



*America's*  
**ZERO CARBON  
ACTION PLAN**

## 4. APPROACHES FOR ALL LEVELS OF GOVERNMENT

### 4.1 Federal Legislative and Administrative Framework

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Achieving net-zero carbon emissions by 2050 will necessitate significant changes to most of America's physical assets, from its power generation and transmission infrastructure to its buildings, vehicles, factories, forests and farms. These broad changes will need to address all four pillars of deep decarbonization – electricity decarbonization, energy efficiency and conservation, electrification of transportation and buildings, and carbon capture – supplemented by significant reductions in emissions of non-CO<sub>2</sub> pollutants. Such comprehensive change will necessitate the coordinated action of most of the departments of the Federal Government, from the Environmental Protection Agency (EPA) and Department of Energy (DOE) to Department of Defense (DOD), Department of Housing and Urban Development (HUD), the General Services Administration (GSA), and other federal agencies, including the Departments of Transportation, Commerce, Agriculture, Interior, Education, and Justice over a 30-year period. In addition, the states, territories, and local and tribal governments will play essential roles. Launching and implementing this comprehensive, coordinated action over three decades will require the establishment of clear and enforceable goals and subgoals; reporting and accountability, including processes for feedback loops and course corrections; and an organizational structure that can manage and drive this sprawling endeavor. Moreover, the process must be protected from backsliding.<sup>i</sup>

#### 4.1.1 Overall Approach

##### Change Strategy

Congress should adopt a Zero Carbon Action Plan committing the nation to net-zero or net-negative anthropogenic GHG emissions by no later than 2050. The Federal Government also needs to set short- and long-term goals to guide and motivate the decarbonization efforts of governments, private actors, nongovernmental organizations, and citizens. Clear and effective implementation mechanisms for implementing and tracking these goals are also needed.

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<sup>i</sup> Many but not all of the recommendations in this section are taken from *Legal Pathways to Deep Decarbonization in the United States* (Michael B. Gerrard & John C. Dernbach eds. 2019).

## Goals

- Congress should establish a binding national goal of achieving net-zero or net-negative anthropogenic GHG emissions by 2050.
- Congress should also establish intermediate and sector-specific emissions reduction goals that further and are consistent with the goals for 2030, 2040, and 2050 that are set out in Chapter 2.
- The goals should be adopted and implemented to fully engage not only the federal government but also state, territorial, tribal, and local governments as well as all sectors of society to participate in their achievement.

## Relationship Among Levels of Government

The federal government; state, territorial, and tribal governments; and local governments all have significant roles to play in reducing GHG emissions. The Federal Government has clear strengths in a number of dimensions, such as its ability to fund research, development, and deployment. The Federal Government has the ability to act at a larger scale – involving all states and municipalities – than any state or local government. The Federal Government also has clear and exclusive responsibility on certain matters, such as its ability to conduct foreign policy.

State, territorial, and tribal governments have long been leaders on climate change, clean energy policy, and efforts to prepare for climate impacts. Some states have also adopted significant economy-wide greenhouse gas targets, regional cap and trade programs, and aggressive renewable portfolio standards. State governments also hold authority over retail electricity regulation, siting of new generation, transportation planning, and other critical components of a decarbonization agenda. States are playing a critical role in electrification of transportation and are beginning to explore new approaches for building sector electrification. States have also often led on many aspects of energy efficiency, including building codes, utility programs, and other initiatives.

Local governments have authority over zoning and land use, as well as authority to operate mass transit systems, and often have authority over building codes and standards. These roles are all important in energy use and efficiency in major sectors as described later in this plan.

But where there is significant overlap between federal authority on the one hand, and state and local authority on the other, certain general principles should guide the allocation of their respective authorities. They are as follows:

### **In general, the Federal Government should:**

- Set ambitious national goals for reducing GHG emissions.
- Establish and strengthen national standards for reducing emissions where national standards are appropriate.
- Provide financial and technical support to state, territorial, tribal, and local governments.
- Establish, where appropriate, trading and other market-based systems to reduce costs, with provisions to ensure that this does not adversely affect low-income and marginalized communities.

**In general, state, territorial, and tribal governments should:**

- Continue to make progress using their legal authority on greenhouse gas emission reduction programs, renewable energy portfolio standards, energy efficiency standards, and other legal tools.
- Take a leading role in implementing national goals and standards.
- Be specifically authorized or allowed to adopt more stringent goals and standards.

**Authority and Process for Achievement of Goals**

- The Administration should establish a White House Office on Climate Change to coordinate federal agency implementation of the Zero Carbon Action Plan, including climate change mitigation and adaptation activities; and to the extent authorized by law, direct the development of plans, establish program metrics, track progress, and otherwise oversee those activities.

**Congress should:**

- In addition to the actions recommended below, and without delaying their implementation, require the Administration to create a specific enforceable national plan by January 2022 to ensure that the country is on the path toward carbon neutrality, with long-term policies containing near term milestones that can be accomplished within the Administration's term. The plan shall equitably apportion the environmental, job creation, and other benefits of the transition in terms of geography and ethnicity.
- Require each Administration to update the plan every two years, including near term milestones to be accomplished.
- Require the Administration to report annually to Congress on the progress toward carbon neutrality, including specific reporting criteria; and that a website be established to provide information to the public, businesses, and the press regarding the overall plan and progress, the projects undertaken by each federal agency, links to state websites, funding that is available, and the like.
- Adopt an initial set of fully funded, no-regrets federal policies to be launched while the national plan is under development. No-regret strategies are justifiable based on their social, economic, and environmental benefits, wholly apart from any contribution they make to reducing greenhouse gas emissions.
- Assess the public and private funding needed to implement the plan, and demonstrate how sufficient funding will be available.

**Powers and Duties of Federal Agencies:**

- Congress should direct each federal agency to exercise its existing powers and duties to contribute to the fullest possible extent to the achievement of the Zero Carbon Action Plan, including national climate change goals and specific emission reduction targets.

Congress should also amend the powers and duties of federal agencies so that they can better contribute to the achievement of these goals without any substantial legal question about their legal authority to do so. To use just one federal agency, the Federal Energy Regulatory Commission (FERC), as an example:

- Congress should direct FERC to encourage states to modify electricity markets to provide incentives to maintain capacity fired with gaseous fuels to the extent necessary for grid balancing, but without also providing incentives to make significant use of gas capacity.
- Congress should change the mandate of FERC to include oversight of competitive markets with decarbonization as a central goal.
- Congress should also direct FERC to ensure that renewable power generation gets credited with a clean energy “attribute” value so that it has a strengthened position in the “day ahead” electricity auctions managed by the independent system operators (ISOs).
- Congress should prohibit FERC from approving any new liquefied natural gas (LNG) export facilities, and prohibit any new natural gas pipelines except in extraordinary circumstances.

Congress should require that, in considering permits, licenses, and other administrative approvals and decisions, all federal agencies shall consider whether such approvals or decisions are inconsistent with or will interfere with the attainment of national greenhouse gas emissions reduction goals. Where such decisions are inconsistent with or will interfere with the attainment of any of these goals, the agency must provide a detailed justification and identify alternatives or other GHG mitigation measures that will be implemented.

**Presidential Action if Congress Fails to Act**

- If Congress fails to act, the President should use all lawful means within his executive authority to drive decarbonization to net-zero or net-negative anthropogenic greenhouse gas emissions by 2050.

## Cross-cutting Recommendations

### Research, Development, Demonstration and Deployment (RDD&D)

- Congress should triple funding for deep decarbonization research, development, demonstration and deployment from current levels. The principal focal points of this enhanced effort should include elimination of technological and cost barriers to accelerated decarbonization.<sup>1</sup>
- The Federal Government should accelerate, intensify, and fully fund research and development for zero-greenhouse-gas emitting technologies, energy efficiency technologies, and carbon removal technologies.
- Congress should fund additional research, technology, and development on a range of distribution network and smart grid developments, including energy storage.
- The Federal Government should ramp up spending on building-related RDD&D, including development of carbon neutral fuels appropriate for buildings, to 5 percent of national RDD&D budget, from its current low of 0.1 percent.
- As an example of the kind of new area where RDD&D needs to be developed, Congress should establish and finance ARPA-Land (Advanced Research Projects Agency), a new research agency under the United States Department of Agriculture (USDA) to bolster public and private research funding into technologies, practices and policy measures that can reduce GHG emissions across a range of land-based activities – from monitoring soil carbon storage to next generation biofuels.

### Social Cost of Carbon

- The Federal Government should establish a scientifically based Social Cost of Carbon (SCC) consistent with the Paris Climate Agreement objective of stabilizing greenhouse gases in order to limit global warming to 1.5°C, including decarbonization of the energy system by 2050.
- The Federal Government should use the SCC to guide the development of: regulations, cost-benefit analyses, public procurements, clean-energy subsidies, carbon taxes, feed-in tariffs and auctions, and and other policies.

### Carbon Pricing

- It is important that our market economy has a price signal instilled to reduce carbon. We define “carbon pricing” to embrace a large number of various policy instruments, including but not limited to a carbon tax, cap-and-trade mechanisms, fuel pricing, subsidies, feed-in tariffs, tradable credits, and the like. Carbon pricing in its various forms should be an important part of the national effort to reduce greenhouse gas emissions.
- Congress should use carbon-based border adjustments to address leakage concerns as part of setting a price on CO<sub>2</sub> and other GHGs.

### Procurement

- The Federal Government should use its procurement power to accelerate the development of markets and technologies for low-emission and negative-emission building materials, products, and services, as well as pavements.

### **Climate Regulation**

- The Federal Government should reinstate and strengthen climate change regulations that have been rescinded or weakened under the Trump Administration.

### **Subsidies**

- The Federal Government should eliminate monetary fossil fuel subsidies (except direct payments to low-income households).

### **Other Federal Recommendations**

- The Federal Government should design and implement climate laws, policies and programs based on behavioral science to reduce household emissions.
- The Federal Government should design and implement climate laws, policies and programs to leverage domestic and international private sector action.
- In all actions taken to reduce greenhouse gas emissions, the Federal Government should:
  - › Foster a just transition for those individuals and communities dependent on the carbon economy. The Federal Government should also ensure that all displaced workers receive pension and re-employment guarantees, as well as generous income, retraining and relocation support.
  - › Maximize environmental, economic, and social co-benefits.

## **4.1.2 Pillar I: Electricity Decarbonization**

### **Change Strategy**

Less than a decade ago, it appeared that there may be as many as four ways to decarbonize the electric sector: large-scale use of renewable electricity, large-scale use of nuclear power, large-scale use of carbon capture and storage, or a mixture of these. It has since become clear that variable renewable energy (VRE) is the least-cost form of primary electricity in a decarbonized energy system, per the results of the modeling work discussed in Chapter 2. Transitioning to renewable energy resources is the largest single effort required to efficiently, economically, and cost-effectively mitigate anthropogenic greenhouse gas emissions according to both the International Energy Agency (IEA) and the International Monetary Fund (IMF). These technologies are widely used and their costs are declining, including costs associated with storage of electricity. As a result, this plan's change strategy for electricity decarbonization focuses on renewable electricity. Relying on available technologies at current costs of VRE and utilizing various means of energy efficiency as described in pillar 2, the goals set forth below are feasible, affordable and beneficial to the overall health and resilience of the U.S. economy and workforce.

## Goals

Congress should adopt goals for the electricity sector for 2030 based on Chapter 2:

- Solar and wind capacity should be 3.5 times greater than at present.
- Coal generation should be less than 1 percent of total generation.
- More than 20 GW of battery storage should be available.
- Gas generating capacity should be maintained at the current level with declining usage as VRE scales up.
- The existing nuclear fleet should be maintained to the extent feasible and to an extent it can be done safely and cost effectively – recognizing the value of the zero-carbon power generated.

## Recommendations for Congress

Congress should:

- Adopt a national clean energy standard for electricity and incentives to promote the infrastructure investments required to meet the targets established; these should rise over time to 100 percent zero-carbon electricity.
  - › The standard should be based on carbon emissions.
  - › The standard should also reduce emissions compared to the present by at least 60 percent by 2030, 80 percent by 2040, and >95 percent by 2050.
  - › Each state should be required to achieve zero-carbon electricity production, but the required pace of achieving zero-carbon should depend on its resource mix and legacy generation facilities.
  - › EPA should set the timetables for meeting the target for each state. Trading among states would be permitted.
  - › Require sufficient storage capacity coupled with demand response to accommodate intermittent renewables as part of the national clean energy standard.
  - › Consider nuclear power as clean energy for purposes of the national clean energy standard.
- Call for a program for the large-scale construction of offshore and onshore wind, utility-scale solar, distributed solar, and associated transmission and storage to lead to a rapid expansion of zero emissions electricity. A national clean energy standard, state zero-carbon goals, and a price on carbon should go a long way toward inducing the private sector to undertake this construction. Should this fall short, the Federal Government should, using its own funds, contract for and oversee the necessary construction. If the Federal Government does this, it should recoup its expenses from electricity sales.
- Mandate the phasing out of all coal-fired power plants by 2030.
- Make adequate provision for displaced workers as part of that phase out. For example:
  - › Congress should use grants, technical assistance, and peer learning to induce more companies to reposition themselves from carbon to non-carbon energy markets, retraining and retaining more of their existing workers, and reducing job loss in communities currently dependent on carbon jobs.

- › Congress should enact and fund the RECLAIM Act of 2019 (H.R. 2156) (also known as “Power Plus”) to provide \$1 billion over five years to restore abandoned coal mines to something like their natural state and to plug abandoned oil and gas wells, employing workers displaced by the phase out of coal, oil, and gas, while also scaling up economic diversification efforts in coal, oil, and gas country.
- › Congress should adopt “carbon adjustment assistance” for workers dislocated by trade, and move toward an overall “active labor market system” through which society as a whole covers more of the costs to workers and their families of all economic transitions.
- Adopt a low-carbon fuel (aka clean fuel) standard for transportation fuels to support and accelerate the transition to electricity, hydrogen and biofuels. It should be based on a carbon intensity metric, and the target should be at least 15 percent lower than in 2020.
- Reform the process for approval of interstate transmission lines to facilitate long-distance transmission of electricity from renewable sources.
- Continue the production tax credit and the investment tax credit for renewables.
- Adopt the Master Limited Partnerships Parity Act to extend favorable tax treatment to financing arrangements known as “master limited partnerships” and “yieldcos,” a benefit already available to investors in fossil fuel development, to also include investments in renewable power demand reduction projects. In adopting the Master Limited Partnerships Parity Act, Congress should also extend favorable tax treatment for certain financing arrangements to include investments in energy storage.

## Other Federal Recommendations

- The Federal Government should adopt expedited approval procedures for leasing for offshore wind and onshore wind and solar and not unduly delay the National Environmental Policy Act (NEPA) and Endangered Species Act (ESA) processes.
- The FERC should adopt policies that encourage rather than discourage the development of renewable energy resources.
- In the absence of a federal carbon price, FERC should approve applications by regional transmission organizations (RTOs), independent system operators (ISOs), and state public utility commissions for carbon adders on wholesale electricity rates.
- The Federal Government should impose a moratorium on leasing of federal onshore and offshore lands for fossil fuel extraction, and a moratorium (subject to project-specific review) on the construction of fossil fuel infrastructure.
- The EPA should strengthen the regulation of air pollution from coal-fired power plants using existing authority under the Clean Air Act.
- The Securities and Exchange Commission should require and enforce greater disclosure:
  - › of investments in coal and other fossil fuels;
  - › of corporate and financial institutions’ exposure to losses due to the energy transition;
  - › of physical risks of climate change; and
  - › of broader Environmental/Social/Governance impacts.

## 4.1.3 Pillar 2: Energy Efficiency and Conservation

### Change Strategy

Energy efficiency and conservation measures are well established, widely available, have a long history of reducing costs, and make energy services more affordable to families and businesses. These measures also support the first pillar of decarbonization because they reduce the required buildout of renewable electricity from about four terrawatts (without high use of energy efficiency) to three terrawatts (with high use of energy efficiency). These measures also support the third pillar of decarbonization (electrification of transportation and buildings) because they reduce emissions in the short and medium terms. In addition, these measures offer one of the largest job multipliers in the decarbonization technology toolkit.

### Recommendations for Congress

Congress should:

- Amend the Energy Policy and Conservation Act in order to broaden the DOE's authority to establish energy efficiency standards for new products; authorize DOE to adopt energy efficiency standards with multiple efficiency metrics; give DOE discretion to establish shorter compliance lead times for energy efficiency standards; require establishment of standards for sectors that are not currently covered (such as computers and displays); and give DOE binding deadlines for adopting and strengthening standards.
- Amend the Energy and Policy Conservation Act (EPCA) to remove federal preemption of state standards applying to appliances for which DOE has missed its deadlines, to allow the standards to be fuel neutral, and to require DOE to establish an overall reduction goal across each six-year cycle that is consistent with the national carbon goals.

### Other Federal Recommendations

The Federal Government should provide incentives for building retrofits, including but not limited to multi-family affordable housing and senior housing, for resilience, electrification, and efficiency, including low-interest loans and favorable tax treatment.

### Metropolitan Travel

The Federal Government should:

- Shift federal funds (including stimulus packages) away from the funding of new highway capacity and lane expansions. Focus on support for multimodal integration, micro-mobility infrastructure, transit-oriented development, and for improved bike/pedestrians/transit. Funding should be allocated for public-private partnerships, with an increased focus on under-resourced and minority communities.
- Empower and support state and local governments to create pricing systems that discourage single occupant vehicles and single passenger services and encourage more intensive use of vehicles (e.g., incentives for multiple occupants in ride-hailing services, personally owned vehicles, and transit). Pricing can include road user charges, congestion pricing, and making "free parking" at work taxable income.

### **Vehicle Automation**

The Federal Government should:

- Modify road pricing, curb management, vehicle registration fees, and more to encourage pooling and right-sizing of vehicles.
- Encourage electrification by creating incentives for compliance with zero-emissions vehicle (ZEV) mandates and fuel economy rules.
- Support and encourage telecommunication as a substitute for passenger travel and local goods delivery.
- Expand broadband, especially for rural areas via infrastructure spending (as part of infrastructure and stimulus bills).

### **Public Transit**

The Federal Government should:

- Modify public finance rules to encourage integration and coordination with pooled mobility services, with initial focus on mobility disadvantaged travelers.
- Subsidize rural on-demand transit service for small cities and denser rural areas.

### **Aviation**

- The Federal Government should continue to incentivize aircraft design and low-carbon fuels to achieve 2 percent carbon intensity improvements per year.

### **New Buildings**

- Congress should require that, starting in 2025, new buildings generally will not burn fossil fuels onsite, will be highly energy efficient, and will be constructed using low-carbon techniques and materials. This should be accomplished through a model National Energy Code for Buildings (NECB). The NECB should also ensure that replacement equipment and appliances in existing buildings will be energy efficient and largely electrified.
- Congress should direct the adoption of the NECB to be cognizant of geographic differences.
- Congress should provide incentives to states to help them make their latest residential and commercial energy codes consistent with national carbon reduction goals and to help them vigorously enforce these codes. Congress should require DOE to develop the model NECB to be consistent with national carbon reduction goals and be updated every three years. In addition, Congress should give DOE the authority to directly enforce those codes in states that do not adopt or enforce adequate codes.
- The Federal Government should place requirements on testing and eliminating refrigerant leaks and methane leaks in buildings.
- The Federal Government should support the development of local manufacturing for advanced building products in the rust belt and in areas that are likely to lose jobs in the energy/carbon transition, making long-term commitments for support.
- Federal agencies, including the General Services Administration, Department of Defense, and U.S. Postal Service, should lead by example in the decarbonization of buildings on federally-owned properties.

- Congress should require (and adequately fund) aggressive per square foot energy and carbon emissions reductions across the federal building portfolio, such as 20 percent aggregate energy reductions and 60 percent aggregate carbon reductions by 2030, and 30 percent and 90 percent aggregate reductions respectively by 2035.
- Congress should fund a program to help states and localities to achieve similarly deep reductions across their portfolios, perhaps on a slightly slower timeline, with federal seed funding.
- Congress should also fund a program to assist sub-regional governments in adopting and enforcing energy and carbon codes and in developing and enforcing codes that go beyond the nationally mandated minimums.

### **Materials**

- Congress should amend the Resource Conservation and Recovery Act (RCRA), articulating and codifying Sustainable Materials Management (SMM) as the new framework for solid waste/materials management, keeping associated delegated authorities intact. SMM includes, but is not limited to, extended producer responsibility, increased diversion rates of specified materials from landfills, bans of certain single-use materials, and other means of reducing the amount of waste requiring disposal as much as possible.

### **Food and Land Use**

Guidelines and information:

- The Federal Government should consider incorporating sustainability, including carbon footprint, in its dietary guidelines.
- The Federal Government should prioritize climate change in procurement contracts.
- Congress should adopt legislation prioritizing low-carbon agricultural products, including local agriculture products, for all government bodies.
- The Federal Government should develop certification programs for carbon-neutral food products.
- The Federal Government should encourage and support dietary interventions such as pricing strategies and product placement at retailers; menu labeling and healthy default choices in restaurants; adding more vegetables and fruits to the Supplemental Nutrition Assistance Program (SNAP); and providing plant-based meat alternatives in workplaces and schools.

Food waste policies:

- The Federal Government should establish policies for reducing post-harvest food losses by 50 percent by 2050 compared to 2010 levels, and reducing household-level food waste from 30 percent to 15 percent by 2050.

## 4.1.4 Pillar 3: Electrification of Transportation and Buildings

### Change Strategy

Reducing greenhouse gas emissions from transportation and buildings through use of greater energy efficiency and conservation is necessary but insufficient. For deep reductions, it is imperative to change the energy source for transportation and buildings to electricity. For light-duty and heavy-duty vehicles, this can be accomplished largely by ensuring that new vehicles are powered by electricity and, to some extent, encouraging existing vehicles to be retired early. Separate strategies are needed for new and existing buildings. The U.S. population may grow by tens of millions of people by 2050, which means a substantial increase in new housing and commercial building stock. To prevent additional GHG emissions from this new housing stock, these buildings need to be electrified as they are built. For existing buildings a variety of renovation strategies need to be employed on a large scale.

### Goals

Congress should adopt goals for electrification that include the following benchmarks from Chapter 2 for 2030:

- More than 50 percent of sales of light duty vehicles should be electric vehicles.
- More than 50 percent of new building sales should be buildings that have heat pumps.
- No new oil and gas transport facilities should be authorized or constructed.

### Recommendations

- The Federal Government should tighten GHG emission standards under the Clean Air Act and fuel economy standards under the Energy Policy and Conservation Act to compel a reduction in fossil fuel use and eventual phasing out of internal combustion engines for new passenger vehicles, with substitution by electric vehicles. For heavy duty vehicles, the Federal Government should continue to tighten GHG standards, in part to accelerate electrification of trucks (including H<sub>2</sub> fuel cells) and low-carbon biofuels for long-haul trucks.
- The Federal Government should engage in a massive infrastructure program to partner with industry and state and local governments and electric utilities to construct EV charging stations.
- The Federal Government should direct biofuels use from LDV to long-haul trucks, aviation, and ocean shipping, and strengthen requirements to reduce their carbon intensity and assure production is more sustainable.

### Vehicles

Congress should establish:

- National LDV ZEV mandate at a minimum of 30 percent of new sales by 2030 and 100 percent of new sales by 2040.
- National medium duty vehicle (MDV) and HDV ZEV mandate at a minimum of 20 percent of new sales by 2030 and 80 percent of new sales by 2050.

- National bus ZEV mandate of 100 percent urban bus purchases by 2035.
- A requirement for annual improvements of about five percent in both energy efficiency and carbon dioxide emissions per year in cars and trucks and feebates for new LDVs (providing ongoing incentives to EV buyers).
- Fleet car and truck ZEV purchase requirements (including for Federal Government).
- Incentives for TNCs (e.g., Uber, Lyft), transit agencies, and medium- and heavy-duty truck fleets to purchase and use electric vehicles.

## **Fuels**

Congress should:

- Establish a national Low-Carbon Fuel Standard (LCFS) for gasoline, diesel, and jet fuel, with 20 percent reduction in carbon intensity by 2030 and 80 percent by 2050, and allow states to adopt stronger standards.
- Establish incentives and subsidies for charging and H<sub>2</sub> infrastructure, with focus on truck stations for H<sub>2</sub>, until at least 2030.
- Accelerate vehicle turnover (e.g., “scrap and replace”) for low-income buyers.
- Use LCFS and other pricing and regulatory policies to accelerate use of low-carbon biofuels in aviation.
- Use revenue from cap and trade for incentives for electric cars and trucks and mobility programs that reduce vehicle use, as well as RDD&D for low-carbon technologies and fuels, including biofuels for aviation.
- Reform transportation finance to support partnerships between transit operators and mobility service companies, with a particular focus on increasing service to low-income and other disadvantaged riders.
- Increase funding of transport operators serving dense cities.
- Increase funding for micro mobility (shared bikes and scooters) and public and private microtransit, especially in suburban areas and small cities where transit is sparse.
- Convert the gasoline tax financing system to a mileage-based system that incorporates environmental and climate priorities.

## **Stimulus package**

Congress should:

- Provide greater funding for electric car and truck purchase incentives, possibly linked to a feebate and/or to restrictions on the income of people receiving it.
- Provide targeted incentives for commercial drivers/operators to purchase or use electric vehicles.
- Establish a federal job stimulus program to build electric grid redundancy/resiliency and large numbers of EV charging stations and H<sub>2</sub> refueling stations.

### Existing Buildings

- Congress should require each state to create a census of its building stock at a minimum of every five years, including annual benchmarking of energy use and carbon emissions from all buildings greater than 25,000 square feet, and a representative sampling of such information for smaller buildings, no later than 2025.
- Congress should also create a program to manage and enforce building decarbonization at the federal level and provide funding and general resources to states to develop and maintain such programs.
- The Federal Government should create systems to collect and manage this building level data, make it broadly accessible to researchers, and provide annual reports on the progress of the nation's existing buildings.
- The Federal Government should develop an energy code supplement tailored to existing buildings, and require states to adopt it, targeted to achieving the maximum reasonable reductions at time of equipment replacement.
- The Federal Government should provide funding to cities, states, territories, and tribes to adopt and enforce these building requirements, and provide additional funding for cities and states that go beyond the minimum.
- The Federal Government should use all of the financial instruments at its disposal to encourage energy/carbon improvements in the building sector, including Fannie Mae policies, tax incentives, low cost loans, depreciation schedules, and Property Assessed Clean Energy (PACE) financing.
- The Federal Government should fund a national program to promote electrification in buildings where it would reduce bills for heating and hot water.
- The Federal Government should provide generous subsidies for affordable and low-income housing energy efficiency and electrification retrofits.

## 4.1.5 Pillar 4: Carbon Capture

### Change Strategy

An all-hands-on-deck approach to reducing U.S. greenhouse gas emissions requires the serious consideration of all possible technologies to do so, including approaches and technologies that are just beginning to be demonstrated as well as technologies that are not even imagined at present. Removing CO<sub>2</sub> from combustion processes as it is produced and removing CO<sub>2</sub> from the atmosphere are both essential. The latter is particularly important because it is increasingly clear that the U.S. and other countries need to have net-negative emissions, not just zero emissions. The change strategy employed here is designed to foster a high level of technological innovation and reduced costs, so that these technologies can be deployed at scale as rapidly as possible.

### Recommendations for Congress

Congress should adopt the following goals and strategies, and appropriate implementing mechanisms, for carbon capture:

- For RDD&D, carbon capture and negative emissions technologies should be brought to scale at much lower costs as soon as possible
- For carbon sequestration, Congress should mandate the development of a strategy to achieve a national reforestation goal by 2050.

## Other Federal Recommendations

- The Federal Government should provide appropriate financial mechanisms and a legal structure that will attract private investment.
- The Federal Government should direct emissions reductions as well as carbon capture and utilization in a broad range of high-heat-generation industrial activities through a combination of incentives, research and development, procurement mandates, and regulatory requirements.
- The Federal Government should make the 45Q tax credit more generous for CO<sub>2</sub> removal and sequestration technologies.
- Congress should make negative emissions technologies eligible to participate in a national clean energy standard.
- The Federal Government should progressively reform agricultural subsidy and crop insurance programs, as well as triple the number of USDA extension agents, to incentivize and facilitate agricultural best practices that enhance soil carbon storage. The Federal Government should also reform the renewable fuel standard to spur the development, scale-up and adoption of low-GHG biofuels.
- Congress should amend the “organic legislation” for each federal public land system to mandate consideration and implementation of climate mitigation, adaptation, and resilience in management plans.
- Congress should adopt the following to meet the reforestation goal:
  - › Carbon price to incentivize reforestation on private land.
  - › Incentive programs (e.g., tax breaks, cost-sharing for planting costs), such as:
    - › Reforestation tax incentives akin to the Investment Tax Credit (ITC) for solar, the Production Tax Credit (PTC) for wind, and 45Q tax credit for carbon capture, utilization, and storage.
    - › Conservation easement tax deductions.

### 4.1.6 Significant Reductions in Emissions of Non-Carbon Dioxide Pollutants

#### Change Strategy

Although non-CO<sub>2</sub> pollutants are not directly included in the modeling framework described in Chapter 2, they are a significant contribution to U.S. GHG emissions. Many of the pollutants included in this framework, moreover, are byproducts of the combustion, transportation, or production of fossil fuels, particularly black carbon, nitrous oxide, and methane. Policies specifically directed at these pollutants are intended to reinforce other recommended policies. More generally, reducing these pollutants – whether they are derived from fossil fuels or not – will provide an extra measure of insurance that the level of emissions reductions sought for the four pillars presented in this chapter will actually be achieved.

## Recommendations for Congress

- Congress should amend the Energy Policy and Conservation Act to apply full life-cycle climate performance accounting to regulated appliances as a way to reduce the use and emission of fluorinated compounds.

## Other Federal Recommendations

- The Federal Government should strengthen controls over leakage, venting, and flaring of methane throughout its life cycle. The controls that were imposed during the Obama Administration and revoked or weakened during the Trump Administration, including those for landfill methane, should be reinstated.
- The Federal Government should require the shift from diesel engines to electric trucks as soon as possible, thus eliminating particulate matter emissions.
- To reduce black carbon and other emissions, EPA should prioritize regulations that accelerate fleet turnover and otherwise take older and dirtier engines and vehicles off the road.
- The Federal Government should update and amend its green purchasing program requirements to eliminate purchases of equipment containing hydrofluorocarbons (HFCs) where other low-global-warming-potential and more energy efficient alternatives are available.

### 4.1.7 Foreign Policy

#### Change Strategy

In terms of direct physical reductions in GHG emissions, foreign policy is not a pillar of domestic decarbonization in the same sense as the four pillars outlined in this chapter. It is, however, an absolutely essential component of any overall federal strategy to reduce GHG emissions. While climate change is widely understood as a global problem, the U.S. has among the highest per-capita emissions of any country in the world and produces 13 percent of global GHG emissions. A strong U.S. foreign policy on climate change involves a great many different kinds of approaches to make rapid global progress on deep decarbonization. The critical components are (1) a serious domestic effort to reduce GHG emissions that demonstrate the credibility of U.S. foreign policy actions on climate change, and (2) a willingness to engage in genuine and constructive ways with other countries and the international community.

#### Recommendations

- The Federal Government should quickly rejoin the Paris Climate Agreement and set a new, stronger Nationally Determined Contribution for U.S. greenhouse gas emissions.
- The Federal Government should refrain from using trade mechanisms to disadvantage renewable energy in the U.S. and other countries.
- The Federal Government should quickly ratify the Kigali Amendment, either through existing authority under the Clean Air Act or through formal advice and consent of the U.S. Senate.

- The U.S. should begin to re-establish foreign policy leadership by:
  - › Supporting global “Zero-by-2050” commitments, and aligning its policies with other national mid-century transition strategies, particularly that in the particularly those in Europe.
  - › Actively participating in technology partnerships with key global industry groups, including aviation, shipping, global grid interconnections, hydrogen, and international markets for renewable energy, etc.
  - › Providing financing for low-income countries to ensure the global engagement envisioned by the Paris Climate Agreement.
  - › Establishing border taxation and regulation for trade in carbon-intensive fuels and products.
  - › Actively participating in transnational processes for sub-national actors and firms so that best practices can be identified (akin to ICLEI and C40 but with much more active systems for policy review and learning).
  - › Negotiating mainstream circular economy objectives in free trade agreements; bilateral, regional, and multilateral processes and agreements; and in U.S. external policy funding instruments (such as that for the EU).

## References

1. Columbia University SIPA Center on Global Energy Policy, Energizing America: A Roadmap to Launch a National Energy Innovation Mission 43-50 (2020), [https://www.energypolicy.columbia.edu/sites/default/files/file-uploads/EnergizingAmerica\\_FINAL\\_DIGITAL.pdf](https://www.energypolicy.columbia.edu/sites/default/files/file-uploads/EnergizingAmerica_FINAL_DIGITAL.pdf).



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