energy companies. This week all the Republicans on this Committee sent a letter to John Kerry warning the Administration to stop abusing Government power in this way.

Mr. Kerry has said the very purpose of President Biden's expected global warming Executive order is to "change the allocation of capital"—in other words, to redirect capital from traditional energy companies to companies deemed to be sufficiently "green."

This effort disturbingly resembles the Obama administration's notorious "Operation Choke Point" scandal, in which regulators attempted to coerce banks into denying services to legal yet politically disfavored businesses.

It's neither practical nor desirable to immediately cease fossil fuel production. Fossil fuels represent approximately 80 percent of U.S. energy production and consumption. Abusing Government power to try to achieve that objective will distort capital allocation, raise energy costs for consumers, and slow economic growth.

Finally, Green New Deal jobs programs have a history of failure. Yet, President Biden's infrastructure plan would double down on these failed policies of the past. Consider one example: his plan would establish a \$27 billion "National Climate Bank" to provide financing for so-called green investments.

We know that when the Government substitutes its judgment for that of the market, it picks winners and losers based on political favoritism, not business fundamentals. Just look at the 2009 Obama-Biden spending bill. That bill included over \$80 billion in spending, loan guarantees, and tax credits for green energy projects. What were the results of this massive Government program? Waste, fraud, and abuse.

Who can forget the infamous case of the solar panel company Solyndra? It went bankrupt and defaulted on a \$535 million loan guaranteed by Federal taxpayers. Solyndra's ability to secure a loan guarantee may have resulted from its political connections—not a track record of success. And the Department of Energy's Inspector General found that Solyndra engaged in a "pattern of false and misleading assertions and statements."

Nevertheless, taxpayers had to bailout Solyndra for over half-a-billion dollars. This is what happens when the Government picks winners and losers based on political considerations.

As one of today's witnesses, David Kreutzer, will testify the Biden administration is repeating these mistakes.

The climate is changing. And we should be having a vigorous debate about what to do about that. But that debate should honestly acknowledge that if we shift from low-cost fossil energy to high-cost energy, like wind and solar, there will be costs. Jobs will be destroyed and energy prices will go up.

We should weigh these costs against the potential benefits of a shift, and we should do so in an open, transparent, and accountable way—not through sweeping Executive actions and backdoor pressure campaigns to coerce banks to implement the Administration's preferred policies.

**PREPARED STATEMENT OF ERNEST MONIZ**  
**CHIEF EXECUTIVE OFFICER, ENERGY FUTURES INITIATIVE**  
**APRIL 22, 2021**

**Testimony of Secretary Ernest Moniz, CEO, Energy Futures Initiative**  
**before the Senate Committee on Banking, Housing and Urban Affairs**  
**April 22, 2021**

Chairman Brown, Ranking Member Toomey, and Members of the Committee, I am pleased to have the opportunity to discuss with you today the risks associated with climate change and some possible options for addressing those risks.

**Climate Change Poses Risks to U.S. Financial Systems.** Late last year, the U.S. Commodity Futures Trading Commission (CFTC) released a groundbreaking report, *Managing Climate Risk in the U.S. Financial System*. A central message of this report:

“... U.S. financial regulators must recognize that climate change poses serious emerging risks to the U.S. financial system, and they should move urgently and decisively to measure, understand, and address these risks. Achieving this goal calls for strengthening regulators’ capabilities, expertise, and data and tools to better monitor, analyze, and quantify climate risks. It calls for working closely with the private sector to ensure that financial institutions and market participants do the same. And it calls for policy and regulatory choices that are flexible, open-ended, and adaptable to new information about climate change and its risks, based on close and iterative dialogue with the private sector.”

The CFTC report identified categories of assets that are most likely to be put at risk by climate change and examples of those categories of financial products, including real property; infrastructure; companies whose assets are directly affected by climate risk; insurance companies; and government revenues (Table 1). A summary of some of the report’s conclusions includes:

- the lack of standards and definitions for climate data and financial products is hindering the management of climate risk by market players and regulators. Methodologies, definitions, data on climate risks and financial products labeled “green” or “sustainable” should be standardized and transparent.
- corporate disclosures of climate-related financial risks are critical for understanding and assessing the impacts of climate change on the range of financial market participants, processes, and products.
- A carbon price, appropriately developed and supported, is essential for adequately assessing climate risks and informing financial and investment decision-making.
- Cascading and inter-acting risks could amplify climate impacts on financial systems. At the same time, the re-pricing of assets based on climate risk should be orderly, informed, and systematic.

**Table 1. Categories of Assets Exposed to Climate Change Impacts**

Categories	Examples
Financial assets directly tied to real property	<ul style="list-style-type: none"> <li>• Commercial mortgage-backed securities (CMBS)</li> <li>• Commercial real estate (CRE) bank loans</li> <li>• Government-sponsored enterprise (GSE) Credit Risk Transfer securities</li> <li>• Real Estate Investment Trusts (REITs)</li> <li>• Residential mortgage-backed securities (RMBS)</li> <li>• Residential mortgages</li> </ul>
Financial assets tied to infrastructure	<ul style="list-style-type: none"> <li>• Debt and equities of power and water utilities and communications companies</li> <li>• Debt and equities of public and private transportation infrastructure</li> </ul>
Financial assets tied to companies with business models or operations likely to be impacted by physical or transition risk	<p>Equities and debt of firms in the following sectors:</p> <ul style="list-style-type: none"> <li>• Agriculture</li> <li>• Airlines and the broader transportation sector</li> <li>• Automobiles</li> <li>• Cement, steel, chemicals, plastics</li> <li>• Energy, including coal, oil, and gas production</li> <li>• Hospitality</li> <li>• Metals and mining</li> <li>• Power generation</li> <li>• Service and infrastructure providers to oil and gas</li> <li>• Tourism</li> </ul>
Financial assets tied to insurance coverage providers	<ul style="list-style-type: none"> <li>• Insurance and reinsurance company debt and equities</li> <li>• Insurance linked securities (ILS)</li> </ul>
Financial assets tied to streams of government revenue	<ul style="list-style-type: none"> <li>• Municipal bonds</li> <li>• Sovereign bonds</li> </ul>

Today we are dealing with two global challenges simultaneously -- a pandemic and climate change -- that can reinforce each other as they pose risks to financial institutions, commodities, credit, financial aid, exports, insurance, supply chains and more -- all issues of concern to this committee. Reasons for the interdependence are that COVID has already stressed balance sheets, required large government expenditures and threatened the financial health of many families and businesses alike.

**The Range of Climate Risks is Growing.** I will start by offering some perspective on today's risks from climate change. These risks are growing and manifest in increasingly serious ways. More specifically, I will discuss:

- the global risks of and responses to climate change;
- U.S. climate risks and the changing risk profile;
- risks to critical energy infrastructures;
- risks to economic growth and jobs;
- technology risks; and
- supply chain risks, both for existing US energy supplies; as well as risks to the supply chains for our allies.

Quantifying these risks is difficult but efforts to elucidate these risks are essential for the stability of the nation's financial, security, social, and health systems going forward.

**The Texas "Big Chill" of 2021.** The Texas events of last February provide an example of how climate risks and finances intersect, an example of the kinds of risks and concerns outlined in the CFTC report. In Texas, the recent extreme cold snap left much of the state without power and heat. In Dallas, February temperatures were -2°F, while the average low for this time of year was around 40°. Because two-thirds of Texans rely on electric heating, this led to a surge in electricity demand throughout the state of about 20 GWs, or one-third of the winter peak; this far exceeded ERCOT's worst case planning scenario.

It is clear that Texas was unprepared for the polar vortex of February 2021 even though ten years earlier, the state experienced another major cold snap, albeit not as severe as the most recent one. The 2011 event led to a FERC/NERC report with a set of recommendations, such as winterization of assets; unfortunately, there was no systematic response to these recommendations by Texas regulators and policymakers.

Another key recommendation: understanding the interdependencies of the electricity and natural gas infrastructures. Actions were not taken on this issue either, with disastrous consequences. The natural gas producers had electrified important parts of their production system, while the electricity system had become extremely dependent on gas supply. The approach to shedding electricity load did not adequately incorporate the need for natural gas supply to run generation, and the need for electricity to produce natural gas. The separated regulatory responsibilities of the Texas PUC and the Railroad Commission created a structural impediment to this kind of coordination -- the crisis underscored the need for new cross-cutting structures to reflect these interdependencies and an empowered decision-making process to ensure reliable and resilient electricity in the face of increasingly extreme weather events.

In this regard, it is clear that the PUC, state officials and ERCOT did not adjust to the changing risk profile generated by increased global warming and extreme weather -- but they are not alone. *Institutions, policymakers, system operators, and investors across the country need to acknowledge that yesterday's weather is not a good predictor of future weather extremes.* It must also be emphasized that the extreme weather risks are not only about cold, and they are considerable: heat and cold, floods and droughts, sea level rise and tropical storm damage, wildfires, and more. All need appropriately updated regional risk profiles for damage to critical infrastructures.

The Texas electricity market structure also needs reexamination. I stress that the choice of a deregulated system is not itself the issue, but rather the failure to erect sufficient guardrails in defining the energy-only market rules. I am reminded of the old joke about "How many Chicago economists does it take to change a light bulb?" Answer: "Zero -- if the market wants it, the market will take care of it." Clearly, the "market" needs improved rules of the road to reduce physical and financial risk to the citizenry.

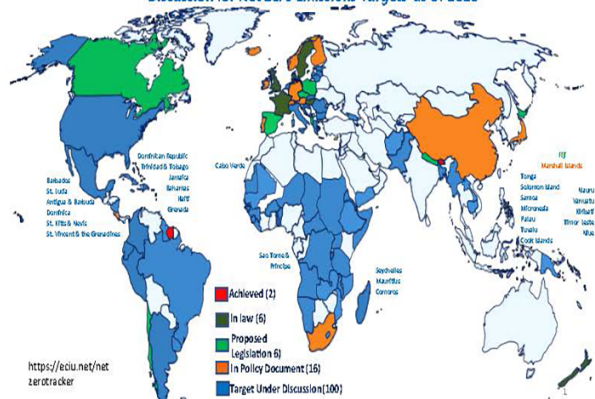
This brings us to the financial consequences. In addition to the enormous human suffering from the catastrophic weather event in Texas, there were huge financial consequences. Electricity rates were held at \$9000/MWh for a sustained period, and natural gas prices exceeded \$100/MMBtu, a price that had significant ripple effects on natural gas prices far from Texas. Within the state, there are now a significant number of stressed balance sheets for utilities, families, businesses, and even for military installations. The Navy reported, for example, that its electricity bill for Texas installations for February 2021 totaled \$13.9 million, an order of magnitude greater than the February 2020 cost of \$616,000.<sup>1</sup> The largest and oldest electric power cooperative in Texas filed for bankruptcy, and the last chapter has not yet been written on the financial fallout of the February events. Ultimately, some combination of rate payers, tax payers and shareholders will pay the price. This episode provides a stark example of the warnings in the CFTC's report. The open question is whether legislation in response to the big chill in Texas will materially improve resilience in the face of extreme weather events with highly uncertain risk profiles in the future.

**Global Responses to the Increasing Risks From Climate Change.** While the planet has seen major climate variation over its history, the pace of change today is well beyond that attributable to natural phenomena and is driven by human activity, especially from energy. The UN's 2019 Climate Action Summit brief noted that the last four years were the four hottest on record, and winter temperatures in the Arctic have risen by 3°C since 1990. The U.S. Fourth National Climate Assessment released in 2018 noted that, "Without significant reductions, annual average global temperatures could increase by 5°C or more by the end of this century compared to preindustrial temperatures."<sup>10</sup> The growing intensity and frequency of floods, hurricanes, and droughts across the country and the world have underscored both the ferocity and costs of a changing climate.

This has not gone unnoticed by the nations of the world. In 2015, 197 countries adopted the Paris Accord at COP21. According to the Special Report by the Intergovernmental Panel on Climate Change (IPCC) published only three years after Paris, "limiting global warming to 1.5°C is projected to reduce risks to marine biodiversity, fisheries, and ecosystems, and their functions and services to humans" while a 2°C rise would bring with it greater increases in frequency and intensity of heavy precipitation in several regions along with an increase in intensity or frequency of droughts in others.<sup>11</sup>

According to the UNFCCC, since COP21, 191 countries have submitted their first Nationally Determined Contribution (NDC) and eight have submitted their second.<sup>12</sup> Importantly, since Paris, the number of countries

**Figure 1. Countries That Have Either Achieved, Have Laws, Policies, Proposals Under Discussion for Net Zero Emissions Targets as of 2020**



130 countries have either implemented or are considering implementing net zero targets.

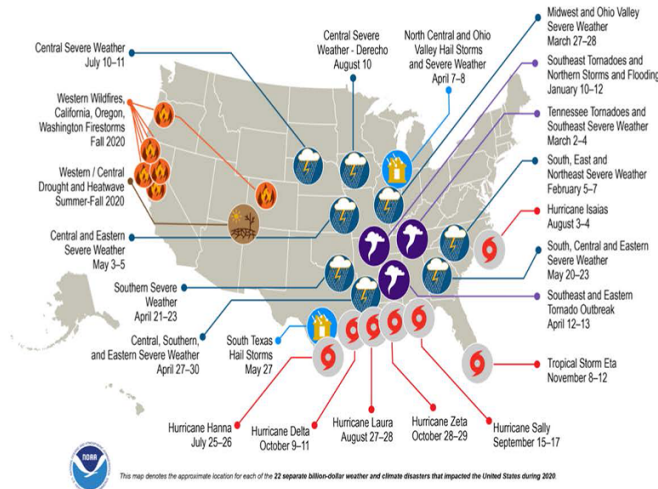
that have implemented or are considering net zero emissions targets, now stands at 130, up from around 17 just two years ago (Figure 1).

**U.S. Climate Risks.** The Fourth U.S. Climate Assessment also found that “Climate change creates new risks and exacerbates existing vulnerabilities in communities across the United States, presenting growing challenges to human health and safety, quality of life, and the rate of economic growth” and that “Without substantial and sustained global mitigation and regional adaptation efforts, climate change is expected to cause growing losses to American infrastructure and property and impede the rate of economic growth over this century.”

The events described earlier did not just impact Texas. The winter storm in mid-February 2021 affected large regions of the southern U.S., including Texas, with sustained subzero temperatures and snow. These events are not anomalies; they represent the new norm. According to the National Centers for Environmental Information at the National Oceanic and Atmospheric Administration, the U.S. has sustained 291 weather and climate disasters since 1980 where overall damages/costs reached or exceeded \$1 billion (including CPI adjustment to 2021). The total cost of these 291 events exceeds \$1.9 trillion. The 1980–2020 annual average is 7.1 events (CPI-adjusted); the annual average for the most recent 5 years (2016–2020) is 16.2 events (CPI-adjusted).

2020 sets the new annual record of 22 events - shattering the previous annual record of 16 events in both 2011 and 2017. 2020 is the sixth consecutive year (2015–2020), in which there have been ten or more, billion-dollar weather and climate disaster events that have impacted the United States.<sup>1</sup> The costs of such events are highlighted in Figure 2 below that describes 2020 weather and climate-related events that caused \$1 billion or more damage across regions in the U.S.

**Figure 2. U.S. 2020 Billion-Dollar Weather and Climate Disasters**



The Biden Administration is setting us on a new and accelerated course towards an economy with net zero greenhouse gas (GHG) emissions by mid-century. The U.S. has rejoined Paris and it is expected that at the Earth

<sup>1</sup> <https://www.ncdc.noaa.gov/billions/>



Day Summit, the Administration will release an updated ambitious Nationally Determined Contribution, setting a new interim target for GHG reductions by 2030. I look forward to working on ways the US can meet these increased ambitions and to highlight these and other U.S. actions at COP 26 in Glasgow later this year.

The Administration's actions are as warranted as they are critical. In the last two years, two of our largest states – Texas and California – have been devastated by the impacts of climate change. Wildfires in California forced the preemptive shutdown of large sections of the state's grid. Last August, a western US extreme heat wave forced rolling blackouts in California. These and other events suggest that weather and other risk profiles that have guided infrastructure protection, development, and investments are no longer adequate for risk assessment, associated policy actions, and infrastructure investments in the future. The number and magnitude of severe weather events increasingly fall outside historical ranges, e.g., the concept of a 100-year flood, may no longer be valid; the scope of adverse impacts has expanded due to the increasing interdependencies of infrastructures; and the geographic pattern of risks has changed due to changing climate. Simply stated, yesterday's weather is no longer a good guide for planning to meet tomorrow's weather extremes. We need new baselines for calculating climate risks.

**Changes in the Work Environment.** As we assess U.S. climate risk, we also need to consider the impacts COVID has had on work and the associated patterns of energy use. While no one knows for certain how the unprecedented experience of the pandemic will affect the work environment of the future, it appears likely that there will be dramatic increases in the numbers of people working from home. This could have significant implications for energy needs and the associated infrastructures to support the changed workplace.

First and foremost, it would likely increase demand for reliable and resilient electricity supplies across the entire grid as the productivity of highly decentralized working environments will be directly linked to power availability. It could also lower energy demand for transportation at the same time it could increase residential electricity demand; the time of day for peak electricity demand, a critical consideration in grid management, could change. In addition, it would require universal access to broadband to ensure all Americans have equal workplace flexibility options. The COVID crisis drove this point home: children without access to broadband could not "go to school". Businesses without access to broadband couldn't meet customer needs. Finally, the increased use of broadband and the internet to conduct business could increase concerns about cyber-security. Innovation investments should consider this changing profile and address these needs. An overarching point: continued electrification of the economy ups the ante for reliability, resilience, security and power quality of the electric grid.

**Climate Risks and Responses will Vary Greatly by Region of the Country.** The resources, infrastructures, emissions profiles, innovation, and policy needs vary greatly by region of the country—a "one size fits all" approach to climate risks will likely impede, not accelerate progress towards deep decarbonization. EV charging infrastructures will, for example, look very different in both rural and urban areas, where the typical "suburban EV model mindset" and its associated infrastructure will have little relevance to densely populated cities and sparsely populated regions of the country. Industrial centers in the U.S. will have ongoing need for high quality process heat that cannot easily be provided by electricity. Many regions have sequestration options, some do not. Offshore wind resources are clearly available only to those regions with coastlines, and onshore wind resources vary greatly across the country as do solar resources. They also have large seasonal variations.

**Risks to Critical Infrastructures.** Another critical finding in the Fourth Climate Assessment: "Changes in energy technologies, markets, and policies are affecting the energy system's vulnerabilities to climate change and extreme weather. Some of these changes increase reliability and resilience, while others create additional vulnerabilities. Changes include the following: natural gas is increasingly used as fuel for power plants; renewable resources are becoming increasingly cost competitive with an expanding market share; and a resilient energy supply is increasingly important as telecommunications, transportation, and other critical systems are more interconnected than ever."

Existing U.S. infrastructure, aging and in need of repair, is especially vulnerable to climate impacts. The American Society of Civil Engineers *2021 Report Card* gives America's infrastructure a C- overall and a C- for the energy

system. The *Report Card* notes that American dependence on electricity has increased as have grid investments over the last four years, “however weather remains an increasing threat.” Among the 638 transmission outage events between 2014 and 2018, severe weather was the predominant cause, and “in the coming years, additional transmission and distribution infrastructure, smart planning, and improved reliability are needed to accommodate the changing energy landscape as delivery becomes distributed and renewables grow.”

**The Complex Interdependencies of Critical Infrastructures.** The 2021 crisis in Texas is not surprising. Preliminary analysis of what went wrong in Texas, from a systems perspective, suggests that the natural gas, electricity, and water infrastructures were all affected by the extreme cold and that their interdependencies were major contributors to the electricity crisis.

We made energy infrastructure an early priority in my tenure as Secretary at DOE with the drafting and publication of the first installment of the Quadrennial Energy Review, or QER. The first installment of the QER focused on energy infrastructure. It was released in 2015 and included a section specifically focused on the growing interdependencies of the electricity and natural gas infrastructures highlighting the Big Chill in Texas and New Mexico in 2011 as an example. As noted earlier, this concern was borne out by the events in Texas 10 years later (see Text Box 2).

The second installment of the QER focused on the nation’s electricity system. One of its many conclusions: the reliability of the electric system underpins virtually every sector of the modern U.S. economy. Reliability of the grid is a growing and essential component of national security. Standard definitions of reliability have focused on the frequency, duration, and extent of power outages.

With the advent of more two-way flows of information and electricity—communication across the entire system from generation to end use, controllable loads, more variable generation, and new technologies such as storage and advanced meters—reliability needs are changing, and reliability definitions and metrics must evolve accordingly.<sup>4</sup>

This reliance on electricity is illustrated in Figure 3, which illustrates the interdependencies between several of the nation’s critical infrastructures. It’s important to note that in this figure, IT/Communications and Electricity are connected to all of the critical infrastructures depicted in the figure. Not shown but also critical, is the financial sector. It too is connected to all critical infrastructures in this figure. Electricity, however, not only supports all the other infrastructures, it supports Finance and IT/Communications as well.

#### Text Box 2. QER 1.1 Highlighted Growing Gas/Electric Interdependencies

##### The Big Chill: A Disruptive Event Made Worse by Infrastructure Interdependencies<sup>1</sup>

The “Big Chill” of 2011 illustrates the complicated relationship between natural gas and electric power, which had compounding effects during a period of extreme weather.

During the first week of February 2011, the U.S. Southwest was hit by an arctic cold front that was unusually severe in terms of its low temperatures, gusting winds, geographic extent, and duration. From January 31 to February 4, temperatures in Texas, New Mexico, and Arizona were the coldest experienced within the region since 1971. Dubbed the “Big Chill” in the media, it overwhelmed the routine preparations for cold weather that had been put in place by electric generators and natural gas utilities located in those states.

Within the Electric Reliability Council of Texas (ERCOT) interconnection, starting in the early morning hours of February 2, the cold temperatures and wind chill caused a significant number of outages at generating plants, with approximately one-third of the total ERCOT generating fleet unavailable at the lowest point of the event. With electricity demand soaring because of the cold weather, ERCOT and some utilities in New Mexico instituted rolling blackouts to prevent collapse of their electric systems. For the Southwest as a whole, 67 percent of electric generator failures (by megawatt-hour) were due directly to weather-related causes, including frozen sensing lines, frozen equipment, frozen water lines, frozen valves, blade icing, and low-temperature cutoff limits on equipment.

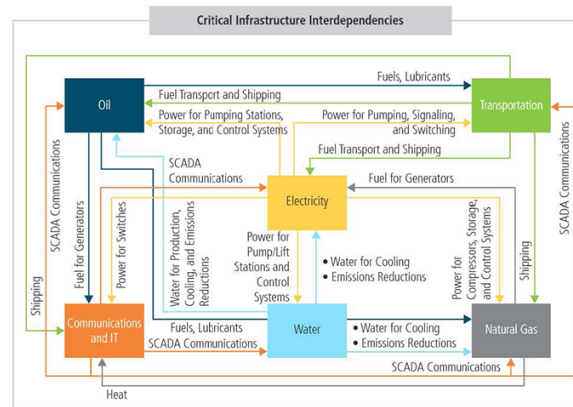
Gas producers and pipelines were also affected in Texas, New Mexico, and Arizona. Natural gas production was diminished due to freeze-offs and the inability to reach gas wells (due to icy roads) to remove produced water and thereby keep them in operation. When rolling electricity blackouts hit gas producers and gas pipelines, it had the effect of causing further losses to natural gas supply. The ERCOT blackouts or customer curtailments caused or contributed to 29 percent of natural gas production outages in the Permian Basin and 27 percent of the production outages in the Fort Worth Basin, principally as a result of shutting down electric pumping units or compressors on gathering lines. As a result of all these factors, natural gas deliveries were affected throughout Texas and New Mexico. More than 30,000 customers experienced natural gas outages at some point during this period.

The majority of the problems experienced by the many generators that tripped, had their power output reduced, or failed to start during the event were attributable, either directly or indirectly, to the cold weather itself. However, at least another 12 percent of these problems were attributed afterward to the interdependencies between gas and electricity infrastructures (such as lost electricity generation due to natural gas curtailments to gas-fired generators and difficulties in fuel switching).

<sup>1</sup> Federal Energy Regulatory Commission and North American Electric Reliability Corporation, “Report on Outages and Curtailments During the Southwest Cold Weather Event of February 1-5, 2011: Causes and Recommendations,” August 2011. <http://www.ferc.gov/legal/staff-reports/08-16-11-report.pdf>. Accessed February 2, 2015.

This figure also clearly illustrates the centrality of electricity as the “uber” infrastructure, essential to the U.S. economy and the health and welfare of our citizens. Making all of these critical infrastructures more resilient is essential. Electricity infrastructure, however, which is especially exposed to the impacts of climate change, supports virtually all economic, health and safety activities in the country; this raises the bar for both its reliability and its resilience. The centrality of electricity and the growing exposure of its infrastructures to the impacts of climate change, along with the associated risks, should be a major consideration as policies are being advanced to increase the electrification of the buildings and transportation sectors.

**Figure 3. U.S. Critical Infrastructure Interdependencies: The Central Role of Electricity**



Key critical infrastructure interdependencies represent the core underlying framework that supports the American economy and society. The financial services sector (not pictured) is also a critical infrastructure with interdependencies across other major sectors supporting the U.S. economy.

Acronyms: supervisory control and data acquisition (SCADA).

Source: *Transforming the Nation's Electricity System: The Second Installment of the Crossmodal Energy Review*

**Risks to Conventional Energy Jobs Posed by the Clean Energy Transition.** As the science of climate change has advanced and the impacts have become more obvious and severe, the Energy Futures Initiative's analysis has increasingly focused on policy and technology innovations that are central to any climate action plan that can both succeed in reaching the aggressive—but essential—net-zero goal and underpin a thriving economy in the U.S.

Achieving both climate and economic goals in the clean energy transition represents an enormous challenge. Technological revolutions have stimulated economic growth while leaving vulnerable workers behind. The First Industrial Revolution mechanized production, the Second introduced mass production, the Third brought automated production. The first two were enabled by new energy technologies, the third from electronics and information technology. The Fourth Industrial Revolution, already underway, is the digital revolution<sup>2</sup> which, like the others, can create opportunities as well as inequities and lost jobs. As noted, this past year, the economic divide associated with the digital revolution has become tragically and strikingly evident as work and education from home and tele-health have depended upon access to broadband and digital devices. It is imperative that we avoid such a divide as we transition to a clean energy economy.

It's a fact of the nation's changing energy profile: a number of energy jobs in key job classifications have been declining and will continue to decline. Coal jobs, for example, have been declining over the past two decades,

<sup>2</sup> <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/>



along with the declines in the costs of wind, solar and natural gas technologies or supplies or both. Detailed data on these and other job classifications, numbers, and declines/increases can be found on the EFI website in several issues of the U.S. Energy Employment Report (USEER).

In this regard, EFI, in partnership with the National Association of State Energy Offices, has conducted an annual energy jobs survey that we started at DOE when I was Secretary. The previous Administration discontinued this survey. Understanding its importance, EFI and NASEO have sustained this critical work and released a five-year trend analysis of energy jobs last year. The data in this summary analysis (all pre-COVID) indicated that energy jobs were created at twice the rate of overall jobs in the economy, a critical consideration as we work on COVID recovery. I am pleased to tell the Committee that DOE has recently agreed to renew its support of this effort.

The USEER also documents the geographic concentration of many conventional energy jobs that are dependent on the location of key resources, generation technologies, refining and processing, etc. The largest percentage of energy jobs, however—efficiency jobs—are ubiquitous, present in 99.8 percent of all counties in the U.S. Energy efficiency employment grew 20 percent, more than any of the energy sectors between 2015-2019, and represented 2.38 million Americans in 2019; 56 percent of these jobs were in the construction industry. It is important that we continue to support these jobs or create new, comparable employment as we consider the risks to conventional energy jobs inherent in the clean energy transition, we catalogue skillsets, support the translation of the skills to focus on clean energy opportunities, and invest in programs and incentives to mitigate these risks. Table 2 shows an EFI work product that starts this cross-walking, looking first at conventional infrastructures/technologies and how these might be used for clean energy production and use.

Table 2. Cross-walking Conventional to Clean Energy Infrastructures

Opportunities for Using Existing Carbon Infrastructure for Decarbonization					
	Oil Refineries & Gas Processing	Natural Gas Generation	Oil & Gas Pipelines	Waterborne Transportation & Ports	Storage
<b>Biofuels</b>	<ul style="list-style-type: none"> <li>Conversion of oil refineries to biorefineries</li> <li>Upstream blending of oils with drop-in biofuels</li> <li>Applying industry expertise</li> </ul>	<ul style="list-style-type: none"> <li>See Renewable Natural Gas examples below</li> </ul>	<ul style="list-style-type: none"> <li>Transporting biofuels in petroleum product pipelines</li> <li>Leveraging pipeline rights-of-way</li> </ul>	<ul style="list-style-type: none"> <li>Using fuel storage and transportation hubs</li> </ul>	<ul style="list-style-type: none"> <li>Using underground storage tanks for biofuels and petroleum-biofuel blends</li> </ul>
<b>Hydrogen Fuel or Feedstock</b>	<ul style="list-style-type: none"> <li>Leveraging industry expertise on hydrogen safety</li> <li>Producing hydrogen currently produced for refining petroleum to perform other energy services</li> </ul>	<ul style="list-style-type: none"> <li>Co-firing hydrogen (up to 50 percent) with NG</li> <li>Gas turbine combined-cycle plants with expected efficiency of 360 percent</li> </ul>	<ul style="list-style-type: none"> <li>Doping in NG pipelines (15 percent with minor pipeline upgrades needed)</li> <li>Leveraging pipeline rights-of-way</li> </ul>	<ul style="list-style-type: none"> <li>Using fuel storage and transportation hubs</li> </ul>	<ul style="list-style-type: none"> <li>Using salt caverns and other geologic formations</li> <li>Capitalizing on industry expertise with NG storage</li> </ul>
<b>Negative Emissions Technologies /Carbon Capture, Utilization, and Storage (CCUS)</b>	<ul style="list-style-type: none"> <li>Applying industry expertise to CCUS technologies for direct-air capture (DAC) and bioenergy with carbon capture and storage (BECCS)</li> </ul>	<ul style="list-style-type: none"> <li>Applying industry expertise: CCUS technologies for DAC and BECCS</li> </ul>	<ul style="list-style-type: none"> <li>Using compression technologies (pipelines, those in NG infrastructure for CO<sub>2</sub>)</li> <li>Rail and roadway = existing infrastructure</li> <li>Leveraging pipeline rights-of-way</li> </ul>	<ul style="list-style-type: none"> <li>Using industry expertise in liquefaction and transport of LPG/LNG for liquid CO<sub>2</sub></li> <li>Marine vessels for CO<sub>2</sub> using the same technology as existing LPG or LNG tankers</li> <li>Port infrastructure for loading</li> <li>Offshore facilities for subsea injection</li> </ul>	<ul style="list-style-type: none"> <li>Using saline formations, depleted O&amp;G reservoirs, unmineable coal seams, basalt formations</li> <li>Using industry expertise in large-scale CO<sub>2</sub> separation and sequestration</li> <li>Applying technologies for drilling and injection, subsurface characterization, and site monitoring, same as in the O&amp;G sector</li> <li>Leveraging similarities with NG storage, acid gas disposal, and CO<sub>2</sub>-EOR</li> </ul>
<b>Renewable Natural Gas (RNG)</b>	<ul style="list-style-type: none"> <li>Processing technologies are similar to NG processing</li> </ul>	<ul style="list-style-type: none"> <li>Minimal processing for using RNG for power generation in gas turbines</li> </ul>	<ul style="list-style-type: none"> <li>Doping in NG pipelines</li> <li>Leveraging pipeline rights-of-way</li> </ul>	<ul style="list-style-type: none"> <li>Utilizing existing fuel storage and transportation hubs</li> </ul>	<ul style="list-style-type: none"> <li>Leveraging industry expertise with NG storage</li> </ul>
<b>Smart Systems/Platforms</b>	<ul style="list-style-type: none"> <li>Applying process automation for improved refinery performance</li> </ul>	<ul style="list-style-type: none"> <li>Creating smart generation solutions: NG-battery and NG-solar</li> </ul>	<ul style="list-style-type: none"> <li>SCADA expertise</li> <li>Improving the efficiency of transport of RNG, H<sub>2</sub>, CO<sub>2</sub></li> <li>Enhanced leak detection</li> </ul>	<ul style="list-style-type: none"> <li>Using transport management systems and other IoT applications</li> <li>Data tracking of</li> </ul>	<ul style="list-style-type: none"> <li>Optimizing revenues from grid-scale storage systems</li> </ul>

Special attention also needs to be paid to providing the training needed as we transition from conventional to clean energy jobs. Again, offshore wind provides an example. The skills of oil and gas workers who have






experience with building and maintaining offshore drilling platforms can be transferred to offshore wind platform construction and maintenance. CCUS, hydrogen, engineered geothermal and carbon dioxide removal offer other opportunities to apply the subsurface and pipeline construction and maintenance knowledge and skills of oil and gas workers to work on large scale decarbonization infrastructures. Many of the “new energy” opportunities will also be located in regions with oil and gas production, thereby minimizing dislocation of the workforce.

This underscores some of the key reasons why we formed the Labor Energy Partnership (LEP) with the AFL-CIO last year. The LEP is a joint effort of both organizations, designed to develop a framework for the 21st Century energy system that creates and preserves quality jobs while addressing the climate crisis.

The LEP’s four guiding principles demonstrate its approach to a range of issues, including grid modernization, offshore wind, CCUS, and hydrogen. These principles are: 1) Energy policy must be science-based; 2) We need an “all-of-the-above” energy strategy that is regionally focused, flexible, and preserves optionality; 3) preserving jobs, while creating new ones, is essential to climate policy; and 4) there are significant economic opportunities in the development and deployment of clean technologies and infrastructure.

The LEP is currently analyzing the policies needed to site and permit new electricity infrastructure projects in the near-term. It is also evaluating policy solutions to ensure rapid development of offshore wind resources along the east and west coasts, and in the Great Lakes region. In line with its holistic approach to policy analysis, the LEP is considering local economic impacts, the opportunity to onshore the offshore wind manufacturing and supply chains, the social equity and environmental justice concerns, and the lessons learned from the existing global market. On Monday of this week, the LEP released a report detailing the highlights of a workshop it held on Offshore Wind and development of domestic supply chains, and also announced a set of five regional workshops, detailed in Figure 4.

Figure 4. Upcoming LEP Regional Workshops Announced April 19, 2021

	<p><b>Resilient Infrastructure   Gulf of Mexico</b></p> <p>The Gulf states process much of the United States’ oil and gas and will be impacted by the clean energy transition. Pathways to deep decarbonization need to help transition conventional energy jobs</p>
	<p><b>Metals &amp; Minerals   Rocky Mountain West</b></p> <p>Natural resources in the Rocky Mountain West can help develop the domestic supply chains for the metals and minerals needed for clean energy technologies</p>
	<p><b>Hydrogen   The Carolinas</b></p> <p>Given its current infrastructure and central location, the Carolina Region has a unique opportunity to build a market for clean hydrogen</p>
	<p><b>Carbon Capture and Storage &amp; Hydrogen   Ohio River Valley</b></p> <p>The Ohio River Valley is a historic corridor of American manufacturing and deployment of carbon capture can reduce industrial emissions while preserving high paying jobs.</p>
	<p><b>Nuclear   Upper Midwest</b></p> <p>Nuclear capacity in the Upper Midwest has provided zero emissions electricity for decades. This region has an opportunity to preserve existing generation and explore next generation technologies.</p>

**Technology Risks Underscore the Need for an “All of the Above” Approach.** The recent *Clean Energy Innovation Report* from the International Energy Agency provides a global context for immediate action on clean energy investment. The report emphasizes that while energy efficiency and renewable energy will be crucial, they are not sufficient to meet net-zero climate goals, especially in sectors like heavy industry and transportation.

The IEA Report also estimates that, on a global level, **at least 40 percent of emissions reductions to reach net zero will rely on technologies not yet at commercial scale** [emphasis added]—including known technologies such as end-use electrification, CCUS, hydrogen, and bioenergy. In the study, IEA also stresses that action is necessary immediately because past innovations, such as LEDs and lithium-ion batteries, took decades to reach full commercialization, and some energy-consuming infrastructure operates on refurbishment cycles of 25-30 years.

Also, there will be no single nor simple solution to meet net zero emissions. While the key technological near-term strategies to move towards net zero may be generally understood (policy support is a separate and less clear-cut issue), many that may be currently available could benefit from further improvements in performance and cost. In addition, **many of the technology solutions needed to meet mid-century targets are not yet available**, [emphasis added], a conclusion specific to California but with broad application, that was made in the EFI study, *Optionality, Flexibility & Innovation: Pathways for Deep Decarbonization in California*, released in May 2019.

Electricity storage is a case in point. Deployment of electricity storage systems is only in its earliest stage. Current commercial battery storage technology typically provides from 4-6 hours of storage; other options may provide longer duration storage but are site-specific, limited by geography or geology. Large scale deployment of intermittent carbon free electricity generation will require significant levels of longer duration storage capable of meeting daily, weekly, and even seasonal variations. The 2019 California study illustrates the challenges associated with limited-duration storage, seen in Figure 5. Long duration storage is one of those technology solutions that is “not yet available” but, with increased penetration of variable renewables, is needed to ensure system reliability.

**Figure 5 . California Wind and Solar Generation for Each Day of 2017, CA Installed Storage Capacity, 2019**

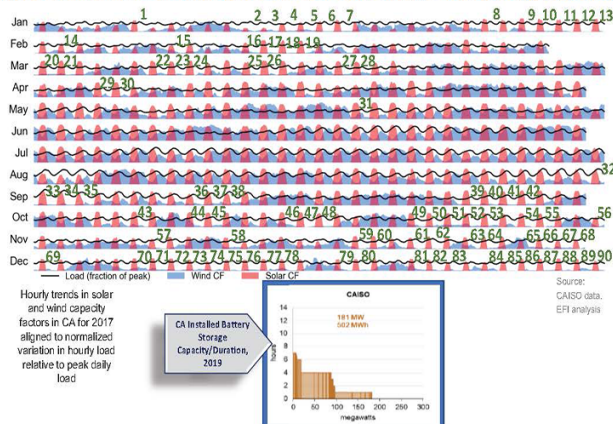


Figure 5 shows the hourly wind and solar generation for every day in 2017. Numbers in green count the days in the year where there was little to no wind generation in the state. The inset shows the installed battery storage capacity and duration in California which is currently insufficient to provide longer duration storage during multi-day periods with little to no wind generation.

To illustrate the degree of uncertainty about technology options, it is worth noting that in 2003, then chair of the Federal Reserve, Alan Greenspan, testified before Congress that the U.S. was facing an impending natural gas crisis, noting that, “Today’s tight natural gas markets have been a long time in coming, and futures prices suggest that we are not apt to return to earlier periods of relative abundance and low prices anytime soon.... As the technology of LNG liquefaction and shipping has improved, and as safety considerations have lessened, a major expansion of U.S. import capability appears to be under way. These movements bode well for widespread natural gas availability in North America in the years ahead.”<sup>3</sup>

Eighteen years later, after a range of technology investments and supporting policies, the U.S. is now the number one producer of natural gas in the world because of hydraulic fracturing combined with horizontal drilling and is already the world’s third largest LNG exporter. Technologies enabled this dramatic turnaround in the U.S. natural gas supply profile and the associated security of supply issues. One of DOE’s earliest actions was characterizing shale basins. Research by the Gas Research Institute and a time-limited tax credit supported the development of shale gas (and oil) that has changed the U.S. energy profile in the last decade. This underscores the need for both a broad portfolio of technology innovation options that do not pick winners and losers, as well as policy support for demonstration and deployment.

The uncertainty and risks of the range of technology pathways and their successes suggests that there is ongoing need for an “all of the above approach” to federal innovation investments, both for risk management and to accommodate the significant regional differences in the U.S. Developing a portfolio based on any single variable, such as cost or a policy preference, may be inadequate. Some sectors, such as aviation and manufacturing, are more difficult to decarbonize than others but will require significant attention, innovation spending, and other types of policy, regulatory, and business model support.

There are also significant systems integration needs that cannot be met if innovation investments are too narrowly focused. We must also not lose sight of the importance of fundamental R&D in platform technologies – AI, data analytics, additive manufacturing, robotics, materials by design, and many more – that become enablers of technological progress in multiple domains.

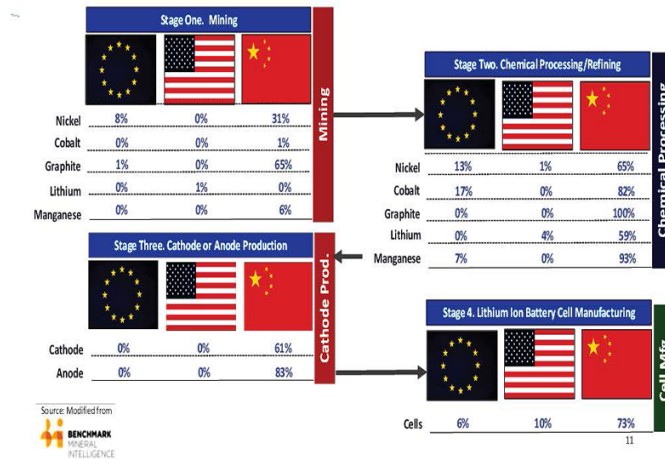
**Supply Chain Risks for Clean Energy Technologies.** Clean energy technologies introduce entirely new supply chain needs; there are corresponding and growing risks to those supply chains. Supply chain issues for new clean energy technologies must be evaluated and factored into policies. Clean energy technologies must accommodate potential material and process limitations, and the geopolitical risks that could, without policy support, delay or hinder U.S. and global decarbonization efforts.

Meeting the increased demand for critical metals and minerals will likely require a corresponding increase in domestic mining, albeit to support deep decarbonization, this will need to be mining that employs environmentally sustainable practices. Targeted RD&D activities can supplement these strategies. Opportunities for materials substitution and materials recycling, as well as alternative approaches for materials processing and equipment manufacturing, should become a more prominent part of DOE funded RD&D for clean energy technology. Strategies for commercial deployment should take into consideration security and reliability of supply chains and develop appropriate acquisition strategies to accelerate market development. As an example, Figure 6 underscores these risks and the need for innovation throughout the supply chain for the metals and minerals needed for EV battery manufacturing.

<sup>3</sup> <https://www.federalreserve.gov/boarddocs/testimony/2003/20030610/default.htm>



Figure 6. Select Process for Key Metals and Minerals Needed for EV Battery Production: EU, US, and China Shares, 2019



The need to address these issues was underscored by President Biden's Executive Order 14017, America's Supply Chains, which notes that "More resilient supply chains are secure and diverse—facilitating greater domestic production, a range of supply, built-in redundancies, adequate stockpiles, safe and secure digital networks, and a world-class American manufacturing base and workforce. Moreover, close cooperation on resilient supply chains with allies and partners who share our values will foster collective economic and national security and strengthen the capacity to respond to international disasters and emergencies."

It is also worth noting that Title VII of the Energy Act of 2020 promotes a robust effort to rebuild domestic supply chains, emphasizing responsible production and efficient use, recycling, and development of alternatives for critical metals and minerals. In particular, the establishment of a robust program for assessment of critical metals and minerals is an essential first step. The Act also authorizes DOE to conduct a comprehensive program of RD&D as well as commercial application for critical materials, including development of alternatives, recycling and efficient production and use. These efforts should expand to include all materials vital to the clean energy transition. Onshoring offshore wind supply chains, for example, including raw material extraction, manufacturing, and final assembly could generate thousands of good jobs that would generate significant regional economic activity.

Protecting global supply chains, growing domestic industries and options, and investing in innovation are all critical to providing the energy and associated infrastructures for a clean energy future. This should, in fact, inform and broaden the definition of both energy infrastructure and energy security to help ensure policymakers are providing adequate direction and incentives to support the supply chains and industries needed for a clean energy future. In sum, the heavy reliance on foreign supply at key points in the supply chain point to the need for RD&D and associated deployment policies to support net-zero domestic mining, chemical processing and refining, and manufacturing of electric vehicle lithium-ion batteries. Policies and programs that could enhance US capacity and reduce supply chain risk in these areas include:

- protection of global supply chains for minerals/metals needed for wind, solar and batteries;
- an increased focus on trade relationships with South America and Africa;
- support for innovation to support new domestic, environmentally responsible, net-zero

- mining activities for key minerals/metals, including associated infrastructures;
- an increase in the capacities, capabilities, and associated infrastructures needed for key mineral chemical processing/refining and battery manufacturing;
- significant recycling programs for key metals and minerals; and
- research into substitutions for key minerals by earth-abundant metals and minerals.

**Corporate America is Investing in Clean Energy Technologies.** Companies across America are also calling for strong climate targets and are committing to their own emission reductions. Responses to the climate crisis range from initial exploration to carbon net zero commitments. Many are incorporating climate risk to the business in their strategic planning and investing in clean energy technologies. Over 300 businesses and investors called on the Biden Administration to announce a 50% emissions reduction target by 2030.<sup>4</sup>

So far, over 200 US companies have made a public pledge to meet net-zero emissions by 2050.<sup>5</sup> The industrial sector is also starting to align on net zero climate plans. At the Davos World Economic Forum in January, for example, over 400 companies from aviation, aluminum, cement/concrete, chemicals, finance, shipping, steel and trucking, announced an agreement to work together to decarbonize by 2050.<sup>6</sup>

**Oil and Gas Companies.** According to S&P Global Market Intelligence, “Many of the largest oil and natural gas companies in the U.S. and Canada jumped on the train to combat climate change in the second half of 2020 as they began to more fully embrace the energy transition and started to adopt stricter goals to reduce emissions.”<sup>7</sup> Eleven oil and gas companies with a market cap of over \$450 billion, including seven large integrated companies, e.g., Shell and BP, have net zero targets. Two – Williams and Enbridge – are oil and gas storage and transportation companies, one is exclusively an exploration and production company, and one is a refining and marketing company. Nineteen other oil and gas companies do not have net zero targets but have a range of emissions reduction targets such as “plans to reduce greenhouse gas emissions per boe processed to 30% below 2014 levels by 2030,” or “committed to reducing greenhouse gas emissions intensity by 25% and flaring intensity by 50% by 2020...”<sup>8</sup>

**Automakers.** U.S. and global automakers are also changing their products to address consumer demand for lower emissions personal vehicles. More specifically:

- Ford announced a \$29 billion investment in EVs and autonomous vehicles through 2025 and the majority of Ford vehicles will be electric.<sup>9</sup>
- General Motors as set a goal to stop making gasoline-powered vehicles by 2035, investing \$27 billion in electric and autonomous vehicles by 2025.
- Tesla, the electric vehicle only car manufacturer, represented 79% of all EVs registered in the U.S. in 2020<sup>9</sup> and reached a valuation well over half a trillion dollars.
- Volkswagen is seeking to become the global market leader in e-mobility, investing 35 billion euros by 2025 and is planning to launch 70 pure e-models, having started on 20 already.<sup>10</sup>

<sup>4</sup> <https://www.wemeanbusinesscoalition.org/ambitious-u-s-2030-ndc/>

<sup>5</sup>

<https://www.wemeanbusinesscoalition.org/companies/#country=USA&checkedOptions=Science%20Based%20Targets%20Initiative>

<sup>6</sup> <https://www.reuters.com/article/climate-change-industry-int/heavy-industry-transport-sectors-to-align-on-net-zero-climate-plans-idUSKBN29W0EA>; <https://missionpossiblepartnership.org/join-us>

<sup>7</sup> <https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/path-to-net-zero-climate-change-takes-center-stage-at-more-us-oil-companies-61440277>

<sup>8</sup> <https://www.caranddriver.com/news/a35432253/ford-ev-commitment-announced/>

<sup>9</sup> <https://www.cnet.com/roadshow/news/tesla-cars-ev-registrations-us/>

<sup>10</sup> <https://www.cleanenergywire.org/factsheets/dieselgate-forces-vw-embrace-green-mobility>

- BMW has announced plans for half of its sedans, SUVs, and mini cars to be electrified in Europe by 2030, noting that currently 13.3% are either all electric or hybrid, compared to an average of 8% in Europe.<sup>11</sup>

**Electric and Gas Utilities.** Seventy percent of the top 30 largest electricity and gas utilities in the U.S. have net zero commitments, including giants like Duke, Southern, Sempra and PG&E. While the remaining nine do not have net zero commitments, many of their emissions reduction targets are significant. NextEra for example, has a 67% reduction target by 2025 from 2005 levels. Exelon has a 15% reduction by 2022 from 2015 levels and AEO has a 70% reduction by 2030 from 2000 levels (it also has a loose aspirational net zero goal by 2050).

**CFTC Recommendation.** With this background, the CFTC made a clear overarching recommendation: “The United States should establish a price on carbon. It must be fair, economy-wide, and effective in reducing emissions consistent with the Paris Agreement. This is the single most important step to manage climate risk and drive the appropriate allocation of capital.” This is obviously a challenging recommendation, but it surfaces a critical point: if we are to meet ambitious goals for decarbonization in the mid-century time frame, we must address greenhouse gas emissions across the entire economy, not just in the electricity sector. At the same time, any such policy should respect the core principles of the Jim Baker – George Shultz proposal: the resources generated by a carbon emissions fee should be returned to the citizenry in a socially progressive manner, and a mechanism, such as a carbon border adjustment, should be put in place to counter moves to “leak” domestic manufacturing and jobs outside the United States.

**The Investment Community: An Increased Focus on Climate Change Risks.** Returning to the financial dimensions of climate risk, the U.S. Department of the Treasury’s Financial Stability Oversight Council, at its meeting last month, discussed climate risk and the implications of this risk for the nation’s financial systems. The Council is charged with identifying risks to the financial stability of the U.S. The U.S. Securities and Exchange Commission, Federal Reserve and the U.S. Commodity Futures Trading Commission are also analyzing options on disclosure of climate risks.

Specifically, the Federal Reserve is working to “...understand the potential implications of climate change for financial institutions, infrastructure and markets.” These activities need to be supported by research to update climate risk assessments in order to better guide investment planning and disclosure requirements. These actions also reinforce the Environmental, Social, and Corporate Governance (ESG) focus of shareholders and institutional investors. Taken together, we anticipate profound shifts in corporate priorities in the direction of accelerating the response to climate change. The rationale for the Fed’s role was succinctly summarized by Chairman Powell:

The reason we’re focused on climate change is that our job is to make sure that financial institutions, banks, particularly the largest ones, understand and are able to manage the significant risks that they take.

Jerome Powell, Chair, Federal Reserve

Economic Club of Washington, April 14, 2021

Chairman Powell’s perspective is shared by major investors and corporations. In February, both the International Monetary Fund and World Bank committed to increase efforts to address climate change by examining climate-related financial stability risk. World Bank President David Malpass noted that the World Bank is launching new reviews to integrate climate into all its country diagnostics and strategies.

Similarly, this past January, IMF chief Kristina Georgieva, underscored that climate change posed a fundamental risk to economic and financial stability. Founded simultaneously under the 1944 Bretton Woods Agreement, the World Bank and International Monetary Fund are organizations responsible for significant investment pools.

<sup>11</sup> <https://www.forbes.com/sites/neilwinton/2020/08/14/bmw-50-electrification-target-for-2030-is-ambitious-but-is-it-achievable/?sh=1d57ec5201fe>

Governed by its 190 member countries, the IMF has the ability to lend \$1 trillion. And by June 2021, the World Bank expects to have deployed up to \$160 billion in the past 15 months.<sup>12</sup>

The private sector is also examining the role of climate risks and the associated impacts on investment strategies. At an important convening of oil and gas industry and other executives in 2019, the second meeting of this group, Pope Francis challenged the industry, saying that climate change is a threat to the future of humanity, and that “Time is running out...Deliberations must go beyond mere exploration of what can be done, and concentrate on what needs to be done. We do not have the luxury of waiting for others to step forward, or of prioritizing short-term economic benefits.” The dialogue also focused on economic, environmental, and social justice and how solutions and responses to climate change could and should assist the world’s poor.

At this summit, major oil producers pledged to support “economically meaningful” carbon pricing regimes. I was included as CEO of an NGO focusing on deep decarbonization as were leaders from the energy investment community. US oil and gas companies at the summit at the CEO level included ExxonMobil, Chevron, ConocoPhillips, and Occidental. US financial institutions were also represented, and included Vanguard, BlackRock, State Street and CALSTRS, among others. Obviously, these are major players in our economy. Participants signed a joint statement to reflect conclusions of the dialogue, noting that:

“As leaders in the energy sector, the global investment community, and other organizations, we recognize that a significant acceleration of the transition to a low-carbon future beyond current projections requires sustained, large-scale action and additional technological solutions to keep global warming below 2°C while advancing human and economic prosperity.

- Companies should provide clarity for investors about how they are planning and investing for the energy transition. This includes issuing disclosures that provide meaningful and material information consistent with the reporting obligations in their jurisdictions.
- Companies should be encouraged to work with investors on the evolving recommendations of the Task Force on Climate-Related Financial Disclosures (TCFD), aligned with its four pillars of (1) governance, (2) strategy, (3) risk management, and (4) metrics and targets.
- Further, we support scenario analysis as an important and useful tool for assessing how resilient company strategies are to climate-related risks and opportunities pertaining to the 2°C or lower scenarios. We encourage companies to conduct a range of scenario analyses in line with the principles of TCFD.
- It is important that boards of directors assess climate-related issues as part of their risk oversight function, as well as management’s role in evaluating and addressing these issues. These include sector and company-specific transition risks incorporating financial, policy and legal, technology, market, reputation and physical risks both acute and chronic. Opportunities such as resource efficiencies, new energy sources, new products and services should also be considered.
- Investors play a critical role through dialogue and feedback in supporting companies regarding appropriate disclosures on governance, strategy, and performance on climate-related risks.”

Following up on the Vatican Summit, BlackRock, Vanguard, and State Street enhanced their ESG practices and leadership. Known as the “Big Three” they manage over \$15 trillion in global assets, equivalent to 75% of U.S. GDP, and accounting for about 82% of the S&P 500’s market capitalization.<sup>13</sup>

In his 2021 letter to CEOs, Larry Fink of BlackRock identified four issues pivotal to creating durable value: capital management, long-term strategy, purpose, and climate change. Fink made another statement that is

<sup>12</sup> <https://www.dailysabah.com/business/economy/imf-world-bank-to-step-up-efforts-against-global-climate-risks>

<sup>13</sup> <https://www.thinkadvisor.com/2020/11/30/group-aims-to-limit-power-of-blackrock-vanguard-state-street/>



fundamental to the point I wish to make at this hearing. He stated: “We know that climate risk is investment risk. But we also believe the climate transition presents a historic investment opportunity.”<sup>14</sup>

Vanguard and Blackrock have both expressed support for the Sustainability Accounting Standards Board (SASB) and Task Force on Climate-related Financial Disclosures (TCFD) disclosure frameworks. State Street announced that beginning in 2022, they will vote against independent directors at companies that underperform according to SASB disclosures. *The Big Three and Corporate Carbon Emissions Around the World*, a paper to be published in the Journal of Financial Economics, examined the role of the BlackRock, Vanguard, and State Street Global Advisors on the reduction of global corporate carbon emissions. The authors found a “strong and robust negative association between the Big Three Ownership and subsequent carbon emissions among MSCI<sup>15</sup> index constituents.”<sup>16</sup>

Regarding climate risk, Vanguard is placing greater focus on boards’ “climate competency” and joined the “Net Zero Asset Managers Initiative” to cut the net GHG emissions of its funds to zero by 2050. BlackRock changed its thinking on shareholder resolutions, which were historically seen as a tool of last resort. Now, BlackRock characterizes shareholder votes as a “primary tool” for companies that are ESG laggards. In late 2020, State Street joined Climate Action 100+, which is an investor initiative focused on companies’ plans to align with the goals under the Paris Agreement. This is the single most important step to manage climate risk and drive the appropriate allocation of capital.”

#### Conclusion: The Need for New Climate Risk Frameworks and Methodologies.

Clearly, the private sector is moving rapidly towards climate risk disclosure as a fundamental pillar of investment decisions. The proliferation of expensive extreme weather events helps drive this. Governments and multilateral institutions, such as the G-20, are looking to incorporate such risk disclosure into their financial regulatory responsibilities to provide relevant information to investors. President Biden is expected to take executive action requiring financial institutions and companies to disclose climate risks, and a number of central banks are working on climate risk reporting and are preparing to stress-test the global financial system’s response to such risks.

The IMF has a new “Climate Change Indicators Dashboard” that provides definition and information on a range of climate change issues, underscoring the increasing interest of financial institutions in climate risk. On a link on the dashboard entitled, Financial, Physical and Transition Risk Indicators,” it notes that, “These indicators include green finance indicators to illustrate the financial support towards a low-carbon emission environment, such as carbon footprint adjusted loans for deposit takers and green bonds. Other indicators cover climate-related physical risk and transition risk.”<sup>17</sup>

Another link on the IMF dashboard labeled, “cross border” climate indicators, notes that, “Indicators in this category examine how CO2 emissions from production in one economy can be used to meet demand at home or abroad as well as how they are impacted by the decisions of multinational enterprises on where to locate their production. They include CO2 emissions embodied in trade, measures of trade in environmental goods, and several indicators related to direct investment, including measures of emissions associated with tangible investments financed by direct investment and with value added of multinational enterprises.”

<sup>14</sup> <https://www.blackrock.com/corporate/investor-relations/larry-fink-ceo-letter>;  
<https://www.forbes.com/sites/iese/2021/01/27/how-does-blackrock-measure-up-on-climate-change/?sh=6cfbcb243e1>

<sup>15</sup> The Morgan Stanley Capital International (MSCI) index measures equity market performance in global emerging markets, and represents 13% of global market capitalization.

<sup>16</sup> [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3553258](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3553258);

<sup>17</sup> <https://climatedata.imf.org/pages/go-indicators>

It's clear that the global finance community is rapidly moving towards climate risk disclosures and the stakes are high both for the climate and for the financial relationships of countries, allies and adversaries alike in the geopolitical domain. For example, the EU is working on a border adjustment tariff for products with embedded emissions that could affect exports from the U.S. to Europe.

Closer to home, as noted earlier, the Commodities Futures Trading Commission, in an extensive analysis of climate change risk, made many recommendations on how to address threats to the Nation's financial systems. Important to this discussion, it recommended, "Financial regulators, in coordination with the private sector, should support the development of U.S.-appropriate standardized and consistent classification systems or taxonomies for physical and transition risks, exposure, sensitivity, vulnerability, adaptation, and resilience, spanning asset classes and sectors, in order to define core terms supporting the comparison of climate risk data and associated financial products and services. To develop this guidance, the United States should study the establishment of a Standards Developing Organization (SDO) composed of public and private sector members."<sup>15</sup>

It is critical that we develop a new, flexible climate risk profile for energy systems and the broader economy, including the associated analytical tools. This is an area that needs significant innovation investments in new models, techniques, and approaches for considering climate change-based risk into the system. We need to answer key questions about supply chain and Scope 2 and 3 emissions to ensure that the methodologies for any risk disclosures we develop are fair, focused on emissions and not favored products or technologies, accommodate regional differences, and that we maximize emissions reductions in all sectors. We also need to understand climate disclosure actions and activities of other regions and countries of the world to adequately assess their impacts on U.S. export markets.

It is also critical that multi-agency efforts, with support from universities, DOE's National Laboratories, and other research institutions continue to develop tools, programs, and partnerships that closely monitor climate conditions, feeding into decision making processes in both the public and private sectors. The risk profiles need to be developed with regional granularity not just for polar vortices but for the entire spectrum of weather and other climate change extremes. It is a major challenge and requires rapid action – but it is essential that we reset how we assess climate risks and develop technologies and policies for reaching net zero emissions by mid-century.

Mr. Chairman, ranking member Toomey and members of the Committee, thank you for the opportunity to testify today and I look forward to your questions.

---

<sup>1</sup> Energy Wire, April 19, 2021

<sup>2</sup> <https://nca2018.globalchange.gov/>

<sup>3</sup> <https://www.ipcc.ch/sr15/chapter/spm/>

<sup>4</sup> <https://www4.unfccc.int/sites/ndcstaging/Pages/Home.aspx>

<sup>5</sup> Transforming the Nation's Electricity System: the Second Installment of the Quadrennial Energy Review, released by the Department of Energy, January, 2017

---

<sup>15</sup> <https://www.cftc.gov/sites/default/files/2020-09/9-9-20%20Report%20of%20the%20Subcommittee%20on%20Climate-Related%20Market%20Risk%20-%20Managing%20Climate%20Risk%20in%20the%20U.S.%20Financial%20System%20for%20posting.pdf>

**PREPARED STATEMENT OF KHALIL SHAHYD**  
 SENIOR POLICY ADVISOR, NATURAL RESOURCES DEFENSE COUNCIL

APRIL 22, 2021

Good morning Chair Brown, Ranking Member Toomey, and distinguished Members of the Senate Committee on Banking, Housing, and Urban Affairs. I want to thank you for holding this hearing on Capitalizing on Opportunities in the Clean Energy Economy and inviting me to testify and provide comments.

My name is Khalil Shahyd. I am a Senior Policy Advisor on Equity, Environment and Just Communities with the Natural Resources Defense Council (NRDC). NRDC is an international nonprofit organization of scientists, lawyers, and environmental specialists dedicated to protecting public health and the environment. Founded in 1970, NRDC has more than 3 million members and activists supporting work to protect public health, the environment and grow more sustainable livelihoods.

The United States is confronted today by the extraordinary and interconnected crises of the global pandemic, economic recession, the persistence of deep racial injustice, a rapidly destabilizing climate, and threats to the democratic foundations of the Nation. Few sessions of Congress have ever shouldered a greater responsibility—or a greater opportunity. Among the many acts of leadership that will be necessary, making it safely through these crises will require comprehensive and sustained Federal investment to recover, rebuild, and lay the foundation for a more just and stable future.

Make no mistake about it: the pandemic has wreaked havoc on the lives of many American families, with more than 8 million people now having fallen below the Federal poverty line since May of 2020 and prior to the American Rescue Plan.<sup>1</sup>

Climate change threatens to undo steps taken to alleviate that economic burden and deepen the crisis unless we act swiftly to mitigate the most severe outcomes and build back better with a more health, just, and resilient economy fueled by clean energy. The climate crisis exacerbates the situation as millions of people in the U.S. feel the social, economic, and environmental effects of extreme weather each year. In 2020, there were 22 extreme weather/climate disaster events in the United States, with losses exceeding \$1 billion each. Currently, the total cost of U.S. weather and climate disasters since the 1980s exceeds \$1.875 trillion. These numbers represent more than just losses to the economy: The increasing risk of disasters threatens to plunge millions into poverty and deepen crises for those already suffering.

Like most of the economy, clean energy was hit hard by the COVID-19 pandemic and economic downturn in 2020. At one point more than 600,000 clean energy workers had filed for unemployment. The decline in total clean energy employment last year was the first recorded since E2 (Environmental Entrepreneurs) began producing its annual Clean Jobs America reports in 2016. If the clean energy sector is to be the engine that drives us toward a more equitable, sustainable economy, we must ensure it recovers and expands to provide the opportunity and livelihoods so many people need. Fortunately, the signs are there. The sector rebounded strongly after May to recover about half of those jobs, but finished the year still down 307,000 clean energy workers. More Federal leadership through policy and investments will be needed to ensure a long-term recovery and economic transition to clean energy.

*How the Clean Energy Transition Will Affect the American Economy and Our Ability To Compete Globally in the 21st Century*

The clean energy transition is already happening, but not fast enough. It's not happening fast enough for regions such as southern Ohio, where due to market forces and the rise of cheap but still polluting natural gas, more coal-fired power plants have closed than in any other State. Plants producing a whopping 16 gigawatts of electricity—enough to power about 11 million homes for a day—have either shut down or announced they'll be retiring soon.<sup>2</sup>

Global energy consumption has been shifting from a mid-20th century system dominated by coal and oil to one that will be dominated by renewable energy by the mid-21st century. President Biden has committed to increase the pace of climate action in order to cut emissions by at least 50 percent below 2005 levels by 2030—a nearly doubling of the current U.S. climate targets. This level of ambition is the minimum that the moment requires. Cutting U.S. emissions by this much is ambi-

<sup>1</sup> <https://www.businessinsider.com/8-million-americans-fallen-into-poverty-as-government-benefits-lapse-2021-1>

<sup>2</sup> <https://www.nrdc.org/stories/what-can-green-groups-labor-unions-veterans-and-coal-mining-exec-all-get-behind-solar-power>

tious, achievable, and necessary. Establishing a target to cut emissions by at least 50 percent below 2005 levels by 2030, and delivering the necessary actions, sets the conditions for the U.S. to help rally the world. This will need to be combined with the mobilization of significant financing to support developing countries in shifting toward a net-zero economy and addressing the impacts of climate change.

However, what matters most to ensuring U.S. leadership to the world in addressing the climate crisis are strong actions at home. The Federal Government has an important role in facilitating the acceleration of a clean, modern 21st century energy system. Ignoring that role, or diminishing its effectiveness, condemns millions of small communities and families who struggle to pull themselves out of dire economic circumstances to continue suffering if we cling to outdated infrastructure and energy sources. We have a clear path forward.

Consider that clean energy is the fastest growing energy sector in the United States and the energy system as a whole is getting cleaner.

#### *Expected Job Growth and Economic Development Accruing From the Clean Energy Transformation*

Clean energy jobs eventually bounced back from pandemic-caused losses by nearly 11 percent in the second half of 2020 to employ more than 3 million Americans across every State and nearly every county, according to the fifth annual Clean Jobs America report from E2.<sup>3</sup> The report, released at the start of U.S. Climate Action Week in Washington, DC, comes as the Biden administration prepares to host the Leaders' Summit on Climate beginning tomorrow and Congress prepares to consider the Administration's American Jobs Plan infrastructure and clean energy package.

While it appears the clean jobs sector is coming back, it still has not reached prepandemic levels. No one foresaw the COVID-19 pandemic and the continuing economic impact it would have.

Clean energy sectors saw significant declines in 2020, including renewable energy (6 percent), grid and storage (7 percent), and clean fuels (7 percent). Energy efficiency jobs saw the biggest drop, declining about 11 percent over the year as workers were prevented from entering homes and offices because of the pandemic lockdowns. Nonetheless, energy efficiency still accounts for an even greater share of U.S. construction jobs, employing about one in every five construction workers nationwide.

As noted in the October 2020 "Clean Jobs, Better Jobs" analysis of clean energy jobs wages and benefits by E2, the American Council on Renewable Energy, and the Clean Energy Leadership Institute, the economic shutdown affected ethnic and racial minorities more significantly across the Nation. In April 2020, at the peak of the economic shutdown, six in 10 Hispanic Americans (61 percent) and four in 10 Black Americans (44 percent) reported that someone in their household had either lost a job or experienced wage losses due to COVID-19; this compares to only 38 percent of White Americans.<sup>4</sup>

Still, several clean energy sectors did see job gains in 2020, including wind energy which added about 2,000 jobs. But the brightest spot was in manufacturing of electric and plug-in hybrid vehicles, where about 12,200 jobs were added as an increasing number of automakers announced shifts to producing 100 percent zero-emission vehicles.

Despite the setbacks, clean energy jobs rebounded quicker than the overall nationwide workforce, according to the analysis. Clean energy jobs have grown by about 11 percent since last May, compared to less than 9 percent growth in the national workforce during the same period.

However, if Members of Congress want to ensure that the pace of job growth is fast enough and occurring in the communities and regions that need it most—and in the struggling districts of yours and every State in the Nation—we need your leadership in supporting smart policies, including enacting the American Jobs Plan. As Clean Jobs America 2021 shows, these jobs are and can be created in every State. They can't be downsized or exported. They're not blue State jobs or red State jobs. They're American jobs with the potential to employ a member of every household in this Nation with good, family sustaining wages and benefits.

According to an analysis of Bureau of Labor Statistics data (BLS), the median hourly wage for clean energy jobs was \$23.89 in 2019. That was 25 percent higher than the nationwide median hourly wage of \$19.14 and also higher than most fossil fuel extraction jobs.

<sup>3</sup><https://e2.org/reports/clean-jobs-america-2021/>

<sup>4</sup><https://e2.org/wp-content/uploads/2020/10/Clean-Jobs-Better-Jobs.-October-2020.-E2-ACORE-CELL.pdf>

For instance, wind turbine technicians in 2020 earned about \$56,230 and solar installers made about \$46,470, according to BLS data. Oil and gas deck or galley hands made about \$39,420 while oil and gas derrick operators took home about \$47,920.

Within the clean energy sector, looking at median hourly wages, wind energy workers earn the highest wages at \$25.95 per hour, compared with \$25.40 for grid modernization, \$24.82 for storage, \$24.48 for solar, and \$24.44 for energy efficiency.

To ensure that these jobs are available to workers who most need them, we need policies to support them and overcome hurdles, whether they are the result of the pandemic or the irrational antagonism of the previous Administration—or both. The Biden administration’s plans to increase energy efficiency and weatherization programs, its plans to boost renewable energy, and its proposed investments in modernizing the Nation’s power grid and transportation system with more electric vehicles and charging stations will also provide a much-needed shot in the arm for clean energy companies post-COVID-19. At the same time, President Biden’s strategy to invest \$100 billion in workforce training will help create new career paths to clean energy for millions of Americans. Whether all of that translates into jobs, however, remains dependent on what Congress does. Failure to act means prolonging the COVID recession, keeping us locked into a dying fossil fuel economy, and increasing the threat of extreme weather disruptions to lives, labor, and our infrastructure due to climate change.

On the other hand, the benefits of action are many.

Potential benefits of economywide electrification and decarbonization efforts, in the transportation and housing sectors.

Most people in the U.S.—particularly renters—spend more than half of their income on transportation, rent, and home energy costs. Investment in cleaner transportation options, water and waste sewer systems, energy efficiency, and a clean energy future—combined with commitments to addressing racial inequities—can lead our actions against climate change while creating a stronger, more resilient economy set for future growth.

### *Transit*

Public transit is one of the key solutions to addressing the climate crisis and in creating more opportunity while improving the daily quality of life for millions of people. Transit is critical to the millions of Americans who use it and contrary to the way it is often presented, it is even critical to those who do not use it. For regular transit riders, it is a lifeline providing mobility options, generates jobs, spurs economic growth. For the wider public, policies supporting the improvement and expansion of transit have many societal benefits, such as improving air quality, reducing overall energy use, and avoiding carbon pollution. It also decreases traffic congestion for drivers by taking millions of cars off the road thus shortening average commute times.

Investment in public transit has benefits beyond those counted by the rides. Federal spending on public transportation is a win for working families because it creates immediate jobs and income by supporting manufacturing and construction, in addition to public transportation operation activities.

According to the Census Bureau, 13 percent of U.S. households have incomes less than \$15,000, but among transit-using households, the ratio rises to 21 percent.<sup>5</sup> Targeting Federal investments in public transit can ensure that spending, which helps address climate change, also improves the lives of the poorest households.

But public transit alone won’t take us where we need to go on climate change. Try as we might, we won’t convince the majority of Americans to leave the comforts and personal freedom of their private vehicles for mass transit. Commuting needs, family responsibilities, or lifestyle choices means we have to find ways to decarbonize private vehicle miles traveled with the rapid deployment of electric vehicles.

Meeting this challenge, President Biden’s American Jobs Plan includes investments in electric vehicle infrastructure delivering 500,000 charging stations by 2030, and incentives to buy American-made electric vehicles. The latter also include a rebate for lower-income buyers of zero-emitting electric vehicles, a policy to make access to the electric vehicles market for electric more equitable.

A national Clean Cars Program can deliver many benefits to communities across America. Drivers will save on fuel costs even when accounting for the incrementally higher upfront cost of electric vehicle technologies.

<sup>5</sup> <https://www.apta.com/wp-content/uploads/Resources/resources/reportsandpublications/Documents/APTA-Who-Rides-Public-Transportation-2017.pdf>

A national clean cars program would benefit public health by reducing thousands of tons of smog-forming pollutants annually, as well as fine particulate matter and other toxic air contaminants. A study of the Illinois Clean Cars Program commissioned by NRDC also found that lower-income families as well as rural families will benefit. The study finds that the operating cost savings provide greater benefit to low-income households because they tend to spend a larger proportion of their income on transportation fuel than do higher-income consumers. Similarly, rural drivers tend to have higher operating costs due to the longer distances traveled. The Studies also show that 85 percent of people who buy new vehicles finance them, and most will see fuel cost savings from Day One.

Smart investments in transportation, including public transit and vehicle electrification, can have many tangible benefits to quality of life, health and job creation.

### *Housing*

Housing represents a key element of the Biden climate strategy, which calls for cutting the carbon footprint of the U.S. building stock in half by 2035 by creating incentives for deep retrofits that combine appliance electrification, efficiency, and on-site clean power generation. The climate crisis and the increasing cost of housing are absolutely linked—creating extreme burdens for households and families across this country. These include renters, female heads of households, and the elderly—and disproportionately challenge the financial stability of African-Americans and other communities of color.

Often, low-income and vulnerable households have very few housing options. They are left to rely on low-quality housing due to residential segregation, long-term neighborhood disinvestment, and deferred maintenance of the housing stock. These homes tend to waste energy so that low-income families pay more per square foot than higher income residents. The result is that nearly one-third of households in the United States struggle to pay energy bills and in fact, about one in five households has been forced to choose between buying food, medicine or other necessities—or paying an energy bill.<sup>6</sup>

As if rising cost of housing were not enough, poor and low-income Americans are increasingly reliant on older housing units, leaving them more vulnerable to major weather disasters such as hurricanes, flooding, wildfires, and other climate-related emergencies. These weather extremes place vulnerable housing stock at risk of destruction, leading to the displacement and destabilization of families and communities and increasing the likelihood that they will experience—or be trapped in—poverty.

To avert the worst impacts of climate change, our policies must ensure both the reduction of emissions that cause climate change—and that people can live in safe, affordable housing. With decisive leadership, Congress can help address the dual crisis of affordable housing by fully funding Federal programs such as the Housing Trust Fund and Community Development Block Grant and climate change through smart investments in energy efficiency, electrification, and clean energy generation while helping to produce hundreds of thousands of new clean jobs—and alleviate the negative health impacts of indoor and outdoor air pollution.

NRDC's report, *America's Clean Energy Frontier: The Pathway to a Safer Climate Future*, shows that we can reduce carbon emissions by at least 80 percent by 2050, with fully half coming from energy efficiency. This means that smarter energy use is absolutely critical to achieving U.S. emissions reduction goals—and doing so in an affordable manner.

Consider that residential energy efficiency is the largest single measure that can reduce climate pollution in the United States. Along with cutting that pollution and shrinking energy bills, efficiency has considerable health and safety benefits—including improved indoor air quality, which reduces the likelihood of asthma cases.

The primary source of Federal investment in residential energy retrofits comes through the Department of Energy's Weatherization Assistance Program. Every year, the program's efficiency improvements alone cut America's climate pollution by 2 million metric tons.<sup>7</sup> In total, residential efficiency improvements can account for carbon reductions as high as 550 million metric tons every year by 2050.

Unfortunately, there are many barriers to increasing energy efficiency in the Nation's affordable housing. But Congress can help.

Despite the considerable need for efficiency improvements in low-income housing, many programs that facilitate retrofits are sorely underfunded. Across the country,

<sup>6</sup><https://www.eia.gov/todayinenergy/detail.php?id=37072>

<sup>7</sup><https://energy.gov/eere/articles/celebrating-40-years-america-s-weatherization-assistance-program>

only about 35,000 homes can enroll in WAP on a yearly basis. That's not enough. There's not a State in the country where the waiting list for services is not extremely long (sometimes years). For example, at the current rate, it would take Ohio almost 150 years to weatherize all the currently eligible homes.<sup>8</sup> Meanwhile, WAP's maximum per unit expenditure is only about \$7,500 for weatherization and \$2,000 for solar installation. Raising the per-unit spending cap will allow deeper home retrofits, producing more savings for families and the environment. It also will allow WAP contractors to increase the wages for workers on these projects. Reducing labor turnover slows down and makes quality standards difficult while providing stable career pathways to thousands of potential workers. Today the under-resourced WAP program employs roughly 8,500 Americans across the Nation. With proper funding, it could employ far more while providing numerous health, economic, and environmental benefits to communities across the Nation.

Despite the value the WAP program offers, multifamily housing units—which are often relied upon by the poorest families—are severely underserved in most regions of the country. The cost of regular maintenance and upgrades for multifamily housing are among the most significant barriers to preserving affordable, quality homes for low-income households. Without attention, the properties deteriorate. Federal action is needed to incentivize investments in hard-to-reach sectors of the housing market, with specific attention to the multifamily market which has tremendous potential for skilled employment, and energy and cost savings nationwide. Without it, there will be greater inequity and greater costs to families who are least able to afford them.

We have a housing affordability crisis in America. Millions of affordable rental homes have already been demolished because housing providers could not afford the cost of maintaining those buildings. Much of the remaining affordable rental homes are aging and in need of repair. The escalating climate crisis will only worsen the situation.

Energy efficiency can help bridge the growing gap between renter incomes and rising housing costs.

*Recommendations for Public and Private Solutions To Foster and Equitably Distribute the Opportunities Inherent in These Changes*

Clean energy has a diversity problem. Despite its broad range of businesses—from construction to utilities, manufacturing, professional services, and repair and maintenance—the clean energy sector is dominated by White men.

About 75 percent of clean energy workers across America are White. Black and Hispanic/Latino workers are more underrepresented in clean energy than they are across the rest of the economy, with Blacks representing 8 percent of the clean energy workforce and Hispanic/Latinos representing 16 percent. Further, women only represent about 26 percent of all clean energy jobs, even though they account for about half of the U.S. population.

Given job growth in the clean energy sector over the past decade, this lack of diversity has resulted in many women and people of color missing out on one of America's great economic expansions.

As the United States looks to build back a better, cleaner, more equitable economy, a renewed focus on increasing diversity in the clean energy sector is an economic imperative. Both the transition to a low-carbon energy system as well as proposed State and Federal stimulus to boost the economy have the potential to create millions of new jobs across the United States. Policies that support the energy sector and its low-carbon transition must center the inclusion of women and ethnic and racial minorities, particularly Black workers, so that the economic benefits are more equitable.

In 2018, the Boston Consulting Group found that across the broader economy “companies that reported above-average diversity on their management teams also reported innovation revenue that was 19 percentage points higher than that of companies with below-average leadership diversity.”<sup>9</sup>

In a sector like clean energy that relies heavily on innovation, there is ample room for improvement in diversifying management teams. According to a 2019 report from the Solar Energy Industries Association and The Solar Foundation, of all

<sup>8</sup>Dave Rinebolt, Executive Director and Counsel at Ohio Partners for Affordable Energy; Comments during a panel discussion on the multiple benefits of Federal energy programs.

<sup>9</sup><https://www.bcg.com/en-us/publications/2018/how-diverse-leadership-teams-boost-innovation>

senior executives in the solar industry, just 2 percent are Black and only one in five are women.<sup>10</sup>

A September 2020 report from Citi identified missed revenue gains and missed annual job creation opportunities due to inequitable lending practices economywide. “Providing fair and equitable lending to Black entrepreneurs might have resulted in the creation of an additional \$13 trillion in business revenue over the last 20 years,” Citi’s authors wrote. “This could have been used for investments in labor, technology, capital equipment, and structures and 6.1 million jobs might have been created per year.”<sup>11</sup>

Federal investments are critical to overcome these barriers and the circumstances that drive them. The private sector alone cannot undue over a century’s worth of Federal and financial policies that deepened segregation and labor discrimination.

Policies like the national Clean Energy and Sustainability Accelerator would address that need by providing for better financing tools for clean energy projects. It would also ensure minority, rural, and low-income communities can:

- gain access to clean energy technologies,
- fund projects, and
- grow jobs across racial and economic lines, as well as geographic ones.

There are many steps lawmakers can take—right now—to ensure greater diversity in the clean energy workforce in the months and years ahead:<sup>12</sup>

#### *For Workers*

- Support education and job training for members of traditionally underserved communities to expedite their involvement in the development of renewable energy solutions.
- Invest in apprenticeship programs in the transportation industry and industry-academic partnerships to prepare underrepresented populations for entry into career positions.
- Enhance and enforce hiring and procurement policies that benefit low-income communities, people of color, and women.

#### *For Businesses*

- Create and fund “green banks” and other financing mechanisms through more traditional financial institutions that can help jumpstart clean energy companies and include specific metrics for investing in minority-owned companies and communities.
- Collaborate with the renewable energy industry to increase business opportunities for minority entrepreneurs and increase diversity of suppliers in the public and private sectors.
- Support and advance clean energy programs, including renewable portfolio and energy efficiency standards, with specific metric for jobs and economic development in economically disadvantaged areas.

#### *For Communities*

- Strategically and cooperatively engage low-income and disadvantaged communities on energy policies at all levels in order to help address the energy and jobs needs of these communities while also protecting the environment.
- Ensure underserved communities that host clean energy resources and facilities—such as solar and wind farms and clean energy and clean vehicle industry factories—directly benefit from the presence of these facilities with jobs and supplier opportunities.
- Design codes, regulations, and policies to address minimum energy, water, and health performance in existing multifamily buildings, while providing resources to support their equitable implementation.
- Adopt adequate funding and performance targets, such as energy savings, for efficiency programs serving under-resourced (low-income) communities.
- Ensure State housing finance agencies make ever-increasing commitments to efficiency and health improvements in Low-Income Housing Tax Credit-funded properties.

<sup>10</sup> <https://www.thesolarfoundation.org/wp-content/uploads/2019/05/Solar-Industry-Diversity-Study-2019-2.pdf>

<sup>11</sup> <https://ir.citi.com/>

<sup>12</sup> From a forthcoming E2 (Environmental Entrepreneurs) report: “Help Wanted: Diversity in Clean Energy Jobs”.



*Conclusion*

Congress must act to double down on an ambitious strategy to rebuild our Nation's economy, infrastructure, and struggling communities. An approach based on leveraging bold and aggressive Federal Investments in the next generation of clean energy from efficiency, to generation, batteries to support health and more affordable homes, clean reliable transportation, and low-carbon sustainable agriculture.

Robust Federal commitments in this sector will then send the right signal to private-sector investors to get on board.

Congress can help address the broader unemployment situation today by providing pathways to careers in a sector that will be growing for years to come. They can also help ensure the minority communities, rural communities, and communities transitioning from fossil fuel employment are all part of the clean energy jobs of tomorrow.

Tackling the economic costs and harnessing the economic opportunities of climate change make these investments worthwhile. But with millions of Americans still out of work or underemployed, they are an absolute necessity.

A "whole of Government" approach to addressing the climate crisis and the related challenges that confront us, begins with this Congress. Ensuring a functioning social safety net for all Americans, investing in modernizing our Nation's infrastructure, and workforce training policies will transform our economy. It will grow jobs today and set America on the path of economic success for decades to come.

**PREPARED STATEMENT OF ZOE LIPMAN**  
**DIRECTOR, MANUFACTURING AND ADVANCED TRANSPORTATION, BLUEGREEN**  
**ALLIANCE**  
**APRIL 22, 2021**



CREATING GOOD JOBS, A CLEAN ENVIRONMENT, AND A FAIR AND THRIVING ECONOMY

**WRITTEN TESTIMONY**

**Zoe Lipman**

**Director, Manufacturing & Advanced Transportation, BlueGreen Alliance**  
**Before the 117th U.S. Senate Committee on Banking, Housing & Urban Affairs**  
**21st Century Communities: Capitalizing on Opportunities in the Clean Energy Economy**  
**Thursday, April 22, 2021**

Thank you Chairman Brown, Ranking Member Toomey, and distinguished members of the committee. My name is Zoe Lipman and I am the Director of Manufacturing and Advanced Transportation at the BlueGreen Alliance, a national partnership of labor unions and environmental organizations. On behalf of my organization, our partners, and the millions of members and supporters they represent, I want to thank you for convening this hearing today.

We cannot rebuild prosperity if we fall behind the rest of the world in building the technologies of the future, or if working people and the communities they live in fail to see the gains from innovation and a cleaner economy. We stand at a crossroads and we must take the correct path now to ensure the next generation of investments in advanced, clean vehicles, energy, and infrastructure are made here in the United States and that those investments result in the kinds of good-paying jobs that are out of the grasp of too many Americans. The investments we make today and over the next few years will have a profound impact on the future of our nation and on its workers.

These actions are particularly essential as we work together towards recovery from the ongoing COVID-19 health and economic crisis. We went into this pandemic with three ongoing and interconnected crises: economic inequality, racial injustice, and climate change. The COVID-19 pandemic has cast a harsh spotlight on the severe and disproportionate impacts of these crises. It has also shown how the loss of American manufacturing has hurt workers, communities, and our security in the face of a crisis.

Rebuilding American manufacturing to lead in a clean economy and transforming basic industry is critical—both to meeting our climate goals, and to powering a real and lasting recovery that extends to all. Also critical is investing in our infrastructure—including modernizing our schools, hospitals, and transit systems; delivering broadband to rural communities; modernizing our grid and upgrading water systems; and protecting communities through natural infrastructure resiliency. These infrastructure investments can provide a much-needed jolt to our economy, while delivering good jobs and public health and climate benefits to communities. And, if we utilize Buy American procurement policies to incentivize the use of American-made materials

and components, the infrastructure investments will also deliver good-paying jobs in our manufacturing sector.

### **REBUILDING AND RETOOLING AMERICAN MANUFACTURING, BASIC INDUSTRY, AND ESSENTIAL SUPPLY CHAINS**

The U.S. can once again lead the world in manufacturing the technologies and products of the future. As an integral part of an aggressive strategy to address the climate emergency head on—and in line with achieving net zero emissions economy-wide by 2050—we have the opportunity to modernize and transform our industrial base to make it the cleanest and most advanced in the world, while spurring the creation of a new generation of good, safe jobs manufacturing clean technology.

This industrial transformation can bring dynamic industries back to communities that have been left behind by deindustrialization and under-investment, and provide a starting point for broadly shared growth and prosperity. It can help deliver a better future for workers and communities—revitalizing main streets and rebuilding the economic engine that has driven the middle class for decades.

The BlueGreen Alliance—alongside our labor and environmental partners—released Solidarity for Climate Action, an ambitious, concrete platform to address the crises of climate change and economic and racial inequality simultaneously.<sup>1</sup> Transforming America’s manufacturing sector is an opportunity to do so—creating and sustaining good, union jobs and rebuilding the middle class, while also reducing pollution and protecting our air and water.

#### *Manufacturing matters*

The economic stakes are enormous. Manufacturing directly employs about one in 11 American workers, and contributes \$2 trillion a year to the gross domestic product (GDP). Including the industry’s purchases of goods and materials, however, manufacturing accounts for one-third of U.S. economic output or more, and its impact on the nation’s innovation and competitiveness is even larger.<sup>2</sup> Manufacturing accounts for more than two-thirds of private sector research and development (R&D), while the sector’s domestic strength plays a central role in the balance of U.S. imports and exports—and the jobs that go with them. Manufacturing also has the proven ability to provide pathways into the middle class for millions of workers and families, and to support millions of high-skill, high-wage jobs. It has not always delivered on that promise, however, and today those opportunities are increasingly unavailable for too many American workers.

Meanwhile, global investments in clean energy, transportation, and infrastructure technologies are forecast to reach into the tens of trillions of dollars over the next three decades, posing both a powerful opportunity for job creation and economic growth and a serious risk that—without action to lead as technology changes—American workers and companies could be left behind.<sup>iii</sup>

The industrial sector represents a significant source of U.S. emissions. In 2018, the largest sources of greenhouse gas emissions by sector were transportation (nearly 28%), electricity production (27%), and industry (22%).<sup>iv</sup> However, distributing electricity by end-use reveals that the industrial sector is the largest source of emissions in the United States, responsible for 29% of emissions overall.<sup>v</sup>

Not only are industrial sector emissions large today, they have been growing and are projected to increase further. Globally, industrial sector emissions increased at an average annual rate of 3.4% between 2000 and 2014, significantly faster than total carbon dioxide (CO<sub>2</sub>) emissions.<sup>vi</sup> Industrial sector emissions are also growing at a faster rate than other sectors. Between 1990 and 2014, industrial sector emissions increased by 69%, while emissions from buildings, power, and transport increased by only 23%.<sup>vii</sup> Industrial sector emissions in the United States are projected to increase 17.6% through mid-century.<sup>viii</sup>

While other economic sectors are projected to see flat or declining emissions, these climate benefits will be offset by increases in industrial emissions under a business-as-usual scenario.<sup>ix</sup> Reductions in the power and transportation sectors, for example, are projected to be offset by an increase in carbon emissions from industrial sources.<sup>x</sup>

We need a holistic approach to retaining and growing manufacturing in the U.S., while also investing in these industries to make them the cleanest and most competitive in the world.

The BlueGreen Alliance’s manufacturing agenda lays out a plan across five pillars of action, and it is guided by an overarching strategic focus on strengthening good jobs, equity, reducing pollution, and reinvestment in manufacturing, communities, and workers. It proposes a set of national actions to achieve global leadership across clean technology manufacturing; cut emissions from the production of essential materials; upgrade and modernize the entirety of the U.S. industrial base; and undertake a new generation of industrial development that rebuilds good jobs in America and is clean, safe, and fair for workers and communities alike.<sup>xi</sup>

We appreciate and applaud the fact that many of these same priorities are reflected in pieces of legislation currently being considered in Congress. We look forward to working with the committee, Congress, and the administration to get this job done. Waiting is not an option because the opportunity to lead on climate and manufacturing, jumpstart economic recovery, and build a more equitable and prosperous economy will not wait for us.

*Meeting the economic challenge*

Worldwide, nations and regions are rushing to capture the economic gains from rapidly growing demand for clean technology. More than 40 countries have enacted carbon prices or targets, and they are simultaneously making long-term technology plans, building strong domestic markets, and taking coordinated policy action to lead in the production of clean energy and transportation technology, advanced clean materials, and infrastructure.

Even as the U.S. joins other nations in rapidly deploying clean technology, our ability to manufacture these technologies is not keeping pace, or we are dependent on other nations for critical subcomponents or technology. As these technologies become more and more widespread, failure to build them here increasingly threatens future jobs and the economy. Equally critical is a robust network of suppliers building the components, materials, and technologies that go into them. Not only do these companies account for the bulk of manufacturing jobs, but robust domestic supply chains are critical for sustaining innovation and technological leadership, and for economic security in the case of any type of disruption or crisis.

Other nations are also going first in modernizing heavy industry. They are demonstrating cutting edge, low-carbon processes for producing energy-intensive basic materials and fuels that will be essential to future global competitiveness and emissions reduction. If the United States hopes to compete and to lead, we need to invest in transforming our manufacturing and industrial sectors at the same or greater scale and pace.

**To meet this challenge, we too have to use all the tools in the toolbox.** We need to take coordinated action to make up for decades of disinvestment, offshoring, and outsourcing that weakened American manufacturing, and reinvest in today's industrial plants and communities. We need to reverse the unsafe and inequitable practices that all too often left workers and communities bearing the costs—but not the benefits—of industrial development, and ensure that jobs building clean technology are as good—or better—than the jobs of today. We need to scale up manufacturing and industrial support overall; boost startup and backup funding to help companies continue to invest for the long term, even when times are tough or uncertain; and provide the patient, consistent, and low-cost financing necessary to make investment in comparatively large, risky, innovative or first-in-class projects possible in America—not just in other nations.

We must make a significant coordinated national investment now to jumpstart domestic clean technology manufacturing, secure critical supply chains in the U.S., transform energy-intensive manufacturing in line with achieving net-zero emissions economy-wide by mid-century, and ensure a new generation of clean and safe industrial development in America.

*Leadership in clean technology manufacturing*

**Immediate Priorities:** We must create new industrial investment funds, expand existing programs to support urgent manufacturing conversion and retooling, and act at scale to fill critical supply chain gaps. And we must target investments to strengthen the communities and workers that need it most.

**What this looks like across America:**

- **Offshore wind can mean revitalized ports, good union jobs, and manufacturing across the country:** The potential for responsible offshore wind development in the United States is substantial. Through offshore wind, the United States has the technical potential to produce almost double the amount of electricity the nation consumed in 2019.<sup>xii</sup> According to the U.S. Department of Energy, if we utilized even one percent of the nation's technical potential offshore wind capacity, we could power nearly 6.5 million homes. We have the technology to harness wind power off the coasts of at least half of our states, and the industry is rapidly expanding both domestically and internationally.<sup>xiii</sup>

America's first offshore wind project at Block Island was the result of years of collaboration between labor, environmental organizations, industry, and key government officials and entities. Its five turbines began generating power off the coast of Rhode Island at the end of 2016. They produce enough clean, local energy to power 17,000 homes.<sup>xiv</sup>

This project was built with the highest standards of wildlife and environmental protection, and demonstrates the type of diverse, highly skilled workforce needed in the offshore wind industry. Though it was comparatively small, Block Island put more than 300 people to work and employed electricians, welders, ironworkers, pipefitters, pile drivers, engineers, scientists, and vessel operators.

In addition to the construction phase of these projects, a critical component of the job creation potential for the offshore wind sector is in operations and maintenance as well as the vast manufacturing supply chain that offers major opportunities for growth in a variety of sectors. While Block Island's Project Labor Agreement (PLA) resulted in significant quality job creation through the construction of the project, it largely missed the mark when it came to the materials that went into the project. The major parts and components of the Block Island farm—with the exception of the foundation—were manufactured outside the United States. The nacelles for the project came from France, the towers from Spain, and the blades from Denmark.<sup>xv</sup>

Maximizing the number of jobs created by the offshore wind industry will require growing a domestic supply chain. According to one report, the offshore wind industry can support between 45,000 to 83,000 jobs by 2030, “depending on installation levels and supply chain growth.”<sup>xvi</sup>

Beyond Block Island, larger projects are in development along the Eastern Seaboard from Massachusetts to North Carolina, and two offshore wind demonstration projects are planned in waters off Ohio and Maine. We can either seize this opportunity to manufacture the steel, cement, aluminum, nacelles, and other supply chain components here in the United States or we can cede manufacturing the future of the offshore wind industry to our global competitors, where the world leaders and workers in Northern Europe are more than willing to meet our demand. If we fail to act now or without enough urgency and at the scale needed, we are choosing to hand over good-paying jobs for workers in our own communities to other workers and communities in other nations.

- **Gaps in supply chains remain to be filled:** By contrast, the U.S. is already seeing what failing to act with urgency and scale has done to another industry. Solar panel manufacturing has been whipsawed by inconsistent policy, while key pieces of the solar manufacturing supply chain are missing in the United States. The U.S. is already behind our competitors in the race to build the future of batteries, transmission technology, hydrogen infrastructure, and more. Robust support for the domestic clean energy supply chain must fill these gaps in the clean energy technology sector—or else risk reliance on foreign manufacturing for essential components of a secure energy system.
- **Manufacturing incentives build and sustain jobs in industrial communities:** Manufacturing incentive programs have worked to maintain and expand U.S. manufacturing and competitiveness in the growing clean technology sector. As one example, the always over-subscribed 48C Advanced Energy Manufacturing Tax Credit program provided a credit of up to 30% for investments in building new manufacturing facilities or expanding existing facilities to produce clean energy technologies. This program led to job-creating investments in industrial communities throughout the U.S. and across a range of industries—from the production of cooling roof shingles in Massachusetts to expanded production of a material that strengthens the performance and durability of solar modules in Ohio. Looking forward to an enhanced and expanded program, according to one report, “every \$1 billion issued through a new 48C credit program could add \$3.6 billion in GDP and roughly 8,000 direct jobs across the country.”<sup>xvii</sup>



- **Energy efficiency improvements support existing jobs, increase the quality of jobs created, and reduce carbon pollution.** There are currently over 2.3 million jobs in the energy efficiency sector,<sup>xviii</sup> and roughly 70% of these are in small businesses.<sup>xix</sup> Furthermore, identifying the supply chain and moving policies to increase domestic manufacturing of energy efficiency retrofit products can also help to create quality manufacturing jobs.

The BlueGreen Alliance Foundation's Building Clean program works to identify these products and advance energy efficiency retrofits, particularly for multi-family housing.<sup>xx</sup> The database at BuildingClean.org lists roughly 4,500 local manufacturing facilities in nearly every state across the country. In New York, Flower City Habitat for Humanity helps build affordable housing for communities in Rochester. Through a commitment to in-state sourcing with 95% of parts coming from New York manufacturers, Flower City Habitat will be using windows and doors that exceed Energy Star standards at an affordable price. Many of these New York based suppliers are IUE-CWA-represented, supporting quality jobs and local businesses in these communities while reducing emissions.

These kinds of examples demonstrate the opportunity of the clean economy to revitalize American manufacturing, protect the environment, and create quality jobs across the country.

#### *Transforming our industrial base*

**Immediate priorities:** We must make comprehensive investments to secure, modernize and reduce emissions from energy intensive industry, ranging from widespread deployment of energy saving industrial efficiency measures to full scale deployment of first in class ultra-low emissions technology. We must also enhance R&D and ensure what we invent is built in America. Lastly, we must take key steps towards responsible production, reclamation, and recycling of minerals and materials critical for clean and advanced technology.

#### **What this looks like across America:**

- **Securing steel jobs in Pennsylvania, safeguarding aluminum smelting west of the Mississippi, improving emissions worldwide:**

Steel made in the U.S. goes into everything from bridges to wind turbines and as we rebuild and retool our manufacturing sector we cannot leave behind these basic industries that are the backbone of building a strong, domestic supply chain for clean energy and infrastructure projects. The last several decades have seen offshoring this production and



worsening environmental and labor standards worldwide. Transforming energy-intensive industries to produce essential materials with far lower emissions can ensure that deploying clean technology doesn't drive jobs or pollution overseas.

Today the last aluminum smelter west of the Mississippi is at risk of permanent closure—a potential economic and national security risk. At the same time, innovative technologies for ultra-low carbon production of energy intensive materials are being commercially deployed overseas. These include, for example, innovative processes to produce ultra-low emission steel and others that capture carbon from steel making and integrate those processes with fuel production.

Loans, grants, or other incentives to enhance efficiency, aid in adoption of combined heat and power, improved processes, and carbon capture, and in select cases, to rebuild core energy intensive facilities with globally leading technologies could stem the flow of steel production and aluminum smelting overseas, and mean opportunities to upgrade, innovate, cut energy use and costs, and safeguard jobs in 34 iron, steel, and cement facilities in Pennsylvania alone.<sup>xxi</sup>

## **EXECUTING A STRONG ADVANCED AND ELECTRIC VEHICLE MANUFACTURING AGENDA**

The decisions we make today will also determine whether we grow jobs and manufacturing in key industries that have been the backbone of our economy for decades—like the automotive industry.

The auto industry is at the heart of the U.S. manufacturing economy. Over 900,000 workers are directly employed by U.S. auto manufacturers and parts suppliers,<sup>xxii</sup> and one job in an auto assembly plant creates an additional 7.4 jobs from upstream and downstream economic activity.<sup>xxiii</sup> The auto sector is also a major driver of spending on research and development, patents, and technological innovation.<sup>xxiv</sup>

The global auto industry is at a crossroads. New technologies, new market entrants, and an industry committed to decarbonization means that change is accelerating.

Over the next decades, the industry will make a historic shift away from internal combustion engines towards electric vehicles (EVs). Other nations are not waiting, for example China has invested more than \$60 billion to support EV manufacturing. Chinese firms, either owned or supported by the Chinese government, currently produce 60% of passenger EVs sold around the globe and produce almost 70% of battery cells.<sup>xxv</sup> China also controls some 80% of the supply of

rare earth minerals—which are essential for aerospace, defense, and EV production—and may impose export controls on these vital materials.<sup>xxvi</sup> The European Union (EU) and South Korea are similarly making investments in battery and other technologies. Without new action, projections show the U.S. falling further behind over the next decade.

Rapid growth of EVs will create jobs producing key components such as batteries, electric motors, electronics, regenerative braking systems, and semiconductors.<sup>xxvii</sup> On the other hand, battery powered propulsion systems have fewer parts than traditional internal combustion engine vehicles, and while engines are often built here, battery cells are not—yet. Producing the materials, components, and technology that go into vehicles makes up more than half of jobs in auto manufacturing. There is intense global competition for this high-value manufacturing work, and potential benefits for U.S. workers and communities will be lost if EVs and key components are imported, or shifted to low-wage, insecure jobs. Maintaining and adding U.S. vehicle assembly capacity will also be a central factor in the location of supply chain jobs. If those factories are lost, so too are the jobs not only in those facilities, and in EV batteries and cells, but also in other supplier industries: steel, aluminum, glass, tires, seats and more.

American auto workers, steel workers, rubber workers, and others know all too well what happens when the U.S. market, industry, and policy falls behind the rest of the world. When U.S. trade, currency, or technology policy has lagged what other nations were doing, domestic jobs and production were often sacrificed as a result. By contrast, strong fuel economy and vehicle greenhouse gas standards in the 2010's coupled with aid to retool U.S. manufacturers spurred enhanced investment in domestic manufacturing and aided in the recovery of U.S. auto jobs from the 2008-2009 recession.

In 2017, a BlueGreen Alliance and NRDC report found more than 1,200 U.S. factories and engineering facilities in 48 states—and 288,000 American workers—building technology that improves fuel economy for today's vehicles.<sup>xxviii</sup> While the dynamic of potential job gains and losses are different for vehicle electrification, good outcomes for workers still depend on building the most advanced vehicles here in the United States.

That means coupling globally competitive standards, and other deployment measures—which give companies the certainty they need to invest—with an equally aggressive push to manufacture vehicles and strategic components here in the United States. And it means reversing unwise tax, trade, and labor policies that have hollowed out U.S. manufacturing, encouraging the outsourcing and offshoring of jobs, and leaving remaining workers with less compensation and deteriorating working conditions.

With the right policies, the U.S. can be a leading market and a leading manufacturer of the most advanced vehicles. We have to act, because the policies and investments that will shape the location and the quality of jobs in an increasingly electric automotive sector are being taken now.

**Immediate Priorities:** Securing and growing jobs in the auto sector depends on a coordinated industrial and manufacturing strategy that includes:

- A return to smart vehicle standards;
- Major investments to convert, retool, and reshore American manufacturing to build electric vehicles and components, convert and retool plants at risk, and bring new manufacturing into existing plants;
- Target investments to rebuild manufacturing and deindustrialized communities, strengthen supplier networks, and improve job quality, equity, and environmental outcomes throughout the supply chain;
- Strategic investments and coordination to fill gaps in essential supply chains including semiconductors and battery cells;
- Key steps towards economically, environmentally, and socially responsible production, reclamation, and recycling of critical EV materials like lithium;
- Strengthening and enforcing policies to leverage U.S. advantage in basic research;
- A new approach to trade agreements and trade enforcement focused on protecting workers, consumers, and the environment; and
- Boosting incentives for domestically manufactured EVs and charging stations, and electrifying publicly owned vehicle fleets at all levels of government, with high-quality environmental, labor and safety standards for manufacturing, operations and maintenance.

**What does this look like across America:**

- **A dynamic and essential supply chain that stretches across nearly every state represented by members of this committee:** BlueGreen Alliance reports on suppliers of the technologies that improve fuel economy and cut emission in the automotive sector (Supplying Ingenuity II<sup>xxxx</sup>), on the risks of the recent rollback of standards to future job growth, (Tech@Risk<sup>xxx</sup>), and on the challenges and opportunities in the EV industry (EVs at a Crossroads<sup>xxxx</sup>), along with a new report due out soon, all show the profound breadth and impact of the automotive sector and the policy choices we make on domestic manufacturing. The industry includes not only automotive assemblers and the vast array of automotive component manufacturers, but significant portions of our materials manufacture and innovation, such as high-strength lightweight steels, new aluminum products, adhesives, and robotics needed to utilize them. We also see the full range of outcomes for workers, both the power of advanced manufacturing to support good family-supporting jobs, and too many instances that demonstrate the decline in workers

bargaining power, wages, benefits, and safety on the job. When these companies and their employees prosper they in turn support even more jobs and businesses in and beyond the communities in which they are located—when these manufacturing facilities are offshored, or jobs outsourced, or when workers cannot fairly or effectively access these jobs, the impact on local economies is profound. And we can vividly see the profound impact of the decisions that policy makers and companies make—or fail to make—now to shape the investments in manufacturing and workers across the nation.

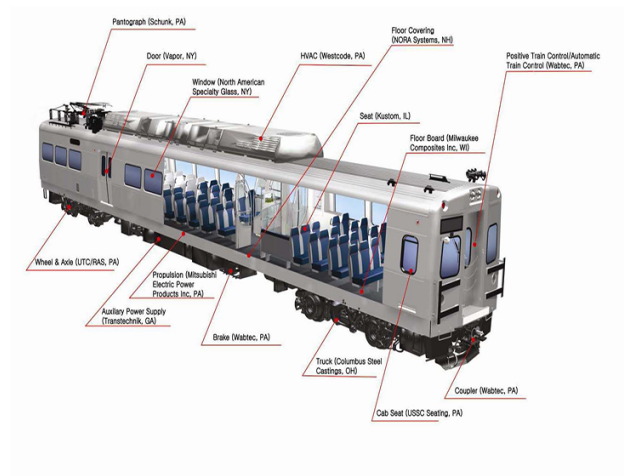
- Manufacturing risk, potential, and the demonstrated success of policies to build the advanced vehicle supply chain in states across the country.** In states like Ohio or Tennessee, we see the breadth and impact of the automotive supply chain; including major conventional vehicle assembly, electric vehicle assembly, examples of reinvestment to convert long standing union manufacturing facilities to be major sites of future electric vehicle or battery cell production. We see the full range of components being manufactured—including EV components and conventional engines and transmissions—facilities that should be first in line for investments to retool to supply assemblers as they shift to electrified technology. We see the advanced materials and electronics that support advanced vehicles of all kinds. Automotive manufacturing can be explored by technology and location in BlueGreen Alliance interactive data sets available online.<sup>xxxii</sup>

And finally we see numerous facilities that were established or expanded with the support of groundbreaking manufacturing incentives in both the advanced conventional supply chain, and in manufacturing electrified vehicles and components. The range of facilities in these states also illustrates the potential to expand or improve these programs to make a greater impact in building advanced technology manufacturing and sustaining good jobs in the automotive sector today and for the long term.

#### **BUILDING PROSPERITY AND MANUFACTURING BY REINVESTING IN OUR TRANSPORTATION INFRASTRUCTURE**

The United States relies on transportation infrastructure—like roads, bridges, railroads, and public transit systems—to keep the economy moving. Not only is safe, modern transportation infrastructure vital to daily life and commerce, it is critical to ensuring that all workers have access to employment opportunities, and serves as a major employer creating jobs in construction and operations and maintenance. The job creation potential of investments in transportation infrastructure does not stop there, however, with a robust supply chain rippling through communities across the nation. For example, parts and materials for passenger and transit rail systems are manufactured in nearly every state, supporting 90,000 jobs alone.<sup>xxxiii</sup>

Figure 1: The Components of an RTD Subway Car in Denver Illustrate A Vast Nation-wide Transit Supply Chain.<sup>xxxiv</sup>



Unfortunately, investment in this vital sector has been lacking and the condition of the nation's transportation infrastructure continues to deteriorate, reaching a truly unacceptable state of disrepair that threatens the nation's economy, and sacrifices jobs and job creation potential. Every four years the American Society of Civil Engineers (ASCE) releases a report card of the nation's infrastructure. Looking at the United States' transportation infrastructure we see just how detrimental the impact that the lack of investment has been. Driven largely by investment in the freight sector, only the nation's rail infrastructure scored above average grade with a "B," though passenger rail fared much worse.<sup>xxxv</sup> The nation's bridges got a "C," while roads were given a "D."<sup>xxxvi</sup> Finally, the nation's public transit systems were awarded a "D-." The report card notes that "over a 10-year period across the country, 19% of transit vehicles, and 6% of fixed guideway elements like tracks and tunnels were rated in 'poor' condition. Currently, there is a \$176 billion transit backlog, a deficit that is expected to grow to more than \$270 billion through 2029."<sup>xxxvii</sup> Meanwhile nations across the globe have deployed diverse investment strategies to ensure modern effective transportation assets, airports, rail, transit, and roads and bridges. These investments not only help their businesses and workers compete, they sustain manufacturing innovation and supply chains for the long term. It is also crucial that as we rebuild our nation's crumbling transportation infrastructure, we do so in a way that will make it more resilient and able to withstand the impacts of climate change. As we see more extreme weather, our transportation systems will have to endure severe conditions on a more regular basis.

Congress has rightly identified the need for major investment in transportation infrastructure, both to meet immediate needs and as a driver of economic recovery. We commend these moves and urge continued ambition. As aggressive as current proposals are, they are still far from the \$5 trillion the ASCE calls for over ten years to return the nation's surface transportation systems a "state of good repair."<sup>xxxviii</sup>

The impact of such an investment would mean job creation across the nation, if done right. Infrastructure projects require huge amounts of building materials and components. Coupled with strong Buy American provisions, infrastructure investments have a proven track record of creating jobs.<sup>xxxix</sup> Further, requiring strong labor standards, including prevailing wage, Project Labor Agreements, community workforce and benefit provisions, and targeting these investments in disadvantaged communities, will ensure that the jobs created by these investments are good jobs and deliver benefits to the workers and communities most in need.

**Immediate Priorities:** We must invest at levels commensurate with our economic and transportation needs. We must also sustain and strengthen critical Buy America, labor and community benefit standards to ensure we capture the full recovery, jobs, equity, and local economic benefits of these investments.

**What does this look like across America:**

- **Transportation infrastructure investments underpin a stronger, more resilient, and more equitable recovery.** A case study in New Jersey, as analyzed by the American Road & Transportation Builders Association (ARTBA), found that the combined economic impact of transit and highway investment had significant economic impacts over ten years, with a \$1.65 billion sustained increase in annual transportation spending leading to an average \$7 billion annual increase in economic impact for the state over that timeframe. In this example, most of the jobs—54%—created by the added investment are outside the construction industry.<sup>xl</sup> A similar ARTBA analysis in Kansas from 2017 found that a sustained increase in investment in bridges and highways alone would more than double in return in economic output.<sup>xli</sup> Finally, the American Public Transportation Association (APTA) reports that the long-term economic impact of increased investment in transit alone would result in a \$5 billion return in total economic benefit for every additional \$1 billion in funding, and notes that business productivity "would increase from access to broader labor markets with more diverse skills, enabled by expanded public transit service areas and reduced traffic congestion."<sup>xlii</sup>
- **Transit and passenger rail manufacturing alone supports jobs across every state represented by this committee—many far from where these vehicles are put into**



**service.** While millions of Americans rely on public transit to get to work every day,<sup>xliii</sup> the benefits of investment in public transit extend far beyond the communities these systems serve, and extend into the supply chain to create jobs across the nation. As demonstrated in Figure 1, parts and components for electric buses, subway cars, and other vital components of the public transit system are often built far from the projects themselves. Rail assembly operations are in Idaho, Pennsylvania, and throughout the Northeast, with component parts coming from across the country. Buses are assembled in states such as Kansas, Minnesota, Ohio, Massachusetts, and across the Southern Piedmont—a key corridor of bus and rail transportation manufacturing, for both assembly and components. Public procurement of advanced and electric vehicles can further help boost reinvestment, job retention, manufacturing conversion, and growth in domestic manufacturing of electric vehicle technology, with EV and EV component manufacturing investments taking place in new and existing facilities in Minnesota, North Carolina, South Carolina, Alabama, and Georgia, as well as in many other states nationwide.

**Conclusion: Jobs here, jobs now, good jobs in communities across the U.S.**

We do not have time to wait. If we do not move proactively to rebuild the American manufacturing and transportation infrastructures now we risk losing the race to develop, manufacture, and capture the jobs and economic gains from the technologies of the future. Our global competitors are moving fast. Making these investments right, and making them now, will give us the opportunity to lead globally, rebuild jobs in manufacturing communities across the nation that have been struggling, and to bolster innovation and production of the clean technology of the future here at home.

All too often in recent decades, working people and communities have suffered when technology and markets changed. At the same time good jobs promised in new industries have too often not materialized. There is nothing inevitable about these outcomes. The decisions policymakers make now can reverse outsourcing and offshoring, and ensure the industries and jobs of the future deliver fair wages and respect for workers' rights. We have an opportunity now to correct course—to address the vulnerabilities and inequities of our economy so vividly underscored in the current crisis, rebuild the manufacturing industry, repair our infrastructure, lead the world in addressing climate change, and deliver good jobs across America at the same time.

<sup>i</sup> BlueGreen Alliance, *Solidarity for Climate Action*. Available online: <https://www.bluegreenalliance.org/work-issue/solidarity-for-climate-action/>

<sup>ii</sup> Economic Policy Institute, *The Manufacturing Footprint and the Importance of U.S. Manufacturing Jobs*. January 22, 2015. Available online: <https://www.epi.org/publication/the-manufacturing-footprint-and-the-importance-of-u-s-manufacturing-jobs/>

<sup>iii</sup> Bloomberg NEF, "Global results and investment trends," 2019. Available online <https://bnef.turk.co/story/neo2019/page/2/2?teaser=true>

- <sup>29</sup> U.S. Environmental Protection Agency (EPA), Sources of Greenhouse Gas Emissions. Available online: <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>
- <sup>30</sup> Ibid.
- <sup>31</sup> Intergovernmental Panel on Climate Change (IPCC), Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development, 2018. Available online: [https://www.ipcc.ch/site/assets/uploads/sites/2/2019/02/SR15\\_Chapter2\\_Low\\_Res.pdf](https://www.ipcc.ch/site/assets/uploads/sites/2/2019/02/SR15_Chapter2_Low_Res.pdf), IPCC, “Global Warming of 1.5°C.” Available online: <https://www.ipcc.ch/sr15/>
- <sup>32</sup> McKinsey & Company, Decarbonization of Industrial Sectors: the next Frontier, 2018. Available online: <https://www.mckinsey.com/industries/oil-and-gas/our-insights/decarbonization-of-industrial-sectors-the-next-frontier>
- <sup>33</sup> Third Way, Industry Matters: Smarter Energy Use Is Key for US Competitiveness, Jobs, and Climate Efforts, 2018. Available online: <https://www.thirdway.org/report/industry-matters-smarterenergy-use-is-key-for-us-competitiveness-jobs-and-climate-effort>
- <sup>34</sup> Third Way, Industry Matters: Smarter Energy Use Is Key for US Competitiveness, Jobs, and Climate Efforts, 2018. Available online: <https://www.thirdway.org/report/industry-matters-smarterenergy-use-is-key-for-us-competitiveness-jobs-and-climate-effort>
- <sup>35</sup> Utility Dive, “EIA: US Far off Track for Global Climate Goals as Fossil Fuel Reliance Persists,” January 2019. Available online: <http://www.utilitydive.com/news/eia-us-far-off-track-for-globalclimate-goals-as-fossil-fuel-reliance-pers/546857/>
- <sup>36</sup> BlueGreen Alliance, *Manufacturing Agenda: A National Blueprint for Clean Technology Manufacturing Leadership and Industrial Transformation*. Available online: <https://www.bluegreenalliance.org/resources/manufacturing-agenda-a-national-blueprint-for-clean-technology-manufacturing-leadership-and-industrial-transformation/>
- <sup>37</sup> Frontier Group & Environment America Research & Policy Center, *Offshore Wind for America: The promise and potential of clean energy off our coasts*, March 2021. Available online: <https://frontiergroup.org/sites/default/files/reports/Offshore%20Wind%20Print.pdf>
- <sup>38</sup> U.S. Department of Energy (DOE), Office of Energy Efficiency & Renewable Energy, “Computing America’s Offshore Wind Energy Potential,” September 9, 2016. Available online: <https://www.energy.gov/eere/articles/computing-america-s-offshore-wind-energy-potential>
- <sup>39</sup> Orsted, “Our Offshore Wind Projects in the U.S.” Available online: <https://us.orsted.com/wind-projects>
- <sup>40</sup> General Electric, *My Turbine Lies Over The Ocean: It Takes Herculean Labor To Build America’s First Offshore Wind Farm*, July 6, 2016. Available Online: <https://www.ge.com/news/reports/my-turbine-lies-over-the-ocean-it-takes-herculean-labor-to-build-americas-first-offshore-wind-farm>
- <sup>41</sup> American Wind Energy Association, U.S. Offshore Wind Power Economic Impact Assessment, March 2020. Available online: [https://supportoffshorewind.org/wp-content/uploads/sites/6/2020/03/AWEA\\_Offshore-Wind-Economic-ImpactsV3.pdf](https://supportoffshorewind.org/wp-content/uploads/sites/6/2020/03/AWEA_Offshore-Wind-Economic-ImpactsV3.pdf)
- <sup>42</sup> Third Way, *Manufacturing the Future of Clean Energy With 48C*, December 18, 2020. Available online: <https://www.thirdway.org/memo/manufacturing-the-future-of-clean-energy-with-48c>
- <sup>43</sup> Energy Futures Initiative, *2019 U.S. Energy and Employment Report*. Available online: <https://www.usenergyjobs.org/2019-report>
- <sup>44</sup> E4theFuture, *Energy Efficiency Jobs in America*, December 2016. Available on [https://e4thefuture.org/wp-content/uploads/2016/12/EnergyEfficiencyJobsInAmerica\\_FINAL.pdf](https://e4thefuture.org/wp-content/uploads/2016/12/EnergyEfficiencyJobsInAmerica_FINAL.pdf)
- <sup>45</sup> BlueGreen Alliance Foundation, “Building Clean.” Available online: <http://www.buildingclean.org>
- <sup>46</sup> US Environmental Protection Agency, “US Greenhouse Gas Reporting Program,” accessed April 20, 2021. Available online: <https://www.epa.gov/ghgreporting>
- <sup>47</sup> U.S. Bureau of Labor Statistics, “Automotive Industry: Employment, Earnings, and Hours,” accessed Jan 14, 2021. Available online: <https://www.bls.gov/iag/tgs/iagauto.htm#earnings>
- <sup>48</sup> Economic Policy Institute, “Updated employment multipliers for the U.S. economy,” January 2019. Available online: <https://www.epi.org/publication/updated-employment-multipliers-for-the-us-economy/>



- <sup>xxxiv</sup> Statista, "Ranking of the 20 companies with the highest spending on research and development in 2018," March 17, 2021. Available online: <https://www.statista.com/statistics/265645/ranking-of-the-20-companies-with-the-highest-spending-on-research-and-development/>
- <sup>xxxv</sup> New York Times, "The Auto Industry Bets its Future on Batteries," February 16, 2021. Available online: <https://www.nytimes.com/2021/02/16/business/energy-environment/electric-car-batteries-investment.html>
- <sup>xxxvi</sup> Financial Times, "China targets rare earth export curbs to hobble US defense industry," February 16, 2021. Available online: <https://arstechnica.com/tech-policy/2021/02/china-targets-rare-earth-export-curbs-to-hobble-us-defense-industry/>
- <sup>xxxvii</sup> United Auto Workers, "Taking the High Road," June 2019. Available online: <https://uaw.org/wp-content/uploads/2019/07/>
- <sup>xxxviii</sup> BlueGreen Alliance, *Supplying Ingenuity II: U.S. Suppliers Of Key Clean, Fuel-Efficient Vehicle Technologies*. Available online: <https://www.bluegreenalliance.org/resources/supplying-ingenuity-ii-u-s-suppliers-of-key-clean-fuel-efficient-vehicle-technologies/>
- <sup>xxxix</sup> BlueGreen Alliance, *Supplying Ingenuity II: U.S. Suppliers Of Key Clean, Fuel-Efficient Vehicle Technologies*. Available online: <https://www.bluegreenalliance.org/resources/supplying-ingenuity-ii-u-s-suppliers-of-key-clean-fuel-efficient-vehicle-technologies/>
- <sup>xl</sup> BlueGreen Alliance, *Tech@Risk: The Domestic Innovation, Technology Deployment, Manufacturing, and Jobs at Risk in Stepping Away from Global Leadership on Clean Cars*. Available online: <https://www.bluegreenalliance.org/resources/techrisk-the-domestic-innovation-technology-deployment-manufacturing-and-jobs-at-risk-in-stepping-away-from-global-leadership-on-clean-cars/>
- <sup>xli</sup> BlueGreen Alliance, *Electric Vehicles at a Crossroads: Challenges and Opportunities for the Future of U.S. Manufacturing and Jobs in the Electric Vehicle Sector*. Available online: <https://www.bluegreenalliance.org/resources/electric-vehicles-at-a-crossroads/>
- <sup>xlii</sup> BlueGreen Alliance, *Visualizing the Clean Economy: The Automotive Sector*. Available online: <https://www.bgafoundation.org/programs/visualizing-the-clean-economy-autos/>
- <sup>xliii</sup> BlueGreen Alliance, *Passenger Rail & Transit Rail Manufacturing in the U.S.*, January 30, 2015. Available online: <https://www.bluegreenalliance.org/resources/passenger-rail-transit-rail-manufacturing-in-the-u-s/>
- <sup>xliiii</sup> BlueGreen Alliance, *Passenger Rail & Transit Rail Manufacturing in the U.S.*, January 30, 2015. Available online: <https://www.bluegreenalliance.org/resources/passenger-rail-transit-rail-manufacturing-in-the-u-s/>
- <sup>xlv</sup> ASCE, *2021 Report Card for America's Infrastructure*, March 3, 2021. Available online: <https://infrastructurereportcard.org/>
- <sup>xlv</sup> Ibid.
- <sup>xlvii</sup> Ibid.
- <sup>xlviii</sup> ASCE, *Failure to Act: Current Investment Trends in our Surface Transportation Infrastructure*, 2020. Available online: [https://www.asce.org/uploadedFiles/Issues\\_and\\_Advocacy/Infrastructure/Content\\_Pieces/failure-to-act-2021-surface-transportation.pdf](https://www.asce.org/uploadedFiles/Issues_and_Advocacy/Infrastructure/Content_Pieces/failure-to-act-2021-surface-transportation.pdf)
- <sup>xlix</sup> Industry Week, "Industry Group Says 'Buy America' Provisions Are Necessary for U.S. Jobs," January 27, 2021. Available online: <https://www.industryweek.com/the-economy/public-policy/article/21937604/industry-group-says-buy-america-provisions-are-necessary-for-us-jobs>
- <sup>l</sup> ARTBA, *The Economic Impacts of a \$1.65 Billion Increase in Capital Investment by the New Jersey Turnpike Authority, New Jersey Transit & The South Jersey Transportation Authority*, May 2020. Available online: <https://forwardnewjersey.com/wp-content/uploads/2020/07/ARTBA-Report-1.pdf>
- <sup>li</sup> ARTBA, *The Economic Impact of an Annual \$264 Million Increase in Kansas Highway and Bridge Construction Investment*, March 2017. Available online: [https://www.artba.org/wp-content/uploads/2014/03/ARTBA\\_Kansas\\_Economic\\_Impact\\_Report\\_March\\_2017.pdf](https://www.artba.org/wp-content/uploads/2014/03/ARTBA_Kansas_Economic_Impact_Report_March_2017.pdf)

---

<sup>xlii</sup> APTA, *Economic Impact of Public Transportation Investment*, February 2020. Available online:

<https://www.apta.com/wp-content/uploads/APTA-econ-impact-transit-investment-2020-ES.pdf>

<sup>xliii</sup> Bloomberg, “The Great Divide in How Americans Commute to Work,” January 22, 2019. Available online:

<https://www.bloomberg.com/news/articles/2019-01-22/how-americans-commute-to-work-in-maps>

**PREPARED STATEMENT OF DAVID W. KREUTZER**

SENIOR ECONOMIST, INSTITUTE FOR ENERGY RESEARCH

APRIL 22, 2021

Chairman Brown, Ranking Member Toomey, and other Members of the Committee, I want to thank you for giving me this opportunity to testify on the clean energy economy.

My name is David Kreutzer. I am senior economist at the Institute for Energy Research. The opinions I express today, are my own and do not necessarily reflect those of the Institute for Energy Research.

The economic impact of a shift to energy sources with lower carbon dioxide emissions depends on how that shift is made. The reductions in CO2 emissions brought on by the smart-drilling revolution and the dramatically increased access to natural gas helped revive our industrial base, increasing income and employment. Forced reductions in CO2 emissions that raise energy costs have negative impacts on income and employment. In addition, policies that force CO2 reductions have been hijacked by political opportunists in the past and are susceptible to similar problems in the future.

Creating and maintaining a dynamic, robust, and resilient economy is critically important for the Nation's welfare today and for generations to come. We are the beneficiaries of decades and centuries of phenomenal economic growth and we should hope to see that growth continue.

Over the past 150 years, inflation-adjusted income per capita in the U.S. has increased by a factor of 18. Even this nearly 20-fold increase cannot fully measure the benefits of modern medicine and technology.<sup>1</sup> For instance, that same period saw the tragedy of childhood mortality drop from 317 per thousand to seven per thousand—a 98 percent decrease.<sup>2</sup>

We see similarly dramatic improvements in human well-being on a shorter time scale. Since the year of my birth (1953), per-capita energy consumption has doubled and the atmospheric CO2 concentration has risen 32 percent.<sup>3 4</sup> These changes were associated with:

- A 76-percent drop in childhood mortality;<sup>5</sup>
- The death rate from famine dropping 98 percent;<sup>6</sup>
- An increase in inflation-adjusted World per-capita GDP of 300 percent.<sup>7</sup>

This is only a partial list of the beneficial changes in human welfare the decades have seen. Of course, there are many factors driving these benefits, but economic freedom and affordable energy are among them. The Heritage Foundation's Index of Economic Freedom consistently shows a link between economic freedom and economic growth.<sup>8</sup> Government subsidies and mandates work against economic freedom and can undermine the process that creates the best jobs. The push for green jobs too often ignores this lesson.

In his first term, President Obama promised to create 3 million new green jobs. A significant chunk of \$787 billion stimulus package was devoted to meeting that goal. The package included grants, loan guarantees, and funding for job-training programs. The resulting green-job creation fell pathetically short of its goal. The failure was documented in two reports from the inspector general at the Department of Labor and two reports from the Bureau of Labor Statistics.

<sup>1</sup> For the span 1870 to 2020. Found at Measuringworth.com, (accessed April 19, 2021).

<sup>2</sup> Statista.com, "Child Mortality Rate (Under 5 Years Old) in the United States, From 1800 to 2020", <https://www.statista.com/statistics/1041693/united-states-all-time-child-mortality-rate/> (accessed April 19, 2021).

<sup>3</sup> Theoil drum.com, "World Energy Consumption Since 1820 in Charts", <http://theoildrum.com/node/9023> (accessed April 19, 2021).

<sup>4</sup> Sealevel.info, "Atmospheric Carbon Dioxide (CO2) Levels, 1800–Present", <https://sealevel.info/co2.html> (accessed April 19, 2021).

<sup>5</sup> Max Roser and Jaiden Mispy, "Global Child Mortality: It Is Hard To Overestimate Both the Immensity of the Tragedy, and the Progress the World Has Made", Our World in Data, <https://ourworldindata.org/child-mortality-globally> (accessed April 19, 2021).

<sup>6</sup> Joe Hasell and Max Roser, "Famines", Our World in Data, December 7, 2017, <https://ourworldindata.org/famines> (accessed April 19, 2021).

<sup>7</sup> Max Roser, "Economic Growth", Our World in Data, <https://ourworldindata.org/economic-growth> (accessed April 19, 2021).

<sup>8</sup> The Heritage Foundation, Index of Economic Freedom, <https://www.heritage.org/index/> (accessed April 19, 2021).

The title for the first inspector general report, “Recovery Act: Slow Pace Placing Workers into Jobs Jeopardizes Employment Goals of the Green Jobs Program,” is a surprisingly good summary.<sup>9</sup> The report noted:

- Nearly three-fourths of the way through, only 61 percent of the target level of participants had even been signed up for training;
- Job placement was only 10 percent of the target level; and
- Participants who retained employment for at least 6 months met only 2 percent of the target level.

A follow-up report a year later was no more upbeat.<sup>10</sup> It found:

- More than 20 percent of certificates and degrees went to recipients who had only one day of training;
- 47 percent of those completing the Green Jobs program received five or fewer days of training;
- Grantees could not document between 24 percent and 44 percent of the employment outcomes;
- The number of trainees who entered employment was less than 40 percent of the target; and
- 38 percent of those who did enter employment already had jobs before the training program.

On the surface the BLS reports are more positive, asserting that the economy had over three million green jobs.<sup>11</sup> A little digging shows that number to be so misleading as to be nearly comical. First, they were not the promised new jobs. Second, to get the three-million count, the definition of a green job was made so broad that most of the green jobs had greenness that was, at best, tenuous. Even if the definition was accepted, few of the green jobs could have been attributed to the green jobs program. For instance:

- There were 30 times as many green jobs in portable-toilet and septic-tank servicing as in solar electric utilities;
- More than 50 percent of all jobs in steel mills were green;<sup>12</sup>
- There were more green jobs in school bus and employee transportation (160,896), trash collection (116,293), and used merchandise stores (106,865) than in either engineering services (100,847) or architectural services (71,891); and
- The acting commissioner of the BLS admitted that lobbying for the oil industry could be considered a green job.<sup>13</sup>

Of course, all of these jobs are important, but they are not what people envision when they hear about green jobs of the future, nor can many of them be attributed to Obama-era green-jobs policies.

Though there were few green jobs to show for it, a lot of money was spent on green initiatives.

Much of that money went to wealthy corporations and the politically well-connected. A *Washington Post* investigation into the clean-energy program found a disturbing amount of political influence:<sup>14</sup>

Meant to create jobs and cut reliance on foreign oil, Obama’s green-technology program was infused with politics at every level, *The Washington*

<sup>9</sup>U.S. Department of Labor Employment and Training Administration, Office of the Inspector General, “Recovery Act: Slow Pace Placing Workers into Jobs Jeopardizes Employment Goals of the Green Jobs Program,” September 30, 2011, <https://www.oig.dol.gov/public/reports/oa/2011/18-11-004-03-390.pdf> (accessed April 20, 2019).

<sup>10</sup>David W. Kreutzer, Heritage Foundation Commentary, November 1, 2012, <https://www.heritage.org/environment/commentary/green-jobs-go-0-4> (accessed April 20, 2019).

<sup>11</sup>Bureau of Labor Statistics, News Release, “Employment in Green Goods and Services—2011,” March 19, 2013, <https://www.bls.gov/news.release/pdf/ggqcew.pdf> (accessed April 20, 2021).

<sup>12</sup>David Kreutzer, “Green Jobs Count: Fewer than Before, Sillier than Ever,” Daily Signal, July 9, 2012, <https://www.dailysignal.com/2012/07/09/green-jobs-arent-shrinking-because-they-dont-exist/> (accessed April 20, 2021).

<sup>13</sup>Youtube, “Oil Lobbyists Have Green Jobs?” June 15, 2012, <https://www.youtube.com/watch?v=DsEMHQ2sjOk> (accessed April 20, 2021).

<sup>14</sup>By Joe Stephens and Carol D. Leonnig, “Solyndra: Politics Infused Obama Energy Programs,” *The Washington Post*, December 25, 2011, <https://www.washingtonpost.com/solyndra-politics-infused-obama-energy-programs/2011/12/14/g1QA4HUHP—story.html> (accessed April 20, 2021).

*Post* found in an analysis of thousands of memos, company records and internal e-mails. Political considerations were raised repeatedly by company investors, Energy Department bureaucrats and White House officials.

The story went on:

“What’s so troubling is that politics seems to be the dominant factor,” said Ryan Alexander, president of Taxpayers for Common Sense, a nonpartisan watchdog group. “They’re not talking about what the taxpayers are losing; they’re not talking about the failure of the technology, whether we bet on the wrong horse. What they are talking about is ‘How are we going to manage this politically?’”

The Administration, which excluded lobbyists from policymaking positions, gave easy access to venture capitalists with stakes in some of the companies backed by the Administration, the records show. Many of those investors had given to Obama’s 2008 campaign. Some took jobs in the Administration and helped manage the clean-energy program.

It is hard to spend hundreds of millions of dollars in Washington and not have serious political influence involved. Some things may need to be done by Government, but Federal funding of private ventures is not at the top of the list. Two cases from the Obama administration’s green initiatives illustrate the problem with Government financing of private ventures.

The poster child for politically directed bad green investment is Solyndra—a story of failed technology and successful rent-seeking. An early beneficiary of the Stimulus Package, Solyndra received a \$535 million loan guarantee in 2009. However, improvements in older technology undercut that of Solyndra. This problem was evident from almost the first day, and the company declared bankruptcy in September of 2011, laying off all 1,100 of its workers. Of course, taxpayers were left on the hook for the millions of dollars on the outstanding loan.

The second example, the Ivanpah solar-power project, highlights a logical flaw in the Department of Energy’s loan-guarantee program and illustrates problems in green-energy accounting.

The Department of Energy’s loan program supposedly targeted projects that were economically viable and unable (despite the supposed market viability) to get private financing. That the owners of Ivanpah might be unable to finance a market-viable project is laughable. The owners include the following corporations (or their subsidiaries):

- Google
- General Electric
- Chevron
- BP Alternative Energy
- StatoilHydro Venture
- Morgan Stanley
- Black River Asset Management
- Draper Fisher Jurvetson
- Vantage Point Capital Partners
- Riverwood Capital
- Double Bottom Line Venture Capital
- California State Teachers’ Retirement System
- NRG Energy

The combined market capitalization of the partners exceeded \$1 trillion at that time. Further, the list of partners included some of the most sophisticated and accomplished firms in corporate finance. Nevertheless, the Department of Energy awarded them a \$500 million grant and a \$1.6 billion loan guarantee.

Ivanpah is a solar-thermal power plant that uses mirrors to concentrate solar energy to heat a liquid that then drives conventional turbines. Though the liquid has some thermal mass that moderates short-term fluctuations in power output, nighttime and cloudiness are still problems. Overnight, the liquid cools so much that it takes a while to reheat it in the morning until it is hot enough to drive the turbines. To overcome this problem, Ivanpah uses natural gas to keep the liquid hot overnight, which is not a technological problem, but it is a problem for calculating green credits. The solution is to ignore the overnight use of natural gas when calculating how much electricity is generated by solar heat. This matters because virtually all of Ivanpah’s power is sold at the higher prices commanded by renewable electricity

and because that power is used by its customers to satisfy renewable portfolio requirements. I have estimated that were the natural gas burned in a modern power-plant it would generate nearly one-third of the power sold by Ivanpah.<sup>15</sup>

Companies that should not need loan subsidies to finance their project, got the subsidies and produce “green” power, in large part, with natural gas. This bit of mislabeling is ignored by Ivanpah’s owners, the Department of Energy, California regulators, and the utilities that purchase the power to meet mandates, because none of them have any incentive to do otherwise.

Though problems like those with Solyndra and Ivanpah were not universal, they were all too common. In his broad overview of the Department of Energy’s Loan Portfolio, Nick Loris found these recurring themes:<sup>16</sup>

- Failed companies that could not survive even with the Federal Government’s help;
- Projects that have the backing of companies with large market capitalizations and substantial private investors. These companies should have no trouble financing a project without Government-backed loans if they believe it is worth the investment;
- Private investors hedging their bets and congregating toward public money. These projects on their surface appear to be financial losers but the Government involvement entices companies to take a chance;
- Companies and projects that benefit from a plethora of Federal, State, and local policies that push renewable energy;
- Government incompetence in administering and overseeing the loans.

In 2009, the American economy was just beginning its recovery from the 2008 recession. The billions of dollars in green expenditures were promoted as a tool to combat the unemployment crisis of the time. The green expenditures of the Stimulus Package failed to provide significant help to the unemployed workers whose plight was used to justify the programs.

Today, a multitrillion-dollar policy is offered as a source of jobs. It is also offered as a solution to problems of climate justice, despite the fact that these programs will have no measurable climate impact for decades and are unlikely to have significant positive impacts beyond that. With history as a guide, there is reason to think these programs will be encouraged and then usurped by the politically well-connected and the economically powerful. We saw this in 2009 and we have seen it more generally for decades.

Big Government expenditure too often helps the well-connected and powerful instead of the supposed beneficiaries. Hints of this diversion can also be seen in the accumulating wealth of Washington, DC, and its suburbs.

In 1970, three of the twenty wealthiest counties in America were in the DC area and six were in the Midwest.<sup>17</sup> By 2019, eight (nine if you count the independent city of Falls Church, VA) of the richest twenty counties were in the DC suburbs and none of these twenty were in the Midwest.<sup>18</sup> Real estate prices show a corresponding trend. Between 1970 and 2017, the median house price in Washington, DC, grew faster than in any State and 3.5 times as fast as the national average.<sup>19</sup>

The changing fortunes of industries and regions spring from many factors, but the data in the previous paragraph do not support a claim that the burgeoning Government programs and budgets have stimulated the economy of our manufacturing

<sup>15</sup> David W. Kreutzer, “The Status of Ivanpah and Other Federal Loan-Guaranteed Solar Energy Projects on Bureau of Land Management Lands”, Testimony before the Committee on Natural Resources Subcommittee on Oversight and Investigations: United States House of Representatives,” July 14, 2016, <https://republicans-naturalresources.house.gov/uploadedfiles/testimony-kreutzer.pdf> (accessed April 20, 2021).

<sup>16</sup> Nick Loris, “Examining the Department of Energy’s Loan Portfolio”, The House of Representatives Committee on Science, Space and Technology’s Subcommittee on Energy and Subcommittee on Oversight”, March 3, 2016, <https://docs.house.gov/meetings/SY/SY20/20160303/104591/HHRG-114-SY20-Wstate-LorisN-20160303.pdf> (accessed April 20, 2021).

<sup>17</sup> Jack Rosenthal, “50 Richest Counties Are in Suburbs”, *The New York Times*, September 19, 1972, <https://www.nytimes.com/1972/09/19/archives/50-richest-counties-are-in-suburbs.html> (accessed April 21, 2021).

<sup>18</sup> Terrence P. Jeffrey, “9 of 20 Richest Counties Are D.C. Suburbs; Virginia Suburbs Beat Silicon Valley”, *CNSNews*, December 12, 2019, <https://www.cnsnews.com/article/national/terrence-p-jeffrey/9-20-richest-counties-are-dc-suburbs-virginia-suburbs-beat> (accessed April 21, 2021).

<sup>19</sup> Hillary Hoffower and Andy Kiersz, “Home Values Have More Than Doubled in the U.S. Since 1970—Here’s How Much They’ve Increased in Every State”, *Business Insider*, December 18, 2018, <https://www.businessinsider.com/home-value-home-price-change-in-50-years-every-state-2018-12> (accessed April 21, 2021).

heartland. We should be skeptical that several trillion more dollars will have a significantly different impact.

Even if the shift to reduced carbon dioxide emissions is done without the political rent seeking, the costs to the economy come early and are significant, while any impacts on climate come with long delays, are speculative and small.

My former colleagues, Kevin Dayaratna and Nick Loris, and I estimated the projected economic impact of the U.S. meeting its CO<sub>2</sub> reduction targets of the Paris Agreement.<sup>20</sup> We projected the 20-year impact would lead to:

- An overall average shortfall of nearly 400,000 jobs;
- An average manufacturing shortfall of over 200,000 jobs;
- A total income loss of more than \$20,000 for a family of four;
- An aggregate gross domestic product (GDP) loss of over \$2.5 trillion; and
- Increases in household electricity expenditures between 13 percent and 20 percent.

The climate impact of these significant costs would be a moderation of global warming of only 0.03 degrees centigrade in 2100.<sup>21</sup>

The beginning of this testimony highlighted the amazing increase in the standard of living witnessed over the past 150 years. Though it may be hard to imagine, the next 150 years should see similar increases in wealth and amazing improvements in technology. In addition to providing a higher standard of living, economic growth provides for resiliency and protection against adversity of all sorts, whether from natural disasters, pandemics, or something else. Economic growth is, in a sense, an insurance policy.

The benefits of economic growth are most significant over long periods, but growth is also effective in the shorter run. Before the worldwide COVID pandemic, the U.S. economy, spurred by lower tax rates and reduced red tape, was recording record low unemployment rates for African-Americans and Hispanic Americans. In addition, wages at the lower end were growing faster than average for the first time in decades.

To ensure they reap the benefits of this increasing standard of living, we should deliver to our grandchildren a world that is not impoverished by antigrowth ideology, a world where major conflict is not driven by minor differences, and a world where leaders do not exaggerate problems so there will be a false crisis to exploit.

#### **PREPARED STATEMENT OF NEAL CRABTREE**

WELDER, PIPELINERS LOCAL UNION

APRIL 22, 2021

Chairman Brown and Ranking Member Toomey, thank you for the opportunity to testify today.

I live near Texarkana, Arkansas, and I am a member of Pipeliners Local Union 798. Local 798 is a trade union with more than 7,000 members, including skilled welders. I have been a welder for 25 years and have traveled throughout the United States to work on energy pipeline infrastructure. Being from a rural area of our country, opportunities are limited. I spent 2 honorable years in the U.S. Army and after that I've been serving my country providing the energy that has built us into the super power we are today.

Although it's an honor to speak with you, I have to admit, I'd rather be working. This time of year is the beginning of pipeline construction season. Like other industries in this country, pipeline construction suffered through 2020 because of COVID. Many projects were cancelled so we were looking forward to 2021 and the chance to be back working. Right now, over 88 percent of my Local Union members are out of work and have been for some time now.

I was lucky enough to be involved in the early stages of Keystone XL oil pipeline and had been working on the pipeline in Nebraska at the start of this year. But all that ended on January 20th when President Biden shut it down. His decision caused more than 1,000 union workers to lose their jobs and prevented thousands

<sup>20</sup> Kevin Dayaratna, Nicolas Loris, and David Kreutzer, "Consequences of Paris Protocol: Devastating Economic Costs, Essentially Zero Environmental Benefits", Heritage Foundation Report, April 13, 2016, <https://www.heritage.org/environment/report/consequences-paris-protocol-devastating-economic-costs-essentially-zero> (accessed April 21, 2021).

<sup>21</sup> Bjorn Lomborg, "Impact of Current Climate Proposals", Global Policy, November 9, 2015, <https://onlinelibrary.wiley.com/doi/full/10.1111/1758-5899.12295> (accessed April 21, 2021).

more from getting jobs this year. These are good union jobs. To have a project of this magnitude canceled is devastating.

It's hurting a lot of workers, a lot of families, and a lot of communities. We've got members of my Local Union who have been out of work for months, many of them for over a year now. They could have benefited from the jobs created by Keystone XL, matter of fact, the environment would have benefited from Keystone XL. The members of my Union feel like pawns in a chess game. We delivered the low energy prices that the public wanted, now it seems we're being sacrificed for a Green Experiment at the taxpayers' expense.

In my case, I was laid off three hours after President Biden took office. I never dreamed my own President would put me out of work building a pipeline that would've transported oil that's already coming into the country by rail. And to make matters worse he proclaimed that doing so was some major environmental victory when, in fact, it was just the opposite. What do I mean by that? It's simply safer, cleaner, and more environmentally friendly to transport oil by pipeline than it is by rail.

The Biden administration seems to think these Keystone pipeline jobs were just "temporary jobs" and so the impact of destroying them is not that bad. They don't seem to understand that a lot of careers in this country rely on temporary projects, especially careers in pipeline construction. A carpenter doesn't spend his whole career on the same house. A lawyer doesn't spend his whole career with the same client. The Keystone XL was our house to build this year, it was our client. The effects of canceling this project will be far reaching, not only for the workers but I also believe it will have negative effects on future projects that provide the reliable energy this country needs. I am very concerned by the Biden administration's attacks on the energy industry as a whole. In addition to cancelling Keystone, President Biden has banned new oil and gas leases on Federal lands, both onshore and offshore. That's going to kill tens of thousands of jobs, not just in the energy industry, but in other sectors indirectly supported by the energy industry.

According to John Kerry, workers who lose their jobs because of the Biden administration's policies should just go find jobs in Green Energy. Mr. Kerry and others seem to think construction workers don't have a particular set of skills and that if you work construction then you can do any construction job, like building wind farms and installing solar panels. That's an insult to me and every other blue collar worker in this country. My fellow Union members and I didn't go to college to learn to do what we do, but that doesn't mean we didn't spend years and years training on the job to advance ourselves to earn the wages that we do today.

Telling us to go find entirely new Green Energy jobs is like telling a lawyer there aren't going to be any more attorneys in this country, so you go be a dentist. Just because you're a professional doesn't mean you can work in any profession. What Mr. Kerry and others are telling us is that we've got to start all over in something we know absolutely nothing about. I've spent 25 years in my trade and when jobs are available, I'm compensated accordingly. Starting over in another field means you'll start at entry level positions with entry level pay. That's not an option for someone with mortgage payments, kids to raise, and health coverage to provide.

You'll never hear me complain about a private company's right to develop Green Energy. But I don't believe the Government should be destroying the right of a private company, like a pipeline developer, to upgrade our reliable energy infrastructure and putting Americans out of work in the process. In my view, there's just no justification for that.

Thank you for giving me the opportunity to share my experience and perspective. I look forward to answering any questions you have, matter of fact, I want my elected leaders to give me the tough questions and I beg you to. It's the only way to find solutions and perhaps some common ground.



**RESPONSES TO WRITTEN QUESTIONS OF CHAIRMAN BROWN  
FROM ERNEST MONIZ**

**Q.1.** Mr. Secretary, advanced generation nuclear energy production can play a key part of a clean-energy economy. It's my understanding that these next generation plants require a different fuel enrichment process compared to the nuclear plants of today. Yet, without a market for these advanced reactors, the private sector will likely not invest in the technology necessary for the high-assay, low-enriched uranium (HALEU) that will power these future plants. What role do you believe the U.S. Government should play to support the domestic manufacture of future nuclear technology—like HALEU processing—for both climate change as well as national security purposes?

**A.1.** The United States is in a period of unparalleled innovation in advanced nuclear reactor design, with a strong focus on modular reactors in the 50–300 MWe range and microreactors in the 1–10 MWe range. Private funding has played an important role in advancing these designs, but it is generally viewed that public-private partnerships will be needed for building the needed supply chains and deploying these technologies in a timely way. Congress has been supporting steps in this direction through cost-shared projects at the Department of Energy (DOE).

These technology advances may be critical for meeting ambitious greenhouse gas emissions reduction targets, especially the target of a net-zero emissions economy by mid-century. It is becoming widely understood that a reliable and resilient carbon neutral electricity system will need significant amounts of firm dispatchable zero-carbon power, as is provided by nuclear energy. Furthermore, many of the new technologies operate at much higher temperatures than today's prevalent light water reactors, thereby opening up industrial applications that need high quality heat and are otherwise difficult to decarbonize.

Most of these advanced nuclear reactors need HALEU fuel, and it is time to build the supply chain for the advanced reactors and for multiple other applications (more on this later). Demonstration projects for several of these advanced reactors are being planned for construction in the second half of this decade, so building the fuel supply capability now is timely.

Rebuilding an American nuclear supply chain will also position us better internationally. Having both attractive advanced modular nuclear reactor designs and the capacity to fuel them with HALEU will give U.S. companies an advantage for success in export markets. In turn, such success will greatly strengthen our position in negotiating bilateral 123 agreements with strong nonproliferation provisions. The current degraded state of the nuclear supply chain in the U.S. has weakened our negotiating position materially and deprived our companies of some developing markets for nuclear technology.

Consistent with these imperatives, the DOE is advancing a HALEU demonstration project in Piketon, Ohio, the site where the AC-100 uranium enrichment centrifuge was demonstrated a few years ago. The project will produce modest amounts of HALEU in 2022. I believe it is important to scale up this project, both to provide additional HALEU and to continue building the manufac-

turing capacity and supply chain for domestic-origin enrichment. Starts and stops make it extremely difficult to build a reliable high-tech supply chain.

I mentioned earlier multiple applications for HALEU beyond being an enabler for the new generation of advanced modular reactors and microreactors. An important need that serves our nuclear nonproliferation goals is replacing HEU in research reactors, many of which are U.S. origin but deployed both domestically and internationally. Another potential need is for deep space missions.

In addition, there are multiple national security needs for enriched uranium. The key requirement for meeting these needs is that the enriched uranium be “all-American”—that is, domestically produced uranium enriched by an American designed and built technology. This requirement derives from nonproliferation requirements in international agreements. The HALEU facility in Piketon will meet this requirement but will need to be expanded over time beyond the capacity needed to meet advanced reactor requirements. Such an expansion can use existing infrastructure built at considerable expense by DOE many years ago.

One of security needs is to produce LEU fuel for TVA light water reactors that produce tritium for the nuclear weapons stockpile. Another is production of HEU for Navy nuclear propulsion. These needs are currently being met by using DOE enriched uranium reserves, which are blended down with natural or depleted uranium to provide HALEU or LEU. While this consumption of reserves can continue for some time, I believe it is preferable to maintain the optionality afforded by retaining sufficient reserves, especially when the alternative of enriching natural uranium to LEU and HALEU is available. At some point, the reserves will be depleted and there will be no choice but to construct an American enrichment facility, and it must be remembered that nuclear facilities often take longer to construct than anticipated.

A decadal plan should be implemented now to build up enrichment capacity with American technology in a measured way, with an eye towards a stable sustainable manufacturing supply chain. The Piketon HALEU demonstration project can seed such a development in a timely way to meet advanced reactor needs in the next years and national security needs for the longer term.

For disclosure purposes, I note that I advise Centrus Energy Corporation on strategic matters.

ADDITIONAL MATERIAL SUPPLIED FOR THE RECORD

MAPS SUBMITTED BY ZOE LIPMAN, DIRECTOR, MANUFACTURING AND  
ADVANCED TRANSPORTATION, BLUEGREEN ALLIANCE

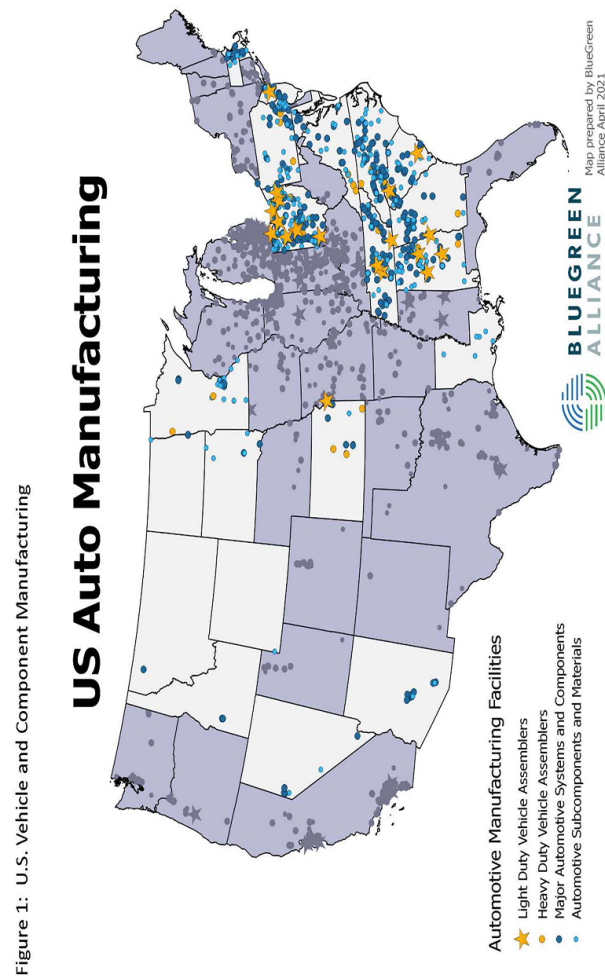


Figure 2: US Bus, Transit and Passenger Rail Manufacturing

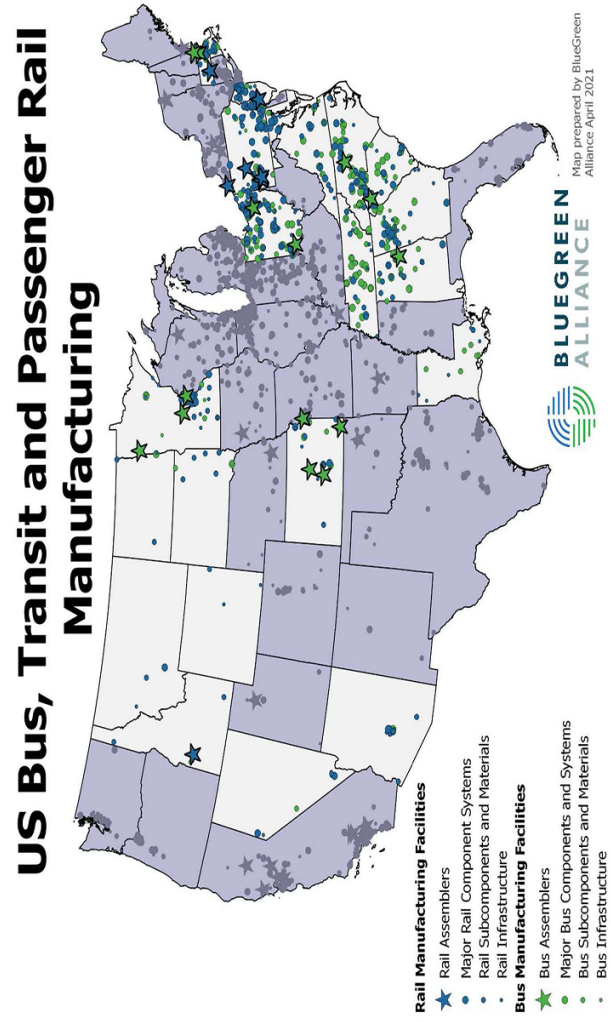


Figure 3: Vehicle and Component Manufacturing in Tennessee, additional detail

### Auto Manufacturing in Tennessee

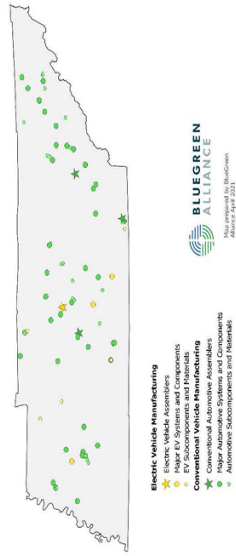


Figure 4: Rail, Auto and Select Industrial Facilities in Pennsylvania

### Selected Manufacturing and Industrial Facilities in Pennsylvania

