



LARRY HOGAN  
GOVERNOR

STATE OF MARYLAND  
OFFICE OF THE GOVERNOR

March 13, 2019

The Honorable Thomas V. "Mike" Miller, Jr.  
President  
Senate of Maryland  
State House, H-107  
Annapolis, MD 21401

The Honorable Paul G. Pinsky  
Chair, Education, Health & Environmental Affairs  
Committee  
11 Bladen Street, Suite 2 West  
Annapolis, MD 21401

The Honorable Michael E. Busch  
Speaker  
Maryland House of Delegates  
State House, H-101  
Annapolis, MD 21401

The Honorable Kumar P. Barve  
Chair, House Environment and Transportation  
Committee  
6 Bladen Street, Room 251  
Annapolis, MD 21401

Dear President Miller, Speaker Busch, Chairman Pinsky, and Chairman Barve:

On behalf of the State of Maryland, I am proud to submit our report on the state's participation in the U.S. Climate Alliance (Alliance). The report includes "any collaborations or partnerships among the Alliance members or external stakeholders; and any policies or program that the Alliance has endorsed, undertaken, or considered." *Annotated Code of Maryland*, Environment §2-1401(b). The Alliance now includes 23 participating states, has a full-time staff, and has coordinated a range of important actions and outreach activities among states.

Over the past year, Maryland has been very engaged in the national work of the Alliance, and has advanced regional and state climate initiatives that will reduce greenhouse gas emissions and strengthen our economy. The content of the report is a summary of the activities and priorities the Alliance, Maryland and other participating states worked on in 2018. Currently, the Alliance is working to develop a strategic plan for activities in 2019, 2020, and 2021.

The Maryland Department of the Environment looks forward to any questions or comments the committees may have upon review of the report. Please contact Secretary Ben Grumbles at 410-537-4187 with any questions or concerns.

Sincerely,

Larry Hogan  
Governor

cc: Sarah Albert, Department of Legislative Services (5 copies)  
Ben Grumbles, Secretary, Maryland Department of the Environment

**Maryland's  
Participation in the United  
States Climate Alliance**

**Annual Report 2018**

# TABLE OF CONTENTS

<b>INTRODUCTION .....</b>	<b>3</b>
<b>PARTICIPATING STATES.....</b>	<b>5</b>
<b>ALLIANCE INITIATIVES.....</b>	<b>6</b>
REDUCING SUPER POLLUTANTS .....	6
POWER SECTOR INVESTMENT AND MODERNIZATION .....	7
NATURAL AND WORKING LANDS .....	8
CLEAN TRANSPORTATION.....	9
ENERGY EFFICIENCY .....	9
CLIMATE RESILIENCE .....	9
<b>CONCLUSION .....</b>	<b>10</b>
<b>APPENDIX .....</b>	<b>11</b>
APPENDIX A: GOVERNOR’S LETTER COMMITTING MARYLAND TO PARTICIPATE IN THE U.S. CLIMATE ALLIANCE.....	12
APPENDIX B: MARYLAND’S ONE-PAGE SUMMARY .....	15
APPENDIX C: U.S. CLIMATE ALLIANCE FACT SHEET .....	17
APPENDIX D: U.S. CLIMATE ALLIANCE 2018 STRATEGY.....	20
APPENDIX E: U.S. CLIMATE ALLIANCE 2018 ANNUAL REPORT.....	24
APPENDIX F: U.S. CLIMATE ALLIANCE STATEMENT ON LEADERSHIP .....	64
APPENDIX G: JOINT STATEMENT ON NORTH AMERICAN CLIMATE LEADERSHIP .....	67
APPENDIX H: TALANOA DIALOGUE.....	70
APPENDIX I: U.S. CLIMATE ALLIANCE SHORT-LIVED CLIMATE POLLUTANT CHALLENGE .....	81
APPENDIX J: A ROADMAP FOR REDUCING SHORT-LIVED CLIMATE POLLUTANTS TO MEET THE GOALS OF THE PARIS CLIMATE AGREEMENT.....	83
APPENDIX K: NON-WIRES SOLUTION PLAYBOOK – REPORT OVERVIEW .....	146
APPENDIX L: U.S. CLIMATE ALLIANCE NATURAL AND WORKING LANDS CHALLENGE.....	149
APPENDIX M: NATURAL AND WORKING LANDS FACTSHEET.....	151
APPENDIX N: U.S. CLIMATE ALLIANCE CLEAN TRANSPORTATION FACTSHEET .....	154
APPENDIX O: U.S. CLIMATE ALLIANCE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION COMMENT LETTER .....	157
APPENDIX P: U.S. CLIMATE ALLIANCE RESILIENT COMMUNITIES, INFRASTRUCTURE AND NATURAL RESOURCES FACTSHEET .....	160

## **INTRODUCTION**

The United States Climate Alliance (the “Alliance” or “U.S. Climate Alliance”) is a bipartisan group of states and territories committed to meeting their obligations under the Paris Climate Agreement, while continuing to grow their economies. Currently, there are 17 participating states and territories, and the Alliance is eager to grow larger as more states begin to prioritize climate action. The Alliance formed in 2017 in response to President Trump announcing his intention to withdraw from the Paris Agreement. The states in the Alliance represent 40% of the U.S. population, and account for nearly \$9 trillion in combined economic activity.

The 2018 year marked the first year of accomplishment for the Alliance, as the group established a structure and added an executive director. On June 1, 2018, the U.S. Climate Alliance celebrated their one-year anniversary by announcing a wave of initiatives to accelerate and increase climate action across the Alliance states. The states worked together at the end of 2017 and in early 2018, to establish priorities that would return economic benefits while reducing the impacts of climate change. Despite federal efforts to repeal many federal climate and greenhouse gas (GHG) policies, the Alliance states are projected to achieve a combined 18-25 percent reduction in GHG emissions below 2005 levels by 2025. This is thanks to the hard work of each of the participating states, the U.S. Climate Alliance staff, and technical support from non-profits.

*The 2018 initiatives include:*

- Reducing emissions of short-lived climate pollutants
- Increasing Power Sector Investment and Modernization
- Increasing carbon sequestration on natural and working lands
- Decreasing carbon emissions from the transportation sector
- Coordinating state adoption of energy efficiency standards
- Increasing state resilience to climate impacts

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### **Maryland’s Role**

In January 2018, Governor Hogan proudly committed Maryland to participation in the U.S. Climate Alliance. When the president announced his intention to withdraw from the Paris Climate Agreement, Governor Hogan disagreed with the decision. It is important that there is aggressive but balanced action in states, communities, and businesses and the need for multi-state collaboration and international leadership on climate change grows stronger every day.

Over the course of 2018, Maryland has worked with the U.S. Climate Alliance states to share insights, experiences, and strategies in order to meet and excel beyond the requirements of the Paris Climate Agreement. Maryland has encouraged all participating states to adopt clean air standards and greenhouse gas goals as strong and aggressive as Maryland's. Through collaborative efforts, the U.S. Climate Alliance states are demonstrating leadership in addressing climate change and inspiring climate action throughout the United States.

During the past year, Maryland has been a leader and active participant in the Alliance, contributing our experience, knowledge, and cutting-edge research. Many participating states have looked to Maryland to learn from our collaborative and ground-breaking work on the Healthy Soils Initiative, the Climate Leadership Academy, the Maryland Commission on Climate Change, the Regional Greenhouse Gas Initiative, and the Transportation and Climate Initiative. The U.S. Climate Alliance has played an integral role in helping Maryland launch a regulatory initiative to phase out Hydrofluorocarbon (HFC) and also work to strengthen our forest and agricultural carbon sequestration programs.

# PARTICIPATING STATES

Each of the following member states commit to:

- Implement policies that advance the goals of the Paris Agreement, aiming to reduce greenhouse gas emission by at least 26-28 percent below 2005 levels by 2025
- Track and report progress to the global community in appropriate settings, including when the world convenes to take stock of the Paris Agreement, and
- Accelerate new and existing policies to reduce carbon pollution and promote clean energy deployment at the state and federal level.



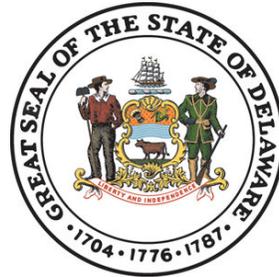
California



Colorado



Connecticut



Delaware



Hawaii



Maryland



Massachusetts



Minnesota



New Jersey



New York



North Carolina



Oregon



Puerto Rico



Rhode Island



Vermont



Virginia



Washington

## **ALLIANCE INITIATIVES**

The Alliance and participating states know there are significant actions needed to reduce GHG emissions. For this reason, the 17 participating Governors committed to accelerating climate action in 2018 that was based on collaborative and consistent efforts across the U.S. Climate Alliance states. Together the states developed six priority initiatives for 2018: Reducing Super Pollutants, Increasing Power Investment and Modernization, Natural and Working Lands, Clean Transportation, Increasing Energy Efficiency, and Increasing Climate Resiliency. Work groups on these priorities have met regularly to discuss roadmaps, model rules, and technical support to one another.

Maryland continues to encourage all participating states to adopt cleaner air standards and greenhouse gas goals as strong and aggressive as Maryland's. In addition, Maryland has found the Alliance's coordination helpful and encouraging as we advance actions and partnerships in our own state.

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### **Reducing Super Pollutants**

Short-lived climate pollutants (SLCPs), such as black carbon, methane, tropospheric atmospheric ozone, and HFCs, act as powerful greenhouse gases. U.S. Climate Alliance states are stepping up with state-level rules and programs to backstop against federal efforts to unwind reasonable regulations that reduce methane from oil and gas and landfills, HFCs, and black carbon from woodstoves. The Alliance states challenged all national and subnational jurisdictions to work to reduce SLCPs at the Global Climate Action Summit in September (Appendix I). This year the Alliance's main SLCP focus was reducing HFC emissions.

In Maryland, we accepted the SLCP Challenge (Appendix I) and are working to reduce black carbon, methane, tropospheric atmospheric ozone, and HFCs. Maryland has had a head start in addressing many of the SLCP initiatives, thanks to our accelerated climate action already in place. Maryland is using its knowledge and experience to help other states reduce their SLCP emissions, while also learning how we can further reduce SLCP emissions in Maryland.

#### *Black Carbon*

States are working to slash black carbon through local and state efforts to improve air quality and cut diesel pollution. Maryland has taken significant efforts to reduce black carbon through our work to meet the 40 percent GHG emissions reductions by 2030 in the Greenhouse Gas Reduction Act and our anti-idling campaign for diesel trucks. Maryland's Volkswagen mitigation plan will also reduce black carbon emission and help protect public health. Maryland

is sharing our accomplishments with the other Alliance states, to ensure states are doing the most they can to reduce black carbon emissions.

### *Methane*

To address methane, states are actively working to determine better techniques to capture and utilize methane from natural gas. To reduce methane pollution in the atmosphere, Maryland collaborated with the participating states to learn how states are cutting methane from oil and gas production and natural gas pipelines, as well as how to reduce methane release on dairy, poultry, and swine farms. Maryland is working with stakeholders to reduce methane emissions from compressor stations, landfills, and wastewater treatment plants, the three largest sources of in-state methane emissions. Maryland is looking forward to sharing our experiences as the Alliance expands their work to reduce methane emissions.

### *Tropospheric Atmospheric Ozone*

With the many SLCP initiatives, the Alliance did not make significant strides to develop a plan to reduce tropospheric atmospheric ozone. Maryland looks forward to being a model as the Alliance begins to reduce tropospheric atmospheric ozone in the future. In 2015, Maryland developed a requirement that provided important immediate NO<sub>x</sub> reductions. The 2015 requirements alone have achieved approximately 10 tons of additional NO<sub>x</sub> reductions on hot, peak energy demand days. Our experience in reducing NO<sub>x</sub> will be valuable to the other participating Alliance states.

### *Hydrofluorocarbons (HFCs)*

HFCs are used as refrigerants and in air conditioning, foams, aerosols, and other applications. The four Alliance states are currently working to phase-out HFC's. Maryland joined the first group of Alliance states to announce they would pursue HFC phase-out rules in 2019. Together, Maryland, New York, and Connecticut are working with California to develop consistent rules that would follow SNAP rule 20 and rule 21 in phasing out HFCs. The group of states is meeting and discussing the successes and challenges California met when adopting their rule, to ensure each state can smoothly adopt their own consistent rules.

## **Power Sector Investment and Modernization**

The U.S. Climate Alliance states are committed to reducing carbon emissions, while improving our economy. In the Alliance states, residents are reaping the benefits of market-based programs and grid modernization through cleaner air, more clean energy jobs, lower energy bills, and more resilient communities. Maryland has been a leader in the Alliance, as a RGGI participating state. Maryland is an example of how a cap and invest program, benefits residents. In addition, renewable portfolio standards across the participating Alliance states have encouraged \$110 billion in renewable energy investment since 2011 across the participating states. In addition, to

encourage Federal action on clean energy, the U.S. Climate Alliance states opposed the repeal of the Clean Power Plan.

Through the Power Sector Working Group, Maryland is working with other participating states to develop new tools and resources that benefit the electric grid and help meet renewable energy and emission reduction goals. Maryland is learning from other states on non-wire alternative projects. The work group is in the process of developing the Non-Wires Solution Playbook for utilities, regulators and developers to use as they begin to take action using non-wire alternatives (Appendix K).

### **Natural and Working Lands**

The U.S. Climate Alliance states are pursuing a wide range of actions and measures that support land conservation, improve ecosystem health, and sequester carbon. Alliance states have programs in place to support the rural economies, wildlife habitat, and water infrastructure that depend on healthy forests, which provide water resources to cities, towns, and farms. The Natural and Working Lands initiative of the United States Climate Alliance is identifying best practices for land conservation, management and restoration to develop a carbon storage policy framework for implementation (Appendix N). At the Global Climate Action Summit, the U.S. Climate Alliance challenged all national and subnational jurisdictions to reduce GHG emissions and protect and enhance carbon sequestration across all natural and working lands (Appendix M).

#### *NGO Partnerships*

Through the support of the Doris Duke Charitable Foundation (DDCF), the participating states worked with leading non-governmental organization (NGO) partners American Forests (AF), The Nature Conservancy (TNC), World Resources Institute (WRI), American Farmland Trust (AFT), the Coalition on Agricultural Greenhouse Gases (C-AGG), and Trust for Public Land (TPL) to pursue shared goals. Maryland and other states benefited from the technical expertise to support comprehensive action on natural and working lands for climate goals. The first product of the innovative partnership with leading NGOs was a series of Opportunity Assessments to support natural and working lands climate mitigation in Alliance states. The Opportunity Assessments identified the carbon sequestration and emissions reduction potential of land and coastal conservation, restoration, and management practices for land types.

#### *National Learning Lab: Natural and Working Lands*

On July 9th through 11th, American Forests hosted a Learning Lab in Washington, D.C. staffed by more than 50 leading experts in the field of land-based carbon mitigation from government, academia, nonprofits, landowners and industry. Alliance states were able to build on their Opportunity Assessments to create detailed, state-specific strategies that activate the best opportunities for carbon sequestration on natural and working lands. Maryland actively

participated, sharing our experience with the Healthy Soils Program. Since the Learning Lab, Maryland has assisted many states as they move forward with programs similar to our Healthy Soils Program.

## **Clean Transportation**

Alliance states continue to lead the nation in reducing passenger vehicle emissions by implementing policies and programs that advance the deployment of zero emission vehicles. Maryland is participating in the Clean Transportation work-group as they work to reduce the carbon footprint of the transportation sector. The Alliance states know that by shifting towards zero-emission vehicles (ZEVs), and working to reduce vehicle miles travelled, we can dramatically reduce our carbon pollution, create jobs, and protect the health of our communities (Appendix N).

Maryland, along with other participating Alliance states, is a member of the zero-emission vehicles (ZEV) program, which is working to increase ZEV sales and distribution, as well as increase our charging infrastructure. While a member of the U.S. Climate Alliance, Maryland has worked to educate others on the work of the Transportation Climate Initiative, and encouraged others to participate. Being a member of the U.S. Climate Alliance is another opportunity for Maryland to continue the conversation of cleaning-up our transportation system. Individually, all Alliance states invested as much as they could from the Volkswagen settlement funds into charging infrastructure. This effort will grow electrified corridors across the country. In addition, together, the Alliance states opposed recent efforts by the EPA and National Highway Traffic Safety Administration (NHTSA) to weaken the nation's clean car standards (Appendix O).

## **Energy Efficiency**

Various Alliance states are collaborating to advance energy efficiency standards for consumer products and appliances to save Americans billions in energy costs and cut greenhouse gas emissions. This new initiative is still developing. Maryland is excited to begin collaborating with participating states on new energy efficiency rules. By creating consistent rules, the participating states hope to ease the transition for industry and residents and help provide leadership across the nation.

## **Climate Resilience**

Improving the resilience of our communities, infrastructure, and natural resources has long been a priority in the U.S. Climate Alliance states. The participating states are now taking steps to better understand the human, physical and economic impacts of severe weather and climate change on their communities, especially those most vulnerable, to help plan and respond to a

changing climate. This analysis will ensure the participating states are investing in mitigation and adaptation actions that deliver benefits that far exceed the costs of inaction (Appendix P).

All of the Alliance states have conducted state impact assessments, and the vast majority has a climate resilience plan in place or under development. Maryland has shared with the other states our CoastSmart Communities Program, which assists coastal communities to address short- and long-term coastal hazards, such as coastal flooding, storm surge, and sea level rise by connecting local planners to essential resources, information, tools and trainings. In addition, states are following our Maryland Climate Leadership Academy, to learn from the successes of the program. Coordinated action with the other Alliance states builds on Maryland's leadership in helping to protect our residents from climate impacts.

## **CONCLUSION**

Maryland appreciates the opportunities for collaboration and assistance in the U.S. Climate Alliance. Member states are working together to meet GHG reduction goals outlined in the Paris Climate Agreement. Maryland is proud to be a part of the Alliance and to be a leader in reducing GHG emissions nationwide.

# **APPENDIX**

**Appendix A: Governor's Letter Committing Maryland to Participate in the U.S. Climate Alliance**



STATE OF MARYLAND  
OFFICE OF THE GOVERNOR

LARRY HOGAN  
GOVERNOR

January 10, 2018

Julie Cerqueira  
Executive Director  
US Climate Alliance  
United Nations Foundation  
1750 Pennsylvania Avenue NW, Suite 421A  
Washington, DC 20006

Dear Executive Director Cerqueira:

Maryland is proud to be a leader in protecting our environment and fighting climate change and commends other states and commonwealths for their efforts to find the right balance for environmental, economic, and energy progress. In Maryland, we are living proof that it is possible to both protect the natural world around us while also fostering a pro-jobs and vibrant economic opportunity environment.

When the president announced his intention to withdraw from the Paris climate accord, I said I disagreed and that it was not a decision I would have made. That continues to be my position. The fact is that Maryland's clean air standards were already significantly stronger than the Paris climate accord, and they still are. Most importantly, the importance of aggressive but balanced action in states, communities, and businesses and the need for multi-state collaboration and international leadership on climate change grows stronger every day.

For all of these reasons and others detailed below, I now intend to commit Maryland to participation in the U.S. Climate Alliance. Over the course of 2018, we will share our insights, experiences, and strategies in meeting and excelling beyond the requirements of the Paris climate accord and the Clean Power Plan.

Most importantly we will be using this opportunity to encourage all states, especially those in the U.S. Climate Alliance, to adopt clean air standards and greenhouse gas goals as strong and as aggressive as Maryland's. As we all know, there are many states that fall well below those standards. In our state, we believe that you have to do more than just talk about protecting the environment; you have to actually do the work.

From the very beginning, our administration has been fully committed to protecting the environment, and our bipartisan accomplishments before and after the president's announcement should be shared with others as a reminder of what is possible when leaders work across state and party lines and learn from one another.

Maryland is on track to meet its goal of reducing greenhouse gas emissions by 25 percent by 2020 under the state's greenhouse gas reduction law, which I signed into law in 2016, and we are working on a comprehensive plan to meet the even more ambitious goal of 40 percent by 2030. As you know, these goals are significantly stronger than the Paris climate accord and more aggressive than 48 other states. In 2015, I was proud to sign into law a bill creating the Commission on Climate Change, chaired by my secretary of the environment, which is a model in bipartisan, science-based discussion of climate and energy policy.

Maryland is also very active in and committed to the Regional Greenhouse Gas Initiative (RGGI), a bipartisan, nine-state collaborative to cap emissions from power plants and strategically invest revenues into energy and the environment. Our state is proud of its role over the last year in strengthening, extending, and - we hope - expanding the size and reach of RGGI. We are actively encouraging the leadership in Virginia, New Jersey, North Carolina, and Pennsylvania to join RGGI. Maryland is also engaged in other important partnerships such as the Transportation and Climate Initiative and the Climate Registry.

Recently, Maryland participated extensively in the United Nations Conference on Climate Change in Bonn, Germany in November 2017. My representative, Maryland's Environment Secretary Ben Grumbles, was there to learn from others, but also to show the world that Maryland means business when it comes to reducing greenhouse gas emissions, advancing clean energy, and increasing community resiliency and preparedness. It was also an opportunity to learn more about the emerging structure and work plan of the U.S. Climate Alliance, which now has an executive director and established workgroups to track progress among the states.

In closing, as long as the U.S. Climate Alliance adds value, shows true bipartisanship, and avoids Washington D.C.'s politics-as-usual, corrosive tactics and distractions, we will gladly invest our time and energy with state colleagues for this cause.

We look forward to working with you.

Sincerely,



Larry Hogan  
Maryland Governor

Cc: Governor Jerry Brown  
Governor Jay Inslee  
Governor Andrew Cuomo

**Appendix B: Maryland's One-Page Summary**



# Maryland

GHG Reduction Target  
% Below 2005 Levels

**40%** by 2030      **80–95%** by 2050

Renewable Energy  
and Energy Efficiency Jobs

**76,685**  
Jobs in 2018  
(EFI & NASEO, 2018)

RPS Target

**25%**  
by 2020

## Climate Framework and Laws

The **Maryland Commission on Climate Change (MCCC)** was established by executive order in 2007 to develop an action plan for mitigation of and adaptation to the likely impacts of climate change in Maryland. The MCCC is charged with advising the Governor and General Assembly on ways to mitigate the causes of, prepare for, and adapt to the consequences of climate change. In 2009, Maryland passed the **Greenhouse Gas Reductions Act** which calls for 25% emissions reductions by 2020. The 2016 update, adopts a 40% reduction of greenhouse gas emissions by 2030 and a hopeful goal of 80%–95% reduction by 2050. MDE will present a draft **40 by 30 Plan** by the end of 2018.

## Energy

Maryland is a member of the **Regional Greenhouse Gas Initiative**. Auction proceeds from RGGI fund various state and local programs which promote energy efficiency, renewable energy, bill assistance, or other consumer benefits. Maryland recently passed a bill that accelerates the state’s RPS to 25% in 2020.

## Energy Efficiency

Maryland’s **EmPOWER Energy Efficiency Program** charges utility customers a monthly fee that is then used to fund programs including lighting and appliance rebates for homeowners, energy efficiency services for industrial facilities, home energy assessments, and various other types of incentives. Maryland has a **Weatherization Assistance Program** that helps eligible low-income households across the State of Maryland with the installation of energy conservation materials in their dwelling units. In 2013, Maryland passed and signed into law the **Maryland Offshore Wind Energy Act of 2013**. In May 2017, the PSC announced in **Order No. 88192** that two projects, amounting to 368 MW of total capacity, were approved (with conditions) to receive ORECs.

## Transportation

Maryland is a member of the **Transportation Climate Initiative** with the goal of developing the clean energy economy and reducing greenhouse gas emissions in the transportation sector. Maryland is a member of the **Multi-State ZEV Task Force** and has a goal of having 60,000 ZEVs on the road by 2020 and 300,000 ZEVs on the road by 2025. It offers the **Maryland Excise Tax Credit** of up to \$3,000 and a rebate of up to 40% through the **Electric Vehicle Supply Equipment Rebate**. The **Maryland Clean Cars Program**, adopted in 2007, commits the state to follow California’s Low Emission Vehicle Standards.

## Resilience

The **CoastSmart Communities Program** assists Maryland’s coastal communities to address short and long-term coastal hazards, such as sea level rise, by providing technical assistance and training opportunities, along with financial assistance through the **Community Resilience Grant Program**. In 2018, Maryland launched the **Climate Leadership Academy** to provide climate training and support to state and local government officials, citizens, the private sector, and non-profits.

## Climate Finance

In addition to the various incentives and programs administered through **EmPOWER Maryland**, the Maryland Energy Administration’s **Energy Finance Initiative** is a collection of programs, financing tools, and other resources designed to help fill the funding needs of clean energy projects.

## Natural and Working Lands

Maryland established the **Maryland Healthy Soils Program** to increase biological activity and carbon sequestration in the State’s soils by promoting practices based on emerging soil science, through incentives, research, education, technical assistance, and financial assistance for farmers.

**Appendix C: U.S. Climate Alliance Fact Sheet**

# UNITED STATES CLIMATE ALLIANCE

The [United States Climate Alliance](#) is a bipartisan coalition of 17 governors committed to reducing greenhouse gas emissions consistent with the goals of the Paris Agreement. The Alliance is led by state governments, and is focused on state-to-state cooperation to accelerate the deployment of climate solutions needed to help each achieve their climate goals.

The Alliance represents 40 percent of the U.S. population and a \$9 trillion economy – an economy larger than all countries but the United States and China. The climate and clean energy policies in Alliance states have attracted billions of dollars of new investment and helped create more than 1.3 million clean energy jobs, nearly half the U.S. total. Independent analysis highlighted in the Alliance’s [2018 Annual Report](#) shows that Alliance States are not only outpacing non-Alliance states in reducing their emissions, they are also growing their economies at a faster pace. Between 2005 and 2016, Alliance States reduced their emissions by 14 percent compared to 11 percent. In that same time period, the combined economic output of Alliance states grew by 16 percent while the rest of the country grew by only 14 percent. The Alliance is demonstrating that climate leadership and economic growth go hand-in-hand.



## Our Principles

**States are continuing to lead on climate change:** Alliance states recognize that climate change presents a serious threat to the environment and our residents, communities, and economy.

**State-level climate action is benefitting our economies and strengthening our communities:** Alliance members are growing our clean energy economies and creating new jobs, while reducing air pollution, improving public health, and building more resilient communities.

**States are showing the nation and the world that ambitious climate action is achievable:** Despite the U.S. federal government’s decision to withdraw from the Paris Agreement, Alliance members are committed to supporting the international agreement, and are pursuing aggressive climate action to make progress toward its goals.

## Our Commitments

Alliance States commit to:

- Implement policies that advance the goals of the Paris Agreement, aiming to reduce greenhouse gas emission by at least 26-28 percent below 2005 levels by 2025
- Track and report progress to the global community in appropriate settings, including when the world convenes to take stock of the Paris Agreement, and
- Accelerate new and existing policies to reduce carbon pollution and promote clean energy deployment at the state and federal level.

## Our Priority Sectors:

### ○ CLIMATE RESILIENCE

Alliance states know too well the devastating effects of climate change and extreme weather. We are working together to enhance the resilience of our infrastructure to extreme weather events through improved procurement practices, and analyzing the physical and economic impacts of climate change on our communities. We are also coordinating on the development and implementation of technical tools to support community resilience, including mapping to identify the risk posed by combined sea level rise, storm surge and extreme precipitation.

### ○ CLEAN ENERGY FINANCE

In the coming decades, Alliance states will invest trillions in clean energy, critical infrastructure and climate change mitigation. To minimize climate risk and maximize economic growth, Alliance States are collaborating on clean energy investment, focusing on new insurance and risk mitigation approaches, building upon the success of established finance tools and Green Banks, and working together across the board on finance-related opportunities.

### ○ POWER SECTOR MODERNIZATION

Alliance states are leading the way in rethinking traditional electric utility regulation to accommodate rapidly changing technology, meet renewable energy and emission reduction goals, and build clean, resilient and affordable electricity markets for the future. Working together, Alliance states can develop new regulatory tools and resources that benefit the country as a whole, share best practices, and expand and strengthen carbon markets.

### ○ PRODUCT ENERGY EFFICIENCY STANDARDS

Alliance States have been at the cutting edge of energy efficiency policy nationally. Coordinated policy action among Alliance states can drive the development and design of new building engineering and construction models that could be replicated across the country, and can transform national markets for energy-consuming equipment and appliances.

### ○ ADVANCED TRANSPORTATION

Alliance States represent nearly a third of total light duty vehicle sales and nearly two thirds of electric vehicle sales nationally. Coordinated action to drive zero emission vehicle deployment and clean fuel development can transform the national vehicle market. Alliance States are cooperating on comprehensive approaches to clean up America's transportation system and protect the health of their citizens from vehicle pollution.

### ○ NATURAL RESOURCES

Alliance States have established the most ambitious and innovative approaches to protecting our precious natural resources. Together, we are enhancing state-level stewardship of natural resources, including approaches to reduce and phase out short-lived, high-intensity pollutants that impact the health of our citizens and damage our environments.

## Our Priority Cross-Cutting Initiatives:

### ○ GREENHOUSE GAS INVENTORIES & PROJECTIONS

Alliance states are cooperating to improve their greenhouse gas inventories and projections in order to strengthen policy-making and track and report progress towards our ambitious climate targets.

### ○ CLIMATE CLEARINGHOUSE

Responding to climate change requires data-driven coordination. To coordinate and integrate state-led climate efforts, the U.S. Climate Alliance is building a Climate Clearinghouse — an online platform that aggregates state-specific climate tools, maps, data, and information for use by policymakers and the public.

### ○ INTERNATIONAL ENGAGEMENT

The Alliance is engaging internationally to inspire others to make progress towards the goals of the Paris Agreement. Alliance States are working across borders to share best practices and further drive down emissions, including through regional initiatives such as the North America Climate Leadership Dialogue.

**Appendix D: U.S. Climate Alliance 2018 Strategy**

# UNITED STATES CLIMATE ALLIANCE

## 2018 STRATEGY

### VISION

The U.S. Climate Alliance will demonstrate leadership in addressing climate change by meeting or exceeding its share of the U.S. contribution to the Paris Agreement goals, and by protecting Americans from the impacts of unavoidable climate change. The Alliance will further inspire climate action in the United States and abroad so that the world may avoid catastrophic climate change by limiting temperature increases to well below 2°C, striving for below 1.5°C.

### COMMITMENT TO ACTION

Each Alliance State commits to:

- Implement policies that advance the goals of the Paris Agreement to reduce greenhouse gas emissions by at least 26-28 percent below 2005 levels by 2025;
- Track and report progress to the global community in appropriate settings, including when the world convenes to take stock of the Paris Agreement; and
- Accelerate new and existing policies to reduce carbon pollution and promote clean energy deployment at the state and federal level.

### APPROACH

Through their leadership and state-led tools and initiatives, Alliance Governors can reshape the United States into a low-carbon economy and demonstrate that fighting climate change is a winning strategy for the nation.

The Alliance will accelerate and scale-up near-term emission reductions in the United States by advancing state climate action and collaborating on multi-state approaches to reduce greenhouse emissions. Alliance States are committed to collectively reduce their emissions by at least 26-28% below 2005 levels by 2025, to make progress toward the United States' commitment under the Paris Agreement, and to do more wherever possible. We do this to inspire in 2020 or before announcements of enhanced ambition by Parties to the Paris Agreement.

Even with drastic emission reductions, some impacts of climate change are unavoidable. To reduce the vulnerability of our communities, ecosystems, and economies to severe weather events and other climate change-related impacts, the Alliance will deepen cooperation among states and other entities to enhance climate resilience.

Core to the Alliance's vision is a commitment to create and maintain U.S. jobs, grow a low-carbon economy, and create opportunities for U.S. firms to provide climate solutions to the world's markets.

By demonstrating and promoting climate leadership at home, the Alliance aims to inspire climate action and discourage backsliding on climate commitments abroad.

## | 2018 FOCUS

In 2018 the Alliance will focus on establishing core organizational capacity; operationalizing Climate Alliance Working Groups; demonstrating tangible progress on priority climate actions; and communicating success. As the Alliance demonstrates success, it will focus on growth and additional steps.

In 2018 the Alliance will focus on the following actions:

### **1. Accelerate the implementation of Alliance State climate priorities and ambitions**

Through dialogue, the sharing of expertise and best practices, and technical cooperation, Alliance States will deliver results in 2018–2020 and serve as models for others.

The Alliance will launch a consortium to bring together state and outside experts that can fill technical assistance gaps to enable *implementation* of state climate policies and programs and deploy low-carbon solutions.

The Alliance also plans to launch a U.S. Climate Alliance Clearinghouse that curates data and tools into a user-friendly, interactive platform. The Clearinghouse will support the development of climate policy and preserve climate-related information at risk of being lost.

### **2. Strengthen business opportunities and job creation in the low-carbon economy**

Alliance States will partner with key groups to help create opportunities for U.S. businesses to tap international markets and attract investment in U.S. low-carbon technology infrastructure. Alliance States also will share their experiences in creating green jobs, identifying and implementing workforce development strategies, and addressing job displacement. By cooperating to improve the resilience of infrastructure, Alliance States will help minimize losses to businesses and communities from severe weather events.

### **3. Scale up climate action domestically and internationally**

Alliance States will help lead the way in scaling up climate action by integrating approaches across states, in the private sector, and beyond national borders. By doing so, the Alliance will help build momentum for high-impact global action.

State-level: Through Climate Alliance Working Groups, Alliance States will identify initiatives that can drive near-term, mid-term and long-term state-level clean energy and climate action. Working Groups will seek opportunities across all sectors of the economy, drawing from progress made in leading states, while engaging partners to share and scale best practices and successful strategies.

National: Given the large number and economic power of Alliance States, the Alliance’s climate efforts can have a national impact. The Alliance will work with non-Alliance states on successful policy models, focusing on the climate benefits and other benefits of specific initiatives. The

Alliance will engage with these states to include them in policy and technical dialogues, while it seeks to add new states as members. The Alliance also can set de-facto national standards or strong market signals throughout the U.S. economy, such as for appliances, vehicles, power generation, and other important climate-related areas. The Alliance will serve as an incubator for national climate action in 2020 or later. By demonstrating that coordinated climate action is good for Americans and the U.S. economy, a willing U.S. administration could build on the Alliance's work to scale up initiatives nationally.

International: Alliance States will cooperate with other countries and subnational jurisdictions to coordinate climate actions that are enhanced through cross-border cooperation.

Multi-stakeholder: By coordinating action with the general public, business community, local governments, nonprofits, foundations and other stakeholders, the Alliance will strive to support stakeholder commitments and make global progress toward achieving priority climate goals.

**4. Communicate climate action by the Alliance and others, both domestically and abroad, to demonstrate and inspire continued leadership**

The Alliance will develop the communications capacity necessary to demonstrate sub-national leadership, and build support for enhanced action and expanded participation.

The Alliance will cooperate with stakeholder coalitions to communicate U.S. climate leadership, support international climate negotiations, discourage backsliding abroad, and increase international recognition of the Alliance states.

**Appendix E: U.S. Climate Alliance 2018 Annual Report**

# Fighting for our Future

Growing our economies  
and protecting our  
communities through  
climate leadership



# Fighting for our Future

Growing our economies  
and protecting our  
communities through  
climate leadership

## Contents

Message from the Co-Chairs	2
United States Climate Alliance Principles	3
Executive Summary	4
How Far We Have Come	6
Climate Leadership by Alliance Members	12
California	13
Colorado	14
Connecticut	15
Delaware	16
Hawaii	17
Maryland	18
Massachusetts	19
Minnesota	20
New Jersey	21
New York	22
North Carolina	23
Oregon	24
Puerto Rico	25
Rhode Island	26
Vermont	27
Virginia	28
Washington	29
Continuing to Lead on Climate	30
Setting the Stage for Accelerated Action	32
Appendix	34

# Message from the Co-Chairs

The United States Climate Alliance is committed to protecting all Americans and their livelihoods by fighting climate change. We continue to take action while our communities confront the devastating impacts of extreme weather and climate disasters. Record-breaking economic and environmental damages occurred in our states in 2017 and 2018. Wildfires in the western United States are destroying homes, claiming lives, and forcing thousands of people to evacuate. Severe storms caused extended power outages in the Northeast and devastating flooding in the Southeast.

These challenges underscore the significance of the U.S. Climate Alliance, a burgeoning group of states and territories acting in concert to address the causes of climate change. Since last summer, our Alliance has grown from three to 17 governors representing more than 40 percent of the U.S. population. Together, we have advanced climate leadership, turning verbal commitments into tangible action. We are tackling ‘super pollutants,’ expanding clean energy financing, and storing carbon in landscapes. We are modernizing our electric grids, harnessing renewable energy, advancing appliance efficiency standards, building resilient infrastructure, and deploying clean transportation.

By leading on climate, we have already reduced our collective greenhouse gas emissions 14 percent below 2005 levels – halfway toward our collective share of the

U.S. Paris Agreement target for 2025. Our actions support 1.3 million clean energy jobs while spurring economic growth that exceeds the rest of the nation. Our experience proves that climate action can go hand-in-hand with benefits for our residents, economies, and the environment.

While Alliance states maintain an unwavering commitment to protecting all Americans and the environment, our task has been made more difficult due to the dismantling of federal climate and environmental policies. The new analysis contained in this report projects that as a direct result of federal rollbacks, the nation – including the Alliance states – will fall further behind in our efforts to fulfill our commitments. Until federal leadership is restored, we can only make progress through additional, concerted efforts by individual states. Consequently, we are expanding our efforts to ensure we can meet our share of the nation’s commitment under the Paris Agreement through a series of individual and collective actions and commitments.

When we formed the U.S. Climate Alliance, we committed to transparency, accountability, and acceleration of climate action. Today we re-affirm this commitment and vow to continue our bipartisan efforts to reduce harmful emissions. Science and our concern for our residents, not politics, drives our action. U.S. Climate Alliance states are exploring innovative advances in all sectors and enacting policy to move us toward our goal.



**Andrew M. Cuomo**  
Governor, New York



**Edmund G. Brown Jr.**  
Governor, California



**Jay Inslee**  
Governor, Washington



# U.S. Climate Alliance Principles

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## **States are continuing to lead on climate**

**change:** Alliance states recognize that climate change presents a serious threat to the environment and our residents, communities, and economy.

**State-level climate action is benefitting our economies and strengthening our communities:** Alliance members are growing our clean energy economies and creating new jobs while reducing air pollution, improving public health, and building more resilient communities.

**States are showing the nation and the world that ambitious climate action is achievable:** Despite the U.S. federal government's decision to withdraw from the Paris Agreement, Alliance members are committed to supporting the international agreement and are pursuing aggressive climate action to make progress toward its goals.

## **Each member state commits to:**

**Implement** policies that advance the goals of the Paris Agreement to reduce greenhouse gas emissions by at least 26–28 percent below 2005 levels by 2025;

**Track** and report progress to the global community in appropriate settings, including when the world convenes to take stock of the Paris Agreement; and

**Accelerate** new and existing policies to reduce carbon pollution and promote clean energy deployment at the state and federal level.

# Executive Summary

*The bipartisan U.S. Climate Alliance formed in response to the President's decision to withdraw from the Paris Agreement. Over the course of its first year, we have grown to 17 states and territories, representing a wide diversity of people, places, and economic activity. We are home to 40 percent of the U.S. population and account for nearly \$9 trillion in combined economic activity – enough to be the world's third largest country.*

The U.S. Climate Alliance remains committed to the Paris Agreement and to meeting our share of the U.S. Nationally Determined Contribution – a 26–28 percent reduction in greenhouse gas (GHG) emissions below 2005 levels by 2025 – while continuing to grow our economies. The climate challenge demands an urgent and ambitious response. We call on other states and territories to join us, on local and business leaders to work with us, and on the community of nations to take every measure necessary to meet and strive to exceed their Nationally Determined Contributions.

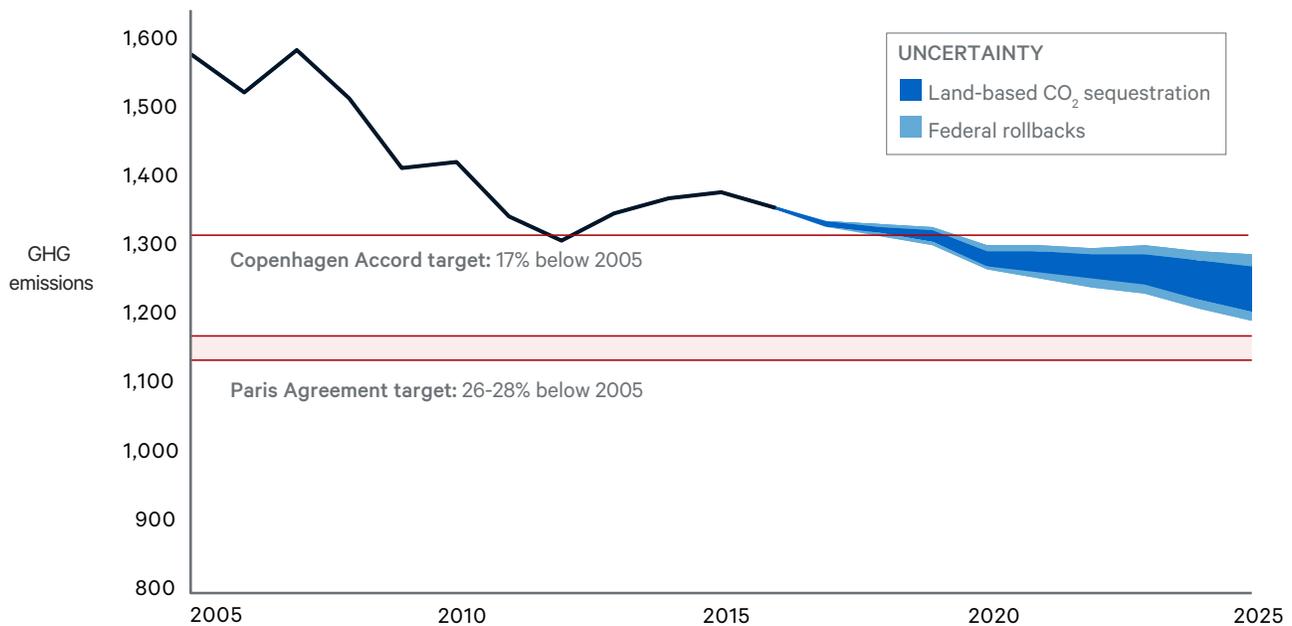
## How Far We Have Come

As the federal government weakens common-sense climate policies aimed at protecting the health of our communities, creating opportunities for innovation, and expanding the economy and access to good jobs, we are doubling down on our commitment to meeting our share of the U.S. emissions reduction target. We are already more than halfway towards this goal, reducing our GHG emissions by 14 percent below 2005 levels. We have achieved this while growing our economies faster than the rest of the country – outpacing all other states across every sector. We are putting more zero-emission vehicles on the road and helping to reduce our nation's dependence on oil. We are generating more renewable energy and generating billions of dollars in public health benefits. We are restoring, maintaining, and sustainably managing our forests while sequestering carbon to offset GHG emissions. Altogether, the clean energy and climate policies we have in place are leading to more clean energy jobs, lower energy bills, a healthier environment, and more resilient communities.

## Continuing to Lead On Climate

Independent analysis finds that Alliance states will continue to lead the nation in reducing GHG emissions in the years ahead. Based on climate and clean energy policies already in place across Alliance states, we are projected to achieve a combined 18–25 percent reduction in GHG emissions below 2005 levels by 2025 (Figure ES-1). This range reflects a higher projection of our future GHG emissions from last year, with a significant portion being the direct result of attempts to dismantle federal climate policies. Since the release of our report last year, the Clean Power Plan has been repealed, and many other federal policies are now in jeopardy. This includes rules that would phase-down emissions of super-pollutants used in air-conditioning and refrigeration, fuel economy standards for passenger vehicles, and methane standards for oil and gas activities and landfills. Despite Alliance states advancing our clean energy and climate policies, the scale of proposed federal rollbacks is threatening state efforts to meet our share of the U.S. climate target for 2025. At the same time, U.S. Climate Alliance membership has grown, both in diversity and the share of national emissions the Alliance is working to drive down. We also continue to make methodological updates to improve the accuracy and transparency of our efforts, which has uncovered even steeper growth in hydrofluorocarbon (HFC) emissions and less carbon sequestration from land use and forests than previous national estimates, shedding light on the need to prioritize immediate action in these sectors. With these findings, we now are even more resolved to accelerate our efforts to help fill the federal gap on climate leadership.

**FIGURE ES-1 U.S. Climate Alliance progress under today’s policies sets the stage for accelerated action**  
 Net GHG emissions from Alliance states, million metric tons carbon dioxide (CO<sub>2</sub>) equivalent



**SOURCE:** Rhodium Group’s U.S. Climate Service **NOTES:** GHG emissions estimates reflect emissions from power generated within state boundaries. Uncertainty in CO<sub>2</sub> sequestration from forests and other lands are derived from U.S. Environmental Protection Agency (EPA) and U.S. Department of Agriculture (USDA) estimates. Federal rollbacks include federal Corporate Average Fuel Economy (CAFE) standards, EPA and Bureau of Land Management (BLM) methane standards for oil & gas activities and landfills, and EPA’s Significant New Alternatives Policy (SNAP) Rule 20 and the Kigali Amendment for phase-down of hydrofluorocarbons (HFCs). For more information see the Technical Appendix. Emissions from Puerto Rico include only CO<sub>2</sub> associated with fossil fuel consumption.

### Setting the Stage for Accelerated Action

We know there is more to be done. That is why the U.S. Climate Alliance states commit to taking additional actions, independently and with one another, to:

- Drive down emissions of short-lived climate pollutants, namely methane, HFCs, and black carbon,
- Increase carbon sequestration on natural and working lands,
- Deeply decarbonize our transportation sector, including investing billions of dollars in zero emission vehicle infrastructure and vehicle deployment, and working together to increase emissions-free mobility options,
- Coordinate on the adoption of product energy efficiency standards,

- Help lessen the impacts of the federal solar import tariffs,
- Identify innovative alternatives to traditional utility investments like distributed solar resources and storage to modernize and decarbonize our electric grid, and
- Help states and communities become more resilient to climate impacts and extreme weather events.

To deliver on these commitments, we will continue working together and through strategic partnerships to ensure that we are taking smart, coordinated action to grow our clean energy economies and continue to reduce our GHG emissions consistent with the goals of the Paris Agreement. We will share our experiences, successes, and lessons learned to encourage other states to take similar actions.

# How Far We Have Come

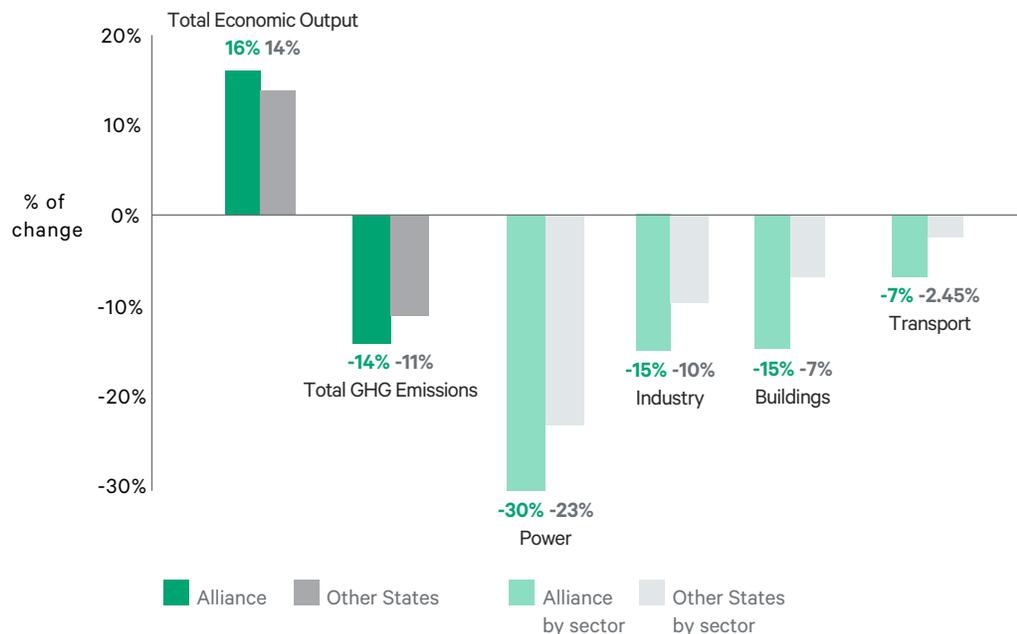
*We are already more than halfway to our emission target under the Paris Agreement – while outperforming other states in economic growth.*

The United States Climate Alliance formed in 2017 in response to the President’s decision to withdraw from the Paris Agreement. In 2018, the Alliance has welcomed two additional states – Maryland and New Jersey – bringing the total to 17 states and territories that are home to more than 40 percent of U.S. population. We represent a wide diversity of people, places, and economic activity, accounting for nearly \$9 trillion in combined economic activity (almost half the U.S. total) – enough to be the world’s third largest country.<sup>1</sup>

A core commitment of the Alliance is to deliver greenhouse gas (GHG) emissions reductions consistent with the goals of the Paris Agreement and the U.S. pledge to reduce net emissions by 26–28 percent below 2005 levels by 2025. Alliance states have already made impressive progress toward achieving this goal. Independent analysis from the Rhodium Group finds that between 2005 and 2016, Alliance states collectively reduced net GHG emissions by 14 percent, compared with 11 percent for the rest of the nation (Figure 1). In all major sectors of the economy, Alliance states have outpaced all other states, with GHG emission reductions from the power sector hitting 30 percent below 2005 levels, and emissions from industry and buildings dropping 15 percent in the same time frame. Efforts to support cleaner cars and trucks in Alliance states, like zero-emission vehicle incentives and mandates, have reduced transportation emissions at three times the rate of the rest of the United States.

**FIGURE 1 Alliance States Lead in Emission Reductions and Economic Growth**

Change in net GHG emissions by sector and economic output, 2005 to 2016



SOURCE: U.S. Bureau of Economic Analysis, Rhodium’s U.S. Climate Service

Our states are driving these reductions at the same time as we are growing our economies faster than the rest of the country. Between 2005 and 2016, the combined economic output of Alliance states grew by 16 percent while the rest of the country grew by only 14 percent (Figure 1).

*In the face of the growing threat posed by climate change, the Alliance is taking the lead in investing in clean energy and energy efficiency. And it is paying off.*

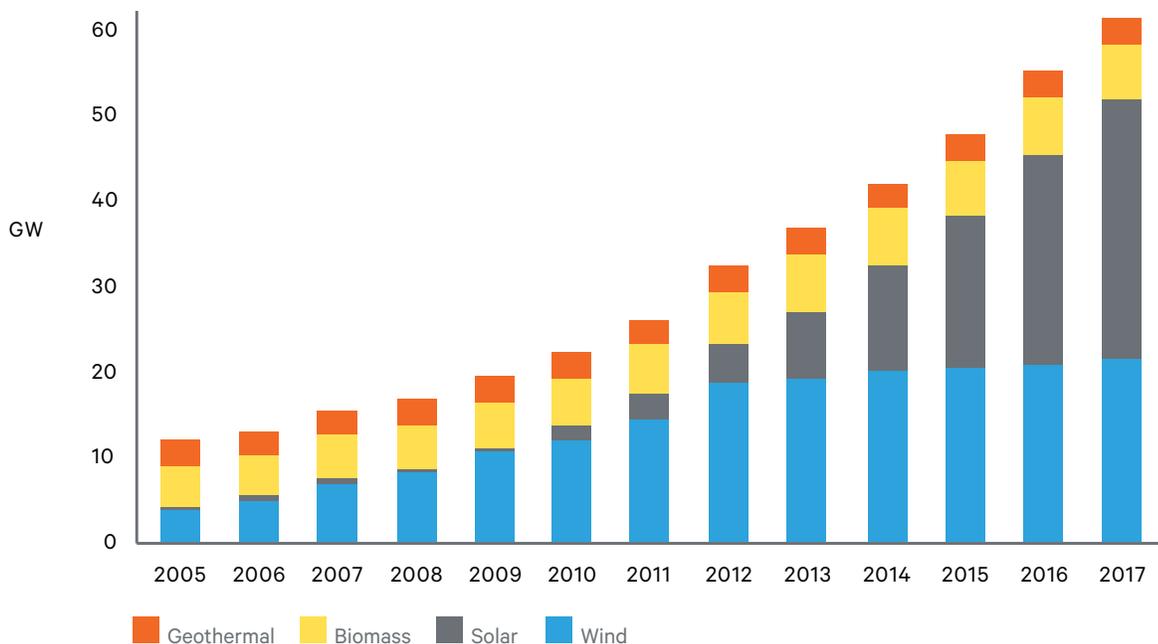
Alliance states are at the forefront of implementing **market-based programs** to reduce carbon emissions cost-effectively. Our residents are reaping the benefits of these, and many other policies and regulations, through cleaner air, more clean energy jobs, lower energy bills, and more resilient communities. For example, California’s multi-sector cap-and-trade program took effect in early 2012 with its economy continuing to grow while also reducing emissions – between 2015-16, California’s Gross Domestic Product (GDP) grew 3 percent while the carbon

intensity of its economy declined by 6 percent.<sup>2</sup> Seven Alliance states participate in the Regional Greenhouse Gas Initiative (RGGI) program in the Northeast, which establishes carbon pollution caps for regional power plants and invests in new clean energy opportunities, with two more states advancing similar programs. A recent analysis finds that RGGI states have reduced their power plant CO<sub>2</sub> emissions by more than 50 percent since the program started nine years ago while likely generating billions of dollars of net economic value between 2015–17 alone.<sup>3</sup>

In the **power sector**, Alliance states have attracted nearly \$110 billion in renewable energy investment since 2011, with wind, solar, geothermal and biomass generating capacity growing 5-fold over the last decade (Figure 2).<sup>4</sup> This is largely due to the renewable portfolio standards (RPS) and state-wide renewable energy goals currently in place in all of the Alliance states.<sup>5</sup> These renewable sources are bringing air quality benefits to our local communities: between 2007 and 2015, the expansion of wind and solar energy in our states collectively reduced both sulfur dioxide (SO<sub>2</sub>) and nitrogen oxide (NO<sub>x</sub>) emissions by over 100,000 tons, resulting in \$16.7 billion in public health benefits.<sup>6</sup> Alliance states stood together in opposing the

**FIGURE 2 Rapid Expansion of Renewable Energy**

Gigawatts of non-hydro renewable electricity generation capacity in Alliance states



SOURCE: U.S. Bureau of Economic Analysis, Rhodium’s U.S. Climate Service

U.S. Environmental Protection Agency’s (EPA) proposal to repeal the Clean Power Plan,<sup>7</sup> which would have led to cleaner and more efficient power generation nationwide.

Alliance states are also U.S. leaders in deploying technology to store these clean energy sources. We are already home to 11 gigawatts of utility-scale energy storage capacity, which is half of all utility-scale capacity and nearly all (95 percent) of the distributed energy storage installed in the United States today (Figure 3).<sup>8</sup> And we are not stopping there. Four Alliance states have energy storage mandates, and these mandates are bearing fruit: 96 percent of all utility-scale storage projects planned for installation over the next five years are in Alliance states.

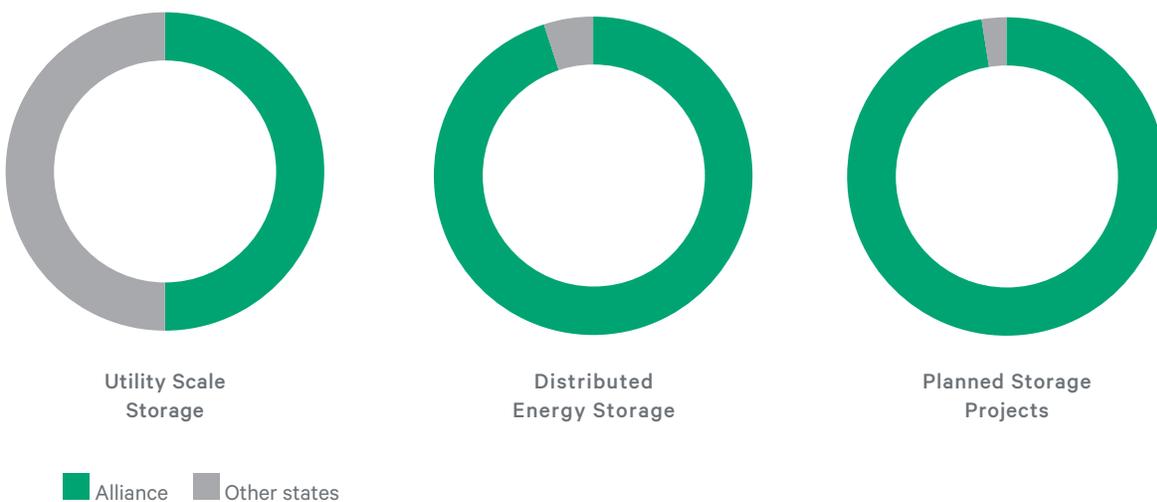
Alliance states lead the country in instituting aggressive **energy efficiency programs and policies**. Alliance states make up the top ten ranked states for energy efficiency policy, and nearly every member state has energy efficiency standards or goals in place, which has helped drive in-state investment and cost savings for our residents and businesses.<sup>9</sup> In fact, we generated \$3.8 billion in new investment in utility-driven energy efficiency improvements in 2016, a 60 percent jump

from 2010.<sup>10</sup> These investments reduced the amount of electricity that households and businesses had to buy in 2016 by more than 13 billion kilowatt hours. This is equivalent to the electricity used by 1,450,000 homes for one year,<sup>11</sup> and more than double the rate of energy savings of non-member states (Figure 4). Not only did this save consumers in our states over \$1.3 billion in 2016, but efficiency programs in Alliance states have put over 1 million people to work, representing nearly half of all energy efficiency jobs in the U.S. in 2017.<sup>12</sup> What’s more, Alliance states are home to over half of all LEED-certified green buildings (54 percent, as of mid-2018), which not only save our residents energy and water but also create healthier environments in which to work and live.<sup>13</sup>

Combustion of fossil fuels to power passenger vehicles makes up the largest source of emissions within the **transportation sector**. Alliance states continue to lead the nation in reducing passenger vehicle emissions by implementing policies and programs that advance the deployment of zero emission vehicles. For example, the majority of U.S. Climate Alliance states are members of the Zero Emission Vehicle (ZEV) Task Force, which is taking coordinated action to ensure the successful

**FIGURE 3 Alliance States Play an Outsized Role in Spurring Energy Storage Capacity**

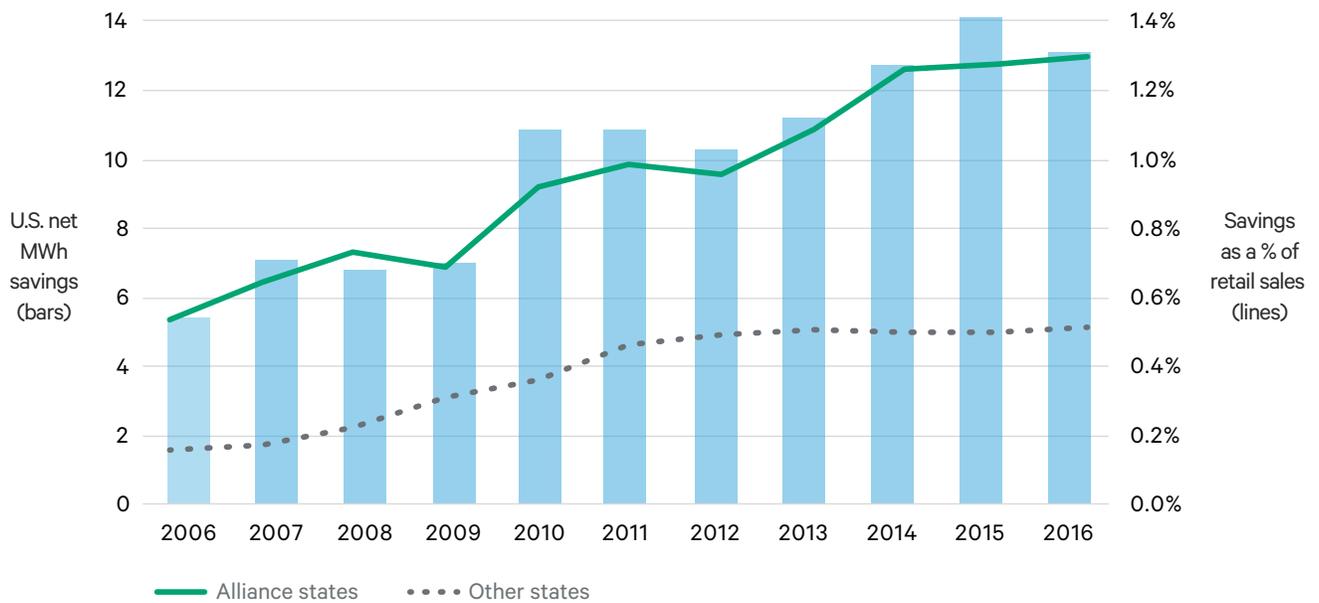
Share of total U.S. storage capacity (megawatts) by type



SOURCE: EIA, RHODIUM GROUP ANALYSIS

**FIGURE 4 Net Incremental Electricity Savings**

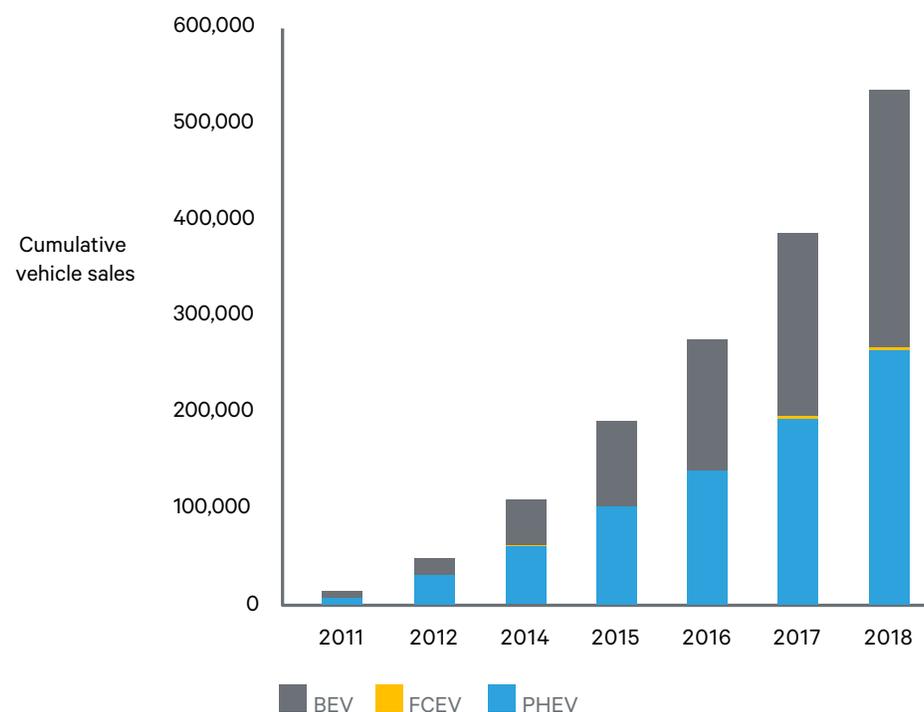
Net megawatt hour savings (left) and savings as a percent of retail sales (right)



SOURCE: American Council for an Energy-Efficient Economy (ACEEE) 2017 Scorecard, Rhodium's US Climate Service.

**FIGURE 5 Alliance States' Growing Zero Emission Vehicle Fleet**

Cumulative sales of battery electric (BEV), fuel cell (FCEV) and plug-in hybrid electric (PHEV)



SOURCE: Automotive Alliance and Rhodium's US Climate Service.



implementation of their state ZEV programs.<sup>14</sup> Together, these states have a collective goal of putting as many as 3.9 million ZEVs on the road by 2025 – an 8-fold increase from today’s levels (Figure 5). Other Alliance states, like Washington and Colorado, also have goals to get more low emission vehicles on the road.<sup>15</sup> Additionally, California recently expanded its target to get 5 million ZEVs on the road by 2030.<sup>16</sup> In order to make these goals reality, Alliance states are the vanguard of a growing wave of investment in electric vehicle charging across the United States, with announced investments totaling nearly \$1.5 billion. Twelve Alliance states are leading the nation with more than 15 percent of the advanced charging infrastructure necessary to support this influx of electric vehicles by 2025 already in place, which will make it even easier to use an electric vehicle for both short- and long-term travel.<sup>17</sup>

U.S. Climate Alliance states are already home to some of the cleanest cars on the road today, thanks in part to the ten Alliance states that offer consumers financial incentives that make it easier to purchase plug-in hybrid or electric vehicles.<sup>18</sup> Altogether, Alliance states account for nearly 80 percent of all battery electric, plug-in hybrid, and fuel cell vehicles sold nationwide last year.<sup>19</sup> Three out of four ZEVs on the road today are in Alliance states, with Alliance vehicles reducing U.S. oil dependence by roughly 20 million barrels each year, supporting America’s energy independence and security.<sup>20</sup>

Through the Clean Air Act, California has been able to lead the country in pushing for cleaner cars and trucks.<sup>21</sup> Eleven Alliance states have also adopted California’s motor vehicle

emission standards, with Colorado announcing in June 2018 that it will take steps to adopt the more stringent standards.<sup>22</sup> Starting in model year 2012, California’s GHG emission standards were harmonized with a national program so that consumers across the country could benefit from cleaner and more efficient vehicles – protecting the health of American families and saving them money at the pump. Current GHG and fuel economy standards require new passenger cars and trucks to achieve, on average, 54.5 miles-per-gallon equivalent by 2025. These more efficient vehicles would save consumers \$3,400 to \$5,000 over the car’s lifetime, after taking into account higher vehicle costs.<sup>23</sup> Together, Alliance states oppose recent efforts by the EPA and National Highway Traffic Safety Administration (NHTSA) to weaken the nation’s clean car standards.<sup>24</sup> In the wake of EPA and NHTSA’s proposal to weaken this program, the majority of Alliance states have joined with 20 total jurisdictions – representing more than 43 percent of the U.S. automobile market and 44 percent of the U.S. population – to mount legal challenges against federal efforts to weaken the nation’s single vehicle GHG emission and fuel economy standard.<sup>25</sup>

**Short-lived climate pollutants (SLCPs)**, such as black carbon, methane, tropospheric atmospheric ozone, and HFCs, act as powerful greenhouse gases. For example, just one pound of HFC-134a warms the planet as much as 1,400 pounds of carbon dioxide. California and New York have developed comprehensive plans to reduce emissions of potent SLCPs by as much as 50 percent by 2030.<sup>26</sup> Leading states like Colorado and Massachusetts have put regulations in place to cut



methane from oil and gas production and natural gas pipelines. Over 100 projects are either operational or under development to reduce methane emissions on dairy and swine farms in California, North Carolina, and other U.S. Climate Alliance states.<sup>27</sup> These projects represent hundreds of millions of dollars of investment in farms and surrounding communities to convert manure into renewable energy, transportation fuel, or compost.<sup>28</sup> U.S. Climate Alliance states are also stepping up with state-level rules and programs to backstop against federal efforts to unwind reasonable regulations to reduce methane from oil and gas and landfills, HFCs, and black carbon from woodstoves. Through local and state efforts to improve air quality and cut diesel pollution, states are slashing black carbon and saving thousands of lives each year.<sup>29</sup>

Alliance states are leading the way in protecting and improving our **natural and working lands**, pursuing a wide range of actions and measures that support land conservation, improve ecosystem health, and sequester carbon. Forests in Alliance states are especially productive and valuable in storing carbon. Home to a quarter of U.S. forests by land area, Alliance states store 35 percent of total U.S. forest carbon, offsetting 16 percent of Alliance states' emissions in 2016.<sup>30</sup> Alliance states have programs in place to support the rural economies, wildlife habitat, and water infrastructure that depend on healthy forests, which provide water resources to cities, towns, and farms. There are nearly 450,000 farms in Alliance states that produce the full range of U.S. crops, yielding 30 percent

of all U.S. agricultural products by value.<sup>31</sup> Investment in our urban forests is also paying off through improved air and water quality, reduced energy use and carbon sequestration, delivering \$6.7 billion in value each year.<sup>32</sup>

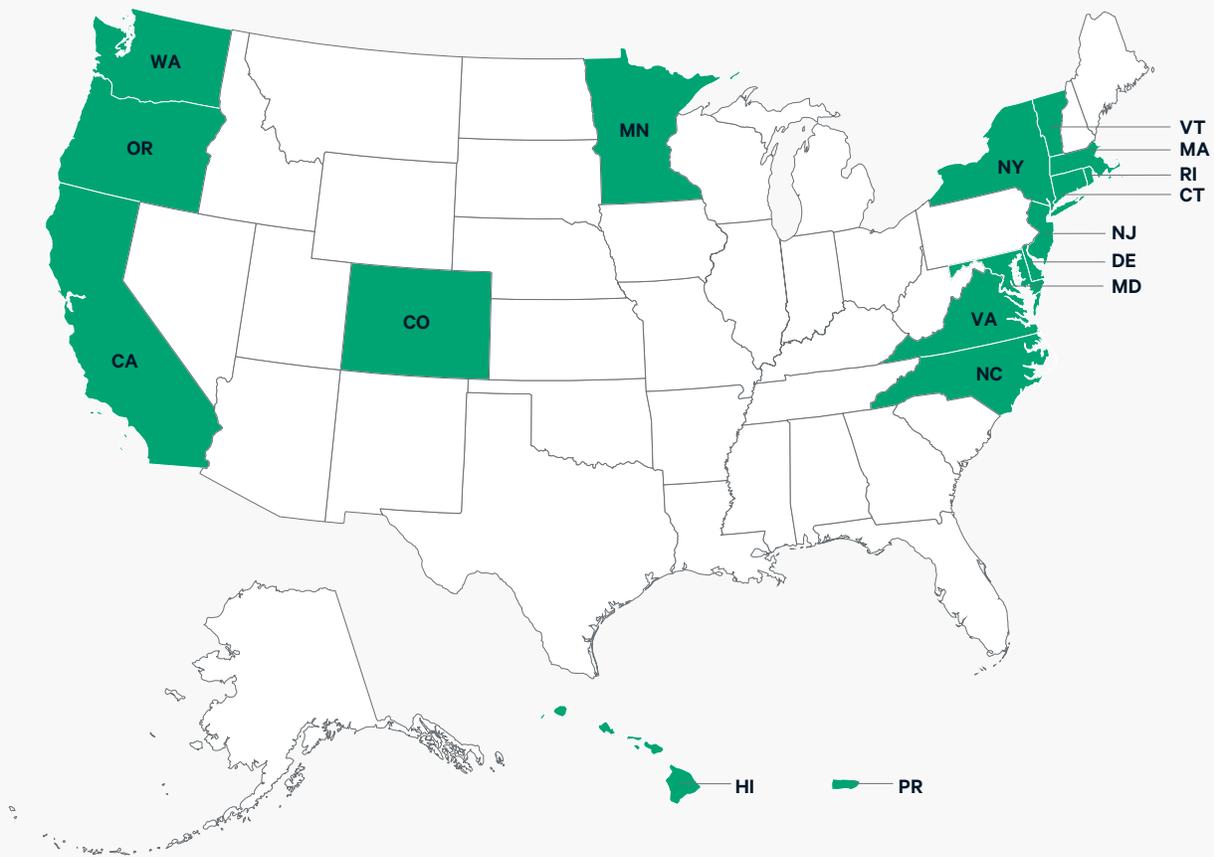
*Investment in our urban forests is delivering \$6.7bn in value each year.*

**Improving the resilience** of our communities, infrastructure, and natural resources has long been a priority in Alliance states. In 2017 alone, extreme weather and climate-related events cost the United States over \$300 billion in damages, following a trend of increasingly severe hurricanes, extreme precipitation events, droughts, wildfires and heat waves. Of the top 20 costliest hurricanes to land on U.S. soil, all but three occurred since 2000, taking a significant toll on local economies. Our state governments are ground-zero for resilience activities across our states as we convene local and private interests, pool and mobilize resources and expertise across state agencies, and integrate the most up-to-date climate data into our natural and built infrastructure investments and planning. All of our states have conducted state impact assessments, and the vast majority has a climate resilience plan in place or under development. As a result of our ongoing efforts to protect our communities and reduce future costs from extreme weather and climate variability, the majority of Alliance states score better than the national average in EPA's Climate Resilience Screening Index.<sup>33</sup>

# Climate Leadership by Alliance Members

*Individual state leadership is the foundation of our collective ambition. U.S. Climate Alliance states are taking bold climate action across every sector of the economy.*

**MAP U.S. Climate Alliance States**



CALIFORNIA	MARYLAND	NORTH CAROLINA	VIRGINIA
COLORADO	MASSACHUSETTS	OREGON	WASHINGTON
CONNECTICUT	MINNESOTA	PUERTO RICO	
DELAWARE	NEW JERSEY	RHODE ISLAND	
HAWAII	NEW YORK	VERMONT	



# California

GHG Reduction Target  
% Below 1990 Levels

**40%** by 2030    **NET ZERO** by 2050

Renewable Energy  
and Energy Efficiency Jobs

**465,505**  
Jobs in 2018  
(EFI & NASEO, 2018)

RPS Target

**50%** by 2030    **100%** by 2045

## Climate Framework and Laws

The California Global Warming Solutions Act (2006) established California as a global leader in reducing greenhouse gas emissions. Senate Bill 32 (2016) mandated a statewide goal to reduce greenhouse gas emissions 40% below 1990 levels by 2030, putting it on track to achieve its overarching goal of reducing greenhouse gas emissions 80% below 1990 levels by 2050. Legislation passed in July 2017 clarified the role of California’s Cap and Trade Program, the only multi-sector greenhouse gas emissions trading system in the United States, in achieving these goals.

## Energy

Enacted in 2006, the California Solar Initiative is a \$3.3 billion sustained commitment to investing in rooftop solar that, as of June 2017, has provided incentives for 1,876 megawatts of installed solar capacity. The Electric Program Investment Charge provides approximately \$162 million annually through 2020 primarily to address policy and funding gaps related to the development, deployment, and commercialization of next generation clean energy technologies.

## Energy Efficiency

California’s Building Energy Efficiency Standards are working toward the goals that all new residential construction be zero net energy by 2020, and all new commercial be so by 2030.

## Transportation

Executive Order B-48-18 commits California to putting five million Zero Emission Vehicles (ZEVs) on its roads by 2030, along with installing 200 hydrogen fueling stations and 250,000 ZEV chargers by 2025. This executive order builds off California’s original ZEV Action Plan, which sought to put 1.5 million ZEVs on the state’s roads by 2025. California’s Low Carbon Fuel Standard requires a 10% reduction in the carbon intensity of transportation fuels in California by 2020.

## Resilience

California has invested over \$10 million in a portfolio of 48 research projects for its Fourth Climate Change Assessment that provide new applied findings on expected climate change impacts for California and inform policies and programs to support adaptation and resilience. The state released an updated Indicators of Climate Change in California report in June 2018 that provides 36 indicators tracking climate change drivers and the resultant effects on the state’s physical and biological systems.

## Climate Finance

As of March 2017, California has appropriated nearly \$3.4 billion in cap and trade auction proceeds to agencies implementing greenhouse gas emission reduction programs through the Greenhouse Gas Reduction Fund. The California Alternative Energy and Advanced Transportation Financing Authority supports programs like the California Hub for Energy Efficiency Financing and the Sales Tax Exclusion, which is allocated \$100 million annually, that increase the development and deployment of renewable energy sources, energy efficiency, advanced transportation, and manufacturing technologies.

## Short-Lived Climate Pollutants

California requires a 50% reduction in black carbon and 40% reduction in methane and hydrofluorocarbon from 2013 levels by 2030. Through the Short-Lived Climate Pollutant Reduction Strategy, California is implementing strategies aimed at reducing these pollutants.

## Natural and Working Lands

California’s Forest Health Grant Program uses funds from the Greenhouse Gas Reduction Fund to implement projects that proactively restore forest health, reduces greenhouse gas emissions, and protect upper watersheds where the state’s water supply originates. \$49 million was invested through this program in 2017.



# Colorado

GHG Reduction Target  
% Below 2005 Levels

**26%**  
by 2025

Renewable Energy  
and Energy Efficiency Jobs

**48,168**  
Jobs in 2018  
(EFI & NASEO, 2018)

RPS Target

**30%**  
by 2020  
(10% or 20% for smaller utilities)

## Climate Framework and Laws

Governor Hickenlooper’s Executive Order D 2017-015 “Supporting Colorado’s Clean Energy Transition” commits the state to climate action by setting the following goals: (1) reduce statewide greenhouse gas emissions by more than 26% from 2005 levels by 2025; (2) reduce CO<sub>2</sub> emissions from the electricity sector by 25% by 2025 and 35% by 2030 from 2012 levels; and (3) achieve electricity savings of two percent of total electricity sales per year by 2020.

## Energy

Colorado has the nation’s first voter-passed **Renewable Energy Standard**, which requires investor owned-utilities to generate 30% of their electricity from renewable energy by 2020. The bipartisan 2010 **Clean Air Clean Jobs Act** requires investor-owned utilities to retire, retrofit, or repower certain coal plants and replace them with facilities fueled by natural gas or low/non-emitting energy sources. This act to date has led to the retirement of almost 750 megawatts of coal power generation capacity and an estimated reduction in greenhouse gas emissions of approximately seven million short tons.

## Energy Efficiency

The **ACRE3 Program** provides financial and technical assistance and education to help agricultural producers and processors develop and implement renewable energy and energy efficiency projects in three focus areas: agricultural hydropower, energy efficiency, and renewable heating and cooling. This is complemented by the **Agricultural Energy Efficiency Program**, which is projected to reach over 200 producers in the next two years and achieve over 5,250 megawatt hours of electricity savings and 524,000 gallons of water savings annually.

## Transportation

Governor Hickenlooper’s Executive Order B 2018-006 “Maintaining Progress on Clean Vehicles” instructs the

Colorado Department of Public Health and Environment to develop a rule (to be proposed in summer of 2018) to establish a state low emissions vehicle (LEV) program, which incorporates the requirements of California’s LEV Program. Colorado’s **Alternative Fuel Vehicle Tax Credits**, which offer \$5000 credit for a light passenger vehicle, will expire in 2022.

## Resilience

An updated version of the **Colorado Climate Plan** was released in January 2018 that provides a roadmap of strategies and recommendations state agencies can take to reduce greenhouse gas emissions, increase adaptation and resilience, and identify priority actions.

## Climate Finance

The **Energy Savings for Schools Program** secures grants to help Colorado public schools finance projects to achieve energy and water savings, and since 2016 has led to seven million gallons of water savings, three million kilowatt hours of electrical savings, and 190,800 therms of gas savings. 20 counties have opted into **Colorado C-PACE**, which offers commercial property owners a unique way to finance 100% of energy and water improvements to their properties. The state also serves thousands of homes per year through the **Low-Income Weatherization Assistance Program**.

## Short-Lived Climate Pollutants

The Air Pollution Control Division of the Colorado Department of Public Health is conducting a stakeholder process to develop a system of tracking and reducing greenhouse gas emissions state and will make available a **Greenhouse Gas Emissions Tracking Rule** by the end of summer 2018.

## Natural and Working Lands

The **Colorado Water Plan** seeks to achieve 400,000 acre-feet of conservation savings by 2050, and the **Water Plan Grant Fund** will allocate \$7 million in FY 2018.



# Connecticut

GHG Reduction Target  
% Below 2001 Levels

**45%** by 2030      **80%** by 2050

Renewable Energy  
and Energy Efficiency Jobs

**37,625**  
Jobs in 2018  
(EFI & NASEO, 2018)

RPS Target

**20%** by 2020      **40%** by 2030

## Climate Framework and Laws

Public Act 90-219, **An Act Concerning Global Warming**, required Connecticut to implement a wide range of measures to reduce energy consumption and associated greenhouse gas emissions. Adopted two decades later, Public Act 08-98, **An Act Concerning Connecticut Global Warming Solutions**, requires the state to achieve a 10% reduction from 1990 emissions by 2020 and an 80% reduction from 2001 emissions by 2050. And passed more recently, Public Act 18-82, **An Act Concerning Climate Change Planning and Resiliency**, requires the state to reduce statewide emissions 45% below 2001 levels by 2030.

## Energy

Public Act 18-50, **An Act Concerning Connecticut Energy Future**, doubled the state’s renewable portfolio standard from 20% by 2020 to 40% by 2030. Connecticut’s Department of Energy and Environmental Protection (DEEP) recently approved proposals for 250 MW of renewable energy projects, 200 MW of which will come from the **Revolution Wind Project**, Connecticut’s first offshore wind farm.

## Energy Efficiency

The **Connecticut Energy Efficiency Fund (CEEF)** supports energy efficiency programs that play a key role in reducing emissions and catalyzing economic growth, enabling the state to achieve electric, gas, fuel oil, and propane system benefits valued at \$2.41, for every \$1 spent on utility-administered energy efficiency programs. The lifetime energy savings achieved through one year of CEEF programs is equivalent to removing 466,259 cars from the road for a year.

## Transportation

The **Connecticut Hydrogen and Electric Automobile Purchase Rebate (CHEAPR)** Program provides

Connecticut residents with a point-of-sale rebate on the purchase or lease of new ZEVs, up to \$5,000. CHEAPR has dispersed over \$6.5 million for 2,962 new vehicle leases and purchases. DEEP has also partnered with the Connecticut Automotive Retailers Association to establish a dealer recognition and cash bonus award, both of which incentivize dealers to actively sell EVs.

## Resilience

Recently passed, **An Act Concerning Climate Change Planning and Resiliency (PA 18-82)** requires Connecticut to prepare for the ongoing effects of climate change and sea level rise by requiring state and federally funded projects to plan for a scenario of 50 centimeters of sea level rise by 2050.

## Climate Finance

Established in 2011, the **Connecticut Green Bank** leverages limited state funding to attract private capital, enabling the state to expand the deployment of rooftop solar, while driving down installed costs and ratepayer incentives. The Bank’s **Commercial Property Assessed Clean Energy (C-PACE)**, provides building owners the opportunity to take advantage of energy upgrades and pay for them over time through a voluntary benefit assessment lien, levied and recorded against the benefitting property, to be repaid along with real property taxes.

## Natural and Working Lands

Connecticut released an updated version of its **Comprehensive Open Space Acquisition Strategy** to achieve its goal of protecting 21% (673,210 acres) of the state’s land as open space by 2023, 10% of which is to be state-owned as additions to the system of parks, forests, and wildlife areas. As of 2017, 75% of the preserved acreage goal (over 500,000 acres) has been achieved.



# Delaware

Renewable Energy and Energy Efficiency Jobs

**13,011**

Jobs in 2018  
(EFI & NASEO, 2018)

RPS Target

**25%**

by 2025

## Climate Framework and Laws

The **Climate Framework for Delaware (2014)** is a summary of state agency recommendations for both climate mitigation and adaptation. It identifies state agency actions to reduce greenhouse gases that contribute to climate change, increase resiliency to climate impacts, and avoid and minimize flood risks that increase state liability and decrease public safety.

## Energy

The **Green Energy Program (GEP)** provides grants to homeowners, local businesses and other relevant stakeholders to fund renewable energy systems, from solar photovoltaic systems to small wind turbines, geothermal heat pumps, and fuel cells. With an annual operating budget of \$3.3 million, the GEP has provided grants for over 4,300 renewable energy projects and increased Delaware’s solar capacity from 8.6 MW in 2010 to 98 MW in 2018.

## Energy Efficiency

The **Energy Efficiency Investment Fund (EEIF)** provides grant money to Delaware businesses, local governments, and non-profits to make facility upgrades that lower their energy use and cost. In 2017, EEIF distributed close to \$2.4 million in grant funding over 146 projects that collectively amounted to 28,930,300 kW hours avoided. The **Energy Efficiency Industrial (E2I) Program** provides grants directed toward large industrial and commercial businesses whose annual energy consumption is greater than 10,000 MW hours or 95,000 MMBtu annually. The **Weatherization Assistance Program** provides energy retrofits to low income homes in Delaware and in 2016, generated energy savings of approximately 135,000 kW hours and 5,700 MMBtu. **Delaware’s Energy Conservation and Efficiency Act (2009)** designates energy efficiency as a priority energy resource and created Energy Efficiency Resource Standards requiring a reduction in energy use through conservation measures.

## Transportation

Delaware’s **Clean Vehicle Rebate Program** provides financial incentives ranging from \$1,000 to \$3,500 for residents and businesses to buy or lease new alternative fuel vehicles. This program complements the **Delaware Workplace Charging Program**, which offers technical guidance and rebates of up to \$5,000 to businesses for every installation of an electric charging station and supports Delaware’s broader efforts to be a Clean Car State, having adopted **California’s Low Emission Fuel Standard** in 2010.

## Resilience

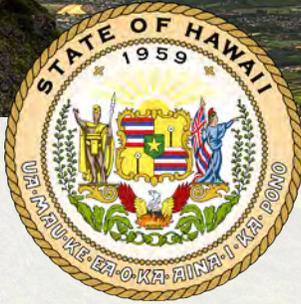
Through various mechanisms, including the **Open Space Program** and the **Coastal Zone Act**, Delaware has permanently protected an estimated 90% of its coastline. The **Beach Preservation Act** directs the Department of Natural Resources and Environmental Control to prevent and repair damage to shorelines and has a dedicated funding source derived from the Accommodation Tax.

## Climate Finance

The **Delaware Sustainable Energy Utility** is a non-profit organization that administers various energy efficiency and renewable energy projects for Delawareans, including the **Solar Renewable Energy Credit Purchase Program**, the **Community Energy Centers and Faith Efficiencies Partnership**, and the **Energy Efficiency Investment Fund**, that totaled \$27 million in spending in 2017.

## Natural and Working Lands

The **Urban and Community Forestry Program** offers grants for tree planting, tree care, and tree management projects on publicly-owned lands. Since its passage, the **Delaware Land Protection Act (1990)** has protected 57,000 acres of land from development.



# Hawaii

GHG Reduction Target

**NET ZERO**  
by 2045

Renewable Energy and Energy Efficiency Jobs

**10,002**  
Jobs in 2018  
(EFI & NASEO, 2018)

RPS Target

**100%**  
by 2045

## Climate Framework and Laws

Act 32 (2017) enshrines the principles and goals of the Paris Agreement as the framework for Hawaii to pursue climate change planning. The **Hawaii Climate Adaptation Initiative Act (2014)** acknowledged climate change as the paramount challenge of this century and established what is now the **State Climate Mitigation and Adaptation Commission**. Act 286 (2012) was passed to enact climate change priority guidelines within the State Planning Act.

## Energy

In June 2018, Governor Ige signed two bills, **HB 1986** and **HB 2182**, that created a framework for a carbon offset program that allows for carbon credits through global sequestration protocols and committed Hawaii to become carbon neutral by 2045, respectively. The **Hawaii Clean Energy Initiative (HCEI)** is a framework of statutes and regulations supported by a diverse group of stakeholders committed to Hawaii’s clean energy future.

## Energy Efficiency

Hawaii’s **Energy Efficiency Portfolio Standard** is a statutory requirement to achieve 4,300 gigawatt hours of electricity use reductions statewide by 2030. The **Ka Hei Department of Education Energy Efficiency and Sustainability Program** integrates energy efficiency and sustainability improvements into facility upgrades and student education through a combination of energy efficiency measures, clean energy generation, and a comprehensive sustainability program. HRS 196-9 targets energy efficiency and environmental standards for state facilities, as well as for vehicles and fuel.

## Transportation

Hawaii’s **State Alternate Fuel Standards** requires 20% of highway fuel demand to be provided by alternate fuels by 2010 and 30% by 2030, while state agencies are required to purchase fuel-efficient vehicles and include projected

fuel costs in life-cycle cost-benefit analysis. On the books HRS 103D-412 directs all state and county entities when purchasing new light-duty motor vehicles, to look for ones with reduced dependence on petroleum-based fuels.

## Resilience

Hawaii’s **Climate Commission** (formerly the **Inter-agency Climate Adaptation Committee**) provides direction, facilitation, coordination, and planning among state and country agencies, federal agencies, and other partners about climate change mitigation and resiliency strategies. In December 2017, it released a **Sea Level Rise Vulnerability and Adaptation Report**, that describes and models sea level rise projections, and provides mechanisms and strategies for improving resilience and adapting to the physical, social, and economic impacts of sea level rise.

## Climate Finance

The **Environmental Response, Energy, and Food Security Tax (aka Barrel Tax)** is a \$1.05 tax per barrel of petroleum products imported into Hawaii that discourages fossil fuel consumption and funds environmentally friendly initiatives. The **Green Energy Market Securitization Program** is a sustainable green financing initiative that provides low-cost capital to finance clean energy improvements for those who might otherwise have difficulty obtaining financing. It has the capacity to finance the installation of over 44 MW of energy and assist as many as 30,000 Hawaii consumers.

## Natural and Working Lands

The **Sustainable Hawaii Initiative** sets the following goals for Hawaii: (1) double food production by 2020; (2) implement Hawaii’s interagency biosecurity plan by 2026; (3) protect 30% of Hawaii’s priority watersheds; (4) effectively manage 30% of Hawaii’s marine areas; and (5) achieve 100% renewable energy by 2045. Hawaii is also engaging in **native forest restoration**, including a public-private pilot to reforest 5,500 acres on Mauna Kea, and pursuing **carbon sequestration**.



# Maryland

GHG Reduction Target  
% Below 2005 Levels

**40%** by 2030      **80–95%** by 2050

Renewable Energy  
and Energy Efficiency Jobs

**76,685**  
Jobs in 2018  
(EFI & NASEO, 2018)

RPS Target

**25%**  
by 2020

## Climate Framework and Laws

The **Maryland Commission on Climate Change (MCCC)** was established by executive order in 2007 to develop an action plan for mitigation of and adaptation to the likely impacts of climate change in Maryland. The MCCC is charged with advising the Governor and General Assembly on ways to mitigate the causes of, prepare for, and adapt to the consequences of climate change. In 2009, Maryland passed the **Greenhouse Gas Reductions Act** which calls for 25% emissions reductions by 2020. The 2016 update, adopts a 40% reduction of greenhouse gas emissions by 2030 and a hopeful goal of 80%–95% reduction by 2050. MDE will present a draft **40 by 30 Plan** by the end of 2018.

## Energy

Maryland is a member of the **Regional Greenhouse Gas Initiative**. Auction proceeds from RGGI fund various state and local programs which promote energy efficiency, renewable energy, bill assistance, or other consumer benefits. Maryland recently passed a bill that accelerates the state’s RPS to 25% in 2020.

## Energy Efficiency

Maryland’s **EmPOWER Energy Efficiency Program** charges utility customers a monthly fee that is then used to fund programs including lighting and appliance rebates for homeowners, energy efficiency services for industrial facilities, home energy assessments, and various other types of incentives. Maryland has a **Weatherization Assistance Program** that helps eligible low-income households across the State of Maryland with the installation of energy conservation materials in their dwelling units. In 2013, Maryland passed and signed into law the **Maryland Offshore Wind Energy Act of 2013**. In May 2017, the PSC announced in **Order No. 88192** that two projects, amounting to 368 MW of total capacity, were approved (with conditions) to receive ORECs.

## Transportation

Maryland is a member of the **Transportation Climate Initiative** with the goal of developing the clean energy economy and reducing greenhouse gas emissions in the transportation sector. Maryland is a member of the **Multi-State ZEV Task Force** and has a goal of having 60,000 ZEVs on the road by 2020 and 300,000 ZEVs on the road by 2025. It offers the **Maryland Excise Tax Credit** of up to \$3,000 and a rebate of up to 40% through the **Electric Vehicle Supply Equipment Rebate**. The **Maryland Clean Cars Program**, adopted in 2007, commits the state to follow California’s Low Emission Vehicle Standards.

## Resilience

The **CoastSmart Communities Program** assists Maryland’s coastal communities to address short and long-term coastal hazards, such as sea level rise, by providing technical assistance and training opportunities, along with financial assistance through the **Community Resilience Grant Program**. In 2018, Maryland launched the **Climate Leadership Academy** to provide climate training and support to state and local government officials, citizens, the private sector, and non-profits.

## Climate Finance

In addition to the various incentives and programs administered through **EmPOWER Maryland**, the Maryland Energy Administration’s **Energy Finance Initiative** is a collection of programs, financing tools, and other resources designed to help fill the funding needs of clean energy projects.

## Natural and Working Lands

Maryland established the **Maryland Healthy Soils Program** to increase biological activity and carbon sequestration in the State’s soils by promoting practices based on emerging soil science, through incentives, research, education, technical assistance, and financial assistance for farmers.



# Massachusetts



GHG Reduction Target  
% Below 1990 Levels

**25%**  
by 2020      **80%**  
by 2050

Clean Energy Jobs

**109,000**  
Jobs in 2018  
(STATE STATISTIC)

RPS Target

**16%**  
by 2020\*  
+2%/year 2020-2029, +1%/year onward

## Climate Framework and Laws

Through the 2008 Global Warming Solutions Act, the Commonwealth set nation-leading, aggressive greenhouse gas emissions limits of 25% below 1990 baseline level by 2020 and 80% by 2050. 2016’s Executive Order (EO) 569 committed the Commonwealth to develop an integrated climate change strategy that addressed both climate change mitigation and adaptation. The Commonwealth has also promulgated new regulations to ensure compliance with 2020 emission reduction targets and committed to a new Regional Greenhouse Gas Initiative Program plan.

## Energy

Massachusetts has passed comprehensive energy diversity legislation (An Act Relative to Energy Diversity, H. 4568) and implemented a range of comprehensive energy policies. These include the RPS and energy storage targets, in addition to its 2017 Clean Energy Standard, requiring utilities and competitive suppliers to obtain at least 16% of electricity from clean energy sources in 2018 and 80% by 2050. Investments in solar and storage continue through the Solar Massachusetts Renewable Target (SMART) and the Affordable Access to Clean and Efficient Energy (AACEE) Initiative, which includes a \$15 million commitment to expand clean energy opportunities for low- and moderate-income residents.

## Energy Efficiency

In 2017, Massachusetts was named the most energy-efficient state for the 7th year in a row by the American Council for an Energy Efficient Economy. The first nine years of the energy efficiency program are expected to return more than \$20 billion in ratepayer benefits. The 2016–2018 Three Year Energy Efficiency Plans established nation-leading savings levels for both electricity (2.93% of retail sales) and gas (1.24% of retail sales). In 2008, Massachusetts developed one of the first “stretch” energy codes which almost 60% of Massachusetts municipalities have adopted.

## Transportation

Massachusetts is engaged with several regional initiatives to reduce transportation sector emissions, including with the Transportation Climate Initiative, the New England Governors and Eastern Canadian Premiers and the Multi State ZEV Taskforce. With a target of 300,000 ZEV vehicles by 2025, the state offers rebates of up to \$2,500 to residents who purchase or lease electric vehicles. Governor Charlie Baker also recently established the Commission on the Future of Transportation to advise on transportation and climate change planning.

## Resilience

The 2017 Municipal Vulnerability Preparedness program helps cities and towns plan and build more resilient communities and has already awarded over \$9 million to 43 percent of state municipalities. Massachusetts is also developing and implementing a first of its kind integrated State Hazard Mitigation and Climate Adaptation Plan, based in the best science and data to develop operational, on-the-ground strategies. Governor Charlie Baker also recently established the Commission on the Future of Transportation to advise on transportation and climate change planning.

## Climate Finance

Since 2008, Massachusetts has reinvested \$306 million in RGGI auction proceeds to increase the energy efficiency of residences and businesses, provide clean-energy solutions to over 180 “Green Communities,” and support the implementation of alternative energy resources.

## Natural and Working Lands

Over the last two years, Massachusetts permanently conserved 26,515 acres (41 square miles) and is investing \$1 million annually in grants to improve local land use practices. The Commonwealth is also working to track changes in terrestrial carbon to evaluate the efficacy of land use policies.



# Minnesota

GHG Reduction Target  
% Below 2005 Levels

**15%** by 2015    **30%** by 2025    **80%** by 2050

Clean Energy Jobs

**59,079**

Jobs in 2018  
(Clean Jobs Midwest, 2018)

RPS Target 25% by 2025

**Achieved**

Seven Years Early

## Energy

The Next Generation Energy Act (2007) set a 25% Renewable Energy Standard by 2025. Minnesota produced 25% of its electricity from renewable sources in 2017, effectively meeting our statutory goal seven years early, and is projected to reach more than 40% by 2030. This Act also set greenhouse gas reduction goals of 15% by 2015, 30% by 2025 and 80% by 2050. In 2013, the Minnesota Legislature passed a 1.5% solar energy standard, which requires utilities to produce 1.5% of its retail sales from solar energy by 2020. The legislation also set a 10% solar goal by 2030.

## Energy Efficiency

The Conservation Improvement Program (CIP) is a statewide program funded by ratepayers and administered by electric and natural gas utilities to help Minnesota households and businesses lower their energy costs by using electricity and natural gas more efficiently. CIP helps to conserve these important resources while reducing harmful emissions and the need to build new utility infrastructure. The Next Generation Energy Act (2007) set a 1.5% Energy Efficiency Resource Standard (EERS) beginning in 2010 for electric and natural gas utilities. Each utility is required to develop a CIP plan to achieve energy savings of 1.5% of gross annual retail sales on an annual basis. The legislation also set a statewide annual savings goal of 1.5% of annual retail sales, which was modified in 2013 legislation to at least 1.5%.

## Transportation

The Minnesota Department of Transportation has a greenhouse gas emissions reduction goal of 30% by 2025 over 2005 levels for the transportation sector. The Department of Transportation and Pollution Control Agency, along with private partners, developed an Electric Vehicle Framework that creates a plan for state-wide EV infrastructure and strategies for substantially increasing EV fleet penetration. Minnesota was the first state to require 10% ethanol in gasoline and has also approved increasing the biodiesel content of diesel fuels to 20%. The state has aggressive goals for biofuel use in the state fleet and has a goal that 20% of fleet vehicles should be electric by 2027.

## Climate Finance

Minnesota has a variety of financing and contracting mechanisms to help accelerate implementation of energy efficiency and renewable energy projects that help lower greenhouse gases in the built environment. The State currently administers a performance contracting program that guarantees energy savings in state agency facilities as well as local unit of government buildings. Another public sector program helps local units of government conduct investment grade energy audits that identify large scale capital investments that save energy. The state also administers and oversees programs that help advance private sector and residential investments in energy efficiency and renewable energy; examples include Commercial Property Assessed Clean Energy (C-PACE), Trillion Btu Revolving Loan Fund, Minnesota Housing Finance Agency's Fix it Up! Program Loan Loss Reserve, and several others.



# New Jersey

GHG Reduction Target to Reach 1990 Levels by 2020

**ACHIEVED**

GHG Reduction Target % Below 2006 Levels

**80%**  
by 2050

Renewable Energy and Energy Efficiency Jobs

**43,448**  
Jobs in 2018  
(EFI & NASEO, 2018)

RPS Target

**50%**  
by 2030

## Climate Framework and Laws

The 2007 Global Warming Response Act authorizes the state to enter RGGI and establishes two targets for greenhouse gas emissions, including an 80% reduction from 2006 levels by 2050; the goal of reaching 1990 emission levels by 2020 has already been achieved. In January 2018, Governor Murphy signed an executive order (EO) directing the state to re-enter into RGGI. Based on current price and emissions estimates, rejoining RGGI could bring in around \$80 million annually in revenue from carbon auction proceeds.

## Energy

Governor Murphy signed an EO establishing an ambitious goal of generating 3,500 megawatts of offshore wind by 2030. To this end, Governor Murphy initiated an interagency strategic planning process and launched rulemaking on a funding mechanism for Offshore Wind Renewable Energy Certificates. 2018's **Clean Energy Act** and **Zero Emission Credit Act** sets ambitious targets for expanding New Jersey's generation of clean energy, including a renewable portfolio standard of 50% by 2030, increasing the state's solar RPS to 5.1%, establishing a community solar program, and supporting nuclear energy.

## Energy Efficiency

2018's Clean Energy Act includes the state's first statutory energy efficiency standards, which sets an electric energy efficiency target at 2% reduction each year and an annual reduction in natural gas consumption of 0.75%. Additionally, New Jersey's **Board of Public Utilities** administers several energy efficiency programs that provide free energy audits and low- and interest-free loans for energy efficient upgrades for residential, commercial and industrial, and local government customers.

## Transportation

New Jersey is a part of the **Multistate ZEV Task Force** and has signed the ZEV Memorandum of Understanding, committing to a shared goal of seeing 3 million ZEVs on the road by 2025. The Department of Environmental Protection (DEP) provides grants to install workplace charging infrastructure and offers incentives for drivers of fuel-efficient vehicles or ZEVs, including a discount on E-Z Passes, insurance discounts, and tax breaks for ZEVs, among others. Additionally, **NJ Transit** is upgrading its facilities and will phase out older and less efficient energy generation technology with cleaner and more efficient solutions.

## Resilience

New Jersey has taken significant steps to mitigate damage caused by climate change and extreme weather events. The DEP has spent \$300 million in acquiring properties that are prone to repetitive flooding, and, with the Army Corps of Engineers, has spent \$20 million conducting a **comprehensive resiliency study**. New Jersey is investing in energy resilience by developing microgrids capable of maintaining power during extreme weather events and upgrading its fuel supply and distribution infrastructure to ensure fuel can be distributed in case of an extreme weather event.

## Natural and Working Lands

Governor Murphy signed legislation banning offshore oil drilling in New Jersey state waters. The law also prohibits the DEP from issuing any permits and approvals for the on-shore development of offshore oil drilling infrastructure. New Jersey also has robust **open space and farmland preservation programs** that have preserved nearly 1.5 million acres of land.



# New York

GHG Reduction Target  
% Below 1990 Levels

**40%** by 2030      **80%** by 2050

Renewable Energy  
and Energy Efficiency Jobs

**138,059**  
Jobs in 2018  
(EFI & NASEO, 2018)

RPS Target

**50%**  
by 2030

## Climate Framework and Laws

Under Governor Cuomo’s **Reforming the Energy Vision (REV)** strategy, New York is building a clean, affordable and resilient energy system for all New Yorkers. In 2017, Governor Cuomo co-founded the U.S. Climate Alliance and issued EO 166, reaffirming New York’s commitment to emissions reductions in the face of the federal government’s retreat from the Paris Agreement. New York is also a founding member of RGGI and has set GHG reduction targets of 40% by 2030 and 80% by 2050.

## Power Sector

The **Clean Energy Standard** will dramatically increase New York’s electricity from renewable energy to 50% by 2030. In March 2018, Governor Cuomo announced \$1.4 billion for 1.4 GW of renewable energy projects, the largest award ever made by a state and enough to power 430,000 homes. The comprehensive **Offshore Wind Master Plan** is guiding the procurement of at least 800 MW of offshore wind in 2018 and 2019. Since 2011, solar power has grown 1,000% in the state, and New York will be one of the largest global economies to end the use of coal for electric generation following Governor Cuomo’s commitment to close all coal-fired power plants by 2020.

## Energy Efficiency and Storage

The state’s **“New Efficiency: New York”** initiative in an ambitious acceleration of energy efficiency and includes a wide range of strategies to help households, developers, building owners and industrial facilities reduce energy consumption. The initiative will enable New York to save the energy equivalent to that of 1.8 million homes by 2025. Under the **Energy Storage Roadmap**, New York has committed to deploying 1.5 GW of storage by 2025, which will provide \$2 billion in benefits to New Yorkers and avoid over one million metric tons of CO<sub>2</sub> emissions.

## Transportation

The **ChargeNY** program is accelerating the transition to a self-sustaining market for Plug-in Electric Vehicles (PEVs) in New York State. In its first phase, the program established a goal of 30,000 to 40,000 PEVs by the end of 2018 and the recently-announced **ChargeNY 2.0** aims to attain at least 10,000 charging stations by 2021. New York’s \$55 million **Drive Clean NY** program provides electric vehicle rebates to consumers, and the state’s Environmental Protection Fund supports municipal purchases of zero-emission vehicles and infrastructure.

## Resilience

**Climate Smart Communities** is an interagency partnership that provides no-cost state support to local governments that pass resolutions to act on climate change. Across New York, 212 communities representing 35% of the population have taken the 10-point **Climate Smart Communities Pledge**, and 17 communities are Climate Smart Certified Communities. The **Community Risk and Resiliency Act** requires state agencies to consider sea level projections, extreme weather events and other climate change impacts in implementing programs, and the Department of State has developed best practices for building, resiliency and land use.

## NY Green Bank

In 2013, Governor Cuomo established **NY Green Bank** to accelerate clean energy deployment by working in collaboration with the private sector to transform financing markets. As of mid-2018, NY Green Bank’s activities are driving approximately \$1.7 billion in clean energy investment across the state, and NY Green Bank is now seeking to raise at least \$1 billion in third-party capital to expand nationally.



# North Carolina

Renewable Energy  
and Energy Efficiency Jobs

**94,503**

Jobs in 2018  
(EFI & NASEO, 2018)

RPS Target

**12.5%**

by 2021

## Energy

North Carolina’s Renewable Energy and Energy Efficiency Portfolio Standard requires investor-owned utilities in the state to supply 12.5% of 2020 retail electricity sales from eligible energy resources by 2021. Municipal and electric cooperatives must meet a target of 10% by 2018. The 2017 legislation “Competitive Energy Solutions for North Carolina,” includes directives to approximately double solar capacity in the state by 2022. This comprehensive energy legislation establishes programs for community solar, solar rebates, third-party leasing, corporate procurement of renewables, and utility procurement of solar energy through a competitive bidding process.

## Energy Efficiency

The North Carolina Energy Program works with the business community, local governments, and non-profit organizations to help them become more energy efficient and productive and educates businesses about how tax credits can make sustainable practices benefit their bottom line. The state’s Utility Savings Initiative for public buildings assesses the entire stock of state buildings, which in the summer of 2018 met its U.S. Department of Energy Better Buildings Challenge goal by achieving an overall 21% improvement in energy intensity, compared to the 2009 baseline year, for our state’s 138 million square foot building portfolio. The North Carolina Weatherization Assistance Program enhances the well-being of low-income residents through the installation of energy efficient and energy-related health and safety measures. In FY 2017, this program weatherized 1,438 residences in the state.

## Transportation

The Energy Policy Act State and Alternative Fuel Provider Rule requires state government and alternative fuel provider fleets that operate, lease, or control 50 or more light-duty vehicles (LDV) within the U.S. to acquire alternative fuel vehicles (AFV). Since 2001, as a covered

fleet, 75% of North Carolina state government new LDV acquisitions must be AFVs. The state earns vehicle credits for purchased light-duty and heavy-duty AFVs, which may be sold, banked, or traded between fleets. As of September 30, 2017, North Carolina earned a total of 3,023 credits under this program. North Carolina is exploring the application and utilization of zero-emission vehicles in both state and local government motor fleets through procurement practices and policies.

## Resilience

The North Carolina Division of Coastal Management (DCM) is addressing sea level rise and coastal resiliency through several research, planning, and policy initiatives. DCM provides staff support to the Coastal Resource Commission (CRC) Science Panel, which develops a 5-Year Sea Level Rise Synthesis and Assessment Report to monitor changing conditions, evaluate state-specific data, and guide coastal policy development by the CRC. DCM is providing funding to local governments in 20 coastal counties for Planning and Management Grants. Land-use planning and management practices related to coastal storms, flooding, and erosion; natural resource management issues; improvements in intergovernmental coordination, and other similar activities will be funded.

## Natural and Working Lands

The Division of Mitigation Services restores and protects wetlands and waterways through mitigation programs designed to assist private, and public entities comply with state and federal compensatory mitigation for streams, wetlands, riparian buffers, and nutrients. North Carolina is also exploring cost-effective opportunities in land conservation and management practices that provide co-benefits of improving ecosystem health and sequestering carbon. Through stakeholder engagement, best practices and mitigation pathways for protecting and enhancing public and private lands will be explored.



# Oregon

GHG Reduction Target  
% Below 1990 Levels

**10%** by 2020      **75%** by 2050

Renewable Energy  
and Energy Efficiency Jobs

**51,033**  
Jobs in 2018  
(EFI & NASEO, 2018)

RPS Target

**50%**  
by 2040

## Climate Framework and Laws

The Clean Electricity and Coal Transition Act (2016) prohibits the state’s largest investor-owned utilities from including electricity generated by coal in their rates by 2030, while doubling Oregon’s RPS commitment to 50% by 2040. The Oregon Global Warming Commission tracks trends and makes recommendations on reducing greenhouse gas emissions, including through the Roadmap to 2020 report.

## Energy

Oregon’s last coal-fired power plant is on track to close by 2020. The state requires electric utilities to offer voluntary programs for their customers to opt to be served entirely by renewable energy sources. The state’s investor-owned utilities are required to propose plans for investment in Utility Transportation Electrification Programs, which are reviewed by the Oregon Public Utility Commission and total several million dollars annually. The Energy Facility Siting Council is working to reduce net CO<sub>2</sub> emissions of energy facilities in Oregon by setting net CO<sub>2</sub> emissions rate standards and requiring facilities to reduce their emissions accordingly, leading to several million metric tons CO<sub>2</sub>-equivalent emission reductions to date.

## Energy Efficiency

The State Energy Efficiency Design Program (SEED) helps state buildings implement energy efficiency through institutional retrofits and best practices, saving the state more than \$7.1 million in energy costs annually. The Energy Efficient Schools Program has implemented approximately 3,000 cost-effective energy efficiency projects in Oregon’s K-12 public schools.

## Transportation

Executive Order 17-21 lays out a multi-agency strategy for achieving the goal of having 50,000 registered electric vehicles on Oregon’s roads by 2020. This goal is complemented by the Clean Vehicle Rebate Program, which will begin issuing rebates in September 2018. Oregon’s Clean Fuels Program requires a 10% reduction in the lifecycle carbon intensity of the state’s transportation fuels from 2015 levels by 2025.

## Resilience

Oregon has both a Climate and Health Resilience Plan (2017) and Climate Change Adaptation Framework in place.

## Climate Finance

Since 1980, the Small-Scale Energy Loan Program (SELP) has made loans totaling over \$600 million for local energy projects. A three percent Public Purpose Charge is applied to ratepayers of the state’s largest investor-owned utility to fund energy efficiency, low-income weatherization and small-scale renewable projects. The state also supports the Renewable Energy Development Grant Program and the State Home Oil Weatherization Program.

## Short-Lived Climate Pollutants

The Cleaner Air Oregon rule-making process is underway to close gaps in the state’s existing air quality rules that can create health risks for families and communities.

## Natural and Working Lands

Oregon created the Ocean Acidification and Hypoxia (OAH) Council to evaluate the impacts of OAH on Oregon’s resources and communities and recommend actions to the legislature and state leadership. The state also established and supports the work of the Oregon Climate Change Research Institute.



# Puerto Rico

RPS Target

**20%**  
by 2035

## Climate Framework and Laws

Puerto Rico Electric Power Authority is required to supply 20% of retail electricity sales from eligible “green energy” resources by 2035.

## Energy

**Net-metering Legislation** was enacted in August 2007, allowing customers of Puerto Rico Electric Power Authority to use electricity generated by solar, wind or “other” renewable-energy resources to offset their electricity usage and customers are to receive credits for producing more energy than was consumed.

## Energy Efficiency

Under **Act No. 57 of 2014**, all state agencies, public corporations and judicial branch buildings by 2022 must reduce their electrical energy consumption by at least 40%. Puerto Rico’s building code includes provisions that reduce energy consumption. For example, the code requires that buildings ensure that pool heaters are powered by renewable or alternative energy sources.

## Transportation

Act No. 81 of 2014 exempts all electric vehicles from import taxes until 10% of cars imported and produced in Puerto Rico are electric vehicles.

## Climate Finance

Created in July 2010, the **Green Energy Fund (GEF)** dictated that Puerto Rico will co-invest up to \$185 million in the development of renewable energy projects on the island and by FY2020, the GEF will have a maximum ceiling of \$40 million per year. Meanwhile, the **Renewable Energy Development Act**, enacted in 2008, exempts all equipment for renewable energy capture, accumulation, generation, distribution, and application from property taxes.



# Rhode Island

GHG Reduction Target  
% Below 1990 Levels

**10%** by 2020    **45%** by 2035    **80%** by 2050

Renewable Energy  
and Energy Efficiency Jobs

**14,647**  
Jobs in 2018  
(EFI & NASEO, 2018)

RPS Target

**38.5%**  
by 2035

## Energy

Governor Raimondo recently announced a 400 megawatt offshore wind farm, building on the success of North America’s first offshore wind farm, located in Rhode Island coastal waters. Raimondo set an ambitious goal for Rhode Island to increase its **clean energy portfolio** tenfold by 2020 (i.e., to 1,000 megawatts) and create 20,000 clean energy jobs throughout the state by 2020. Rhode Island is on track to meet the 1,000 megawatt goal and has already experienced an astonishing 72% growth in its clean energy workforce since 2014.

## Energy Efficiency

Rhode Island’s energy efficiency programs generated \$320 million in total benefits in 2017, while preventing nearly 1.3 million metric tons of greenhouse gas emissions, ranking Rhode Island third nationally in energy efficiency according to the American Council for an Energy-Efficient Economy scorecard. The Office of Energy Resources actively supports public sector energy efficiency through its **Lead by Example** initiatives, including offering financial incentives for LED streetlight adoption by municipalities and supporting cost-effective investments that have already reduced State government energy consumption by more than 10%.

## Transportation

Rhode Island is investing approximately \$10 million in Volkswagen Settlement funds in zero-emission electric buses for its public transportation fleet. With this initiative, Rhode Island’s bus fleet will consist of a 36% low- and zero-emission vehicles. An additional \$1.5 million in Volkswagen funds will be utilized to enhance Rhode Island’s current network of public charging infrastructure throughout the state’s main highway corridors. Rhode Island is also expanding public transit through downtown Providence by connecting Rhode Island Hospital, one of the City’s largest employers, to Providence’s train station with new routes that will provide service every five

minutes, utilizing the state’s first bus-only lanes. In addition, Rhode Island will be employing new transit signal priority technology at 100 intersections throughout Providence’s major thoroughfares, which will increase reliability and reduce travel times for passengers.

## Resilience

On September 15, 2017, Governor Raimondo signed an Executive Order appointing a Chief Resilience Officer to drive climate resilience efforts across the state, both within government and in collaboration with business, academic, and nonprofit partners, with the mission to develop a statewide **Climate Resilience Action Strategy**, which was submitted to the Governor on July 2, 2018. The report provided recommendations across a variety of areas including transportation, water/coastal areas, power, and emergency preparedness and is now being implemented.

## Climate Finance

Rhode Island has a variety of programs that help fund or remove barriers towards energy efficiency, renewable energy, and resilience projects. The **Commercial Property Assessed Clean Energy (C-PACE)** program helps provide up to 100% financing for energy efficiency and renewable energy projects to commercial entities. The **Rhode Island Infrastructure Bank** actively supports and finances investments in infrastructure that enhances the environment through a variety of means, including the issuance of bonds.

## Natural and Working Lands

Rhode Island’s Department of Environmental Management (DEM), in conjunction with the U.S. Department of Agriculture Forest Service, offers guidance on how landowners can properly manage forest areas and maintain healthy local ecosystems through its **Forest Stewardship Program**. The DEM also operates the **Forest Legacy Program** which purchases land threatened by encroachment to prevent commercialization or development to maintain healthy habitats and ecosystems.



GHG Reduction Target  
% Below 1990 Levels

**50%** by 2028      **75%** by 2050

Renewable Energy  
and Energy Efficiency Jobs

**13,563**  
Jobs in 2018  
(EFI & NASEO, 2018)

RPS Target

**75%**  
by 2032

### Climate Framework and Laws

The Governor’s **Commission on Climate Change (CCCC)** was established by executive order (EO) in 2005 with the goal of better understanding greenhouse gas emissions in Vermont and to develop a set of policy recommendations for reducing those emissions across all sectors. The EO also included greenhouse gas reduction goals of 25% below 1990 levels by 2012, 50% below 1990 levels by 2028, and 75% below 1990 levels by 2050. In 2017, Governor Phil Scott created the **Vermont Climate Action Commission** to recommend actions to reduce greenhouse gas emissions consistent with the goals of Vermont’s 2016 **Comprehensive Energy Plan** while spurring economic activity.

### Energy

Vermont’s **renewable energy standard (RES)** mandates electric distribution utilities to have energy portfolios with at least 55% renewable energy starting in 2017 and gradually increasing to 75% by 2032. The RES also requires distribution utilities to procure 1% of their electricity from new distributed renewable generation in 2017, which increases to 10% in 2032 and has a Tier III requirement for projects which reduce fossil fuel consumption by their customers. Vermont is also a member of RGGI, the proceeds of which are used to help fund energy efficiency projects around the state.

### Energy Efficiency

**Efficiency Vermont** is the nation’s first ratepayer-funded energy efficiency utility, which aims to save energy and lower emissions through efficiency improvements to Vermont homes and businesses. Vermont also requires new residential and commercial buildings to meet minimum energy efficiency standards.

### Transportation

The **Vermont Low Emission Vehicle (LEV) Program** requires that new vehicles sold in the state meet the same emissions requirements as new vehicles sold in California. The program, including its Zero Emission Vehicle (ZEV)

requirements, is a key strategy in climate change mitigation. Vermont is a member of both the **Transportation Climate Initiative (TCI)** and the **Multi-State ZEV Taskforce** and has recommitted to the recommendations in the updated 2018–2021 ZEV Action Plan to spur electric vehicle adoption. Through a public-private partnership Vermont supports **Drive Electric Vermont (DEV)** to promote the sale of electric vehicles through outreach and education, and currently has the fifth highest ZEV adoption rate in the country per capita.

### Resilience

Vermont state government, along with local governments, are creating plans for adaptation strategies to help prepare communities for future flooding events, specifically through the Federal Emergency Management Agency and the **Vermont Economic Resilience Initiative (VERI)**.

### Climate Finance

The **Sustainable Energy Loan Fund** and the **Vermont Clean Energy Development Fund** provide funding for renewable and sustainable energy projects while the **Heat Saver Loan Program** provides funding for weatherization and high-efficiency heating systems. The Weatherization Trust Fund provides long-term state funding for weatherization through a 0.5% gross receipts tax on all non-transportation fuels sold in the state, generating approximately \$6 million annually for low-income weatherization.

### Natural and Working Lands

Vermont’s 2017 **Forest Action Plan** advances the ongoing management and preservation efforts. Conservation efforts aimed at keeping forest land as forest land and promoting the growth of new forest increases the state’s carbon sequestration, biologic diversity, and ecological productivity. Vermont is also working to supplement the existing 350,000 acres of conservation land with previously lost or damaged floodplain and wetland areas to help mitigate the impacts of future flooding events.



# Virginia

Renewable Energy  
and Energy Efficiency Jobs

**82,816**

Jobs in 2018  
(EFI & NASEO, 2018)

RPS Target

**15%**

by 2025 (voluntary)

## Energy

Virginia’s Department of Environmental Quality has developed draft regulations to reduce carbon emissions from power plants. The regulation would enable Virginia to link to the **Regional Greenhouse Gas Initiative** beginning in 2020, with emissions reductions of 30% between 2020 and 2030. Governor Northam signed the **Grid Transformation and Security Act** in March of 2018 to overhaul Virginia’s energy regulatory landscape. The legislation will enable Virginia’s electric utilities to modernize the grid with an emphasis on investments in clean energy technology. This will increase the amount of utility-scale solar from the previous level of 500 megawatts to 5,000 megawatts over ten years, with 3,000 megawatts coming in the first four years.

## Energy Efficiency

Virginia has a goal of reducing state government electricity consumption by 15% (from 2010 levels). **Energy Performance Contracting (EPC)** has been a valuable tool for state agencies to take a comprehensive approach to reduce energy consumption in state buildings. Currently, Virginia has achieved 38% of the goal through. These efforts have resulted in the reduction of nearly 43 million kilowatt hours of electricity and the avoidance of 31,219 metric tons of CO<sub>2</sub> emissions annually. The **Grid Transformation and Security Act** requires Virginia electric utilities to propose \$1 billion in energy efficiency projects over the next decade.

## Transportation

Virginia expanded the scope for the use of federal Congestion Mitigation and Air Quality Improvement (CMAQ) funds to include use by localities located in air quality non-attainment areas of Virginia. Through 2020, \$9 million in CMAQ funding will be made available for state and local use to cover the incremental costs of purchasing or converting a vehicle to alternative fuels. The **Virginia Electric Vehicle Initiative** will work to incentivize

and fund the installation of public-access, Direct Current fast-charging stations. The Initiative will leverage the funding provided to the states under the Volkswagen Settlement, from which Virginia recently announced a \$14 million contract with EVgo to begin building an EV charging network in the Commonwealth.

## Resilience

In the 2018 Budget passed by the state legislature, funding was allocated to hire a Special Assistant to the Governor for Coastal Resilience. Once hired, that person will work to create a statewide resilience and natural hazard mitigation program.

## Climate Finance

The Commonwealth’s first statewide **Green Community Program** is funded through the reauthorization of Qualified Energy Conservation Bonds (QECCBs). VirginiaSAVES, has provided nearly \$65 million in financing support for energy efficiency projects in Virginia since September of 2015. The projects funded will annually save over 18 million kilowatt hours of electricity and more than 22 million gallons of water while avoiding 18,675 tons of carbon emissions each year.

## Natural and Working Lands

Governor Northam recently revealed his core land conservation initiative, which will use data and mapping tools to identify high-value lands for conservation purposes. One goal is to align conservation goals with the achievement of broader targets, including climate change and resiliency. Virginia’s natural resource agencies have developed tools to prioritize land conservation based on the best available climate and sea level rise data so we may better address concerns such as coastal lands soon to be flooded, wetland migration areas, as well as planning for existing and future infrastructure.



# Washington

GHG Reduction Target  
% Below 1990 Levels

**1990 LEVELS**    **25%**    **50%**  
by 2020            by 2035    by 2050

Renewable Energy  
and Energy Efficiency Jobs

**73,418**  
Jobs in 2018  
(EFI & NASEO, 2018)

RPS Target

**15%**  
by 2020

## Energy

Washington leads the nation in electricity generation from renewable resources. 57,000 people currently work in the clean technology sector, and the state generates more than 75% of its electricity from renewable resources, mostly hydroelectric power, and will be virtually coal-free by 2026 thanks to **Coal Decommissioning**. Washington produces nearly one-fifth of all renewable electricity produced in the U.S. aided by **Solar Incentives Jobs Program**, **Renewable Energy Sales Tax Exemptions**, and a **Renewable Portfolio Standard** requiring large utilities to obtain 15% of their electricity from renewable resources and to undertake cost-effective conservation. Actions taken by utilities to meet the state’s accompanying conservation standard will yield enough energy savings to meet 85% of projected energy demand through 2029.

## Energy Efficiency

Washington was the first state in the country to adopt high-performance **Green Buildings Standards** for state-funded buildings and is on track to ensure all new buildings are energy-neutral by 2030. The **Building Energy Consumption Disclosure** through the advancing of commercial building energy benchmarking requires large building owners to disclose energy use at time of sale, lease, or when applying for a loan, while the **Evergreen Sustainable Development Standard (ESDS)** ensures affordable housing projects are complying with energy efficiency standards.

## Transportation

Washington has emerged as one of the leading states for deployment of electric vehicles. In 2014 Washington set a goal of putting 50,000 electric vehicles into use by 2020. As of September 2018, there are 33,000 EVs in Washington state so far. Also, Washington is collaborating with West

Coast states to increase the number of charging stations between Mexican and Canadian borders, as well as assess opportunities for high-speed railways, electrified ferry systems, and ACES technology – autonomous, connected, electric and shared vehicles in urban areas of the state.

## Resilience

The **Washington State Climate Leadership Act (SCLA)** and the **Washington Coastal Hazards Resilience Network (CHRN)** both work across many government departments and state agencies to enact studies and plans for climate resilience, addressing issues such as coastal erosion and best land use practices considering long-term climate impacts.

## Climate Financing

Established by Governor Inslee in 2013, the **Washington State Clean Energy Fund (CEF)** is designed to expand clean energy projects and technologies statewide. To date, \$80 million has been invested, leveraged by an additional \$200 million in federal and private funds, in a range of areas spanning clean, renewable, and efficient energy. Additionally, **Meter-Based Financing** has completed 574 loans for a total of \$6.7 million to pay for energy efficiency projects in Washington homes.

## Natural and Working Lands

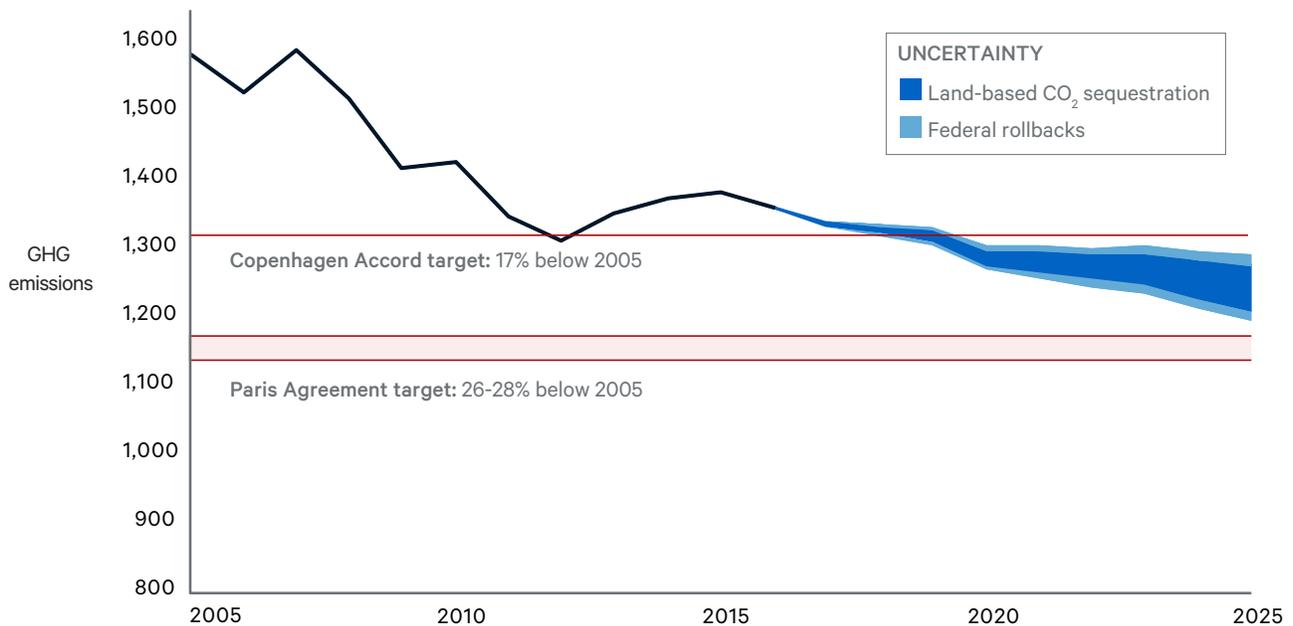
The **Ocean Acidification Policy and Management** and the **Washington Shellfish Initiative** are both multi-group collaborations that inform ocean management in the interest of ocean habitats and the thriving shellfish industry. Inland, the **Chehalis Basin Strategy** seeks to tackle both flooding issues and habitat loss through large-scale flood damage mitigation and reduction measures.

# Continuing to Lead on Climate

Rhodium Group modeled the impact of current policies and actions on future GHG emissions using a detailed, state-level energy-economic model that captures all sectors of the economy and all greenhouse gases. Rhodium modeled a range of potential emissions outcomes with and without federal policies currently in jeopardy and accounting for uncertainty in the capacity of forests and other lands to continue to remove carbon from the atmosphere. The analysis finds that Alliance states will continue to lead the nation in reducing GHG emissions and that we are on our way to meet our share of the U.S. emission reduction target. Under today's policies, Alliance states are projected to achieve a combined reduction of 18–25 percent below 2005 levels by 2025 (Figure 6). This

reflects a higher projection of our future GHG emissions from last year due in large part to increased uncertainty regarding federal regulatory rollbacks and improved HFC and land sector sequestration accounting methodologies. Importantly, these estimates provide a snapshot of Alliance member policies today. They do not include the full range of additional actions we intend to implement or the emission reduction goals we have set for ourselves. While the Administration's efforts to weaken federal environmental policies create real challenges for existing state efforts, these challenges also strengthen our resolve to step up efforts and provide the climate action that the residents and businesses of the Alliance states are seeking. We also remain committed to transparently

**FIGURE 6** Progress Under Today's Policies Set the Stage for Accelerated Action  
 Net GHG emissions, million metric tons CO<sub>2</sub>e



**SOURCE:** Rhodium Group. Methodology included in Appendix. **NOTES:** GHG emissions estimates reflect emissions from power generated within state boundaries. Uncertainty in CO<sub>2</sub> sequestration from forests and other lands are derived from EPA and USDA estimates. Federal rollbacks include federal Corporate Average Fuel Economy (CAFE) standards, EPA and BLM methane standards for oil & gas activities and landfills, and EPA's Significant New Alternatives Policy (SNAP) Rule 20 and the Kigali Amendment for phase-down of HFCs. For more information see the Technical Appendix. Emissions from Puerto Rico include only CO<sub>2</sub> associated with fossil fuel consumption.



reporting on our progress going forward and continuing to improve our emissions estimates so we can understand where to prioritize our emission reduction efforts.

### Changes from last year's report

The Alliance believes in making continuous improvements to our emissions estimates and improving the transparency of our reporting. Each year improvements in accounting methodologies and changes in federal and state policy will change our emissions outlook. A significant portion of the changes in this year's projections is the result of changes in federal policy. Since last year, many federal policies have been put on the chopping block, threatening the progress the Alliance is working to achieve. These include: rules that would phase-down emissions of high-warming HFCs used in air-conditioning and refrigeration; fuel economy standards for passenger vehicles; and methane standards for oil and gas activities and landfills. Policies adopted by some Alliance states to uphold or even exceed the emission reductions of the federal policies that are in jeopardy, like GHG standards for passenger vehicles and SLCP standards, are included in our analysis and offset some, but not all, of the impact of federal rollbacks.

Methodological improvements also affected our emissions trajectory. First, EPA revised their methods for estimating net carbon sequestration from land use,

land use change, and forestry. This change set back U.S. Climate Alliance sequestration estimates compared to last year's projections. At the same time, the Alliance has worked together over the past year to improve methods used to estimate HFC emissions. Until now, there has been very little information about projected HFC emissions and how policies can affect these estimates. Without any updated federal projections, the California Air Resources Board stepped in to develop the most accurate up-to-date national and state estimates available. While these improved methods have resulted in higher HFC emission projections compared to last year (20 percent), we now have much better insight on how state and federal policies affect emissions going forward.

We also welcomed two new states into the Alliance. All states in the Climate Alliance are at different stages in implementing ambitious climate action, and expanding our membership has not only increased the diversity of states committed to working together but also means that the Alliance's actions cover an increased share of U.S. GHG emissions.

Additional details on the methodology and federal rollback assumptions are provided in the Appendix.

# Setting the Stage for Accelerated Action

*Even though the U.S. Climate Alliance continues to reduce our GHG emissions faster than the rest of the country, we know there is more to be done, especially in the face of federal rollbacks. Looking ahead, we aim to accelerate the implementation of effective climate action to meet our share of the Paris Agreement’s emission reduction goals, all while continuing to grow our economies and create jobs for Americans.*

On June 1, 2018 – the one-year anniversary of the formation of the U.S. Climate Alliance – we announced a new wave of initiatives to scale up climate action. Three months later, at the Global Climate Action Summit, we committed to additional concrete actions:

## Short-Lived Climate Pollutants

SLCPs are potent climate forcers and harmful air pollutants that have an outsized impact on climate change in the near-term. Until recently, an effective federal regulatory framework was in place to begin reducing SLCP emissions nationally. Many of these rules have been rescinded or delayed, leading to significant regulatory uncertainty affecting businesses and emissions in the United States. This uncertainty, along with a more accurate understanding of where emissions from this sector are headed, makes state leadership on reducing SLCP emissions all the more necessary and urgent. In the absence of regulatory certainty at the federal level, and building on our commitment under the SLCP Challenge, the Alliance is launching an SLCP Challenge to Action Roadmap that calls on partners to support Alliance states as we collectively reduce our SLCPs emissions by as much as 40–50 percent by 2030. We also commit to develop and implement state-specific strategies reflective of our authority and ability to accomplish the goals.

## Natural and Working Lands

The natural systems upon which we depend are essential to life and critical for reducing the impacts of climate

change on our communities. These systems are also under threat from destructive human activity and climate change. To protect the communities, economies, and ecosystems that depend on them, we will manage forests, farms, rangelands, and wetlands, to be both economically productive and resilient carbon sinks. We launched a Natural and Working Lands Challenge that commits our states to advance programs, policies and incentives to reduce GHG emissions from land and enhance resilient carbon sequestration. Over the next two years, the Alliance will bring resources to bear on improving GHG inventory methods and identify best practices for land conservation, restoration, and management such that land-based pathways can be integrated into state GHG mitigation plans by 2020. Through these actions, we will grow and manage our forest resources, protect our food systems and water quality, and preserve our nation’s natural beauty for generations to come.

## Transportation

The transportation sector is the largest source of GHG emissions across our states. Alliance states are supporting innovation across the sector to provide our residents access to the best technologies, grow our economies and create jobs – all while drastically reducing emissions. Because of this, we are working to mobilize billions of dollars in ZEV infrastructure and vehicle deployment and moving towards a vision of zero-carbon mobility across all transportation modes. We will collectively deploy \$1.4 billion in settlement funds for ZEVs and other clean transportation projects while expanding our networks of

ZEV charging stations. We also will lead by example and work towards converting our state fleets to ZEVs. The U.S. Climate Alliance is developing a playbook of case studies and model policies to help all states achieve this vision.

### Product Energy Efficiency Standards

Over the last three decades, energy efficiency standards have saved consumers billions of dollars while providing the most cost-effective opportunity to avoid constructing costly new power generation. Going forward, the U.S. Climate Alliance will explore state-level efficiency standards for a range of consumer and commercial appliances. Coordinated U.S. Climate Alliance state action could reduce GHG emissions by 5.5 million tons by 2025 while saving ratepayers nearly \$4 billion in the same timeframe.<sup>34</sup> Working together, we also have the potential to transform the U.S. market for this set of products, providing stability to manufacturers and ensuring all Americans have access to money-saving products.

### Solar Soft Costs

We recognize that solar power is a vital component of a sustainable energy system and represents a major economic and job creation engine. Unfortunately, federal import tariffs on solar panels and cells enacted by the federal government in early 2018 are likely to halt these benefits. The Solar Energy Industries Association estimates that tariffs will cause the loss of roughly 23,000 American jobs this year alone, including solar panel installer jobs, which is the fastest-growing employment category in the country.<sup>35</sup> As a first step toward offsetting the impacts of these tariffs, we will release the U.S. Climate Alliance Solar Guidebook, which identifies best practices and hands-on tools for states to reduce solar energy system costs and streamline regulatory processes and work together on the implementation of the guidebook's recommendations.

### Grid Modernization

U.S. Climate Alliance states are leaders in deploying clean energy and innovative distributed energy resources, and states are moving boldly to modernize and strengthen their electric grids. However, withstanding the impacts of a changing climate and further accelerating emissions reductions requires new strategies. That is why we are helping to support the Non-Wires Solutions Playbook,

a groundbreaking implementation resource for regulators and utilities to support the deployment of clean distributed energy resources instead of traditional utility investments. By implementing innovative alternatives to traditional utility investments, U.S. Climate Alliance states will reduce emissions, save money for consumers, and modernize their electric grids.

### Resilience

There is increasing urgency for states to support efforts to build climate change resiliency, enhance local decision-making and to protect communities, residents, and resources from climate-change driven extreme weather, wildfire, drought, sea level rise and other impacts. In August 2017, the federal government disbanded a Federal Advisory Committee designed to help shape the U.S. National Climate Assessment process and ensure it provides information needed to support climate action, including at state and local levels. In January 2018, the group reconvened with support from New York Governor Cuomo as the Independent Advisory Committee (IAC), pledging to deliver recommendations to states in the U.S. Climate Alliance, among others. The IAC will issue a complete report this fall. The U.S. Climate Alliance will continue supporting independent climate science and working with the IAC to support the availability of climate information to policymakers. To expand this work across Alliance states, we will work with partners to provide direct planning assistance and resilience building strategies to our communities.

To deliver on these commitments, we will continue working together through strategic partnerships. This includes continuing to build out the U.S. Climate Alliance Clearinghouse,<sup>36</sup> which aims to aggregate climate tools, data, and information for use by policymakers and the public. It also includes working with Canada and Mexico through the North American Climate Leadership Dialogue and engaging with other initiatives to ensure that we are taking smart, coordinated action to grow our clean energy economies and continue to reduce our GHG emissions consistent with the goals of the Paris Agreement.

# Appendix

Historical data and projections used in this report were provided by Rhodium Group, an independent research company, through its US Climate Service. Historical data includes annual GHG emissions inventories for all sectors and greenhouse gases for all 50 states and U.S. territories and is consistent with international emissions inventory guidance set by United Nations Framework Convention on Climate Change (UNFCCC). The inventory is current through 2016 and relies on data from the U.S. Environmental Protection Agency (EPA), U.S. Department of Agriculture (USDA), Energy Information Administration (EIA) and other sources. GHG projections were produced using RHG-NEMS, a modified version of the detailed National Energy Modeling System used by the EIA to produce the Annual Energy Outlook. RHG-NEMS produces economy-wide, 6-gas projections for all 50 states and territories consistent with historical estimates. Rhodium Group has also updated a number of the energy market, technology cost and behavioral assumptions in NEMS to be consistent with recent market and economic research.

Projected emissions account for all federal and state policies as of June 2018, including the full repeal of the Clean Power Plan. The range of potential outcomes reflects uncertainty about the status of federal rules that are currently in jeopardy because the Administration has proposed to rescind or revise them or has failed to enforce them to date. Rhodium modeled Alliance-wide emissions with and without the following federal policies:

## Hydrofluorocarbons (HFCs)

- Federal Significant New Alternatives Policy (SNAP) Rule 20
- Kigali Amendment to the Montreal Protocol

## Methane

- EPA's methane standards for Municipal Solid Waste Landfills

- EPA's New Source Performance Standards and Control Techniques Guidelines for methane emissions from the oil and gas industry
- BLM's Methane and Waste Prevention rule

## Passenger vehicles

- Full rollback – Federal Corporate Average Fuel Economy (CAFE) Standards are frozen at 2020 levels (the Administration's preferred alternative) for all, but those Alliance states that have adopted California's vehicle emission standards under Section 177 of the Clean Air Act (these states maintain the current standards).
- Moderate rollback – The existing CAFE standards are revised downward by 33% (which aligns most closely with the Administration's alternative 8). Alliance member 177 states maintain the current standards.

Federal rollbacks account for about half of the difference in projected emissions reductions from last year's report. Rhodium's methodological improvements to its GHG inventory and projections contributed to about one-third of the difference, based primarily on the California Air Resources Board's improved methods for estimating baseline HFC emissions and the impact of federal policies, as well as EPA updates to its estimates of carbon sequestration from Land Use, Land Use Change and Forestry (LULUCF). The remainder of the difference in emissions reductions from last year's estimates was due to the change in Alliance membership.

For more information about modeling assumptions, see Rhodium's Taking Stock 2018 report and the detailed Technical Appendix to this report.

**TABLE 1 Aggregate GHG Emissions from Alliance States**

Million metric tons CO<sub>2</sub>e

Gas	Sector	2005	2016	2020	2025
Carbon Dioxide	Transportation	662	618	598	550 to 551
	Electric Power	420	290	238	232 to 235
	Buildings	261	223	244	239
	Industrial	180	158	172	174
	Other	51	49	53	58
	<b>Total</b>		<b>1,606</b>	<b>1,363</b>	<b>1,329</b>
Methane		136	130	125 to 130	125 to 131
Nitrous Oxide		63	62	60	60
F-Gases		47	68	75 to 85	73 to 98
Total	Gross GHG Emissions	1,852	1,623	1,589 to 1,604	1,513 to 1,543
	LULUCF Sequestration	-267	-261	-320 to -299	-253 to -316
	Net GHG Emissions	1,585	1,362	1,269 to 1,305	1,195 to 1,292
	Change from 2005	-	-14%	-18% to -20%	-18% to -25%

**SOURCE:** Rhodium Group's U.S. Climate Service. **NOTE:** CO<sub>2</sub> emissions for all sectors except "other" reflect emissions from fossil fuel combustion only. Puerto Rico's emissions are estimated using data from EPA's 2018 GHG inventory and include only CO<sub>2</sub> emissions from fuel consumption. Projected 2025 values reflect the low (left) and high (right) bounding cases of Rhodium's scenario analysis.

# Endnotes

- 1 Based on <https://www.bea.gov/regional/>; <https://www.imf.org/external/pubs/ft/weo/2017/01/weodata/index.aspx> and <https://www.census.gov/data/tables/2016/demo/popest/nation-total.html>
- 2 [https://www.arb.ca.gov/cc/inventory/pubs/reports/2000\\_2016/ghg\\_inventory\\_trends\\_00-16.pdf](https://www.arb.ca.gov/cc/inventory/pubs/reports/2000_2016/ghg_inventory_trends_00-16.pdf)
- 3 [http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/analysis\\_group\\_rggi\\_report\\_april\\_2018.pdf](http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/analysis_group_rggi_report_april_2018.pdf)
- 4 <https://www.eia.gov/electricity/annual/> and <https://atb.nrel.gov/>
- 5 <http://www.dsireusa.org/resources/detailed-summary-maps/>
- 6 Rhodium Group analysis based on <https://www.nature.com/articles/nenergy2017134>
- 7 <https://www.usclimatealliance.org/publications/2018/1/4/us-climate-alliance-statement-on-epa-repeal-of-clean-power-plan>
- 8 <https://www.eia.gov/electricity/data/eia860M/> and <https://www.eia.gov/electricity/data/eia861m/>
- 9 <http://database.aceee.org/state-scorecard-rank>
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- 12 <https://www.usenergyjobs.org/>
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- 14 <https://www.zevstates.us/about-us/>
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- 20 Rhodium Group analysis.
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- 22 See <https://www.transportpolicy.net/standard/us-section-177-states/> for the full list of existing Section 177 states. Note that in June, 2018, Colorado Governor John Hickenlooper signed an executive order that commits the state to adopting low emission vehicle (LEV) standards similar to the California LEV program. See: <https://www.colorado.gov/governor/news/gov-hickenlooper-signs-executive-order-calling-state-adopt-low-emissions-vehicle-standards>
- 23 <https://nepis.epa.gov/Exe/ZyPDF.cgi/P100EZ7C.PDF?Dockey=P100EZ7C.PDF>
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- 27 <https://www.epa.gov/agstar/live-stock-anaerobic-digester-database>; <https://www.dairycares.com/e-news/california-doubles-down-on-climate-smart-dairy>
- 28 <https://www.cdfa.ca.gov/oefi/AMMP/>; <https://www.cdfa.ca.gov/oefi/ddrdp/>
- 29 [https://www.arb.ca.gov/board/books/2018/020818/18-1-2pres.pdf?utm\\_medium=email&utm\\_source=govdelivery](https://www.arb.ca.gov/board/books/2018/020818/18-1-2pres.pdf?utm_medium=email&utm_source=govdelivery)
- 30 Rhodium Group analysis based on <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2016>
- 31 [https://www.agcensus.usda.gov/Publications/2012/Full\\_Report/Census\\_by\\_State/](https://www.agcensus.usda.gov/Publications/2012/Full_Report/Census_by_State/)
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**UNITED STATES  
CLIMATE ALLIANCE**

[www.usclimatealliance.org](http://www.usclimatealliance.org)

For more information, see [www.usclimatealliance.org](http://www.usclimatealliance.org).

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**Appendix F: U.S. Climate Alliance Statement on Leadership**

# UNITED STATES CLIMATE ALLIANCE

## U.S. Climate Alliance Statement on Leadership Global Climate Action Summit | 13 September 2018

Across every sector, U.S. Climate Alliance states continue to lead the nation in reducing greenhouse gas emissions (GHGs) and have done so while growing our economies faster than the rest of the nation and creating 1.3 million clean energy jobs. We have worked across party lines to share our experiences and find common solutions and as a result, are already more than halfway to reaching our share of the U.S.' Paris Agreement emission reduction goals.

However, in the last year, the federal rollback of our nation's climate framework has had real consequences. These measures are projected to slow the reduction of carbon pollution across the country - putting the health of American families at risk and raising the costs to our communities and businesses from climate impacts. In the last year alone, extreme weather events, exacerbated by climate change, ravaged our communities and cost the United States over \$300 billion.

As leaders, we cannot ignore reality. We must continue to put politics aside and focus on the solutions at hand. The urgency of the climate crisis demands more innovation and ambition. We therefore reiterate our commitment to meeting our share of the Paris Agreement's emission reduction goals and announce a suite of new actions to further address climate change.

The U.S. Climate Alliance is committed to taking the following new actions:

### **Protect our Natural and Working Lands**

We recognize that we cannot achieve the goals of the Paris Agreement by mitigating emission through power, transportation and industry alone. We must pull harmful carbon out of our atmosphere as fast as possible. We therefore resolve to protect and sequester carbon in our lands and will integrate actions and pathways into state GHG mitigation plans by 2020. Through these actions, we also will help secure the livelihoods of farmers, ranchers and foresters, protect our food systems and water quality, and preserve our nation's natural beauty for all our residents for generations to come.

### **Drive Down Potent Short-Lived Climate Pollutants**

Reducing short-lived climate pollutants (SLCPs) - such as methane, hydrofluorocarbons (HFCs) and black carbon - can avoid as many as roughly 200,000 premature deaths and 6 million tons of crop losses annually in the United States in 2030.<sup>1</sup> Action on SLCPs also presents a tremendous economic opportunity for U.S. companies at the cutting edge of SLCP solutions.

Building on our commitment under the [Short-Lived Climate Pollutant Challenge](#), we are releasing the [SLCP Challenge to Action Roadmap](#), which provides a framework that has the potential to reduce our collective SLCPs emissions by as much as 40-50 percent by 2030. We also commit to develop and implement state-specific strategies to support this goal. As a first step, Virginia announces that it is beginning a process to limit methane pollution from natural gas infrastructure and landfills.

To further demonstrate our commitment to lead, Connecticut, Maryland and New York announce their intention to propose regulations in 2019 to prohibit the use of high-warming HFCs, consistent with the 2015 and 2016 EPA SNAP Rules. These proposed regulations will be substantially consistent across these

states and with the regulations recently adopted in California. The U.S. Climate Alliance commits to accelerating the replacement of climate warming HFCs through voluntary and regulatory approaches, and Alliance states will work together in the coming year to explore actions appropriate for each of our states.

### **| Transform Transportation to Reduce Emissions**

Transportation is the largest source of GHG emissions in the U.S. today. Alliance states are already reducing transportation emissions at 3 times the rate of the rest of the United States, and three out of four zero-emission vehicles (ZEVs) on American roads are in our states.<sup>ii</sup> Building on this momentum, we resolve to continue transforming the transportation sector towards deep emissions reductions. Together, the 17 states and territories that make up the U.S. Climate Alliance are investing billions of dollars in infrastructure and vehicle deployment through state programs, mitigation funding, and utility and private investments. Today we announce the deployment of \$1.4bn from the auto settlement to drive down our transportation emissions, and challenge the rest of the states to deploy all available resources towards the same effort.

### **| Increase Access to Affordable Clean Energy for All**

All Americans should have the right to clean, affordable power. U.S. Climate Alliance governors are united in their opposition to the misguided federal import tariffs on solar panels and cells, which are forecasted to reduce solar installations and cause the loss of roughly 23,000 American jobs this year alone.<sup>iii</sup> We commit to reduce the impacts of the federal solar import tariffs through the implementation of innovative solar deployment measures and will work to modernize our grids. To achieve these goals, we are releasing an overview of the forthcoming U.S. Climate Alliance [Solar Deployment Guidebook](#) and [Non-Wires Solutions Playbook](#), groundbreaking implementation resources for regulators and utilities that will reduce emissions and save money for consumers.

### **| Save families money and avoid emissions through improved appliance efficiency standards**

Alignment around a common set of product efficiency standards in the Alliance states could reduce GHG emissions by 5.5 million tons and save consumers across our states \$4 billion dollars by 2025. Today the U.S. Climate Alliance announces plans to identify priority state-level appliance efficiency standards and to coordinate with Alliance states on the adoption, implementation and enforcement of such standards. The Alliance will be partnering with the Appliance Standards Awareness Project, an initiative of the American Council for an Energy Efficient Economy, to advance this effort.

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<sup>i</sup> Updated from Shindell et al (2012) Simultaneously Mitigating Near-Term Climate Change and Improving Human Health and Food Security, *Science* **335**, 183-189 and UNEP and WMO (2011) Integrated Assessment of Black Carbon and Tropospheric Ozone, United Nations Environment Programme and World Meteorological Organization.

<sup>ii</sup> Rhodium Group's U.S. Climate Service

<sup>iii</sup> Solar Energy Industry Association. [President's Decision on Solar Tariffs is a Loss for America](https://www.seia.org/news/presidents-decision-solar-tariffs-loss-america). <https://www.seia.org/news/presidents-decision-solar-tariffs-loss-america>. January 22, 2018

**Appendix G: Joint Statement on North American Climate Leadership**

## JOINT STATEMENT ON NORTH AMERICAN CLIMATE LEADERSHIP

13 September 2018 | Global Climate Action Summit

To accelerate climate policy efforts across North America, Canada, Mexico and the U.S. Climate Alliance launched the North American Climate Leadership Dialogue at COP23, identifying a short list of topics to be addressed. Delivering on that promise for closer cooperation, at today's Global Climate Action Summit, Canada, Mexico, and the U.S. Climate Alliance agreed to work together to achieve an ambitious climate agenda, and to report on our progress at the 2019 UN Secretary General's Climate Summit.

To protect our communities from harmful pollution now, we will stand united in advancing **improvements in efficiency, electrification and greenhouse gas emission performance of vehicles** through information exchanges and collaboration.

Our jurisdictions are already leaders on zero-carbon energy. We commit to go further, by reaffirming the commitment made at the North America Leaders' Summit to work toward a goal of **50% of zero-carbon power generation by 2025 collectively across North America**, working hand-in-hand with the private sector and beyond the borders of our membership. Connecticut, Hawaii and New York join Canada and Mexico in the **Powering Past Coal Alliance**, and resolve to phase out traditional and avoid new coal power stations without operational carbon capture and storage.

Reductions of short-lived climate pollutants (SLCPs) - namely methane, hydrofluorocarbons (HFCs), black carbon and ground-level ozone – can not only help achieve our climate and air quality objectives, but also have significant environmental, energy, economic and health benefits. Cost-effective solutions exist and can enhance economic opportunities in key-sectors. To drive down the emission of these harmful pollutants, **Canada and Mexico accept the [Short-Lived Climate Pollutant Challenge](#) issued by the U.S. Climate Alliance, and we each agree to develop and implement ambitious short-lived climate pollutant reduction strategies.**

We also recognize that we cannot achieve the goals of the Paris Agreement by reducing emissions from the electricity, transportation, and industrial sectors alone. We must remove harmful carbon from our atmosphere as fast as possible. **We therefore resolve to manage natural and working lands to be a net sink of carbon; to protect and increase carbon storage capacity; and to integrate priority actions and pathways into GHG mitigation plans by 2020.** Maintaining natural and working lands protects the communities, economies, and ecosystems that depend on them, which in turn has significant co-benefits for climate mitigation and adaptation.

Given the importance of ecosystem services, we encourage collaborative efforts to build robust observations and modelling networks for mitigation and adaptation efforts, seeking a better integration of ocean observation systems and to foster complementary research on oceans and climate change, including the impacts of climate change on oceans and marine ecosystems.

**We commit to increasing economic and socio-ecological resilience of coastal communities and marine ecosystems** in the context of climate change through enhanced cooperation on ocean management, including among respective marine protected areas.

Cooperative efforts on market-based strategies for emissions reductions continue to drive innovation and grow economies while reducing greenhouse gas emissions. We resolve to deepen our cooperation through existing platforms that seek to incorporate the cost of carbon pollution into decision-making.

We recognize the importance of the Social Cost of Carbon, a critical tool for assessing the damages associated with carbon pollution, and **Canada and Mexico join the partnership between the U.S. Climate Alliance, Resources for the Future, and Climate Impact Lab** in order to share information related to scientific progress to update the metric, and **promote opportunities to use the Social Cost of Carbon** appropriately across a wide range of policy applications.

## **Appendix H: Talanoa Dialogue**

# UNITED STATES CLIMATE ALLIANCE

## Non-Party stakeholders' inputs for the Talanoa Dialogue

### WHERE ARE WE

#### Our Commitments and Actions

The bipartisan U.S. Climate Alliance formed in response to the President's decision to withdraw from the Paris Agreement. Over the course of its first year, we have grown to 17 states and territories, representing a wide diversity of people, places, and economic activity. We are home to 40 percent of the U.S. population and account for nearly \$9 trillion in combined economic activity—enough to be the world's third largest country. The U.S. Climate Alliance remains committed to the Paris Agreement and to meeting our share of the U.S. Nationally Determined Contribution—a 26-28 percent reduction in greenhouse gas (GHG) emissions below 2005 levels by 2025—while continuing to grow our economies. The climate challenge demands an urgent and ambitious response. We call on other states and territories to join us, on local and business leaders to work with us, and on the community of nations to take every measure necessary to meet and strive to exceed their Nationally Determined Contributions.

#### Progress on the Commitments

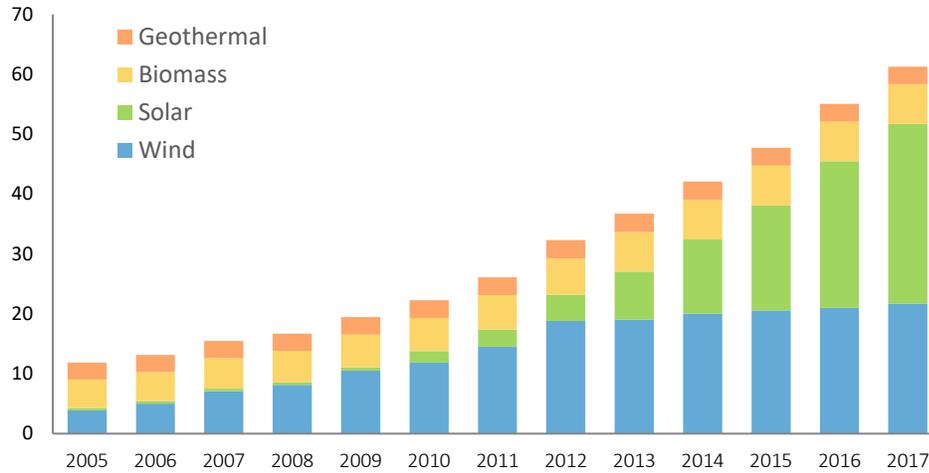
Alliance states are at the forefront of implementing **market-based programs** to reduce carbon emissions cost-effectively. Our residents are reaping the benefits of these, and many other policies and regulations, through cleaner air, more clean energy jobs, lower energy bills, and more resilient communities. For example, California's multi-sector cap-and-trade program took effect in early 2012 with its economy continuing to grow while also reducing emissions - between 2015-16, California's Gross Domestic Product (GDP) grew 3 percent while the carbon intensity of its economy declined by 6 percent.<sup>1</sup> Seven Alliance states participate in the Regional Greenhouse Gas Initiative (RGGI) program in the Northeast, which establishes carbon pollution caps for regional power plants and invests in new clean energy opportunities, with two more states advancing similar programs. A recent analysis finds that RGGI states have reduced their power plant CO<sub>2</sub> emissions by more than 50 percent since the program started nine years ago while likely generating billions of dollars of net economic value between 2015-17 alone.<sup>2</sup>

In the **power sector**, Alliance states have attracted nearly \$110 billion in renewable energy investment since 2011, with wind, solar, geothermal and biomass generating capacity growing 5-fold over the last decade (Figure 1).<sup>3</sup> This is largely due to the renewable portfolio standards (RPS) and state-wide renewable energy goals currently in place in all of the Alliance states.<sup>4</sup> These renewable sources are bringing air quality benefits to our local communities: between 2007 and 2015, the expansion of wind and solar energy in our states collectively reduced both sulfur dioxide (SO<sub>2</sub>) and nitrogen oxide (NO<sub>x</sub>) emissions by over 100,000 tons, resulting in \$16.7 billion in public health benefits.<sup>5</sup> Alliance states stood

together in opposing the U.S. Environmental Protection Agency’s (EPA) proposal to repeal the Clean Power Plan,<sup>6</sup> which would have led to cleaner and more efficient power generation nationwide.

**FIGURE 1: Rapid expansion of renewable energy**

Gigawatts of non-hydro renewable electricity generation capacity in Alliance states



Source: Energy Information Administration (EIA), Solar Energy Industries Association (SEIA) and Rhodium Group analysis.

Alliance states are also U.S. leaders in deploying technology to store these clean energy sources. We are already home to 11 gigawatts of utility-scale energy storage capacity, which is half of all utility-scale capacity and nearly all (95 percent) of the distributed energy storage installed in the United States today.<sup>7</sup> And we are not stopping there. Four Alliance states have energy storage mandates, and these mandates are bearing fruit: 96 percent of all utility-scale storage projects planned for installation over the next five years are in Alliance states.

Alliance states lead the country in instituting aggressive **energy efficiency programs and policies**. Alliance states make up the top ten ranked states for energy efficiency policy, and nearly every member state has energy efficiency standards or goals in place, which has helped drive in-state investment and cost savings for our residents and businesses.<sup>8</sup> In fact, we generated \$3.8 billion in new investment in utility-driven energy efficiency improvements in 2016, a 60 percent jump from 2010.<sup>9</sup> These investments reduced the amount of electricity that households and businesses had to buy in 2016 by more than 13 billion kilowatt hours. This is equivalent to the electricity used by 1,450,000 homes for one year,<sup>10</sup> and more than double the rate of energy savings of non-member states. Not only did this save consumers in our states over \$1.3 billion in 2016, but efficiency programs in Alliance states have put over 1 million people to work, representing nearly half of all energy efficiency jobs in the U.S. in 2017.<sup>11</sup> What’s more, Alliance states are home to over half of all LEED-certified green buildings (54 percent, as of mid-2018), which not only save our residents energy and water but also create healthier environments in which to work and live.<sup>12</sup>

Combustion of fossil fuels to power passenger vehicles makes up the largest source of emissions within the **transportation sector**. Alliance states continue to lead the nation in reducing passenger vehicle emissions by implementing policies and programs that advance the deployment of zero emission vehicles. For example, the majority of U.S. Climate Alliance states are members of the Zero Emission Vehicle

(ZEV) Task Force, which is taking coordinated action to ensure the successful implementation of their state ZEV programs.<sup>13</sup> Together, these states have a collective goal of putting as many as 3.9 million ZEVs on the road by 2025—an 8-fold increase from today’s levels. Other Alliance states, like Washington and Colorado, also have goals to get more low emission vehicles on the road.<sup>14</sup> Additionally, California recently expanded its target to get 5 million ZEVs on the road by 2030.<sup>15</sup> In order to make these goals reality, Alliance states are the vanguard of a growing wave of investment in electric vehicle charging across the United States, with announced investments totaling nearly \$1.5 billion. Twelve Alliance states are leading the nation with more than 15 percent of the advanced charging infrastructure necessary to support this influx of electric vehicles by 2025 already in place, which will make it even easier to use an electric vehicle for both short- and long-term travel.<sup>16</sup>

U.S. Climate Alliance states are already home to some of the cleanest cars on the road today, thanks in part to the ten Alliance states that offer consumers financial incentives that make it easier to purchase plug-in hybrid or electric vehicles.<sup>17</sup> Altogether, Alliance states account for nearly 80 percent of all battery electric, plug-in hybrid, and fuel cell vehicles sold nationwide last year.<sup>18</sup> Three out of four ZEVs on the road today are in Alliance states, with Alliance vehicles reducing U.S. oil dependence by roughly 20 million barrels each year, supporting America’s energy independence and security.<sup>19</sup>

Through the Clean Air Act, California has been able to lead the country in pushing for cleaner cars and trucks.<sup>20</sup> Eleven Alliance states have also adopted California’s motor vehicle emission standards, with Colorado announcing in June 2018 that it will take steps to adopt the more stringent standards.<sup>21</sup> Starting in model year 2012, California’s GHG emission standards were harmonized with a national program so that consumers across the country could benefit from cleaner and more efficient vehicles—protecting the health of American families and saving them money at the pump. Current GHG and fuel economy standards require new passenger cars and trucks to achieve, on average, 54.5 miles-per-gallon equivalent by 2025. These more efficient vehicles would save consumers \$3,400 to \$5,000 over the car’s lifetime, after taking into account higher vehicle costs.<sup>22</sup> Together, Alliance states oppose recent efforts by the EPA and National Highway Traffic Safety Administration (NHTSA) to weaken the nation’s clean car standards.<sup>23</sup> In the wake of EPA and NHTSA’s proposal to weaken this program, the majority of Alliance states have joined with 20 total jurisdictions—representing more than 43 percent of the U.S. automobile market and 44 percent of the U.S. population—to mount legal challenges against federal efforts to weaken the nation’s single vehicle GHG emission and fuel economy standard.<sup>24</sup>

**Short-lived climate pollutants (SLCPs)**, such as black carbon, methane, tropospheric atmospheric ozone, and HFCs, act as powerful greenhouse gases. For example, just one pound of HFC-134a warms the planet as much as 1,400 pounds of carbon dioxide. California and New York have developed comprehensive plans to reduce emissions of potent SLCPs by as much as 50 percent by 2030.<sup>25</sup> Leading states like Colorado and Massachusetts have put regulations in place to cut methane from oil and gas production and natural gas pipelines. Over 100 projects are either operational or under development to reduce methane emissions on dairy and swine farms in California, North Carolina, and other U.S. Climate Alliance states.<sup>26</sup> These projects represent hundreds of millions of dollars of investment in farms and surrounding communities to convert manure into renewable energy, transportation fuel, or compost.<sup>27</sup> U.S. Climate Alliance states are also stepping up with state-level rules and programs to backstop against federal efforts to unwind reasonable regulations to reduce methane from oil and gas and

landfills, HFCs, and black carbon from woodstoves. Through local and state efforts to improve air quality and cut diesel pollution, states are slashing black carbon and saving thousands of lives each year.<sup>28</sup>

Alliance states are leading the way in protecting and improving our **natural and working lands**, pursuing a wide range of actions and measures that support land conservation, improve ecosystem health, and sequester carbon. Forests in Alliance states are especially productive and valuable in storing carbon. Home to a quarter of U.S. forests by land area, Alliance states store 35 percent of total U.S. forest carbon, offsetting 16 percent of Alliance states' emissions in 2016.<sup>29</sup> Alliance states have programs in place to support the rural economies, wildlife habitat, and water infrastructure that depend on healthy forests, which provide water resources to cities, towns, and farms. There are nearly 450,000 farms in Alliance states that produce the full range of U.S. crops, yielding 30 percent of all U.S. agricultural products by value.<sup>30</sup> Investment in our urban forests is also paying off through improved air and water quality, reduced energy use and carbon sequestration, delivering \$6.7 billion in value each year.<sup>31</sup>

**Improving the resilience** of our communities, infrastructure, and natural resources has long been a priority in Alliance states. In 2017 alone, extreme weather and climate-related events cost the United States over \$300 billion in damages, following a trend of increasingly severe hurricanes, extreme precipitation events, droughts, wildfires and heat waves. Of the top 20 costliest hurricanes to land on U.S. soil, all but three occurred since 2000, taking a significant toll on local economies. Our state governments are ground-zero for resilience activities across our states as we convene local and private interests, pool and mobilize resources and expertise across state agencies, and integrate the most up-to-date climate data into our natural and built infrastructure investments and planning. All of our states have conducted state impact assessments, and the vast majority has a climate resilience plan in place or under development. As a result of our ongoing efforts to protect our communities and reduce future costs from extreme weather and climate variability, the majority of Alliance states score better than the national average in EPA's Climate Resilience Screening Index.<sup>32</sup>

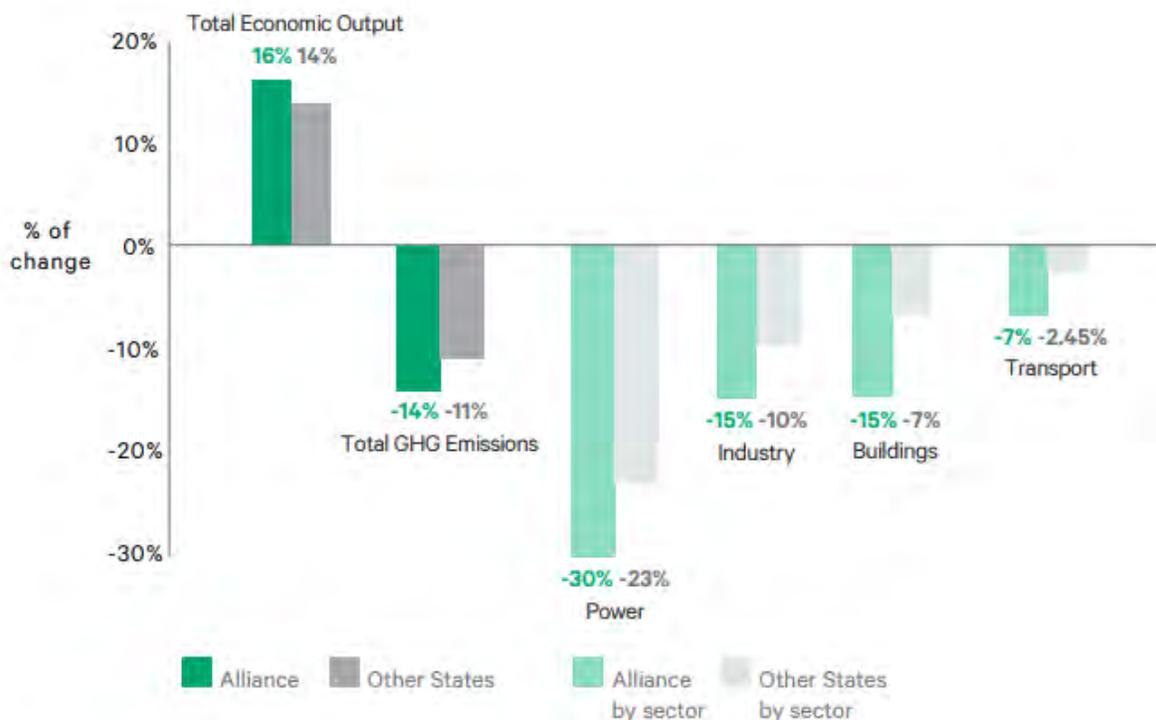
## | Quantitative Impact

A core commitment of the Alliance is to deliver greenhouse gas (GHG) emissions reductions consistent with the goals of the Paris Agreement and the U.S. pledge to reduce net emissions by 26-28 percent below 2005 levels by 2025. Alliance states have already made impressive progress toward achieving this goal. Independent analysis from the Rhodium Group finds that between 2005 and 2016, Alliance states collectively reduced net GHG emissions by 14 percent, compared with 11 percent for the rest of the nation. In all major sectors of the economy, Alliance states have outpaced all other states, with GHG emission reductions from the power sector hitting 30 percent below 2005 levels, and emissions from industry and buildings dropping 15 percent in the same time frame. Efforts to support cleaner cars and trucks in Alliance states, like zero-emission vehicle incentives and mandates, have reduced transportation emissions at three times the rate of the rest of the U.S.

Our states are driving these reductions at the same time as we are growing our economies faster than the rest of the country. Between 2005 and 2016, the combined economic output of Alliance states grew by 16 percent while the rest of the country grew by only 14 percent (Figure 2).

**FIGURE 2 Alliance States Lead in Emission Reductions and Economic Growth**

Change in net GHG emissions by sector and economic output, 2005 to 2016

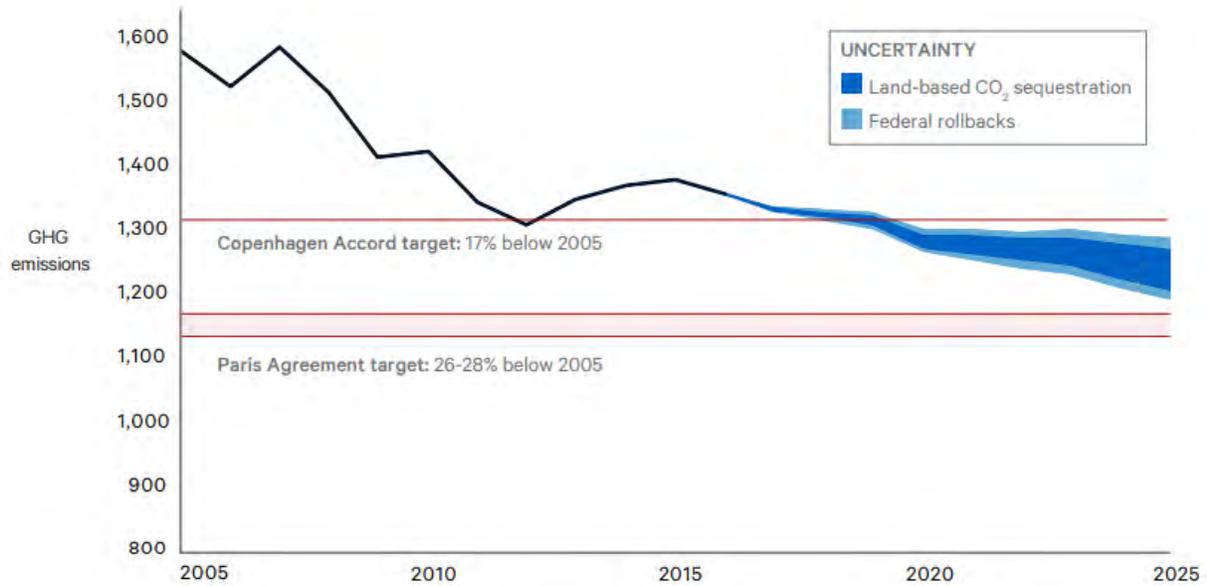


SOURCE: U.S. Bureau of Economic Analysis, Rhodium's U.S. Climate Service

Independent analysis finds that Alliance states will continue to lead the nation in reducing GHG emissions in the years ahead. Based on climate and clean energy policies already in place across Alliance states, we are projected to achieve a combined 18-25 percent reduction in GHG emissions below 2005 levels by 2025 (Figure 3). This range reflects a higher projection of our future GHG emissions from last year, with a significant portion being the direct result of attempts to dismantle federal climate policies. Since the release of our report last year, the Clean Power Plan has been repealed, and many other federal policies are now in jeopardy. This includes rules that would phase-down emissions of super-pollutants used in air-conditioning and refrigeration, fuel economy standards for passenger vehicles, and methane standards for oil and gas activities and landfills. Despite Alliance states advancing our clean energy and climate policies, the scale of proposed federal rollbacks is threatening state efforts to meet our share of the U.S. climate target for 2025. At the same time, U.S. Climate Alliance membership has grown, both in diversity and the share of national emissions the Alliance is working to drive down. We also continue to make methodological updates to improve the accuracy and transparency of our efforts, which has uncovered even steeper growth in hydrofluorocarbon (HFC) emissions and less carbon sequestration from land use and forests than previous national estimates, shedding light on the need to prioritize immediate action in these sectors. With these findings, we now are even more resolved to accelerate our efforts to help fill the federal gap on climate leadership.

**FIGURE 3 U.S. Climate Alliance progress under today's policies**

Net GHG emissions from Alliance states, million metric tons carbon dioxide (CO<sub>2</sub>) equivalent



**SOURCE:** Rhodium Group's U.S. Climate Service **NOTES:** GHG emissions estimates reflect emissions from power generated within state boundaries. Uncertainty in CO<sub>2</sub> sequestration from forests and other lands are derived from U.S. Environmental Protection Agency (EPA) and U.S. Department of Agriculture (USDA) estimates. Federal rollbacks include federal Corporate Average Fuel Economy (CAFE) standards, EPA and Bureau of Land Management (BLM) methane standards for oil & gas activities and landfills, and EPA's Significant New Alternatives Policy (SNAP) Rule 20 and the Kigali Amendment for phase-down of hydrofluorocarbons (HFCs). For more information see the Technical Appendix. Emissions from Puerto Rico include only CO<sub>2</sub> associated with fossil fuel consumption.

## WHERE DO WE WANT TO GO?

### | Vision for the Future

Even though the U.S. Climate Alliance continues to reduce our GHG emissions faster than the rest of the country, we know there is more to be done, especially in the face of federal rollbacks. Looking ahead, we aim to accelerate the implementation of effective climate action to meet our share of the Paris Agreement's emission reduction goals of 26-28% emission reduction below 2005 level, all while continuing to grow our economies and create jobs for Americans.

### | New Commitments and Pledges

On June 1, 2018 – the one-year anniversary of the formation of the U.S. Climate Alliance – we announced a new wave of initiatives to scale up climate action. Three months later, at the Global Climate Action Summit, we committed to additional concrete actions:

#### **Short-Lived Climate Pollutants**

SLCPs are potent climate forcers and harmful air pollutants that have an outsized impact on climate change in the near-term. In the absence of regulatory certainty at the federal level, the Alliance is launching an SLCP Challenge to Action Roadmap that calls on partners to support Alliance states as we collectively reduce our SLCPs emissions by as much as 40–50 percent by 2030. We also commit to develop and implement state-specific strategies reflective of our authority and ability to accomplish the goals.

#### **Natural and Working Lands**

The natural systems upon which we depend are essential to life and critical for reducing the impacts of climate change on our communities. These systems are also under threat from destructive human activity and climate change. To protect the communities, economies, and ecosystems that depend on them, we will manage forests, farms, rangelands, and wetlands, to be both economically productive and resilient carbon sinks. We launched a Natural and Working Lands Challenge that commits our states to advance programs, policies and incentives to reduce GHG emissions from land and enhance resilient carbon sequestration. Over the next two years, the Alliance will bring resources to bear on improving GHG inventory methods and identify best practices for land conservation, restoration, and management such that land-based pathways can be integrated into state GHG mitigation plans by 2020.

#### **Transportation**

The transportation sector is the largest source of GHG emissions across our states. Alliance states are supporting innovation across the sector to provide our residents access to the best technologies, grow our economies and create jobs – all while drastically reducing emissions. Because of this, we are working to mobilize billions of dollars in ZEV infrastructure and vehicle deployment and moving towards a vision of zero-carbon mobility across all transportation modes. We will collectively deploy \$1.4 billion in settlement funds for ZEVs and other clean transportation projects while expanding our networks of ZEV

charging stations. We also will lead by example and work towards converting our state fleets to ZEVs. The U.S. Climate Alliance is developing a playbook of case studies and model policies to help all states achieve this vision.

### **Product Energy Efficiency Standards**

Over the last three decades, energy efficiency standards have saved consumers billions of dollars while providing the most cost-effective opportunity to avoid constructing costly new power generation. Going forward, the U.S. Climate Alliance will explore state-level efficiency standards for a range of consumer and commercial appliances. Coordinated U.S. Climate Alliance state action could reduce GHG emissions by 5.5 million tons by 2025 while saving ratepayers nearly \$4 billion in the same timeframe. Working together, we also have the potential to transform the U.S. market for this set of products, providing stability to manufacturers and ensuring all Americans have access to money-saving products.

### **Solar Soft Costs**

We recognize that solar power is a vital component of a sustainable energy system and represents a major economic and job creation engine. Unfortunately, federal import tariffs on solar panels and cells enacted by the federal government in early 2018 are likely to halt these benefits. The Solar Energy Industries Association estimates that tariffs will cause the loss of roughly 23,000 American jobs this year alone, including solar panel installer jobs, which is the fastest-growing employment category in the country. As a first step toward offsetting the impacts of these tariffs, we will release the U.S. Climate Alliance Solar Guidebook, which identifies best practices and hands-on tools for states to reduce solar energy system costs and streamline regulatory processes and work together on the implementation of the guidebook's recommendations.

### **Grid Modernization**

U.S. Climate Alliance states are leaders in deploying clean energy and innovative distributed energy resources, and states are moving boldly to modernize and strengthen their electric grids. However, withstanding the impacts of a changing climate and further accelerating emissions reductions requires new strategies. That is why we are helping to support the Non-Wires Solutions Playbook, a groundbreaking implementation resource for regulators and utilities to support the deployment of clean distributed energy resources instead of traditional utility investments. By implementing innovative alternatives to traditional utility investments, U.S. Climate Alliance states will reduce emissions, save money for consumers, and modernize their electric grids.

### **Resilience**

There is increasing urgency for states to support efforts to build climate change resiliency, enhance local decision-making and to protect communities, residents, and resources from climate-change driven extreme weather, wildfire, drought, sea level rise and other impacts. In August 2017, the federal government disbanded a Federal Advisory Committee designed to help shape the U.S. National Climate Assessment process and ensure it provides information needed to support climate action, including at state and local levels. In January 2018, the group reconvened with support from New York Governor Cuomo as the Independent Advisory Committee (IAC), pledging to deliver recommendations to states in

the U.S. Climate Alliance, among others. The IAC will issue a complete report this fall. The U.S. Climate Alliance will continue supporting independent climate science and working with the IAC to support the availability of climate information to policymakers. To expand this work across Alliance states, we will work with partners to provide direct planning assistance and resilience building strategies to our communities.

To deliver on these commitments, we will continue working together through strategic partnerships. This includes continuing to build out the U.S. Climate Alliance Clearinghouse, which aims to aggregate climate tools, data, and information for use by policymakers and the public. It also includes working with Canada and Mexico through the North American Climate Leadership Dialogue and engaging with other initiatives to ensure that we are taking smart, coordinated action to grow our clean energy economies and continue to reduce our GHG emissions consistent with the goals of the Paris Agreement.

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<sup>1</sup> [https://www.arb.ca.gov/cc/inventory/pubs/reports/2000\\_2016/ghg\\_inventory\\_trends\\_00-16.pdf](https://www.arb.ca.gov/cc/inventory/pubs/reports/2000_2016/ghg_inventory_trends_00-16.pdf)

<sup>2</sup>

[http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/analysis\\_group\\_rggi\\_report\\_april\\_2018.pdf](http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/analysis_group_rggi_report_april_2018.pdf)

<sup>3</sup> <https://www.eia.gov/electricity/annual/> and <https://atb.nrel.gov/>

<sup>4</sup> <http://www.dsireusa.org/resources/detailed-summary-maps/>

<sup>5</sup> Rhodium Group analysis based on <https://www.nature.com/articles/nenergy2017134>

<sup>6</sup> <https://www.usclimatealliance.org/publications/2018/1/4/us-climate-alliance-statement-on-epa-repeal-of-clean-power-plan>

<sup>7</sup> <https://www.eia.gov/electricity/data/eia860M/> and <https://www.eia.gov/electricity/data/eia861m/>

<sup>8</sup> <http://database.aceee.org/state-scorecard-rank>

<sup>9</sup> Rhodium Group analysis based on <https://www.eia.gov/electricity/data/eia861/>

<sup>10</sup> <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>

<sup>11</sup> <https://www.usenergyjobs.org/>

<sup>12</sup> Rhodium Group analysis based on <https://www.usgbc.org/advocacy/state-market-brief>

<sup>13</sup> <https://www.zevstates.us/about-us/>

<sup>14</sup> [https://www.colorado.gov/governor/sites/default/files/colorado\\_electric\\_vehicle\\_plan\\_-\\_january\\_2018.pdf](https://www.colorado.gov/governor/sites/default/files/colorado_electric_vehicle_plan_-_january_2018.pdf);

<https://www.commerce.wa.gov/growing-the-economy/energy/electric-vehicles/>

<sup>15</sup> <https://www.gov.ca.gov/2018/01/26/governor-brown-takes-action-to-increase-zero-emission-vehicles-fund-new-climate-investments/>

<sup>16</sup> <https://www.americanprogress.org/issues/green/reports/2018/07/30/454084/investing-charging-infrastructure-plug-electric-vehicles/>

<sup>17</sup> <http://www.ncsl.org/research/energy/state-electric-vehicle-incentives-state-chart.aspx>

<sup>18</sup> <https://autoalliance.org/energy-environment/zev-sales-dashboard/>

<sup>19</sup> Rhodium Group analysis.

<sup>20</sup> <https://www.epa.gov/state-and-local-transportation/vehicle-emissions-california-waivers-and-authorizations>

<sup>21</sup> See <https://www.transportpolicy.net/standard/us-section-177-states/> for the full list of existing Section 177

states. Note that in June, 2018, Colorado Governor John Hickenlooper signed an executive order that commits the state to adopting low emission vehicle (LEV) standards similar to the California LEV program. See:

<https://www.colorado.gov/governor/news/gov-hickenlooper-signs-executive-order-calling-state-adopt-low-emissions-vehicle-standards>

<sup>22</sup> <https://nepis.epa.gov/Exe/ZyPDF.cgi/P100EZ7C.PDF?Dockkey=P100EZ7C.PDF>

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<sup>23</sup> <https://www.usclimatealliance.org/publications/2018/8/2/the-us-climate-alliance-representing-17-states-territories-opposes-federal-attack-on-state-rights-vows-to-continue-advancing-a-clean-energy-economy>

<sup>24</sup> <https://www.mass.gov/news/ag-healey-leads-statement-from-20-state-attorneys-general-announcing-intent-to-sue-over-epa>

<sup>25</sup> <https://www.arb.ca.gov/cc/shortlived/shortlived.htm>;  
[http://www.dec.ny.gov/docs/administration\\_pdf/mrpfinal.pdf](http://www.dec.ny.gov/docs/administration_pdf/mrpfinal.pdf)

<sup>26</sup> <https://www.epa.gov/agstar/livestock-anaerobic-digester-database>; <https://www.dairycares.com/e-news/california-doubles-down-on-climate-smart-dairy>

<sup>27</sup> <https://www.cdfa.ca.gov/oefi/AMMP/>; <https://www.cdfa.ca.gov/oefi/ddrdp/>

<sup>28</sup> [https://www.arb.ca.gov/board/books/2018/020818/18-1-2pres.pdf?utm\\_medium=email&utm\\_source=govdelivery](https://www.arb.ca.gov/board/books/2018/020818/18-1-2pres.pdf?utm_medium=email&utm_source=govdelivery)

<sup>29</sup> Rhodium Group analysis based on <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2016>

<sup>30</sup> [https://www.agcensus.usda.gov/Publications/2012/Full\\_Report/Census\\_by\\_State/](https://www.agcensus.usda.gov/Publications/2012/Full_Report/Census_by_State/)

<sup>31</sup> [https://www.fs.fed.us/nrs/pubs/jrnl/2018/nrs\\_2018\\_Nowak\\_003.pdf](https://www.fs.fed.us/nrs/pubs/jrnl/2018/nrs_2018_Nowak_003.pdf)

<sup>32</sup> <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100SSN6.txt>

**Appendix I: U.S. Climate Alliance Short-Lived Climate Pollutant Challenge**



## **U.S. Climate Alliance Short-Lived Climate Pollutant Challenge**

*June 1, 2018*

Reducing emissions of potent short-lived climate pollutants provides outsized global climate benefits in the near-term, along with significant health, agricultural, and ecosystem benefits. Targeted commitments and strategies to rapidly and significantly reduce these pollutants, which include methane, hydrofluorocarbons (HFCs) and black carbon, will minimize the risks of climate change and maximize local benefits associated with addressing it. Immediate action on these pollutants is necessary to limit the global temperature increase to well below 2°C, and to pursue efforts to limit the increase to 1.5°C.

Today, the U.S. Climate Alliance commits to reducing short-lived climate pollutants as a critical component to meeting the goals of the Paris Agreement. The Alliance invites all national and subnational jurisdictions, businesses and other actors to bring commitments to reduce short-lived climate pollutants to the Global Climate Action Summit in San Francisco, California this September.

In the coming months, the Alliance will work to comprehensively address short-lived climate pollutants, including through new and continued actions to improve emissions inventories; quickly identify and address methane leaks and “super emitters;” promote energy efficiency, including in refrigeration and cooling; phasedown the use of HFCs; improve management of organic and agricultural waste streams; and define other targets and measures to rapidly reduce emissions of these potent pollutants.

**Appendix J: A Roadmap for Reducing Short-Lived Climate Pollutants to Meet the Goals of the Paris Climate Agreement**



# From SLCP Challenge to Action

A roadmap for reducing short-lived  
climate pollutants to meet the goals  
of the Paris Agreement

[#SLCPChallenge](#)

# TABLE OF CONTENTS

Table of Contents .....	1
Executive Summary .....	1
Opportunity and Necessity .....	4
Critical Element of the Global Climate Response .....	4
Low-Hanging Fruit .....	5
Economic Opportunity for States .....	6
State Leadership amid Federal Uncertainty .....	7
SLCP Challenge to Action: A Roadmap for Reducing SLCPs .....	10
Methane .....	10
Hydrofluorocarbons (HFCs) .....	19
Black Carbon .....	22
Cross-Cutting Policies – Clean Energy and Natural and Working Lands .....	30
The Path Forward .....	35
Implementing Actions .....	35
Let’s Go Already .....	36
Appendix A: SLCPs in U.S. Climate Alliance States .....	38
Methane .....	39
Hydrofluorocarbons (HFCs) .....	46
Black Carbon .....	49
Appendix B: Status of Federal Policies (as of August 2018) .....	52
Endnotes .....	56

# EXECUTIVE SUMMARY

The impacts of climate change are apparent in U.S. Climate Alliance states and all around the world. Devastating wildfires and droughts, epic heatwaves and Arctic cold snaps, and historic storms and flooding define a new normal that will only get worse.

The global response to climate change must be comprehensive and urgent, and it must include immediate efforts to slash emissions of short-lived climate pollutants (SLCPs) by 2030, as a complement to continued reductions of carbon dioxide (CO<sub>2</sub>). Short-lived climate pollutants include methane, hydrofluorocarbons (HFCs), and black carbon (soot). Many are harmful air pollutants and potent climate forcers with a much shorter lifetime in the atmosphere than CO<sub>2</sub>. Quickly cutting emissions of these potent pollutants will lead to quick climate benefits and is a necessary element of any path to meet the goals of the Paris Climate Agreement and limit global warming below 1.5-2°C. Fortunately, the solutions to the SCLP challenge exist today, are cost-effective, and deliver substantial health and agricultural benefits for local communities and the planet.

Methane is generated when organic materials break down in oxygen-limiting (anaerobic) landfills or manure lagoons. Methane is also the primary constituent of natural gas, and can leak from oil and gas exploration, production, transmission, and distribution activities. Identifying and plugging leaks as part of oil and gas operations is good for the climate and good for business. Methane produced from organic matter decomposing in a landfill or waste lagoon is better used as a renewable power or fuel resource, or as compost. A small number of sources are often responsible for a very large fraction of methane emissions to the atmosphere. Several technologies and strategies are emerging that will help identify these sources and enable targeted actions to achieve significant reductions.

Hydrofluorocarbons are used as refrigerants and in other applications, and they are the fastest growing source of greenhouse gas emissions. Under the Kigali Amendment to the Montreal Protocol, the world agreed to phase down their use and transition to climate friendly alternatives. In many cases, transitioning to new equipment with lower global warming potential (GWP) refrigerants offers energy efficiency benefits and net cost savings. The U.S. has yet to ratify the Kigali Amendment, and federal rules restricting the use of HFCs have been partly vacated by the D.C. Court of Appeals. U.S. Climate Alliance states are stepping up to fill this void and protect American companies and jobs, and are considering adopting their own regulations to transition away from HFCs.

Black carbon is a component of particulate matter and the product of incomplete combustion of fossil fuels or biomass. As a component of particulate matter, black carbon is a leading environmental health hazard, whose sources contribute to millions of premature deaths around the world each year. It affects climate by absorbing radiation, decreasing the reflectivity of surfaces like snow and ice, and affecting cloud formations. Black carbon emissions in the U.S. reach and affect the vulnerable Arctic, whose changing climate has profound implications for sea level rise and global weather patterns. Black carbon emissions are declining in the U.S., largely due to cleaner fuel and diesel engine standards. Accelerating turnover to cleaner trucks and heavy-duty equipment, as well as reducing pollution from stationary sources of combustion and wildfires, will provide additional global climate benefits, and local health benefits where reductions occur.

Even without the imperative of climate change, there is widespread support for action on SLCPs due to the substantial health, agricultural and economic opportunities that accrue locally to communities that take action. Major oil, gas, and chemical companies and their coalitions are taking steps to reduce their SLCP emissions because it helps meet their bottom line. A wide array of businesses, national and subnational jurisdictions are taking action and working across borders through voluntary partnerships such as the Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants, the Under2 Coalition, and through multilateral frameworks such as the Montreal Protocol.

Until recently, a growing and effective regulatory framework was in place to help reduce SLCP emissions nationally. It included regulations to reduce the loss of valuable methane gas from oil and gas production and landfills, phase out the use of HFCs where climate friendly alternatives are available, improve refrigerant management to limit leaks, and develop cleaner woodstoves to cut pollution in our neighborhoods. Many of these rules have been rescinded or delayed, leading to significant uncertainty in the regulatory landscape affecting businesses and emissions in the U.S. Given this uncertainty and inaction at the federal level, state leadership on SLCPs is necessary.

The U.S. Climate Alliance is stepping up to lead on SLCPs. On June 1, 2018, we issued the SLCP Challenge, committing to comprehensively addressing SLCP emissions as a critical component of meeting the goals of the Paris Agreement, and calling on the world to do so as well.

This Roadmap takes that commitment from SLCP Challenge to Action. It outlines a menu of options states can consider as we pursue an ambitious set of actions that have the potential to reduce SLCP emissions in the U.S. Climate Alliance as a whole by 40-50 percent below current levels by 2030. States commit to develop individual SLCP reduction strategies, will continue to share information and best practices, develop and improve emissions inventories to

track progress, and pursue partnerships to expand action on SLCPs and meet the goals of the SLCP challenge. The U.S. Climate Alliance will track and annually report on progress towards its SLCP reduction goals.

Cutting SLCP emissions is something everyone can get behind, and now is time to act. We have no time to waste, and all the opportunity we need. Join us.

#### Reducing SLCPs in U.S. Climate Alliance States

We are committed to doing our part to achieve feasible SLCP reductions in-line with the needs of the Paris Agreement. Existing or emerging technologies and strategies can reduce SLCP emissions in the U.S. Climate Alliance as a whole by an estimated 40-50 percent below current levels by 2030. This is in line with scientific assessments of the global need and opportunity, as well as existing targets in California and New York. Reaching these goals would deliver climate benefits equivalent to removing over 30 million cars from our roads, and over 140 million if accomplished nationally. Broad acceptance of the SLCP Challenge and achieving these levels globally would multiply the benefits in our states, including avoiding as many as about 200,000 premature deaths and 6 million tons of crop losses annually in the U.S. by 2030.

Now is the time to act. We call on the federal government to keep important and reasonable SLCP rules in place, enforce them, fulfill our commitment to Canada and Mexico to reduce oil and gas methane emissions, ratify the Kigali Amendment to the Montreal Protocol, and develop a national framework for transitioning away from HFCs. Building on existing regulations in some states, U.S. Climate Alliance states will consider regulations, incentives or other actions to fill in where federal regulations are lacking or uncertain. Additional areas of potential action by U.S. Climate Alliance states to reduce SLCPs through individual and shared efforts include the following:

- Help to fulfill a commitment by the U.S., Canada, and Mexico to reduce methane emissions from the oil and gas sector by 40-45 percent below 2012 levels by 2025
- Reduce methane emissions from waste streams by supporting federal efforts to reduce food loss and waste by 50 percent below 2010 levels by 2030, increasing diversion of organic waste from landfills, and improving landfill management
- Achieve economically feasible methane reductions from manure management and enteric fermentation on livestock operations in a manner that supports agricultural food production, farmers, ranchers, and surrounding communities
- Identify and mitigate methane emissions from “super emitters,” which may be responsible for as much as half of methane emissions in some sectors
- Transition away from HFCs and meet or exceed emissions reductions expected from the Kigali Amendment to the Montreal Protocol and recent federal regulations
- Improve refrigerant management practices to minimize HFC emissions from equipment in use and at the end of life
- Accelerate black carbon reductions and public health benefits, especially in disadvantaged communities, by striving for “soot free” transportation as soon as possible
- Pursue additional clean energy and natural and working lands strategies that support efforts to reduce SLCP emissions, while mitigating CO<sub>2</sub> emissions

# OPPORTUNITY AND NECESSITY

Short-lived climate pollutants are potent climate forcers and harmful air pollutants that have an outsized impact on climate change in the near-term. Compared to CO<sub>2</sub> and other long-lived climate pollutants, which stay in the atmosphere for centuries, SLCPs have far more warming impact on a gram-to-gram basis, and have a lifetime ranging from days (in the case of black carbon) to decades. Short-lived climate pollutants are responsible for an estimated 40 percent of current net climate forcing, and include:

- **Methane:** Methane is estimated to be 34 times more potent than CO<sub>2</sub> over 100 years and 86 times more potent over 20 years.<sup>1</sup> It has an atmospheric lifetime of about 12 years and is responsible for an estimated 20-25 percent of current global climate forcing. Methane emissions also contribute to the formation of tropospheric ozone, which is itself a short-lived climate forcer and air pollutant that exacerbates smog and harms agricultural productivity. Quickly reducing methane emissions offers one of the greatest opportunities to reduce global warming in the coming decades.
- **Hydrofluorocarbons (HFCs):** HFCs are used in air conditioning units, refrigeration systems, foams, aerosols, and other applications. They are thousands of times more potent than CO<sub>2</sub> and represent the fastest growing source of greenhouse gas emissions in the U.S. and globally. Coupled with efficiency opportunities in refrigeration and cooling, phasing down the use of HFCs and replacing them with gases with lower GWP delivers significant climate and energy efficiency benefits.
- **Black Carbon:** Black carbon, or soot, is a component of toxic particulate matter, which is a leading environmental and health hazard. Black carbon results from incomplete combustion of fossil fuels and biomass and is the third leading contributor to warming behind CO<sub>2</sub> and methane. It affects climate by absorbing light, reducing the reflectivity of snow and ice, and interacting with clouds. Black carbon accelerates snowmelt and sea level rise, modifies rainfall patterns, and as a component of fine particulate matter, contributes to millions of premature deaths globally each year. Because it exists in the atmosphere for days or weeks, reducing particulate matter and black carbon emissions delivers immediate climate and local health benefits.

## Critical Element of the Global Climate Response

Rapid transitions to renewable and low carbon energy systems are essential to cut CO<sub>2</sub> emissions and meet the goals of the Paris Climate Agreement to limit

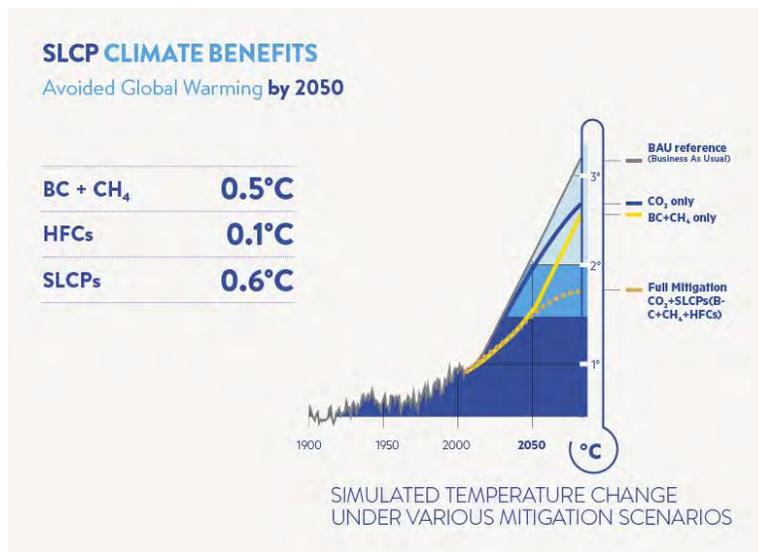
global warming to well below 2°C above pre-industrial levels and to pursue efforts to keep warming below 1.5°C. Targeted action to slash SLCP emissions, and complete those efforts by 2030, are equally critical to meeting the goals of the Paris Agreement and are essential if we are to keep warming below those thresholds through at least 2050.<sup>2</sup>

Near-term actions to address SLCP emissions can slow the pace of warming while we tackle long-lived CO<sub>2</sub>, helping to stay on track towards our climate targets. SLCP reductions also limit dangerous feedback loops, like permafrost thaw releasing massive quantities of greenhouse gases that accelerate global warming, and avoid tipping points from which we cannot return, such as the loss of the Greenland Ice Sheet. Pathways that keep global temperatures within a 2°C rise would avoid an estimated 150 million premature deaths worldwide through 2100, including millions in the U.S.<sup>3</sup>

### Low-Hanging Fruit

Implementing a collection of cost-effective strategies could significantly reduce SLCP emissions globally by 2030. A study by the United Nations Environment Programme and World Meteorological Organization found that 16 measures alone could reduce methane by about 40 percent and black carbon by about 80 percent below reference levels in 2030.<sup>4</sup>

Figure 1. Role of SLCPs in reducing near-term warming.<sup>5</sup>



Putting these measures in place, along with a global transition away from HFCs, would reduce warming by an estimated 0.6°C through 2050.<sup>6</sup> It would also significantly slow sea level rise and avoid over 3 million premature deaths and 50 million tons of crop losses each year. Through 2050, over 50 million premature deaths could be avoided in total.<sup>7</sup> These scenarios do not include strategies

targeting “super emitters” (a small fraction of sources responsible for a relatively large share of emissions) or additional opportunities to reduce methane from agriculture and waste, which could lead to significant additional methane emissions reductions along with water and air quality, health, and agricultural benefits.

This report lays out opportunities to achieve significant SLCP reductions across the U.S. Climate Alliance. Many efforts could reduce costs or increase revenues for farmers, energy producers, and other companies. Targeting SLCP emissions will improve air quality in our communities and help provide the fast response to climate change that is urgently needed.

### **Economic Opportunity for States**

In addition to the health and climate imperatives, reducing SLCP emissions is an economic opportunity for businesses and states. Targeting SLCP emissions offers economic opportunities in the agricultural, energy, industrial, transportation, and waste sectors. It can support health and prosperity in rural and urban economies, alike.

Effectively designed measures to reduce SLCP emissions will make U.S. businesses and states more competitive. Capturing and utilizing methane improves health and safety and offers billions of dollars in potential revenue in the U.S. annually from the sale and use of captured gas.<sup>8</sup> Capturing and utilizing methane from anaerobic digestion at wastewater treatment facilities offers significant opportunities to reduce energy costs and improve water quality. Converting manure or other agricultural residues into energy, fuels, or soil amendments creates new, diverse revenue streams for farmers, helping insulate against fluctuating agricultural commodity prices.<sup>9</sup> A broad, global effort to slash SLCP emissions would boost production of staple crops in the U.S. by over 6 million tons annually by 2030.<sup>10</sup>

From HFC alternatives to innovative methane capture systems and clean diesel technologies and fuels, American companies stand to gain by offering their solutions to the global market. Phasing down the use of HFCs will help keep American companies globally competitive, and could create tens of thousands of jobs and tens of billions of dollars in annual economic value in the U.S.<sup>11</sup> Retooling refrigeration and air conditioning systems to reduce HFC emissions can boost energy efficiency, further reducing greenhouse gas emissions and lowering costs for businesses and households.

These opportunities are widely available in regions adopting strategies to reduce SLCP emissions. For example, in U.S. Climate Alliance states:

- Dairy and swine farms could support thousands of anaerobic digesters producing renewable gas and other products worth billions of dollars per

year. Farms in California, Minnesota, and North Carolina alone can support an estimated 2,500 projects.<sup>12</sup>

- The U.S. Environmental Protection Agency (EPA) estimates that about 45 percent of methane emissions in the U.S. from coal mining and oil and natural gas systems can be reduced nationally at low or negative cost.<sup>13</sup> The International Energy Agency and the Environmental Defense Fund have similarly found that nearly half of methane emitted from oil and gas operations in the U.S. and globally can be reduced at essentially zero net cost.<sup>14,15</sup> Capturing these emissions improves mine and pipeline safety, conserves energy, and saves money.
- Alliance states are home to more than 250 landfill energy projects that consume methane that would be otherwise emitted or flared, and opportunities exist for nearly 100 more.<sup>16</sup>

Accordingly, there is growing, widespread support for reducing SLCPs, including among businesses. Major companies and organizations representing the chemical, dairy, food, and oil and gas industries have made commitments to reduce SLCP emissions, as part of broader climate and sustainability programs. Most chemical and appliance manufacturers support national and global efforts to transition away from and phase down the production and use of HFCs.<sup>17</sup> The Innovation Center for U.S. Dairy, representing over 80 percent of the dairy supply chain in the U.S., recently renewed a Memorandum of Understanding with the U.S. Department of Agriculture including a goal to reduce greenhouse gas emissions by 25 percent below 2007 levels by 2020.<sup>18</sup> Major food companies like General Mills and McDonald's, which has set a goal to reduce the greenhouse gas intensity from its supply chain by 31 percent by 2030,<sup>19</sup> have set greenhouse gas reduction and sustainability goals, including reducing methane from agriculture and food waste.

Many oil and gas companies are involved in efforts to reduce methane emissions through efforts like the Environmental Partnership and the Oil and Gas Climate Initiative. The Oil and Gas Climate Initiative, in particular, represents ten major international oil companies that aim to achieve near-zero methane emissions from the natural gas supply chain.<sup>20</sup> Some companies have set specific targets, including ExxonMobil, which aims to reduce methane by 15 percent by 2020,<sup>21</sup> and Italian oil major Eni, which has committed to reducing upstream methane emissions by 80 percent below 2014 levels by 2025.<sup>22</sup> Some companies have even expressed support for regulatory efforts to mitigate emissions and improve emissions data reporting.<sup>23</sup>

### **State Leadership amid Federal Uncertainty**

Until recently, a broad and effective national regulatory framework was in place to help reduce SLCP emissions, which provided a strong foundation

underpinning state and local actions. Rules covered methane from landfills and the oil and gas sector, supported transitions away from HFCs, and were under development to reduce particulate matter and black carbon from woodstoves. (See Appendix B for a detailed list of federal policies related to SLCPs and their status). Many of these rules have been delayed or vacated, leading to significant uncertainty in the regulatory landscape affecting businesses and emissions in the U.S. The federal government is also working to unwind additional rules related to CO<sub>2</sub>, such as the Clean Power Plan and vehicle greenhouse gas standards, which would help to reduce methane and black carbon emissions from combustion, as well.

*Historically, the U.S. has been a leader  
in fostering global action on SLCPs.*

In 2004, the Bush Administration launched the Global Methane Initiative (known as Methane to Markets), which is an international effort dedicated to the abatement, recovery, and use of methane. In 2011, the U.S. was a founding member of the Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants, which has grown to include 60 countries and hundreds of non-state and local partners. As part of the Arctic Council, and in recognition of the especially acute impacts of climate change and SLCP emissions in the Arctic, the U.S. and other countries adopted a framework for enhanced action to reduce black carbon and methane emissions and a goal to reduce black carbon collectively by 25-33 percent below 2013 levels by 2025.<sup>24,25</sup> In 2016, the U.S. agreed with Canada and Mexico to take “common sense actions” to drive down SLCP emissions. They include developing and implementing federal regulations to reduce methane from existing and new sources in the oil and gas sector by 40-45 percent below 2012 levels by 2025, taking significant national actions to reduce black carbon emissions in North America, promoting alternatives to HFCs, and developing and implementing national methane reduction strategies for the oil and gas, agricultural, and waste (including food waste) sectors.<sup>26</sup> While Canada and Mexico have proposed regulations to reduce oil and gas methane, the U.S. has yet to propose a regulation on existing sources and is working to undo regulations currently in effect for new sources (see Appendix B).

Under President Reagan, the U.S. played a leading role in the negotiation of the Montreal Protocol, originally designed to phase down the use of fluorinated gases responsible for the growing hole in the ozone layer. It is often referred to as the most effective environmental and climate policy in the world. After its unanimous approval by the U.S. Senate, President Reagan wrote in his signing statement that the Protocol was a “milestone” with an adjustment mechanism of which the “wisdom of this unique provision is already being realized.”<sup>27</sup> That adjustment mechanism has allowed for several amendments to the Protocol, recently including the Kigali Amendment in 2016, which set a global phasedown schedule for the production and use of HFCs. The U.S. was a key leader in

negotiating this amendment – working hand-in-hand with industry, but has yet to ratify it, despite the clear economic benefits to U.S. companies and our economy.<sup>28</sup>

Given the uncertainty and inaction at the federal level, state leadership on SLCPs is even more necessary and urgent. The U.S. Climate Alliance is stepping up and accepting the mantle of leadership.

*On June 1, 2018, the U.S. Climate Alliance issued the SLCP Challenge, committing to comprehensively addressing SLCP emissions as a critical component of meeting the goals of the Paris Agreement, and calling on the world to do so as well.*

Building on its commitment, the Alliance developed this Roadmap, offering a menu of options supporting ambitious goals to drive down SLCPs, and offering examples of leadership already demonstrated by states.

# SLCP CHALLENGE TO ACTION: A ROADMAP FOR REDUCING SLCPs

Available and emerging technologies and strategies have the potential to reduce methane, HFCs, and black carbon in the U.S. and across the U.S. Climate Alliance by an estimated 40-50 percent below current levels by 2030 (see Appendix A). Reaching these goals would deliver climate benefits equivalent to removing over 30 million cars from our roads, and over 140 million if accomplished nationally.<sup>1</sup> Broad acceptance of the SLCP Challenge and achieving these levels globally would multiply the benefits in our states, including avoiding as many as about 200,000 premature deaths and 6 million tons of crop losses annually in the U.S. by 2030.<sup>29</sup>

Our states are already taking many steps to reduce SLCP emissions. This section describes the opportunities states have and the actions states may take to reduce SLCPs as they pursue the full potential of available SLCP reductions and tailor strategies to fit local conditions.

## **Methane**

Methane is often emitted from livestock operations, landfills, or fossil energy systems – including leaks and venting in coal mines, oil and gas production operations, and natural gas transmission and distribution systems. Reducing methane requires identifying and replacing old leak-prone pipes, improving capabilities to quickly identify and mitigate leaks from diffuse sources, and requiring or incentivizing practices that reduce or avoid emissions from these sources.

In the energy sector, once leaks have been identified, the case for capturing methane is often clear – either for economic or safety reasons. In the agricultural and waste sectors, methane generated from manure or organic waste can be put to valuable use creating clean energy or soil amendments. Integrated planning and policy development (described in the Cross-Cutting Policies section) helps

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<sup>1</sup> Achieving the SLCP reductions potential identified in Appendix A could reduce SLCP emissions by about 150 MMTCO<sub>2</sub>e below business-as-usual levels in 2030 in U.S. Climate Alliance states, and about 670 MMTCO<sub>2</sub>e nationally. Based on EPA's Greenhouse Gas Equivalencies Calculator, this is equivalent to removing 32 million and 143 million cars from the road, respectively. <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>

put these resources to use and capture that value, leading to management practices that significantly reduce odors and avoid methane emissions.

Several state and national programs are already working to reduce methane emissions. In 2014, the Obama Administration issued a *Strategy to Reduce Methane Emissions*, which outlined a number of existing and new federal programs that it estimated would reduce methane emissions by about 15 percent by 2020.<sup>30</sup> Some, but not all, of this framework has materialized (see Appendix B). Among U.S. Climate Alliance states, California and New York have developed comprehensive plans to cut methane emissions by 40 percent by 2030.<sup>31,32</sup> Colorado was the first state to adopt regulations limiting methane from oil and gas operations, and several other states have subsequently done so, as well. U.S. Climate Alliance states have many other activities in place to reduce methane from the agricultural, energy, and waste sectors.

Significant additional opportunities exist to cut methane emissions quickly and cost effectively across the U.S. Capturing the full potential of expected reduction opportunities, as described in Appendix A, could reduce methane emissions by 40-50 percent below current levels in the U.S. Climate Alliance. Existing and emerging strategies and technologies can achieve these reductions by 2030.

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### Energy

#### *Do Our Part to Reduce Methane Emissions 40-45% by 2025*

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There is an opportunity for the U.S. Climate Alliance to help fulfill the commitment by the U.S., Canada, and Mexico to implement federal regulations on new and existing sources in the oil and gas sector to reduce methane emissions by 40-45 percent below 2012 levels by 2025.<sup>33</sup> Federal rules developed pursuant to this commitment are uncertain, and leadership from states will help ensure continued progress to reduce emissions from these sources.

In addition to reducing SLCP emissions, finding and fixing leaks in the energy sector improves safety and saves money. Significant methane emissions reductions are achievable from oil, gas, and coal facilities at negative or very low cost. U.S. Climate Alliance states could consider the following actions:

- **Develop Regulations to Reduce Methane in the Oil and Gas Sector.** States can design their own rules to reduce methane emissions from new and existing oil and natural gas facilities through emissions monitoring requirements, replacing of leak-prone pipes, and limiting methane venting and flaring, which has the added benefit of reducing black carbon emissions. In 2014, Colorado became the first state to directly regulate oil and gas methane emissions. The state requires facilities to detect and repair leaks infrared

cameras or other approved technologies, which was found in a two-year pilot project to reduce the incidence of leaks by over 70 percent. California has subsequently developed regulations, and New York is currently in the development phase of state regulations to enact new source performance standards and control techniques guidelines. Virginia is beginning a process to limit methane pollution from natural gas infrastructure and landfills.

- **Extend “Upstream” Requirements to all Segments of the System.** Federal rules address oil and gas methane emissions at the point of production for new and some existing sources. Additional rules could expand coverage further, to existing sources as well as transmission and distribution facilities. For example, states can update existing rules requiring leak detection and repair from natural gas transmission and distribution for the sake of safety to account for climate change impacts, as well. New methane sensing technologies are becoming more widely available to help measure natural gas flux associated with leaks and not just the presence of leaks. In New Jersey, a major gas utility (PSE&G) applied such technologies, and has reported successfully reducing methane emissions by 83 percent from targeted areas.
- **Cap Emissions from Natural Gas Distribution.** Massachusetts imposes annually declining emission limits on gas operators to reduce methane from natural gas distribution mains and services. The caps decline from 2018-2020 to help meet the state’s 2020 greenhouse gas emissions limit.<sup>34</sup>
- **Require Reporting and Best Management Practices.** Requiring utility companies and gas suppliers to report natural gas emission data and implement best management practices to mitigate leaks provides data to measure progress and identify additional mitigation opportunities. California requires utilities to incorporate 26 best practices for methane leak detection, quantification, and elimination.<sup>35</sup>
- **Replace Old, Leak-Prone Pipes.** Non-cathodically protected steel, cast-iron, and wrought-iron pipes are vulnerable to methane leaks, and tend to have a higher risk of leaks as they age. States can pursue several strategies to require and incentivize their replacement. Massachusetts law requires replacing aged pipelines, which are the most leak-prone infrastructure.<sup>36</sup> New York has developed incentives for gas distribution companies to encourage accelerated replacement of leak-prone pipes, and has instituted negative revenue adjustments for gas utilities that do not meet their required replacement levels.
- **Capture Methane from Active and Inactive Coal Mines.** Methane captured from coal mines is eligible for Colorado’s Renewable Portfolio Standard and carbon offsets under California’s Cap-and-Trade Program.

- **Identify and Plug Abandoned and Unpermitted Wells.** In certain oil and gas production areas there are wells that pre-date tracking systems, which may be potentially large emission sources that are neither identified nor monitored. States may consider committing resources and establishing programs to search for and prioritize plugging orphaned oil and gas wells.

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### *Agriculture*

#### *Achieve Feasible Methane Reductions, Including from Livestock Operations*

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Actions to improve manure management and to reduce methane from enteric fermentation have the potential to significantly reduce agricultural methane emissions across U.S. Climate Alliance states. Improving manure storage and handling, composting manure, utilizing pasture-based systems, or installing anaerobic digesters significantly reduces methane from manure management on dairy, swine, and other livestock operations. These practices may reduce methane from manure management by as much as 70 percent in U.S. Climate Alliance states (Appendix A) and can help improve soil quality and fertility, reduce water use and increase water quality, reduce odors, and decrease the need for synthetic fertilizers and associated greenhouse gas emissions. Promising technologies are also emerging that may cut methane emissions from enteric fermentation by 30 percent or more (Appendix A). Developing strategies that work for farmers and surrounding communities can significantly reduce methane emissions, increase and diversify farm revenues, and support water quality and other environmental benefits. U.S. Climate Alliance states have several options for reducing methane emissions from the agricultural sector:

- **Collaborate to Develop Effective Solutions.** California has formed a dairy and livestock greenhouse gas reduction working group and three dairy and livestock subgroups focused on fostering markets for digester and non-digester projects and research needs, including enteric fermentation.<sup>37</sup> The subgroups comprise a diverse group of stakeholders, experts, and state and local governmental agencies to identify and address barriers to the development of dairy methane reduction projects. Hawaii's Greenhouse Gas Sequestration Task Force will identify policies that provide greenhouse gas benefits in the agricultural and other sectors.
- **Incentivize Strategies to Reduce Methane.** Several state and federal programs offer financial assistance or tax incentives for projects that help reduce agricultural methane and other emissions. When developing or implementing agriculture funding programs, states can incorporate methane emissions reductions as a requirement or scoring criteria.

- California offers grants that cut methane from dairy manure through the Dairy Digester Research and Development Program<sup>38</sup> and Alternative Manure Management Program<sup>39</sup>
- Massachusetts provides grants through the Massachusetts Clean Energy Center to conduct organics-to-energy project feasibility studies and move forward with implementation and pilot projects<sup>40</sup>
- New York offers cost sharing for projects that improve water quality or reduce climate impacts from agriculture through the Agricultural Environmental Management Framework and Climate Resilient Farming Program
- **Create Markets to Make Improved Manure Management Financially Viable.** Building markets for clean energy or soil amendment products adds value to farming practices and supports improved manure management efforts (see “Cross-Cutting Policies”). California utilities share costs of pipeline interconnection for renewable sources of gas, including from dairies, and are implementing at least five dairy biomethane pipeline interconnection pilot projects.<sup>41</sup>
- **Require Application of Best Practices to Manure Management.** States can work with the agricultural industry to develop best practices for manure management, and facilitate implementation of those best practices. California law requires state agencies, if certain conditions are met, to adopt regulations to reduce methane emissions from livestock manure management, not to take effect before 2024.
- **Demonstrate and Deploy Strategies to Reduce Methane from Enteric Fermentation.** Support for research, demonstration, and deployment will help bring technologies or strategies that reduce enteric fermentation emissions to market and into wide practice. States can explore voluntary, incentive-based, or regulatory approaches to capture economical and market-feasible methane reductions.
- **Improve Predictability of Revenue Streams for Renewable Gas from Dairies and Farms.** Environmental credit markets, such as from low carbon fuel standards, renewable portfolio standards or cap-and-trade programs, provide valuable revenue streams that may be sufficient to cover the costs of dairy digester or other projects. However, credit prices can be unpredictable, making it difficult to finance projects. California is exploring a “pilot financial mechanism” for the state’s Low Carbon Fuel Standard to reduce the economic uncertainty associated with the value of environmental credits for dairy-related projects producing low carbon transportation fuels. California and Vermont offer feed-in tariffs for small bioenergy projects, and Green Mountain Power’s voluntary Cow Power program offers an adder to the feed-in tariff in Vermont. North Carolina’s Renewable Portfolio Standard includes a set-aside for energy from swine and poultry waste.

- **Encourage Best Practices to Reduce Methane from Rice Cultivation.** Projects to reduce methane emissions from rice can receive offset credits under California's Cap-and-Trade Program. Incentives, regulations, or other programs can help further reduce emissions from this source.

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### Waste

#### *Reduce Food Loss and Waste, Increase Diversion and Treatment of Organic Waste, and Improve Landfill Management*

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The waste sector offers a significant opportunity to reduce methane emissions while transforming wasted resources into beneficial products. Methane capture systems and other best management practices at landfills significantly reduce methane emissions and can generate heat, renewable electricity, or fuel from landfill gas. Diverting organics from landfills avoids generating methane from decomposition, and offers a valuable resource stream to produce compost or renewable energy. Reducing food waste and recovering edible food for human consumption is a particularly good opportunity to provide economic and health benefits while reducing methane emissions. The EPA has set a goal to reduce food loss and waste by 50 percent by 2030, consistent with the Sustainable Development Goals.<sup>42</sup>

Significant opportunities for reducing methane emissions from landfills and capturing value can be seized by reducing food loss and waste, diverting organic waste to beneficial uses, and improving landfill management. These and other actions collectively could reduce methane emissions from waste by an estimated 40-50 percent by 2030 (Appendix A). Such efforts could add value in our states by reducing emissions of volatile organic compounds and toxic air contaminants from landfills, recovering healthy food for human consumption in food insecure communities, supporting healthy soils and agriculture, generating clean energy and displacing fossil fuel consumption, and providing economic opportunities across these diverse sectors. Many of these benefits will accrue in low-income and disadvantaged communities.

U.S. Climate Alliance states could consider the following actions:

- **Develop Regulations to Backstop against Federal Uncertainty.** Colorado has adopted the federal New Source Performance Standards for landfills. California and Washington have regulations on landfills to reduce emissions of methane and other pollutants. New York is in the process of developing regulations to further address methane emissions from landfills.
- **Require Reporting and Best Management Practices.** EPA requires mandatory reporting by landfills under the federal greenhouse gas reporting

program. The data are documented in EPA's FLIGHT system,<sup>43</sup> but the current database is limited to large facilities and lacks some key information about the number of gas capture systems and quality and quantity of gas captured at each facility. Additional federal data collected by the Landfill Methane Outreach Program (LMOP) relies on voluntary reporting.<sup>44</sup> Reporting requirements, including the number of gas capture systems and quality and quantity of gas captured at each facility, would improve understanding of opportunities to capture and utilize methane from landfills. Once landfill gas collection systems are in place, they require regular monitoring for leak detection and repair. Providing technical support to landfill owners may help improve leak detection and landfill gas collection.

- **Avoid Methane Emissions by Mandating or Incentivizing the Diversion of Organic Materials from Landfills.** Banning the disposal of organics in landfills, and taking steps to ensure alternative, cost-effective treatment is available for diverted organics, can dramatically reduce methane emissions from landfills. Where banning is not feasible, states may set ambitious diversion targets backed by programs to support, monitor and enforce diversion – including by putting it to beneficial use as energy or compost. Massachusetts bans commercial disposal of organic waste from businesses and institutions that dispose more than one ton of organic materials per week. Vermont has a Universal Recycling Law that contains an organics diversion mandate by 2020. California has a target to reduce organic waste disposal by 75 percent below 2014 levels by 2025. Connecticut has a municipal solid waste 60 percent diversion goal. Maryland has long-term recycling and waste diversion goals.
- **Develop and Implement Food Rescue and Recovery Programs.** The Pacific Coast Collaborative, which includes the U.S. Climate Alliance states of Washington, Oregon, and California, has a low carbon waste goal to advance organic waste prevention and recovery.<sup>45</sup> New York has provided more than \$3.5 million to food banks and other providers to facilitate the increase in food donations, especially fresh fruit and vegetables. California has a goal to recover at least 20 percent of edible food waste for human consumption by 2025.<sup>46</sup>
- **Accelerate Development of Infrastructure to Utilize Diverted Organic Material.** Connecticut has streamlined permitting requirements for certain waste facilities that use newer technologies, like anaerobic digesters, to generate renewable energy and avoid landfilling organics. California's Organics Grant Program helps expand capacity for compost or energy production from diverted organic waste streams. New York's Climate Smart Communities Projects and Municipal Recycling Programs offer cost share for municipalities to implement organics diversion infrastructure, and a grant

program for large organics generators through New York's Empire State Development.

- **Create Markets to Support Organics Diversion.** States can help build markets for clean energy or soil amendment products that support organics diversion goals (described in "Cross-Cutting Policies"). California utilities share costs of pipeline interconnection to renewable sources of gas, including from landfills and anaerobic digesters, and the state's Healthy Soils Initiative promotes activities to increase soil organic matter and improve soil health.<sup>47</sup> State and local agencies can increase use of compost in their operations. New York is supporting research to increase the use of compost in agriculture.
- **Capture Opportunities at Wastewater Facilities.** Many wastewater treatment plants already have anaerobic digesters, and capture and utilize methane to generate renewable energy. In some cases, these facilities have excess capacity to take additional organic material. Integrated state planning that identifies organic waste flows, available infrastructure, and remaining gaps may help capture these and other opportunities to derive value from waste resources. States could consider requiring or incentivizing installation of methane recovery technologies at facilities that currently do not have the technology.

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### Super Emitters

#### *Identify and Mitigate Emissions from "Super Emitters"*

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Super emitters are a small fraction of sources that are responsible for a large percentage of emissions. Wide scale efforts are underway to develop low cost methane sensors, as well as ubiquitous global methane monitoring capabilities with satellites. Within a few years, far more data will likely be available regarding methane emissions, perhaps including nearly real-time detection of super emitters globally.

As data becomes available, there is an opportunity for U.S. Climate Alliance states to use it to improve planning and inventories, but also to act and target the largest sources of methane emissions.

*Effectively identifying and targeting super emitters could quickly reduce total methane by an estimated 30 percent or more (Appendix A), and likely offers one of the most significant near-term opportunities to slow the impacts of climate change.*

To pursue this opportunity, U.S. Climate Alliance states could consider the following actions:

- **Identify Methane Hot Spots and Super Emitters.** More than 50 percent of methane emissions may come from fewer than 10 percent of methane sources, across multiple sectors (Appendix A). California is monitoring methane “hot spots” in the state and is exploring options to launch a satellite capable of identifying super emitters around the world.
- **Plan for Quickly Acting on Data.** States can anticipate increased data availability in the near future, and can plan to quickly address the largest methane sources in different sectors as that data becomes available.

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### ***Improve Emissions Monitoring and Accounting***

#### *Improve Understanding and Expand Opportunities to Reduce Methane*

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Methane emissions are difficult to estimate and measure, and some studies suggest that state and national inventories underestimate them.<sup>48</sup> U.S. Climate Alliance states could work to improve understanding of emissions and sources of leaks, which would accelerate efforts to mitigate emissions and enable deeper reductions, through actions including:

- **Include Methane in State Climate Plans and Targets.** Comprehensive planning and goal setting helps guide activities to achieve necessary and available emissions reductions. California and New York have developed comprehensive methane action plans.
- **Expand Emissions Monitoring.** There are a number of ways to measure methane emissions, including satellite-based measurements, aircraft-based remote sensing, a network of towers, small sensors, and ground verification. California has developed a “tiered observation system” including each of these elements. In New York, some local distribution utilities are working with the Environmental Defense Fund to determine which non-hazardous leaks on the distribution system are emitting the most methane so that they are targeted for quicker repair. New York has also required several of the State’s local distribution companies to provide residential methane detectors to residents, and some of the utilities are working on methane detectors that would send a signal to the utility’s control room through the advanced metering infrastructure if methane is detected, improving response time and reducing the time elapsed before repair.
- **Improve Emissions Inventories Based on Latest Science.** Many state inventories scale from national inventories or use averaged emissions factors that may not accurately reflect the distribution of emissions from a given sector, including the impact of super emitters. Satellite and aerial measurements often suggest methane emissions are higher than inventory levels. States can support continued research and expanded monitoring to

better understand emissions, including from satellites. As emissions monitoring improves and new science emerges, states could work to continuously improve their inventories to capture the distribution of emissions among types of sources and spatially within states.

- Use Updated Global Warming Potential (GWP) Values in Climate Programs.** International convention uses an older GWP value of 25 in accounting for the climate impact of methane over 100 years, relative to that of CO<sub>2</sub>. The prevailing scientific consensus, however, suggests this value could be 34 or higher.<sup>49,50,51</sup> International accounting of GWP may be revised, but in the meantime, updating this value would reflect the latest science, increase the importance of methane in meeting greenhouse gas targets, and increase value associated with methane reductions in some climate programs. States could consider using 20-year GWPs or other accounting frameworks, in addition to the current practice of using 100-year GWPs, to better reflect the near-term impacts of SLCP emissions, including methane. Changes in emissions accounting frameworks deserve careful deliberation, however, especially in the context of existing climate programs. California is considering updating the GWP values used in its programs starting in 2021, and in its SLCP planning, accounts for emissions using both 20-year and 100-year GWPs.

### Hydrofluorocarbons (HFCs)

HFCs are the fastest growing source of greenhouse gas emissions, and a global transition to climate-friendly alternatives is important to meeting the goals of the Paris Agreement and limiting global warming to well below 2°C. Minimizing leaks from refrigeration systems and collecting and destroying used HFCs are also necessary to reducing emissions. States could take steps to support the global transition away from HFCs, detect and repair leaks, and collect and destroy used refrigerants. By addressing all three areas, states can reverse trends in emissions from this fast-growing sector and reduce them by as much as 40-50 percent by 2030 (Appendix A).

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#### *Transition Away from HFCs*

*Meet or Exceed Reductions Expected from Kigali Amendment and Vacated SNAP Rules*

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*There is near-universal support among countries and affected stakeholders for phasing down the use of HFCs globally under the Kigali Amendment to the Montreal Protocol.*

In the U.S., the vacated Significant New Alternatives Policy (SNAP) rules effectively guided this transition, by requiring HFC replacements with a lower

climate impact in applications and end uses where better alternatives are available.

The Clean Air Act explicitly allows states to set more stringent regulations than the federal government.<sup>2</sup> In the absence of comprehensive federal rules, U.S. Climate Alliance states could consider a range of actions, including:

- **Adopt State-Level Regulations to Transition Away from HFCs.** The federal SNAP rules include a list of available alternatives to HFCs and require using those alternatives by certain dates in end use applications where they are available. California adopted new HFC regulations that prohibit the use of HFCs in refrigeration and foam end uses, making much of the vacated SNAP rules enforceable in the state.<sup>52</sup> The state will consider additional regulations covering other end uses and further supporting the transition away from HFCs. At the September 2018 Global Climate Action Summit, Connecticut, Maryland and New York announced their intention to adopt similar rules and others are considering the same. Monitoring and reporting programs would help implement those rules and track progress.
- **Support Ratifying the Kigali Amendment to the Montreal Protocol.** There is widespread, bipartisan support nationally and internationally for the Kigali Amendment to the Montreal Protocol, including from the business community. States could call on the federal government to ratify it and adopt a comprehensive federal framework for implementing it.
- **Limit the Use of High- GWP Refrigerants in Existing Equipment.** In addition to limiting the sale of new equipment using HFCs, California will consider rules to limit the use of high-GWP refrigerants in new and existing refrigeration and air conditioning equipment, when low-GWP alternatives are available. States could consider restricting sales of the very most polluting refrigerants, as well.
- **Develop Incentive Programs to Accelerate Transitions from HFCs.** State or utility incentives can encourage adoption of new refrigerant technologies and transitions away from HFCs in supermarkets, homes, and commercial buildings. California is exploring statewide incentive programs. One of its utilities, the Sacramento Municipal Utility District, has developed the Pilot Natural Refrigerant Incentive Program, which provides incentives to commercial customers who use natural refrigerants (ammonia, CO<sub>2</sub>, or a hydrocarbon) in new or retrofitted refrigeration systems.<sup>53</sup> These systems may offer energy efficiency benefits, as well.
- **Lead through State and Municipal Procurement and Investment.** States could adopt procurement standards requiring public agencies to procure equipment with low-GWP alternatives to HFCs. Incentives or other

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<sup>2</sup> Some states, however, are restricted from adopting regulations more stringent than federal standards in certain circumstances.

investments can support retrofitting large cooling systems, such as public ice rinks or school cafeterias, to use low-GWP alternatives.

- **Account for HFCs in Building Codes and Efficiency Standards/Programs.** Expand the focus of building codes, appliance standards, and other energy efficiency programs where there are direct energy benefits to account for HFCs, or focus on greenhouse gas emissions more broadly. This could include accounting for or requiring the use of low-GWP alternatives in foams and building appliances.
- **Provide Technical Support to Businesses.** Alternatives to HFCs in refrigeration and other uses may offer improved energy efficiency and cost savings. States could provide audits or other technical assistance to help businesses identify opportunities to reduce HFC emissions and costs.

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### Refrigerant Management

#### *Implement Best Practices to Minimize Leaks and Emissions from Equipment in Use*

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One of the largest sources of HFC emissions is leaks in commercial refrigeration systems. Adopting best practices and other programs to detect and repair leaks, retire or retrofit old systems, and ensure proper use of refrigerants can reduce equipment downtime and refrigerant costs for supermarkets and other large stationary refrigeration systems, while reducing emissions. U.S. Climate Alliance states could implement best practices to minimize HFC emissions from refrigeration systems and other equipment, and consider actions including:

- **Adopt In-Use Refrigerant Management Regulations/Programs.** Given the uncertainty around the future of EPA's Refrigerant Management Regulations (see Appendix B), states may consider adopting their own rules. California, for example, has a Refrigerant Management Program that requires large refrigeration facilities to conduct periodic leak inspections, report and promptly repair leaks, and use practices that minimize HFC emissions.<sup>54</sup> California also has a program ensuring that small cans of automotive refrigerant have self-sealing valves to prevent leaks.<sup>55</sup>
- **Develop Incentives to Retire or Retrofit Old Systems.** As part of an incentive program to transition away from HFCs, states could consider targeting the largest users of HFCs, including large and/or old stationary refrigeration systems.
- **Implement Record Keeping and Reporting.** As part of a broader refrigerant management program, states could consider collecting information from the owners of large stationary refrigeration systems on the use of refrigerants and management practices. This information could allow

states to target technical assistance, incentives, or other efforts where they might have the most impact.

- **Expand Partnerships and Use of Best Practices.** States could work with other states, industry, non-governmental organizations, and others to develop and disseminate best practices for refrigerant management. One example is EPA's GreenChill Partnership program.<sup>56</sup> Product labeling is another option, and improves consumer awareness to support sales and use of efficient and climate friendly equipment or refrigerants.

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### *Collect and Destroy Used Refrigerants*

#### *Avoid Venting HFCs at End-of-Life*

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Properly disposing of appliances like air conditioning units or refrigerators, including collection and destruction of high-GWP refrigerants, is important to reducing HFC emissions. As they phase out, stockpiles of new or used high-GWP refrigerants should be destroyed properly, once they are no longer needed. States could consider efforts to collect and destroy used refrigerants and avoid unnecessary HFC emissions, including:

- **Mandate or Incentivize Collection and Proper Destruction of Used Refrigerants.** California's Cap-and-Trade Program includes an offset protocol for the collection and destruction of ozone depleting substances. States could consider requiring appropriate collection and destruction, or providing direct incentives or funding for a collection and destruction program with fees or refundable deposits on the purchase of new HFC-containing equipment or canisters, similar to deposits paid on recyclable bottles in many states.
- **Work through Utility and Appliance Efficiency Programs.** Several states and utilities have rebate programs to support the purchase of energy efficiency appliances, which sometimes includes collection of old equipment. New Jersey, for example, offers a double rebate – one for purchasing an Energy Star® refrigerator and another for recycling old units. States and utilities can expand efficiency rebate programs to consider the use of refrigerants, as well, and include added incentives for the use of low-GWP alternatives. States could also work with utilities to ensure their programs and contractors properly manage, collect, and destroy HFCs and other high-GWP refrigerants during servicing and at end of life.

## **Black Carbon**

Actions to reduce black carbon, which has a lifetime of just days, have almost immediate health, environmental, and climate benefits. Because black carbon is

a particulate that frequently stays near its point of emission, communities that take action to reduce black carbon reap the benefits. Black carbon also has a disproportionate impact on ice, especially that in the Arctic. Fortunately, black carbon emissions are declining in the U.S., primarily as a result of clean vehicle and fuel standards, and are expected to fall 49 percent below 2013 levels by 2025.<sup>57</sup>

More can be done to accelerate and deepen these reductions and their local benefits, particularly in disadvantaged communities. States could accelerate black carbon reductions and community benefits by accelerating the turnover of diesel vehicles and equipment to the cleanest available, “soot free” options as soon as possible.

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### Transportation

#### *Achieve Soot-Free Transportation as Soon as Possible*

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The transportation sector, especially heavy-duty diesel vehicles, offers significant additional potential for black carbon reductions in the U.S. Black carbon emissions from transportation are already declining quickly, as new trucks in the U.S. include particulate filters that eliminate about 99 percent of fine particulate matter and black carbon. Supporting fleet turnover to these newer vehicles and cleaner technologies and fuels – including renewable diesel, renewable natural gas, and zero emissions technologies using electricity or hydrogen – will accelerate progress to virtually eliminate diesel soot. This will also help to reduce other emissions, including smog-forming pollutants like volatile organic compounds (VOCs) and nitrogen oxides (NO<sub>x</sub>). States have several options to reduce black carbon emissions from transportation, including:

- **Implement Broad Frameworks for Reducing Transportation Pollution.** States can build from existing efforts to reduce carbon emissions from the transportation sector. For example, eight Climate Alliance states are part of the Transportation and Climate Initiative of the Northeast and Mid-Atlantic States, which is a regional collaboration of states that seeks to reduce emissions from the transportation sector.
- **Create Integrated Sustainable Freight Plans.** Comprehensive planning can help identify key opportunities to reduce diesel pollution from ports, rail, and truck systems. California has developed a comprehensive Sustainable Freight Action Plan, which includes a detailed list of activities among state agencies to improve freight efficiency, transition to zero-emission technologies, and increase the competitiveness of California’s freight system.<sup>58</sup>

- **Incentivize Vehicle Replacement or Retrofits.** Federal regulations require diesel particulate filters on new diesel engines, but there is a significant opportunity to reduce black carbon emissions from existing diesel vehicles by incentivizing retrofits or replacement. California's Carl Moyer Program, for example, provides grant funding for cleaner-than-required engines and equipment, including vehicle retrofits.<sup>59</sup> The state also has several programs to support cleaner on-road and off-road vehicles and equipment through its Low Carbon Transportation Investments and Air Quality Improvement Program Funding Plans.<sup>60</sup> All U.S. Climate Alliance states participate in the EPA's Clean Diesel Program and have received funding to help reduce diesel pollution, including from grants and rebates funded by the Diesel Emissions Reduction Act (DERA)<sup>61</sup> All states also have access to funding in the Volkswagen Diesel Emissions Environmental Mitigation Trust.<sup>62</sup> These funds must be used to reduce emissions of nitrogen oxides (NO<sub>x</sub>), but many of those projects will serve to reduce particulate matter and black carbon, as well.
- **Require Increasing Zero Emission Vehicle Sales.** Nine U.S. Climate Alliance states already have adopted increasing zero emission vehicle sales requirements for light-duty vehicles. As zero emission technologies increasingly enter the market and become cost-effective, similar requirements could apply to heavy-duty vehicles and off-road equipment. Zero emission vehicles do not emit particulate matter and black carbon from combustion, and emit less particulate matter from brake wear, because of the use of regenerative braking.
- **Transition Bus Fleets to 100 Percent Electric.** Buses offer one of the most attractive, early heavy-duty vehicle markets for transitioning to zero emissions. Several cities have announced plans to transition to 100 percent electric buses between now and 2040. California is considering a regulation that would require all new buses to be zero emission by 2030, and for fleets to be zero emission by 2040.<sup>63</sup> New York plans to finance the purchase of more than 100 transit buses with VW settlement investment proceeds.<sup>64</sup> School buses are another attractive fleet to transition to zero emissions. State, utility, or local programs to offer incentives and technical assistance can help to quickly transition school bus fleets to run solely on electricity reduce children's exposure to pollution.
- **Procure Clean Vehicles and Fuels.** State, municipal, and utility fleets could procure the cleanest technologies and fuels, and retrofit older vehicles and equipment with the cleanest technologies. California government fleets are required to purchase an increasing amount of zero emission light- and heavy-duty vehicles, and use renewable diesel in diesel-powered vehicles and equipment. New York's Climate Smart Communities program provides

rebates to municipalities that purchase or lease zero emission vehicles and has funded 104 plug-in vehicles in the first two years of the program.

- **Partner with Fleets.** States could work with fleet operators to adopt best practices to reduce diesel pollution, including replacing or retrofitting diesel vehicles and equipment with clean technologies and operating vehicles more efficiently to yield significant cost savings. The EPA's SmartWay Program is a voluntary partnership to reduce diesel use and emissions from fleets.<sup>65</sup>
- **Reduce Emissions from Idling.** Colorado Revised Statute (C.R.S.) 42-4-1206, more commonly known as the "puffer" law, allows law enforcement officers across the state to immediately ticket individuals who have left a vehicle running unattended for any period of time, unless the car has a remote starter system and adequate security measures. In addition, some local jurisdictions have adopted anti-idling ordinances that limit idling of all motor vehicles operating in their community. In 2011, the Colorado trucking industry joined with local governments and clean air advocates in Colorado to create a set of recommendations for a statewide idling standard: C.R.S. 42-14-101. Commercial diesel vehicles that weigh 14,000 pounds or more and are designed to operate on highways are limited to idling five minutes within a sixty-minute period unless the vehicle activity or circumstance is exempt under the statute. This consistent guideline enables commercial drivers to comply with the law and protect Colorado's air quality across the state, rather than having to follow a diverse patchwork of local regulations. The federal Diesel Emissions Reduction Act also provides funding for programs or projects to reduce long-duration idling. States could support zero emissions alternatives to idling by investing in truck stop electrification and other technologies.
- **Develop Inspection and Maintenance Programs.** Several states have smog check programs requiring annual or semiannual inspection to ensure that light-duty vehicles comply with emissions standards. States could develop similar programs for heavy-duty vehicles to ensure that emissions control systems are working properly and help identify "gross polluters" (akin to methane super emitters) to replace or repair.
- **Target Reductions at Ports, Railyards, Warehouses, and other High-Traffic Facilities.** Goods movement facilities with high traffic and high levels of diesel pollution are especially good candidates for rules, incentives, or other investments to reduce emissions. Improved logistics, like joint delivery and transport, can increase the efficiency of goods movement and reduce vehicle travel, congestion, diesel use, and emissions. Many local governments, port authorities, and railroad operators have programs to reduce diesel emissions and to shift to zero emissions technologies where possible. California has specific rules and incentive programs targeting drayage trucks that carry freight short distances at ports and railyards,<sup>66</sup>

requiring marine vessels to plug into shore power at berth in ports,<sup>67</sup> and supporting other activities to reduce emissions at these high traffic locations.<sup>68,69</sup>

- **Incentivize or Require Emission Reductions from Off-Road Vehicles.** Off-road vehicles are responsible for a significant amount of black carbon emissions in U.S. Climate Alliance states, and fewer programs address them. States can develop targeted regulatory or incentive programs to reduce particulate matter and black carbon emissions in off-road vehicles and equipment, such as installing diesel particulate filters, encouraging the use of alternative fuels, and replacing old vehicles and equipment with clean technologies. California's FARMER (Funding Agricultural Replacement Measures for Emission Reductions) Program offers \$135 million to deploy cleaner agricultural trucks, pump engines, tractors, and more.<sup>70</sup> New Jersey has a clean construction program that provides funding for retrofits (covering 100 percent of the cost of the equipment and installation) or replacement equipment (covering 30 percent of costs).<sup>71</sup>
- **Enforce Rules.** Effective enforcement is necessary to ensure compliance with clean vehicle rules, realize expected climate and health benefits, and provide a level playing field for regulated companies. Enforcement efforts are important to ensure expected emissions reductions materialize.
- **Increase Access to Clean Fuels.** An evaluation of renewable diesel in California found it reduces particulate matter by about 30 percent,<sup>72</sup> which particularly helps reduce emissions in off-road and older vehicles without particulate filters. States could support transitions to cleaner alternative technologies like low-NO<sub>x</sub> natural gas trucks or zero emissions vehicles by supporting infrastructure development to provide easy access to renewable natural gas, hydrogen fueling, or electric charging. Low Carbon Fuel Standards, like California and Oregon have, and state, utility, or local government infrastructure incentive or investment programs can help increase access to clean fuels. The Pacific Coast Collaborative has pledged to support emerging markets and innovation for alternative fuels in commercial trucks, buses, rail, ports and marine transportation.<sup>73</sup>

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### **Stationary and Residential Fuel Combustion**

#### *Transition to Clean Energy and Increase Access to Cleaner Heating Technology*

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Stationary sources of black carbon emissions include industrial sources, power plants, and residential combustion, especially from woodstoves and fireplaces. Each of these sources can be an important source of local air pollution, including

in disadvantaged communities or rural communities that rely on wood burning for heat.

Utilizing the best available emissions controls and transitioning to cleaner sources of energy, as described below in the “Cross-Cutting Policies” section, can reduce black carbon emissions from the power and industrial sectors. Promoting the use of cleaner woodstoves and transitioning to cleaner heating technologies, like electric heat pumps, can help reduce CO<sub>2</sub> and black carbon emissions from the residential sector. To continue supporting the transition to clean energy, increasing access to cleaner heating technologies, and improving air quality from stationary and residential sources, U.S. Climate Alliance states could take a number of actions that include:

- **Improve Monitoring of Local Air Pollution.** Improved monitoring of air pollution at a local level, including particulate matter and black carbon levels, can help pinpoint sources of pollution, vulnerable communities, and identify targeted actions to improve public health. California’s Community Air Protection Program aims to improve community air monitoring and reduce exposure to air pollution, including particulate matter and black carbon, in communities most impacted by air pollution.<sup>74</sup> This program includes requirements to improve transparency and access to air quality and emissions data.
- **Accelerate Emissions Reductions from Fuel Combustion at Stationary Sources.** Fabric filters, or baghouses, electrostatic precipitators, and diesel particulate filters can be used to reduce emissions of black carbon from stationary sources such as diesel engines, power plants, and industrial boilers. States could work to transition to clean sources of energy in the industrial and power sectors, and collaborate with local air districts to develop policies and deploy technologies to further reduce particulate matter and black carbon emissions. California’s Community Air Protection Program requires accelerated retrofit of pollution controls on industrial sources, increases penalties for non-compliance, and includes funding to support community planning efforts and deployment of the cleanest technologies.<sup>75</sup>
- **Increase Access to Clean Heating Fuels and Technologies.** Many communities rely on wood, oil, or propane for heat. Providing grants or other funding to increase access to cleaner, lower cost, and more reliable sources of heat in these communities (including electric heat pumps, renewable gas or heating oil, or natural gas) can reduce CO<sub>2</sub> and black carbon emissions, while providing community benefits. California is exploring the economic feasibility of various options to bring affordable energy to residents in disadvantaged communities who lack access to natural gas and rely on propane and wood for cooking and heating.<sup>76</sup> Other programs, including

incentives, voluntary efforts, or building codes and standards, can support the transition to cleaner heating fuels in new or existing buildings.

- **Require Cleaner Heating Oil.** Connecticut, Massachusetts, New Jersey, New York, Rhode Island, and Vermont require that heating oil be “ultra-low sulfur,” or no more than 15 parts per million. Programs can support the use of renewable heating fuels, as well, which could further cut CO<sub>2</sub> and black carbon emissions.
- **Require Cleaner Wood Stoves.** As described in Appendix B, EPA has proposed delaying federal regulations to require cleaner wood stoves and wood-heating appliances. Washington State has set rules and guidelines for the sale, installation, and use of residential wood stoves and similar devices.<sup>77</sup> California, Massachusetts, and Vermont offer incentives to replace old wood stoves with cleaner ones. States could consider adopting similar regulations, or developing a model regulation, for states or local air districts to consider.
- **Support Education and Outreach.** Many states and air districts offer information regarding the public health impacts of wood smoke and particulate matter. States could support new or existing public awareness campaigns and efforts to educate the public about the health and environmental impacts of wood smoke, including EPA’s Burn Wise program<sup>78</sup>. States could also consider partnering with wood and pellet stove manufacturers to improve their products and reduce black carbon emissions.

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### *Wildfire and Open Biomass Burning*

#### *Mitigate Wildfire Risk and Create Value from Woody Biomass Waste*

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The impacts of climate change are already apparent. They include increased frequency and severity of wildfires that are decimating forests throughout the western U.S. and elsewhere, putting lives and property at grave risk. Wildfires are a major source of black carbon, and are now a year-round threat in many Alliance states. The federal government and states urgently need to act to reduce the risk of wildfire and strengthen the resiliency of our natural and working lands. This includes increasing the application of techniques that reduce the risk of catastrophic wildfires, and make wildfires easier to contain and extinguish.

Agricultural burning is another major source of black carbon. By creating markets and value for utilizing woody wastes from agriculture and forestry, states could help support improved agricultural and forest management practices and reduce black carbon emissions.

Efforts to reduce black carbon from biomass burning deserve consideration in a broader context that considers forest health, agricultural sustainability, carbon storage in natural and working lands, and public health. Integrated planning can help identify the most effective strategies to achieve multiple priorities. U.S. Climate Alliance states are already taking action to address wildfire risk and natural and working lands, and could consider a number of additional actions that include:

- **Identify and Adopt Best Practices for Greenhouse Gas Reductions and Carbon Sequestration on Natural and Working Lands, Including Forest Management.** U.S. Climate Alliance states could advance programs, policies, and incentives to reduce greenhouse gas emissions and enhance resiliency and carbon sequestration in natural and working lands, including forests. In developing programs, states could recognize the importance of reducing black carbon and particulate matter emissions from catastrophic wildfire and woody biomass disposal. The Oregon Department of Forestry (ODF) recognizes prescribed burning as a means of reducing excess fuels, thereby lowering the risk of wildfires, and administers the Oregon Smoke Management Plan for prescribed burning in cooperation with landowners, land management agencies, and air quality agencies.<sup>79</sup> New Jersey has a similar program for private landowners, who are required to obtain permits before prescribed burning. Regulated prescribed burning provides a safe and cost-effective method of reducing fuels, vegetation, and leaf litter that could contribute to catastrophic wildfire.
- **Invest in Forest Resiliency and Health.** Many forests require active management to return them to health, reduce wildfire risk, and build resiliency. Several states have targeted forest management programs. Increased federal and state investment is necessary. Additional investment can help expand these programs and reach more acres quicker. California, for example, has invested in forest health and resiliency programs through its California Climate Investments Forest Health program. Partnering with federal and private landowners, especially in shared watersheds or firesheds, can help maximize the benefits of forest management efforts. New York encourages beneficial forest management activities on millions of acres of private forest land through a targeted property tax abatement program that requires active forest management for carbon sequestering forest products while at the same time restoring and maintaining forest health and resiliency.
- **Build Markets for Beneficial Use of Woody Waste.** Active forest management and timber harvest produce biomass, sometimes in excess of what can be left in the forest. Avoiding open burning of this or agricultural waste requires available alternatives to capture value from this potentially valuable resource. Developing markets for products from these sources, including bioenergy, biofuels, and a range of wood products supports efforts

to limit open burning and fosters investment in forest management activities. States could help build these markets through procurement programs, or partnerships, incentives, and voluntary efforts. California's Forest Carbon Plan calls for expanded and new programs to grow wood products markets and bioenergy capacity in a manner that both supports forest health and advances the state's climate change mitigation goals for both energy and natural and working lands. California is creating a Joint Institute for Wood Products Innovation and will review and update the California Public Utilities Commission's procurement programs for small bioenergy renewable generators to ensure long-term programmatic certainty for investor-owned utilities, projects developers, and ratepayers.<sup>80</sup> New York encourages the use of wood pellets from forest-sourced wood and forest products manufacturing residues for thermal space heating through its "Renewable Heat NY" Program". The program provides incentives to homeowners and commercial entities for installation of high-efficiency/low emissions gasification boilers. By replacing old wood stoves with new pellet stoves, it has reduced PM emissions by 50 tons annually.

- **Support or Require Alternatives to Agricultural Burning.** Although agricultural burning is still a common practice in the U.S., several states limit or restrict agricultural or other open burning practices because of the air quality impacts. Additional restrictions can help further reduce harmful emissions from these practices.

### **Cross-Cutting Policies – Clean Energy and Natural and Working Lands**

Policies to reduce CO<sub>2</sub> emissions in the natural and built environment often help reduce methane, HFCs, and black carbon emissions, as well. For example, increasing energy efficiency reduces the need for energy production and methane emissions associated with coal mining or oil and gas production and distribution. Transitioning to cleaner sources of energy and away from fossil fuel combustion supports market development for projects that reduce methane and black carbon emissions. Increased energy efficiency in heating and cooling, including commercial refrigeration, can support HFC emission reductions.

Similarly, efforts to reduce greenhouse gas emissions and increase carbon sequestration in natural and working lands will also help reduce SLCP emissions. Healthy soils initiatives support market development for organics diversion and manure management strategies that reduce methane emissions. Efforts to improve the health and resiliency of forests and other natural landscapes can help to reduce black carbon emissions from wildfire. Designing energy policies in a manner that facilitates low-emission pathways for woody biomass and agricultural waste will advance SLCP reduction goals system-wide.

As part of its comprehensive approach to addressing climate change, the U.S. Climate Alliance could continue supporting a broad array of clean energy and natural and working lands strategies. Alongside the SLCP actions identified in this Roadmap, these integrated policies can serve to reduce greenhouse gas emissions to levels needed to do our part to meet the goals of the Paris Agreement.

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### *Efficiency and Clean Energy Policies*

#### *Continue Leading on Energy Efficiency and the Transition to Clean Energy*

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Improved energy efficiency in any sector helps reduce fossil fuel consumption, which reduces methane emissions from coal, oil, or natural gas supply. Renewable energy from non-combustion sources like wind and solar avoids black carbon emissions from stationary combustion, and to the extent it displaces fossil resources, helps to reduce demand and associated methane emissions from coal, oil, or natural gas supply. Clean energy policies often include biomass or biogas as eligible renewable resources, creating value that supports projects that may help avoid agricultural burning (black carbon) or methane emissions from the waste or agricultural sectors. Electrifying end use appliances in buildings or the transportation sector eliminates black carbon from stationary and mobile combustion.

U.S. Climate Alliance states are already leaders on clean energy and energy efficiency, and will continue to lead and benefit from these efforts.<sup>81</sup> States could support additional SLCP reductions by building on these leading efforts, including:

- **Adopt Market-Based Strategies.** Market-based policies that support transitions to clean energy and other efforts to reduce greenhouse gas emissions can also help reduce SLCP emissions. Several U.S. Climate Alliance states have cap-and-trade programs, which set declining caps on greenhouse gas emissions from a sector or group of sectors and creates a market for emissions reductions. California has a multi-sector cap-and-trade program, and Connecticut, Delaware, Maryland, Massachusetts, New York, Rhode Island, and Vermont participate in the power-focused cap-and-trade system called the Regional Greenhouse Gas Initiative (RGGI). New Jersey and Virginia are also in the process of becoming participants in RGGI. In some markets, “offsets” from sectors not covered by the program include specific SLCP projects. California’s program, for example, includes offsets for methane captured at coal mines and dairies.
- **Implement Building, Appliance or Industrial Efficiency Standards.** California, Connecticut, Hawaii, Oregon, North Carolina, Vermont, and

Washington have building efficiency standards in place. Some states are considering expanding the scope of standards to cover greenhouse gas emissions more broadly, which could include requirements to reduce HFC emissions from foams, air conditioning systems, or appliances.

- **Develop Energy Efficiency Plans.** Massachusetts and other states have robust multi-sector energy efficiency programs that have reduced the use of electricity and heating fuels, providing billions of dollars in benefits to program participants.<sup>82,83,84</sup> New York recently published its New Efficiency NY initiative, detailing a comprehensive approach to energy efficiency and designed to achieve 185 Trillion BTU of Efficiency across all fuel uses, and which will provide one third of the greenhouse gas emission reductions necessary to meet the State's 40% emissions reduction goal by 2030.<sup>85</sup>
- **Defend Strong Vehicle Greenhouse Gas Standards.** Light-duty and heavy-duty vehicle greenhouse gas standards significantly reduce oil consumption as well as the methane emissions associated with oil production. California sets vehicle greenhouse gas standards that can be stronger than federal standards, and other states could choose to adopt California's standards or follow federal standards. Several U.S. Climate Alliance states, including Colorado, Connecticut, Delaware, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, Vermont, and Washington, have adopted California's standards. Several U.S. Climate Alliance states have also joined in legal action to protect California's authority to set vehicle greenhouse gas standards.
- **Adopt Low Carbon Fuel Standards.** California and Oregon require fuel providers to increase the availability and use of cleaner, low carbon fuels based on a life cycle "carbon intensity" of fuel pathways. Projects that capture and convert methane emissions into transportation fuels often receive especially low carbon intensity scores. Most low carbon fuels – including renewable diesel, renewable natural gas, electricity, and hydrogen – also help reduce black carbon emissions compared to conventional vehicles and fuels in on-road and off-road vehicles, and in stationary equipment.
- **Expand Renewable Electricity/Portfolio Standards.** Most U.S. Climate Alliance states have targets for increasing renewable electricity generation and use. Some state programs further enable methane reductions by classifying captured methane from coal mines as renewable (Colorado) or requiring a portion of electricity to come from swine manure (North Carolina). California, Colorado, Connecticut, Hawaii, Massachusetts, Minnesota, New York, North Carolina, Oregon, Vermont, Washington all require increasing levels of renewable power.

- **Develop Renewable Gas Standards.** Similar to a low carbon or renewable standard for the transportation or electricity sector, some states are considering requiring increasing use of renewable or low carbon gas supplies to replace use of fossil natural gas. Clean fuel requirements in the natural gas sector may especially support methane reductions, as most available sources of renewable gas include capturing and utilizing methane that may otherwise reach the atmosphere. Directly replacing fossil natural gas reduces methane emissions associated with its supply, as well. California, Oregon, and Washington are considering renewable natural gas potential and policies.
- **Implement Feed-in Tariffs and Net Metering Programs.** California, Vermont, and Washington have feed-in tariff programs that offer fixed-price standard contracts and include small bioenergy renewable generators, including biogas from wastewater treatment, organic waste diversion, dairy and other agricultural bioenergy, or the byproducts of sustainable forest management. Most states have net metering policies for solar power, where excess distributed renewable power that is exported to the grid (rather than used onsite) is credited at the full retail rate, as opposed to the wholesale electricity price. Some state programs also include bioenergy, anaerobic digesters, or energy storage.
- **Electrify Transportation.** California's Zero Emission Vehicle rule requires automakers to sell an increasing number of zero emission vehicles. Connecticut, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Vermont have adopted this rule. Several states have incentive programs to support the purchase of zero emission light-duty or heavy-duty vehicles and are investing in hydrogen fuel or electric charging infrastructure. Education and outreach campaigns can help inform consumers about new technologies and support increased sales.
- **Electrify Buildings.** Building codes, incentive programs, or other efforts supporting net zero energy/carbon buildings can require or incentivize transitions away from natural gas and oil in buildings. Electrifying building appliances can help reduce natural gas and oil use, and methane leaks from natural gas and oil production and distribution.
- **Account for Life Cycle Climate, Health, and Other Impacts.** Expanding accounting frameworks to include life cycle greenhouse gas emissions and other impacts associated with our energy and resource use can be an important tool for states as they plan SLCP mitigation and other climate strategies. Providing a full understanding of the impacts of our policy decisions enables more precise planning, more complete accounting of progress towards plan, and connects local, regional and global actions and impacts. Integrating life cycle accounting into standards can help states engage more effectively with private sector stakeholders. Some state

programs, like Low Carbon Fuel Standards, include life cycle emissions accounting. Regulatory processes for climate programs often include accounting for health and social cost impacts, including co-benefits associated with non-CO<sub>2</sub> pollutants. States could consider adopting other accounting standards, as well.<sup>3</sup> A consensus-building process for integrating new scientific knowledge over time can support effective implementation.

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### ***Natural and Working Lands Strategies***

#### *Protect Natural and Working Lands and Maintain them as Resilient Carbon Sinks*

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Efforts to increase ecosystem health, resiliency, and carbon storage in natural and working lands can help reduce black carbon and methane emissions across forested, agricultural, and other natural and working lands.

- **Reduce Risk of Catastrophic Wildfire.** Wildfire is a large source of black carbon emissions in U.S. Climate Alliance states and a threat to communities in expanding wildland-urban interfaces. Managing forests to reduce wildfire risk is necessary to protect these communities and will also reduce greenhouse gas and black carbon emissions from forests and improve the resiliency of carbon stocks.
- **Optimize Biomass Utilization.** Diverting woody biomass waste away from open burning and to biofuels, bioenergy, wood products, or soil amendments reduces black carbon and methane emissions. Using agricultural waste for compost and other soil amendments can support efforts to reduce methane in the waste and agricultural sectors, and may reduce the need for petroleum-based fertilizers and associated methane emissions. Biomass-based energy and product markets can also support activities to improve land management.
- **Improve Soil Health.** Healthy soils initiatives offer agricultural, climate, and water benefits. Agricultural practices designed to improve soil health like New York's Climate Resilient Farming Program<sup>86</sup> can increase soil carbon, enhance water retention, lower greenhouse gas emissions from agriculture, and support markets for products associated with methane reductions, like compost.

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<sup>3</sup> For example, the 2015 update of the International Standards Organization (ISO) 14001 Life Cycle Assessment standard, developed under the American National Standards Institute (ANSI) process, provides a life cycle accounting framework that includes updated climate metrics, climate impacts across the full life cycle (both indirect and upstream climate impacts) and is designed to address all other environmental and human health trade-offs. ISO 14001 now provides updated life cycle accounting climate metrics, reflecting the projections of the Intergovernmental Panel on Climate Change IPCC. <https://blog.ansi.org/2015/08/iso-14001-life-cycle-assessment/#gref>

# THE PATH FORWARD

This Roadmap lays out a set of achievable strategies for reducing SLCP emissions, and steps that states could take to achieve them. Undoubtedly, new ideas and information will improve our understanding of SLCP emissions, potential for reductions, and present new opportunities for action. The U.S. Climate Alliance will track new developments and maintain an up-to-date assessment of progress and state-level policy options for cutting emissions of methane, HFCs, and black carbon.

## Implementing Actions

Building from this Roadmap and the momentum of the 2018 Global Climate Action Summit, the U.S. Climate Alliance will continue to work to reduce SLCPs. We will develop state-level strategies to reduce SLCP emissions and work toward the shared goals of this Roadmap. To support state-specific efforts and leadership, the U.S. Climate Alliance will continue to:

- **Improve State-Level Emissions Inventories.** U.S. Climate Alliance states are committed to improving individual and collective understanding of SLCP emissions at the state level, and will continue to collaborate to share best practices and improve state SLCP emissions inventories based on updated information. The U.S. Climate Alliance has developed preliminary tools to help estimate emissions of HFCs, methane, and black carbon for all 50 states using consistent methods, data, and assumptions. This is not a replacement for state-specific inventory development, but offers helpful insights to assist with planning efforts and policy development. In the coming months, the U.S. Climate Alliance will work to complete a state-level HFC inventory tool and make it publicly available.
- **Provide Technical Assistance.** Partnerships like the U.S. Climate Alliance provide valuable opportunities to share best practices and participate in technical exchanges with staff in other states. These valuable information exchanges sometimes include external experts or organizations, as well, and offer critical insights for states considering new programs. U.S. Climate Alliance states will continue regular technical exchanges to help states as they develop state-level SLCP strategies and implement actions identified in this Roadmap.
- **Develop Model Regulations and Incentives.** Several states have developed or are considering regulations and incentives to reduce SLCPs in their state, including backstopping against federal actions to delay or rollback

existing rules. States will continue to share best practices and lessons learned in developing SLCP regulations, which will inform new efforts to do so. Building on existing state rules and pulling from federal regulations identified in Appendix B, the U.S. Climate Alliance may also develop model regulations for states to consider adopting to help cut SLCPs. Over the coming months, the U.S. Climate Alliance will identify priority regulations, and incentives that states could use as model rules. Interested U.S. Climate Alliance states will collaborate to develop such rules, which any state may consider adopting. Likely near-term priorities include rules to backstop the federal SNAP rules and transition away from HFCs, reduce particulate matter and black carbon from wood stoves, and limit methane from oil and gas production, natural gas pipelines, and landfills.

- **Expand Partnerships.** The U.S. Climate Alliance consults with a diverse set of non-governmental organizations, foundations, international organizations, and others to provide technical expertise and help connect states to other related activities. It will continue engaging partners to support states in their efforts to cut SLCP and other greenhouse gas emissions. Over the next year, the U.S. Climate Alliance will also seek new opportunities for collaboration and will develop an outreach strategy to secure additional commitments related to the SLCP Challenge (#SLCPChallenge).
- **Report on Progress Annually.** The U.S. Climate Alliance reports annually on our progress toward reducing emissions of greenhouse gasses. Future annual reports will include inventories of methane, HFCs, and black carbon; track progress in reducing SLCP emissions and achieving the potential identified in this Roadmap; and summarize new SLCP activities in U.S. Climate Alliance states.

## Let's Go Already

The impacts of climate change are frighteningly apparent in U.S. Climate Alliance states and all around the world. Our response to climate change must be comprehensive and urgent, encompassing all we can do to minimize the mounting risks we face. Critically, we need a global effort to drastically reduce SLCP emissions by 2030. It is the best way to reduce climate risks in the near-term, while we also work to slash CO<sub>2</sub> emissions and manage climate change risks over the long term.

Fortunately, opportunities to reduce SLCP emissions match the need. Capturing and utilizing methane, avoiding waste, supporting agriculture and strengthening food security, transitioning to more efficient and lower impact refrigeration, and cutting particulate matter pollution and black carbon to improve public health are all worth doing in their own right. The overlap with climate change only increases the reason and need to act on SLCPs. Each sector can, and must, contribute.

The U.S. Climate Alliance is fully committed to doing what we can, and must, to contribute to the global climate response, including reducing SLCPs. We have no time to waste, and all the opportunity we need. Join us. #SLCPChallenge

# APPENDIX A:

## SLCPS IN U.S. CLIMATE ALLIANCE STATES

States could take advantage of significant opportunities to build on existing actions to further cut SLCPs in line with levels needed to meet the goals of the Paris Agreement and beyond. Each state has shared and unique opportunities to reduce SLCPs and capture local benefits.

Many U.S. Climate Alliance states have developed state-level greenhouse gas inventories that include SLCPs. Some rely on different methods, assumptions, or reference years. This Roadmap presents emissions inventories for methane and HFCs, aggregated across the U.S. Climate Alliance, based on state-level estimates from the Rhodium Group's U.S. Climate Service.<sup>87</sup> They may not exactly match official state inventories, but offer a consistent and useful method for estimating emissions and reduction potential across states, and in line with national emissions inventories. There is also interest from many U.S. Climate Alliance states to develop black carbon inventories. The states are in early stages of exploring methodologies for black carbon inventories.

Sources of SLCP emissions are more difficult to track than for CO<sub>2</sub>. Methane comes from diffuse sources that can be difficult to monitor (e.g. pipeline leaks) and living systems with distinct characteristics (e.g. cow burps). Bottom-up inventories do not always match atmospheric measurements, and may not account for the contributions to emissions from a relatively small number of "super emitters." Black carbon is one element in a toxic mix of pollution, which has variable climate impacts depending on source and other parameters. Data for these sources can be limited as well – like animal populations and their distribution among farms, or pollution from household heating appliances.

The inventories and reduction potentials identified in this section represent conditions in the U.S. Climate Alliance as best as possible. They do not represent official estimates for states, who ultimately maintain their own inventories, plans, and targets. But they do clearly indicate both a significant opportunity and need to reduce SLCPs. As they continue taking action to reduce SLCP emissions, U.S. Climate Alliance states will also keep working to improve SLCP inventories and our understanding of emissions, sources, and opportunities for further reductions.

**Methane**

U.S. Climate Alliance states account for an estimated 20 percent of national methane emissions. Agriculture is responsible for nearly half of methane emissions in the U.S. Climate Alliance as whole, with remaining methane distributed about evenly between the energy and waste sectors. Compared to the rest of the U.S., methane emissions from agriculture and waste are larger in the U.S. Climate Alliance states, while energy systems, in particular oil and gas production, represent a larger source of methane in other states (Figure 2).

**Figure 2. Comparison of methane emissions in U.S. Climate Alliance states and other states.**

Figure 2a: Methane Sources in U.S. Climate Alliance

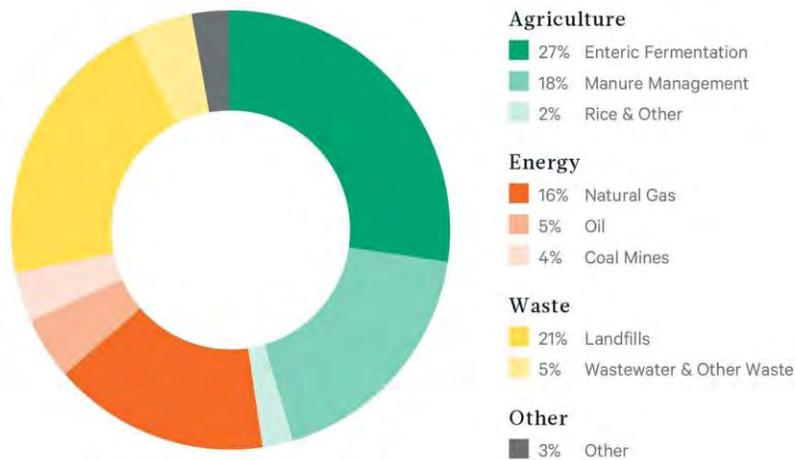
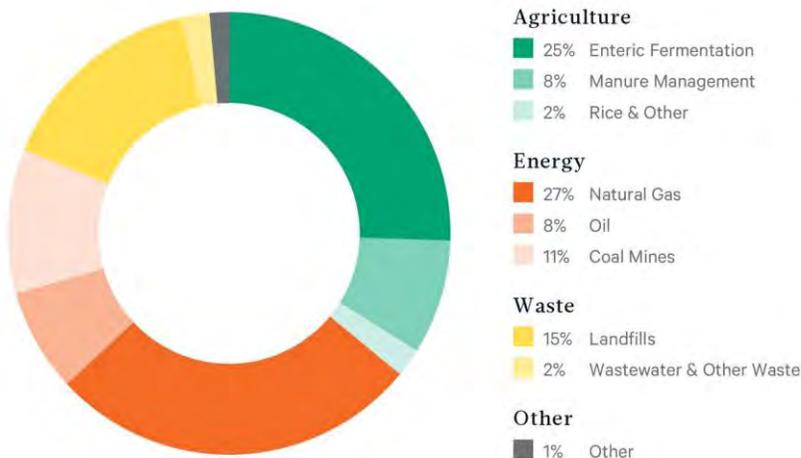


Figure 2b: Methane Sources in Rest of United States



Several opportunities exist to reduce methane significantly from all its major sources. Capturing these opportunities could reduce overall methane emissions in the U.S. Climate Alliance by about 40-50 percent by 2030.

**Agriculture**

Livestock operations are responsible for nearly half of the methane emissions in the U.S. Climate Alliance. Of this, about 60 percent comes from enteric

fermentation, with the remainder from manure management, especially on some large dairy and swine farms that flush manure out of barns and store it under anaerobic conditions in lagoons. Rice cultivation is a small source of methane emissions, accounting for about two percent of methane emissions in U.S. Climate Alliance states and nationally.

While the U.S. Climate Alliance is responsible for about 20 percent of the methane emissions in the U.S., the Alliance generates one-third of the U.S.'s methane emissions from manure management. There is significant opportunity to reduce methane from manure management, by removing manure solids before the lagoon, capturing and utilizing methane generated in a lagoon for energy or fuel (dairy digesters), or converting to dry manure management practices or pasture-based operations. One estimate suggests changes in manure management on confined dairy and swine operations can reduce methane emissions by 50 percent nationally.<sup>88</sup> This might be low, especially considering state and federal grant programs, utility investments, and other clean energy and fuel policies that offer significant potential value for dairy digester or other projects. Indeed, California estimates that a significant amount of its manure methane emissions can be reduced under current programs.<sup>89</sup> Estimates from the EPA suggest the U.S. Climate Alliance could reduce manure methane by about 70 percent or more.<sup>90</sup>

Markets for energy, soil, and other products from improved manure management offer a significant economic opportunity in U.S. Climate Alliance states. Products from dairy digesters, for example, may represent a \$3 billion annual market in the U.S.,<sup>91</sup> and possibly much higher under current policy regimes like Low Carbon and Renewable Fuel Standards. About one-third of this opportunity is in California, Colorado, New York, and Washington.<sup>92</sup> North Carolina and Minnesota are home to about 30 percent of swine farms nationally that are candidates for methane capture and energy generation.<sup>93</sup> These opportunities are beginning to materialize quickly. California, for example, has dozens of projects under development to reduce manure methane and scores more on the way.

U.S. livestock operations are among the most efficient in the world, with low enteric fermentation methane emissions per unit of product. Breeding, feeding, and other strategies have continually improved production efficiency over the past decades, reducing enteric fermentation emissions on a per-gallon-of-milk basis. These strategies are likely to continue providing incremental methane intensity improvements over time.

Many promising strategies are emerging that could reduce enteric fermentation emissions about 30 percent or more. Various feed additives are undergoing trials in the U.S. and other countries that might reduce emissions to those

levels.<sup>94</sup> Extracts from citrus, garlic, and grapes all show promise to reduce methane.

While these strategies all need more testing to verify performance, food production, animal health, and feasibility in the U.S., it is reasonable to expect new products and practices will soon emerge that can reduce enteric methane emissions by 30 percent or more. This is generally in-line with conservative estimates for the global potential,<sup>95</sup> as well as a voluntary target set by the dairy industry in the U.S., to reduce the greenhouse gas intensity of milk production by 25 percent below 2007 levels by 2020.<sup>96,97</sup>

### **Energy**

Fossil energy systems are the largest source of methane emissions in the U.S., but energy-related methane emissions are relatively small in the U.S. Climate Alliance, representing about 12 percent of the national share. Within the U.S. Climate Alliance, natural gas systems represent about 16 percent of methane emissions, oil systems represent about 5 percent, and coal mines represent about 4 percent of methane emissions.

There are significant opportunities to cut methane from the oil and gas sector. The U.S. Department of Energy has identified four U.S. Climate Alliance states among the top six states with the most leak-prone distribution mains,<sup>98</sup> and the Environmental Defense Fund estimates that the U.S. loses \$2 billion worth of natural gas each year to leaks.<sup>99</sup> The EPA estimates that oil and gas methane can be cut by 45 percent, with 60 percent of those reductions coming at negative cost.<sup>100</sup> Another study suggests that methane from onshore oil and gas operations in the U.S. can be reduced by 40 percent in 2018 at a cost of a penny per thousand cubic feet of gas produced, while saving the U.S. economy and consumers more than \$100 million per year.<sup>101</sup>

This loss-reduction and cost-saving opportunity may be even larger globally, where as much as \$34 billion in gas is lost each year.<sup>102</sup> A recent study by the International Energy Agency found that global oil and gas methane emissions can be cut by about 75 percent, with as much as 50 percent at negative cost.<sup>103</sup> Capturing these negative cost reductions would have the same climate impacts in 2100 as immediately shutting down all coal power plants in China.<sup>104</sup>

In addition to the enormous global climate benefits, cutting oil and gas methane provides local benefits by improving pipeline safety and capturing lost revenue for businesses and taxpayers. In 2016, the U.S., Canada, and Mexico agreed to each develop regulations to reduce emissions from the oil and gas sector by 40-45 percent below 2012 levels by 2025.<sup>105</sup> Canada and Mexico have proposed regulations on oil and gas methane. The U.S. currently has a partial, but uncertain, regulatory framework in place (see Appendix B). Some states,

including California and Colorado, already have their own oil and gas regulations in place.

The U.S. Climate Alliance is home to about 11 percent of U.S. active and inactive coal mines.<sup>106</sup> Those states already have projects in place to capture methane from some of them, but other opportunities may exist for low cost reductions at additional mines.<sup>107</sup> In addition to reducing greenhouse gas emissions, capturing methane at coal mines improves mine safety and generates new revenue for coal mines. Various programs exist in U.S. Climate Alliance states to support coal mine methane capture projects, including eligibility for the renewable portfolio standard in Colorado and carbon offsets under California's Cap-and-Trade Program. The EPA estimates that coal mine methane can be reduced by about 45 percent by 2030.<sup>108</sup>

### **Waste**

Landfills account for about 21 percent of U.S. Climate Alliance methane emissions, making them the third largest source after enteric fermentation and manure management. Federal regulations are in place that could reduce methane from landfills by an estimated 30 percent in U.S. Climate Alliance states, and nationally, by 2030.<sup>109</sup> However, these reductions are somewhat uncertain, as EPA has proposed delaying or not enforcing landfill regulations. Several U.S. Climate Alliance states are suing the federal government or developing their own regulations to ensure continued emissions reductions from landfills.

A key opportunity in the waste sector is to collect and capture methane, and once upgraded to meet pipeline standards, use it to generate energy in exactly the same way fossil natural gas is used. The EPA estimates that there are 632 operational landfill gas energy projects in the U.S., with an additional 470 candidate projects, which could collectively reduce methane emissions by 39 MMTCO<sub>2</sub>e/year. In the U.S. Climate Alliance, there are an estimated 250 operational projects and opportunities for more than 100 additional projects, which could reduce methane emissions an estimated 8.3 MMTCO<sub>2</sub>e/year, or by about 30 percent.<sup>110</sup>

**Table 1. Landfill gas energy projects in U.S. Climate Alliance states.<sup>111</sup>**

	Operational projects	Candidate landfills	Projected methane reductions (MMTCO <sub>2</sub> e)
California	73	23	1.8
Colorado	2	14	1.1
Connecticut	3	2	0.1
Delaware	4	N/A	N/A
Hawaii	0	5	0.3
Maryland	12	8	0.5
Massachusetts	17	4	0.3
Minnesota	7	5	0.2
New Jersey	19	1	0.0
New York	28	2	0.1
North Carolina	33	14	1.4
Oregon	7	3	0.2
Puerto Rico	2	6	0.7
Rhode Island	3	N/A	N/A
Vermont	3	N/A	N/A
Virginia	31	13	1.1
Washington	6	8	0.5
USCA Total	250	108	8.3
U.S. Total	632	470	39.2

Another key strategy for reducing waste methane is to divert organic wastes from landfills and put them to better use as food, compost, or energy. Food rescue and recovery programs can improve public health by increasing access to healthy foods in food insecure communities. Generating compost or creating energy from organic waste can create value that may make diversion projects profitable without other support.<sup>112</sup> Suitably, the EPA established a food recovery

hierarchy that prioritizes source reduction and food recovery to feed people, then animals, composting, and ultimately landfilling as a last resort.<sup>113</sup>

Among U.S. Climate Alliance states, California and Vermont have laws in place or under development that will dramatically reduce disposal of organics in landfills. As states increase organics diversion, methane emissions from static non-aerated compost operations, which currently represent about one-half of one percent of methane emissions in the U.S. Climate Alliance, may increase. Reductions in methane from reduced landfilling of organics dwarfs any increase in methane from composting, however. California, for example, estimates its efforts to divert organic waste will cut methane from waste by an additional 20 percent by 2030, with an increasing impact in future years.<sup>114</sup>

Wastewater treatment represents about 4 percent of U.S. Climate Alliance methane, and significant opportunity exists to reduce methane from this source, as well. In the U.S., more than 2,000 wastewater treatment plants can add biogas capture equipment,<sup>115</sup> and many other plants could utilize excess capacity for diverted organic wastes, often cost effectively.<sup>116</sup> Methane reductions of about 40-50 percent are likely achievable from the sector by 2030.<sup>117</sup>

### ***Methane Super Emitters***

Like many pollution sources, a relatively small fraction of methane “super emitters” are likely responsible for a very large fraction of emissions. For natural gas systems, for example, studies have found that one percent of sources are responsible for 44 percent of methane emissions, five percent of leaks responsible are for more than half methane emissions, and 10-20 percent of sources are responsible for 80 percent of methane emissions.<sup>118,119,120</sup>

The same concept holds in other sectors, too. A poorly controlled landfill (or a well-controlled one that happens to spring a large leak) will contribute disproportionately to waste-sector emissions. One manure lagoon may have very different emissions from another, depending on farm management practices and a host of other factors. Indeed, preliminary results from a joint study by California and NASA’s Jet Propulsion Laboratory found that a very manageable number of point sources are responsible for a significant fraction of total emissions.

Identifying and targeting super emitters could provide important opportunities to achieve deep methane reductions very quickly. Many efforts are underway to improve monitoring of methane emissions, which promise to make actionable data available in the near future on super emitters and other sources of methane.<sup>4</sup> A targeted effort to reduce emissions from super emitters could

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<sup>4</sup> For example, ARPA-E has an active program focused on developing low-cost methane detection technologies, EDF has announced efforts to launch a methane satellite, and several companies and the state of California are exploring options to launch satellites capable of pinpointing methane leaks globally.

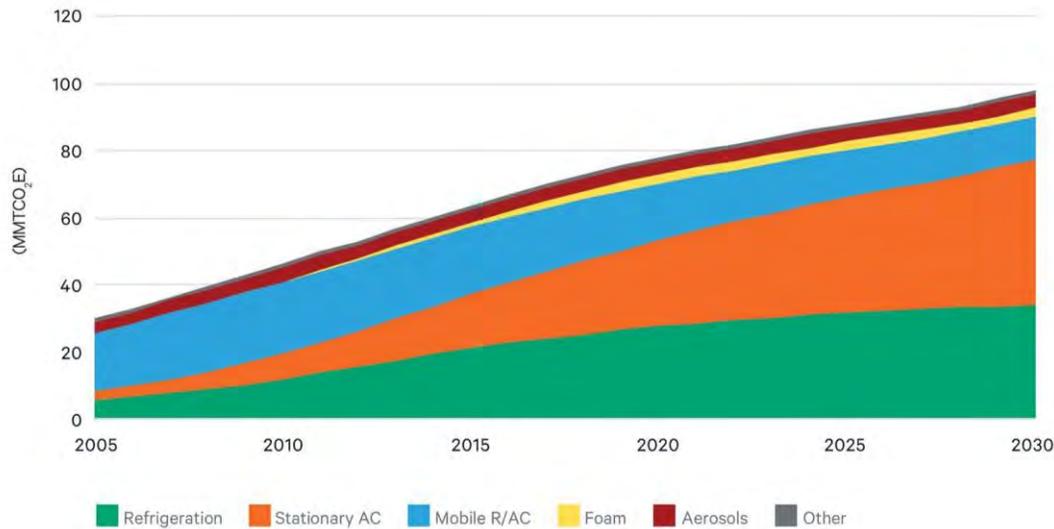
reduce methane from affected sources by perhaps an additional 30 percent, and could lead to reductions in excess of 1,000 MMTCO<sub>2</sub>e/year globally.

### **Hydrofluorocarbons (HFCs)**

HFCs are potent short-lived climate pollutants, with global warming potentials hundreds to thousands of times greater than CO<sub>2</sub>, and with a lifespan of about 15 years. For example, just one *pound* of R-404A, an HFC refrigerant used in supermarkets, has the same climate impact over 100 years as almost two *tons* of CO<sub>2</sub>. HFCs are often used in commercial refrigeration, stationary and mobile air conditioning, heat pumps, foams, and aerosols. They are the fastest growing source of greenhouse gas emissions, both nationally and globally. Without further controls, HFC emissions could double in 20 years.

The U.S. Climate Alliance has developed preliminary HFC inventories and projections through 2030 for all 50 states (Figure 3). It is based on a peer-reviewed, bottom-up fluorinated gas emissions inventory developed by the California Air Resources Board,<sup>121</sup> which utilized over \$2.5 million in research and surveys relating to equipment counts, leak rates, and atmospheric measurements.<sup>122</sup> It includes state-specific data as available, including numbers of retail food markets, air conditioning and heat pump units, vehicles, and cold storage warehouses. The tool includes a range of mitigation scenarios and will help states better understand emissions and opportunities for reductions. The U.S. Climate Alliance plans to make the inventory tool publicly, so all states in the U.S. will be able to gain a better understanding of SLCP emissions in their states and the reduction potential from various policies.

**Figure 1. Estimated HFC emissions and “business as usual” growth in U.S. Climate Alliance states.**



HFC emissions correlate well with population, and accordingly, the U.S. Climate Alliance is responsible for about 40 percent of U.S. HFC emissions. Commercial refrigeration systems, including those in grocery stores and restaurants, are the largest source of HFC emissions, representing about one-third of the total. Mobile air conditioning is the next largest, representing one-quarter of emissions. They mostly come from the light-duty vehicle sector, but also result from the heavy-duty sector – including buses, off-road vehicles, and transport refrigerated units. Emissions from air conditioning in buildings, including residential heat pumps, is the fastest growing source of HFC emissions in U.S. Climate Alliance states and nationally. Under current trends, stationary air conditioning could become the largest source, representing over 40 percent of HFC emissions by 2030.

Transitioning away from HFCs can help reverse these trends and significantly reduce emissions. Many HFC alternatives with a much lower climate impact are available, or expected to be available soon. There are a number of natural refrigerant alternatives to HFCs, including CO<sub>2</sub>, ammonia, and hydrocarbons. Hydrofluoroolefins (HFOs) are non-ozone depleting substances and have global warming potential values of less than six. In some applications, these alternatives offer energy efficiency benefits, and in most, emissions reductions are either negative cost or very low cost. Indeed, the EPA estimates that emissions from refrigeration and air conditioning can be reduced by 77 percent

below baseline levels by 2030, and that over half of those reductions can be had at negative cost.<sup>123</sup>

Fortunately, these transitions are underway in many places. The European Union has adopted regulations to phase down the production and import of HFCs by almost 80 percent below 2014 levels by 2030. In North America, more than 300 stores use transcritical CO<sub>2</sub> as a refrigerant (global warming potential of 1), and another 260 use a hybrid system of CO<sub>2</sub> and HFCs.

Under the Kigali Amendment to the Montreal Protocol, the world has agreed to transition away from HFCs. It begins to phase down the production and use of HFCs starting in 2019, reaching 85 percent reduction by 2050. This action alone will reduce average global temperatures by an estimated 0.5°C this century, compared to current HFC emission trends.<sup>124</sup> The U.S. signed the Kigali Amendment in November 2016, but has not taken action to ratify it through the Senate.

Once ratified, the EPA needs to implement the Kigali Amendment, but the mechanism to do so is uncertain, as well. The Significant New Alternatives Policy, known as SNAP, implements Section 612 of the amended Clean Air Act of 1990, which requires EPA to evaluate replacements for ozone-depleting substances to reduce overall risk to human health and the environment. These replacements include HFCs. EPA applied this authority to prohibit high-global warming potential (GWP) HFCs in new equipment and materials as viable, lower-GWP alternatives became available. However, last year the federal D.C. Circuit Court of Appeals ruled that EPA cannot require replacements of HFCs in many circumstances.

Given federal uncertainty on transitioning away from HFCs, there is a strong need for states to lead. California has adopted much of the SNAP program into state law, and is considering additional rules to cover the remaining categories. Other states are considering similar steps. By adopting these rules into law themselves, states can create a market for a large variety of efficient equipment using low-GWP refrigerants and continue the transition away from HFCs in the U.S., while supporting American companies and jobs.

In the U.S., the Kigali Amendment and recent SNAP program would have HFC emissions fall about 25 percent below current levels by 2030, and continue declining thereafter. States can work to lock in those reductions and ensure the U.S. benefits from the global phasedown in HFC emissions.

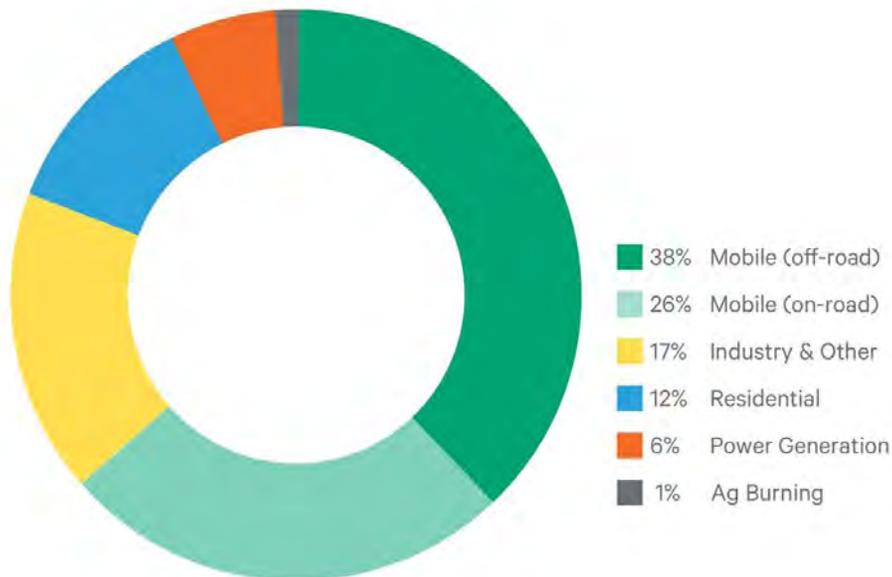
Additional steps could help reduce HFC emissions by 40-50 percent below current levels by 2030. This includes improving refrigerant management in existing systems, transitioning away from HFCs in end uses not covered by the recent regulations, collecting and destroying used refrigerants, reducing the global warming potential value of replacement refrigerants in existing systems,

and creating incentive programs to accelerate the transition away from HFCs. California is doing many of these things, and it and other states are considering additional steps to reduce HFC emissions faster.

### **Black Carbon**

U.S. Climate Alliance states are working to develop and maintain black carbon inventories to guide their planning efforts. California has developed a black carbon inventory,<sup>125</sup> and the EPA has developed state level black carbon emissions inventories, as well. Estimates from the most recent EPA inventory are summarized in Figure 4. Mobile sources account for nearly two-thirds of non-forest black carbon emissions. Cars and trucks account for about a quarter of non-forest black carbon emissions. Trains, planes and ships comprise another 10 percent, and other off-road vehicles and equipment comprise nearly 30 percent of non-forest emissions. Residential wood burning is another large source of emissions in some states.

**Figure 3. Black carbon emissions in U.S. Climate Alliance states in 2014, excluding black carbon from wild and prescribed fire.<sup>126</sup>**



Wildfires and prescribed fires are a significant source of black carbon in many Climate Alliance states, and forests are burning at an increasing rate and with increasing levels of severity. According to EPA estimates, wild and prescribed fire accounted for nearly half of black carbon in 2014 in U.S. Climate Alliance states, including about 60 percent in California, Oregon and Washington, combined.<sup>127</sup> Due to the volatile nature of wildfires and the scientific uncertainty of the composition of particulate matter emissions from open biomass burning, planning efforts related to black carbon often exclude these sources.

Black carbon emissions have declined significantly in the U.S. over the past decades, largely due to reductions from on-road and off-road heavy-duty diesel vehicles and equipment. These gains will continue, as new trucks and equipment with diesel particulate filters displace older, dirtier equipment. Non-forest black carbon emissions in the U.S. are expected to fall 49 percent below 2013 levels by 2025.<sup>128</sup>

States can accelerate and deepen these reductions and their benefits by accelerating the transition away from older polluting vehicles and equipment to “soot free” and zero emissions technologies. The International Council on Clean Transportation defines soot free vehicles as diesel vehicles with a particulate filter that run on ultra-low sulfur fuel, or cleaner alternatives, such as those

powered by renewable natural gas, electricity, or hydrogen.<sup>129</sup> Accelerating this transition and achieving soot free transportation by 2030 might reduce non-forest black carbon emissions in U.S. Climate Alliance states by about another 20-30 percent below already declining levels.

The transition to soot-free on-road transportation could go faster. In California, for example, all on-road trucks will have a particulate filter by 2023. After that point, brake and tire wear will generate more black carbon than on-road engines.<sup>130</sup> These efforts are directly reducing climate change impacts in the state.<sup>131</sup> According to EPA, the public health benefits of reductions from the use of diesel particulate filters on new diesel engines, used in conjunction with ultra-low sulfur diesel fuel are estimated at \$290 billion annually in 2030.<sup>132</sup> If the rest of the world matched California's success on reducing diesel black carbon, global warming for the coming decades could be reduced by about 15 percent.<sup>133</sup>

Black carbon from other sources is not projected to decline significantly in the future in the U.S. without additional policy interventions.<sup>134</sup> Climate Alliance states are taking additional steps, however, to reduce these emissions. Many Climate Alliance states have air quality programs in place to address particulate matter from stationary and mobile sources, which will reduce black carbon as well. Non-attainment air districts in California will require stationary sources to deploy best available retrofit control technology by 2024.<sup>135</sup> Washington and other states are working to reduce emissions from woodstoves. Several states have rules related to residential and agricultural burning. U.S. Climate Alliance states are committed to addressing natural and working lands, as well, and developing goals and strategies to increase carbon sequestration, and the health and resiliency of our forests and other landscapes.

# APPENDIX B:

## STATUS OF FEDERAL POLICIES

### (AS OF AUGUST 2018)

#### **Methane**

**Bureau of Land Management (BLM) Waste Prevention Rule.**<sup>136</sup> Limits venting, flaring, and leaking of natural gas from oil and gas leases on BLM-managed federal and tribal lands. A federal district court in Wyoming has suspended the rule's requirements indefinitely, which California, New Mexico, and several non-profit organizations are appealing to the Tenth Circuit Court of Appeals. Previously, federal district courts in California struck down BLM's two earlier attempts to suspend the rule's January 2018 compliance deadlines. BLM has proposed a replacement rule that would rescind most of the rule's substantive requirements.

**EPA New Source Performance Standards (NSPS) for oil and gas.**<sup>137</sup> Limits methane emissions from oil and gas sector sources constructed or modified since September 2015. The rule is formally in effect. In June 2017, EPA granted industry requests for reconsideration and proposed to stay the rule's compliance deadlines from 2017 until 2019, in which case industry would not have to comply with the existing rule while EPA reconsiders and rescinds or revises rule requirements. The stay has not been finalized. EPA is expected to propose a rule rescinding or replacing the New Source Performance Standard, but the proposal date is unknown.

**EPA Non-Regulation of Existing Oil and Gas Sources.** EPA has not proposed or finalized emission guidelines for methane emissions from *existing* oil and gas sector sources, which the Clean Air Act (section 111(d)) and implementing regulations required the agency to do once it finalized the oil and gas methane New Source Performance Standard. The EPA previously began this process by issuing an Information Collection Request to gather industry data that it said was needed to develop emission guidelines, but withdrew the request in March 2017 and has taken no other steps toward promulgating an existing

source rule. In April 2018, several jurisdictions<sup>e</sup> sued the EPA for unreasonable delay in promulgating an existing source rule; the case is in procedural stages.

**EPA Control Techniques Guidelines.** The Clean Air Act requires EPA to issue Control Technique Guidelines for new and existing sources of criteria pollutants, including ground-level ozone precursors. Control Techniques Guidelines do not directly regulate sources; they instead provide baselines and recommendations for states and local air agencies to consider as they develop their own regulations to ensure compliance with national ambient air standards. EPA finalized Control Technique Guidelines for oil and gas sector emissions of ozone precursors in October 2016 and estimated that, if fully adopted by applicable states, they would help reduce methane by 200,000 tons. EPA has proposed to withdraw the Control Technique Guidelines, which the agency is expected to finalize soon.

**Municipal Solid Waste Landfill Emission Guidelines (Existing Facilities).**<sup>138</sup>

On August 29, 2016, EPA published updated final Emission Guidelines under 111(d) of the Clean Air Act for existing landfills in 40 CFR Part 60, Subpart Cf, requiring owners or operators of existing landfills that have design capacities equal to or greater than 2.5 million megagrams (Mg) by mass and 2.5 million cubic meters by volume to install a gas collection and control system at each landfill that accepted waste at any time since November 8, 1987; commenced construction, reconstruction, or modification on or before July 17, 2014; and has a NMOC emission rate greater than or equal to 34 Mg per year (50 Mg for landfills in the closed landfill subcategory) or reaches a surface methane concentration of 500 parts per million or greater, according to optional Tier 4 surface emissions monitoring. States were required to submit “State Plans” by May 30, 2017. California and New Mexico filed their state plans by the deadlines. Several industry members petitioned EPA to revisit the rules. EPA indicated in a letter it is reconsidering the rule and will not be prioritizing approval of state plans or issuing federal plans and that it expects the review of the rule to be completed in the 2020 timeframe. California filed suit against EPA for failure to perform a non-discretionary duty, and several U.S. Climate Alliance states, including Maryland, Oregon, Rhode Island, and Vermont joined. There are three cases that the D.C. Circuit held in abeyance while EPA reconsiders the rule: Nat’l Waste Recycling Assoc. v. EPA (16-1371 and 16-1372), Utility Air Regulatory Group v. EPA (16-1374).

**Municipal Solid Waste Landfill New Source Performance Standards (New Facilities).**<sup>139</sup> On August 29, 2016, EPA published a New Source Performance Standard under section 111(b) of the Clean Air Act for new, modified and

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<sup>e</sup> The jurisdictions that filed suit are New York, California, Connecticut, Illinois, Iowa, Maine, Maryland, New Mexico, Oregon, Rhode Island, Vermont, Washington, Massachusetts, Pennsylvania, the District of Columbia, and the City of Chicago. The Environmental Defense Fund later became a plaintiff as well.

reconstructed municipal solid waste landfills. Similar to the Emission Guidelines, the New Source Performance Standard require installation of the gas collection control system at 34 Mg per year for landfills that commenced construction, reconstruction or modification after July 17, 2014, among other requirements. The final rule would achieve an estimated 44,300 Mg/yr of methane reductions (1.1 MMTCO<sub>2e</sub>/year). Industry petitioned EPA to revisit this rule. EPA has indicated it will be opening up this rule but has indicated that it is in effect on a recent teleconference. It is expecting to align the revisions of this rule with the Risk and Technology Review rule. In recent court decision (Community In-Power & Development Assoc. v. Pruitt), D.C. Circuit said EPA had to finish revisions to the rule by 2020.

### **HFCs**

**EPA Significant New Alternatives Policy (Refrigerants) (Section 612).** A longstanding rule limits the use of ozone-depleting substances and lists substitutes as either acceptable, unacceptable, or acceptable subject to use limits or conditions. In 2015, the rule removed HFCs from acceptable alternatives list because of their climate impact. In *Mexichem v. EPA*, the D.C. Circuit vacated the 2015 Rule to the extent it requires manufacturers to replace HFCs with a substitute substance. Under this rationale, EPA is authorized to require “replacement” only once for a given compound and use, and could not require a previously authorized substitute such as HFCs to be replaced, even if that substitute was shown to be dangerous. EPA issued a Guidance Document stating it will not be enforcing the 2015 Rule in its entirety.<sup>140</sup> NRDC, Chemours, and Honeywell filed petitions with the U.S. Supreme Court for certiorari, but EPA has asked the Court not to hear the case. HFC phase-down has bipartisan and industry support, and bipartisan bills have been introduced in the House and Senate (S. 2448). New York, joined by California’s Office of the Attorney General, Vermont, Delaware, Massachusetts, Maine, Oregon, Pennsylvania, and D.C. filed suit in the D.C. Circuit challenging EPA’s actions.<sup>141</sup> There are two cases held in abeyance while the Supreme Court considers *Mexichem I*: *Compsys v. EPA* (15-1334), and *Mexichem v. EPA (Mexichem II)*(17-1024).

**EPA Refrigerant Management Regulations (Section 608).** EPA issued a final rule updating its refrigerant management regulations and extending the refrigerant management requirements to some HFCs. EPA is planning to issue a proposed rule to revisit aspects of rule’s extension of the regulation to cover substitute refrigerants, such as HFCs. EPA released a letter dated August 10, 2017 indicating it is planning to revise the rule.<sup>142</sup> The 2016 rule and compliance dates currently remain in effect. There is one case, held in abeyance while EPA reconsiders the rule.<sup>143</sup>

**Black Carbon**

**EPA Residential Woodstove Regulations.**<sup>144</sup> In February 2015, EPA strengthened the existing (1988) New Source Performance Standards for newly manufactured residential wood heaters sold in the U.S., and established federal standards for certain previously unregulated types of new wood heaters (wood-fired boilers, indoor wood-fired air furnaces, single burn-rate woodstoves, and most pellet stoves). EPA did not finalize standards that it had proposed for new indoor fireplaces, and never proposed standards for existing woodstoves or new outdoor fireplaces or fire pits. The New Source Performance Standard provides for a readily-achievable emissions limit by 2015 and a more rigorous emissions limit by 2020. On March 7, 2018, the House of Representatives passed H.R. 1917, a bill that would postpone implementation of the 2020 New Source Performance Standard until 2023. A parallel bill has been introduced in the Senate (S. 2461) but has not yet received a committee vote. EPA sent a draft rule to the White House Office of Management and Budget, which would allow retailers “a period of time” after May 2020 to keep selling appliances made before that date.

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**Appendix K: Non-Wires Solution Playbook – Report Overview**



## REPORT OVERVIEW

# NON-WIRES SOLUTION PLAYBOOK

In an era of accelerating climate change, new investments in the electric grid can either be a part of the solution or part of the problem.

The electric grid of today is inefficient in how it distributes energy, and moreover it is profoundly financially inefficient in allocating capital. Because of its financial inefficiency, the utility sector has vast untapped potential to make investments that reduce emissions and save all consumers money.

As existing electric transmission and distribution infrastructure ages, the United States is expected to invest \$600 billion in upgrades by 2030. If conducted through the business-as-usual “rate-base” approach, these investments will be both financially and energy-inefficient, as well as lock in additional greenhouse gas emissions. However, new distributed energy resources (DERs) and energy management software solutions provide a cost-effective alternative to defer or obviate the need for expensive traditional infrastructure investments. Known as non-wires solutions (NWS), portfolios of DER technologies can provide ratepayers with significant cost savings while achieving emissions reductions. The NWS approach is a powerful tool to evolve away from the inefficiency of the rate-base while animating competitive DER markets and engaging customers in new ways.

In recent years, NWS has developed a proven track-record of success across U.S. Climate Alliance states and beyond. In New York, NWS are being considered as a part of each utility’s capital planning process, which will lead to billions of dollars in savings for ratepayers. In Washington State, an NWS

project at the transmission-level has also yielded immense benefits. These examples show how the NWS approach is already creating value and achieving results. However, some barriers to broader implementation of NWS include: lack of clarity around the NWS value proposition, difficulty in identifying NWS opportunities, and insufficient resources to support new procurement processes. These barriers have prevented the embedding of the NWS approach in everyday utility planning processes across the country.

To help scale the benefits of NWS, Rocky Mountain Institute (RMI) is working with stakeholders in U.S. Climate Alliance states to develop actionable recommendations that utilities, regulators, and developers can use to overcome these challenges and increase NWS implementation. RMI has conducted interviews with more than 60 experts across the country, representing over 20 utilities, as well as developers, regulators, trade associations and industry players working to develop non-wires solutions. In fall 2018, RMI will release a report summarizing these findings, including a ‘playbook’ for scaling successful NWS projects and resources that provide practical guidance for the utility procurement process.

## KEY TAKEAWAYS

RMI has identified three primary components for setting up a successful NWS program:

### 1. Create a supportive regulatory environment

In traditional cost-of-service regulation, utilities are incentivized to invest in traditional, capital-intensive infrastructure solutions. To improve the financial efficiency and energy efficiency of the grid, as well as drive innovation into the system, Public Utility Commissions should seek to avoid simply adding the costs of NWS and grid modernization to the rate-base. To accelerate the development of NWS in their states, regulators can consider the following supportive actions:

- Establishing utility financial incentives for implementing—or mandates for considering— non-wires solutions
- Updating distribution planning processes to make opportunities for NWS implementation more accurate and transparent
- Developing robust screening criteria for NWS projects
- Creating frameworks for evaluating investment opportunities that provide utilities with the tools needed to accurately compare non-wires and traditional infrastructure projects

### 2. Ensure utility structures and practices enable non-wires solutions development

Utility procurement practices, organizational structures, and expertise are currently designed to efficiently procure traditional infrastructure solutions. Adjustments need to be made for utilities to capture the benefits of NWS opportunities. To accelerate the development of NWS projects in their service territories, utilities can consider the following actions:

- Re-designing internal utility organizational structures to support effective communication between planning, procurement, and DER experts to develop creative, practical non-wires solutions
- Considering probabilistic planning to best leverage the full range of values that a portfolio of DER solutions may provide; deterministic planning for peak load scenarios may no longer be sufficient
- Engaging systematically with technology providers to fully understand their product capabilities, and ensure competitive procurement processes are designed to deliver bids that meet underlying grid needs most effectively
- Seeking frequent stakeholder feedback on the very complex optimization challenge of assembling or soliciting an NWS portfolio

### 3. Identify the best-fit procurement strategy

When focusing on competitive procurement of NWS, utilities should consider several adjustments to their existing infrastructure procurement processes:

- Technology agnostic, needs-based problem statements which provide potential bidders with ample utility data to understand the scope of the problem and determine the viability of different technical solutions
- Performance-based solution descriptions that describe the desired outcomes of a technical intervention, rather than the solution itself
- Transparent evaluation criteria, which can help developers understand how competitive their bid might be with respect to both traditional solutions as well as other NWS bidders

## NEXT STEPS

RMI will publish a playbook with more detailed recommendations on these key findings, including specific resource documents to support procurement of non-wires solutions:

- Screening criteria: an evaluation of best practices for the development of screens for considering NWS projects, and recommendations for implementation
- Annotated Request For Proposals (RFP) template: recommendations for drafting RFPs for competitive procurement of non-wires solutions, including needs definition, data requirements, and timeline considerations
- Evaluation framework: a template for considering the costs of an NWS project and the values it may provide to a utility's system and its ratepayers
- Term sheet considerations: example of key terms and contracting options for NWS projects



## About Rocky Mountain Institute

Rocky Mountain Institute (RMI)—an independent nonprofit founded in 1982—transforms global energy use to create a clean, prosperous, and secure low-carbon future. It engages businesses, communities, institutions, and entrepreneurs to accelerate the adoption of market-based solutions that cost-effectively shift from fossil fuels to efficiency and renewables. RMI has offices in Basalt and Boulder, Colorado; New York City; Washington, D.C.; and Beijing.

## GET INVOLVED

The Playbook will be available in October on RMI's website <https://rmi.org/our-work/electricity/>

**Appendix L: U.S. Climate Alliance Natural and Working Lands Challenge**

## **U.S. Climate Alliance Natural and Working Lands Challenge**

*August 23, 2018*

The natural systems upon which we depend are essential to life and critical for reducing the impacts of climate change on our communities. These systems are also under threat from human activity and climate change. U.S. Climate Alliance States will manage natural and working lands, including forests, farms, rangelands, and wetlands, to be resilient carbon sinks and protect the communities, economies, and ecosystems that depend on them.

The U.S. Climate Alliance recognizes that healthy landscapes sequester carbon and provide significant and cost-effective opportunities to reduce greenhouse gas (GHG) emissions consistent with the goals of the Paris Agreement. Therefore, the U.S. Climate Alliance States commit to:

- improve inventory methods for land-based carbon flux;
- identify best practices to reduce GHG emissions and increase resilient carbon sequestration;
- advance programs, policies, and incentives to reduce GHG emissions and enhance resilient carbon sequestration;
- undertake actions that will support a collective, Alliance-wide goal to maintain natural and working lands as a net sink of carbon and protect and increase carbon storage capacity, while balancing near- and long-term sequestration objectives; and
- integrate priority actions and pathways into state GHG mitigation plans by 2020.

The U.S. Climate Alliance will work in the coming months to identify best practices and policy pathways for protecting and enhancing resilient carbon sinks. U.S. Climate Alliance States will consider and, as appropriate, adopt practices that increase long-term carbon sequestration in forests and forest products; reduce losses from catastrophic wildfire and land-use change; protect existing natural and working lands from conversion; support healthy soils on farms and ranches; restore coastal wetlands and sub-tidal habitats that protect shorelines against sea level rise; restore ecosystems and open space for watershed protection and recreation; and grow the urban forest and other greenspace to improve health and livability. These actions to reduce GHG emissions and increase carbon sequestration will be undertaken in a manner that supports watershed health from source to tap; protects the viability of vital farmland, rangeland and productive forestland; fosters resilient rural economies; restores critical habitat and bolsters ecosystem adaptation to climate change; and offers recreational opportunities across our states.

The Alliance invites all national and subnational jurisdictions, tribes, businesses and other actors to make commitments to reduce GHG emissions and protect and enhance carbon sequestration across all natural and working lands at the Global Climate Action Summit in San Francisco, California this September and thereafter.

**Appendix M: Natural and Working Lands Factsheet**

## **Natural and Working Lands Factsheet**

### **An Initiative of the U.S. Climate Alliance**

#### **Background**

Only by utilizing the power of natural and working lands to sequester carbon can we achieve the goal of negative emissions needed to avoid catastrophic climate change.<sup>1</sup> Working in tandem with initiatives to reduce sources of greenhouse gas pollution, efforts to conserve, manage, and restore land can offer comprehensive benefits to ecosystems and the people that depend on them. As the impacts of climate change continue to intensify, the carbon stocks stored in natural and working lands need to be safeguarded and enhanced.

#### **Taking Action to Meet Key Goals**

The United States Climate Alliance has identified enhancing carbon sequestration on natural and working lands as a key near-term opportunity for achieving its climate goals. Alliance states are already pursuing opportunities to increase carbon storage in forests, farms, and ecosystems, but are committed to coordinating and scaling their efforts for this critical purpose.

The Natural and Working Lands initiative of the United States Climate Alliance will identify best practices for land conservation, management and restoration to develop a carbon storage policy framework for implementation. Together, the Alliance states can build on their successes by charting an ambitious path forward for forests, farmland, rangeland, grasslands, wetlands, and urban land to mitigate the harmful effects of climate change.

#### **Building Innovative Partnerships for Strong Action**

By leveraging the breadth and depth of technical expertise to support comprehensive action on natural and working lands for climate goals, states will be able to take coordinated and meaningful steps as part of the Climate Alliance's commitments. Through the support of the Doris Duke Charitable Foundation (DDCF), states will work with leading non-governmental organization (NGO) partners American Forests (AF), The Nature Conservancy (TNC), World Resources Institute (WRI), American Farmland Trust (AFT), the Coalition on Agricultural Greenhouse Gases (C-AGG), and Trust for Public Land (TPL) to pursue shared goals. Together, this partnership will slow climate change by developing policies to:

- increase the volume of carbon stored in ecosystems;
- reduce losses of already-stored carbon; and
- decrease greenhouse gas emissions.

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<sup>1</sup> UNEP. "Bridging the Gap – Carbon dioxide removal". Emissions Gap Report 2017. United Nations Environment Programme, Nairobi. Available online: <https://www.unenvironment.org/resources/emissions-gap-report> ; Hansen, James *et. al.* "Young people's burden: requirement of negative CO2 emissions". Earth System Dynamics, 8, 577-616. July 2017. Available online: <https://www.earth-syst-dynam.net/8/577/2017/esd-8-577-2017.html>

## **| Assessing Opportunity to Understand the Potential of Natural Climate Solutions**

The first product of the innovative partnership with leading NGOs will be a series of Opportunity Assessments to support natural and working lands climate mitigation in Alliance states. The Opportunity Assessments will identify the carbon sequestration and emissions reduction potential of land and coastal conservation, restoration, and management practices for land types including:

- forests;
- croplands;
- rangelands;
- wetlands;
- grasslands; and
- urban greenspace.

The Opportunity Assessments will also include economic assessments of implementation potential that can inform state priorities, providing a crosswalk to facilitate implementation.

## **| Leveraging Opportunity into Action through a National Learning Lab**

On July 9<sup>th</sup> through 11<sup>th</sup>, American Forests will host a Learning Lab in Washington, D.C. staffed by more than 50 leading experts in the field of land-based carbon mitigation from government, academia, nonprofits, landowners and industry. Alliance states will be able to build on their Opportunity Assessments to create detailed, state-specific strategies that activate the best opportunities for carbon sequestration on natural and working lands.

The Learning Lab will be driven by hands-on workshops designed to provide a more refined picture of in-state natural and working lands carbon sequestration and emission reduction opportunities and how to capture them through policy and financial measures. The Learning Lab and follow-up assistance will help states integrate the best available science and solutions into their climate action agendas.

## **| Building on a Common Foundation to Spur Priority Actions**

Following the Opportunity Assessment and Learning Lab activities, states will be well-positioned to develop a compendium of best practices that are comprehensive and easily shared among state governments. The United States Climate Alliance Natural and Working Lands initiative can collaborate even more deeply based on shared information and a common understanding of the priority opportunities for use land conservation, management, and restoration to meet their climate goals.

*The [United States Climate Alliance](#) is a bipartisan coalition of governors committed to reducing greenhouse gas emissions consistent with the goals of the Paris Agreement.*

**Appendix N: U.S. Climate Alliance Clean Transportation Factsheet**

# UNITED STATES CLIMATE ALLIANCE

## Clean Transportation Factsheet

### An Initiative of the U.S. Climate Alliance

#### | Driving towards a carbon neutral future

The transportation sector has exceeded the power sector as our nation's largest source of greenhouse gas emissions. Transportation is also our largest contributor of harmful air pollution. As market forces drive down the cost of renewable energy and expand access to affordable clean power to an increasingly larger share of Americans, transportation is the next frontier for innovation and transformational change. To make this happen, we need to create a new visionary landscape – one where we shrink the fleet and power it with clean energy. By shifting towards zero-emission vehicles (ZEVs) such as battery electric, plug in hybrid and fuel cell vehicles, investing in robust transit, and working to reduce vehicle miles travelled, we can dramatically reduce our carbon pollution, create jobs and protect the health of our communities.

Coordinated state action is needed to transform our transportation sector, and U.S. Climate Alliance states are well positioned to continue driving America towards a low-carbon future. Most Alliance states are members of the Zero Emission Vehicle (ZEV) program, and already the Alliance accounts for over 70% of all battery electric, plug-in hybrid and fuel cell vehicles sold nation-wide last year, and we have over 587,000 ZEVs on our roads. But we're just getting started, and the Alliance is committed taking its clean transportation efforts to the next level.

#### | State Leadership to Date

U.S. Climate Alliance states are at the forefront of the transition to ZEVs:

- California's Governor Brown signed an executive order to achieve a new target of 5 million ZEVs in California by 2030, and will help significantly expand vehicle charging and fueling infrastructure.
- Colorado Governor Hickenlooper's 2017 executive order on clean energy resulted in a statewide EV Plan providing a roadmap for the build out of a fast-charging network enabling EV travel anywhere in the state and a grant program for that network. The order also supports an 8 state MOU called REV West to create an Intermountain West EV corridor.
- Delaware offers rebates for electric vehicles and charging stations. Since the start of the program in 2015, over 1,000 rebates have been provided to Delawareans, reducing carbon emissions by almost 2,500 tons of CO<sub>2</sub> annually.
- Minnesota with four other states in the Mid-West established the first signed ZEV highway on I-94, and eleven states in the Northeast and Mid-Atlantic are cooperating on regional EV corridors and exploring whether to create a carbon market for the transportation sector.

- North Carolina Governor Roy Cooper issued [Executive Order 80](#) mandating the development of a state-wide ZEV Plan designed to increase the number of ZEVs to 80,000 by 2025, and requires cabinet agencies to prioritize ZEVs for purchases and leasing.
- New York Governor Andrew Cuomo is committed to increasing public EV charging infrastructure five-fold between 2018 and 2021, including substantial public investment in charging capacity on the Thruway and other highways. New York's consumer and municipal rebate programs contributed to a 70% increase in EV sales in 2017.
- Washington, Oregon and California are part of the West Coast Electric Highway—a series of publicly accessible charging stations from BC to BC (British Columbia to Baja California) that, within just a few months, displaced 13,500 gallons of gasoline.

### | U.S. Climate Alliance Collaboration

Alliance States are working together to accelerate the deployment of zero-emission vehicles as fast as possible. Together, they are exploring how to support consumer interest in ZEVs, including through incentives, expanding ZEV charging or refueling stations, and removing government barriers. The Volkswagen settlement funds to reduce NOx and GHG emissions is also an opportunity Climate Alliance states are exploring to coordinate investments that promote ZEVs. The U.S. Climate Alliance is also considering rules and requirements that reduce carbon emissions from transportation, as well as partnering directly with OEM's to advance ZEV market penetration and education.

U.S. Climate Alliance states also stand united in their opposition to the federal weakening of vehicle emission standards and are working together to advance the economic, environmental and public health benefits of cleaner cars.

*The [United States Climate Alliance](#) is a bipartisan coalition of seventeen governors committed to uphold the goals of the Paris Agreement.*

**Appendix O: U.S. Climate Alliance National Highway Traffic Safety Administration  
Comment Letter**

## UNITED STATES CLIMATE ALLIANCE

The Honorable Elaine L. Chao  
Secretary  
U.S. Department of Transportation  
1200 New Jersey Avenue, SE  
Washington, D.C. 20590

The Honorable Heidi King  
Deputy Administrator  
National Highway Traffic Safety  
Administration  
1200 New Jersey Avenue, SE  
Washington, D.C. 20590

The Honorable Andrew Wheeler  
Acting Administrator  
U.S. Environmental Protection Agency  
1200 Pennsylvania Avenue, NW  
Washington, D.C. 20460

The Honorable William Wehrum  
Assistant Administrator, Office of Air and  
Radiation  
U.S. Environmental Protection Agency  
1200 Pennsylvania Avenue, NW  
Washington, D.C. 20460

26 October 2018

Dear Secretary Chao, Acting Administrator Wheeler, Deputy Administrator King, and Assistant Administrator Wehrum:

I write today on behalf of the U.S. Climate Alliance – a bipartisan coalition of 17 governors representing 40 percent of the U.S. population - to strongly oppose the Notice of Proposed Rulemaking (NPRM) titled “The Safer Affordable Fuel-Efficient Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks.” The U.S. Climate Alliance resolutely supports the 18 jurisdictions representing 140 million Americans that are suing to defend existing standards for fuel-efficiency and greenhouse gas emissions. The Alliance further supports preserving state flexibility to adopt standards more protective than the federal standards. The existing standards are producing the cleanest and safest vehicles we have ever had—all while addressing the largest source of climate pollution in the United States.

The United States continues to need strong clean car standards that reduce vehicle pollution and improve efficiency to protect our health, environment and climate, while strengthening U.S. manufacturing competitiveness and creating American jobs. The Alliance opposes this effort by the U.S. Environmental Protection Agency and National Highway Traffic Safety Administration to weaken these standards, as it will not only cost our residents more at the pump, but hurt

children, senior citizens and people living with respiratory illness. It will limit the ability of Alliance states to meet their own emission reduction targets and take crucial climate action.

Recognizing that climate change presents a serious threat to our environment, residents, communities, and economy, the Alliance remains committed to meeting its share of the U.S. emissions reduction contribution to the Paris Agreement. This proposal to roll back the standards undermines one of the country's best climate programs and constitutes an unwarranted attack on consumers, our environment, our health, and longstanding tenets of cooperative federalism enshrined in the Clean Air Act. We urge you to withdraw the proposal.

Signed,



Julie Cerqueira  
Executive Director  
U.S. Climate Alliance

### **US Climate Alliance**

California | Colorado | Connecticut | Delaware | Hawaii | Maryland | Massachusetts | Minnesota |  
New Jersey | New York | North Carolina | Oregon | Puerto Rico | Rhode Island | Vermont | Virginia |  
Washington

**Appendix P: U.S. Climate Alliance Resilient Communities, Infrastructure and Natural Resources Factsheet**

# UNITED STATES CLIMATE ALLIANCE

## Resilient Communities, Infrastructure and Natural Resources Factsheet

### An Initiative of the U.S. Climate Alliance

#### | The True Cost of Climate Change

In 2017 alone, severe climate-related events cost the United States roughly [\\$306.2](#) billion in damages, shattering the previous U.S. annual record cost of \$214.8 billion in 2005 – the year of Hurricane Katrina. According to White House estimates, Hurricanes Harvey and Irma reduced September 2017 employment growth by roughly 140,000 jobs, and reduced 3<sup>rd</sup> quarter GDP growth by [0.6](#) percent. Worryingly, this is part of a growing trend. The severity and frequency of extreme events are on the rise: of the top [20 costliest hurricanes](#) to land on U.S. soil, all but three occurred since 2000. In addition, many areas of the country are experiencing extreme precipitation, high temperatures, and drought. The human and economic toll of climate change will continue to grow without coordinated action to both reduce our emissions and prepare for unavoidable climate impacts.

There is a growing recognition that extreme events will disproportionately affect low income communities and elderly populations with the least physical and financial ability to adapt to a changing climate. States are now taking steps to better understand the human, physical and economic impacts of severe weather and climate change on their communities, especially those most vulnerable, to help plan and respond to a changing climate. This analysis will ensure they are investing in mitigation and adaptation actions that deliver benefits that far exceed the costs of inaction. States are also working with local and community leaders to expand access to tools and resources they can utilize to build resilience to climate impacts. Finally, as we continue to expand the built environment, states are exploring ways in which they can enhance the resilience of both built and natural infrastructure, including through improved procurement practices.

#### | State Leadership to Date

Coordinated action through the Climate Alliance builds on years of leadership by member states in helping to protect their communities, economy and infrastructure from climate impacts. Some examples:

- The Connecticut Institute for Resilience and Climate Adaptation (CIRCA) is a joint partnership by the state and UConn to increase the resilience and sustainability of vulnerable communities along Connecticut’s coast and inland waterways by addressing critical infrastructure, coastal flooding, sea level rise, and living shorelines.
- Hawai’i produced the Sea Level Rise Vulnerability & Adaptation Report - a tool to estimate the scale and cost of potential flooding and erosion with sea level rise, and to recommend measures to reduce exposure to sea level rise and increase the state’s capacity to adapt.

- Maryland’s CoastSmart Communities Program assists coastal communities to address short- and long-term coastal hazards, such as coastal flooding, storm surge, and sea level rise by connecting local planners to essential resources, information, tools and trainings.
- Minnesota is experiencing larger and more frequent episodes of extreme rainfall that can lead to flooding, and its Interagency Climate Adaptation Team is working with stakeholders to help meet this challenge by advancing priority climate adaptation recommendations from its recent comprehensive report *Adapting to Climate Change in Minnesota*.
- The New Jersey Climate Adaptation Alliance, based out of Rutgers University, focuses on building capacity in New Jersey to address climate change through adaptation and resiliency, including: (1) providing policy analysis and recommendations; (2) developing decision-support tools to assist in adaptation and resilience efforts; and (3) convening practitioners and decision makers around climate change. Additionally, the Alliance works directly with communities to implement projects, including a 15-municipality regional resilience plan to address the impacts of coastal hazards and storm surge.
- New York State requires applicants in several permit and funding programs to demonstrate consideration of sea level rise and flooding and is developing guidance on incorporation of projected riverine flooding and official state sea level rise projections into these permit and funding programs.
- North Carolina is addressing sea level rise in part through the state’s Coastal Resource Commission Science Panel, which develops 5-Year Sea Level Rise Synthesis and Assessment Reports to monitor changing conditions, evaluate state-specific data, and serve as a resource for decision makers at the local and state levels.

## U.S. Climate Alliance Collaboration

The Alliance is working to build greater resilience of its communities by fundamentally changing the way we design, procure and manage our infrastructure assets, and by giving governors access to critical tools and resources to help our states and communities prepare for climate impacts. Cooperation will be focused on four strategic opportunities:

- **The Economics of Resilience:** A key first step will involve defining the challenge – as Alliance states are expected to invest trillions in infrastructure between now and 2050, Colorado is undertaking a model analysis of the state’s economic and physical risks in 2050 compared to 2018 with regard to vulnerability to floods, wildfire, and drought, quantified on a county-by-county basis. The results of the analysis will be shared with Alliance states, and the initiative will explore how to cost-effectively replicate the analysis for interested states.
- **Community adaptation preparedness training, funding and implementation:** Massachusetts is leading the way with its new Municipal Vulnerability Preparedness program, which helps local communities identify climate vulnerabilities and community strengths, develop and prioritize resilience actions and then implement these priorities with bond funding. Massachusetts will work directly with interested states and partners to embed this model in a proposed playbook,

including through a strategic partnership with The Nature Conservancy, who has supported this program in Massachusetts.

Based on priorities of individual Alliance member states, the Alliance will work with The Nature Conservancy to identify strategies to address risks posed by extreme weather events and sea level rise. The Nature Conservancy will share its experience and best practices in community engagement, deployment of resilience strategies and tool development to help build technical capacity and promote safer, more resilient futures for communities across the Alliance states. Additionally, The Nature Conservancy will bring its many years of public policy experience in this space to help states and local jurisdictions plan for climate change impacts and implement effective solutions.

- **Life-cycle procurement for resilient infrastructure:** By integrating policy, financing, regulation and data-driven innovation, and developing cross-sectoral partnerships to engage communities, governments and the private sector in scaling solutions, we can deliver both low-carbon and high-performance infrastructure outcomes in the 21<sup>st</sup> century. Governor Jerry Brown's 2015 Life Cycle Infrastructure Executive Order (B-30-15) is one of several examples for states to build resilience through better project planning and design, capital facilities and procurement reform and life-cycle asset management. California will work directly with interested states and partners, such as the National Council on Science and the Environment, to develop a playbook for policymakers. The Alliance will also explore new funding mechanisms that recognize the value of natural infrastructure and the importance of life cycle risk management for public assets meant to last 30 to 50 years and creating new local incentives to help communities tap into state and federal expertise.
- **Critical data to drive climate resilience:** The Alliance intends to work in concert with the Independent Advisory Committee (IAC) on Applied Climate Assessment – reconvened by Governor Andrew Cuomo after its disbandment by the federal government - to improve the collection and communication of actionable data to drive climate resilience. Other cooperative efforts will include landscape level outcomes and protection of natural and working lands to secure water, food and the ecosystems that support them.

The [United States Climate Alliance](#) is a bipartisan coalition of governors committed to upholding the goals of the Paris Agreement on climate change.