

Testimony of Hal Harvey, CEO, Energy Innovation LLC
House Select Committee on the Climate Crisis
April 30, 2019

Thanks to the Chair, the Ranking Member, and all the Members of the Select Committee.

I am an engineer by education, with decades of private sector experience—in engineering, construction, and finance—and public policy design experience, across a dozen countries and more than 100 policies that have been adopted into law. I have served on energy panels appointed by Presidents Bush (41) and Clinton, and am the author of several books including *Designing Climate Solutions*.

And as much as I am honored to address this august audience, it is especially important to have my daughter with me. We have a deep obligation to our children, and to all children, to pass on a planet as bountiful as the one we inherited without harming our economy.

My approach is to consider what Americans want—and recent polling¹ shows 71% of Americans think affordable, reliable, safe, clean energy should be a priority for Congress and the president—then find the best ways to deliver all four qualities. This requires that one not fall in love with, or prejudice against, any particular technology. Instead, it is imperative to understand the attributes of each, and their ability to contribute to all four of these crucial goals.

The big picture, in plain terms: It is now cheaper to save the Earth than to ruin it. Amazing advances in clean technology—batteries, electric vehicles, onshore and offshore wind, solar, LED light bulbs, industrial control systems, 3D printing, heat pumps, and more—have driven their costs down and their performance up, so they can outcompete technologies that are less efficient, or that emit more greenhouse gases, like carbon dioxide.

The key missing ingredient is good policy. Do we reward those four attributes—affordable, reliable, safe, and clean—or do we protect incumbent technologies, which would lock in high costs and high pollution, and leave America behind China in the race to own technologies of the future?

Take the power sector as an example. My team analyzed the economics of every existing coal power plant in America. We found that 74% of them cost more to simply operate than it would to replace them with new wind or solar built *within 35 miles of each plant*.² That means re-using existing transmission infrastructure; decarbonizing the grid; saving consumers money; and adding high-quality jobs right where they are needed, all at once. These jobs are also an economic boost: Research shows clean energy jobs can equal an 8%-19% raise, and many are accessible with only a high-school diploma.³

And reliability? Multiple Midwest states already operate on 25% or more wind power, and regional grids with increasing fractions of solar and wind are proving to be **more** reliable than those without⁴. This was proven during stressful situations in Houston, Puerto Rico, and across the country.

¹ <http://climatecommunication.yale.edu/publications/energy-in-the-american-mind-december-2018/2/>

² <https://energyinnovation.org/publication/the-coal-cost-crossover/>

³ <https://www.brookings.edu/research/advancing-inclusion-through-clean-energy-jobs/>

⁴ <https://www.aweablog.org/awea-annual-market-report-top-11-wind-power-trends-2018/>

The policy required? First, ensure the Federal Energy Regulatory Commission is a merit-driven, technology-neutral organization, required to run the power system at lowest cost. FERC had this history for decades, under Republican and Democratic leadership, but in recent years has attempted putting a finger on the scale for certain technologies. That is bad policy, reminiscent of the Soviet Union. It will increase emissions and raise costs, without contributing any meaningful benefit to the grid.

Second, set performance targets for our grid. Aim at 80 percent zero carbon electricity generation by 2035. This is ambitious but realistic, and cost-effective. It will unleash a torrent of innovation, and create hundreds of thousands of jobs. Not convinced? Check out Iowa, Kansas, Texas, and California. Different economies, different parts of the country, different politics, but all landing on the same conclusion: Clean energy saves money, promotes health, and creates jobs.

Third: Let's build the most advanced cars and trucks in the world. Inefficient cars and trucks waste money and fuel, thus hurting the bottom line. And by the way, they pollute our air and emit copious amounts of carbon-dioxide. Technology advancement is a powerful force: Let's use it to eliminate this waste. A combination of ever-stronger efficiency standards and increased electric vehicle deployment can cut all that waste, helping ensure American's car manufacturing business is healthy for the long term. I have made about 70 trips to China, and I can tell you, that country is not standing still in the race to electrify transportation. Nor should we.

Fourth: Let's make sure that affected communities, such as coal mining towns in West Virginia, get proper transition assistance. I would first favor jobs in the communities, for the people who live there now, using skills they have. Concerned about mountain-top removal? Polluted streams? How about environmental restoration projects in those towns? Same locale, same workers, similar skills. And let's make sure that coal miners have access to health care, through proper facilities and proper insurance. Coal miners delivered 100 years of energy for America. Let's make sure they are taken care of in this transition.

My time is up. In my written testimony, I offer specific policy details, with fully quantitative backup, for each sector of the economy. I am happy to take up these opportunities during Q&A.

Let me conclude with one thought. My work is organized around solutions, but I keep up on climate science. And make no mistake: If we fail to act, the consequences will be devastating. Our own government concludes we face hundreds of billions in economic losses⁵ and much of America will become unrecognizable if we do not act, rapidly and seriously, to stem heat trapping gases. The policy agenda we describe in our written testimony is feasible, economically sound, and would defend the American way. That, of course, is a duty of every Member of Congress and every citizen. Smart policy is more than a good idea: It is required for our children's future.

⁵ <https://nca2018.globalchange.gov/>

FEDERAL POLICIES TO SLASH GREENHOUSE GASES

HAL HARVEY, ET AL. ● APRIL 2019

Federal policies could reduce the United States' greenhouse gas (GHG) emissions by at least a third below 2005 levels by 2030, and at least 80 percent by 2050, according to modeling in the Energy Policy Simulator (available at <https://www.energypolicy.solutions>).

Ultimately, we must get to zero, but this package would be a great start, using only federal policy levers that we believe should have a reasonable chance of passing. This package would also kick-start innovation, opening up further options to drive emissions to zero in the coming years. However, this is a comprehensive package, not a menu from which to select. Only enacting policies that address emissions in every sector creates a reasonable chance to avoid the worst impacts of climate change.

The **electricity sector** has the greatest emission reduction potential by 2050, given the recommended policies below – the path to zero is relatively clear, and we know the technologies and approaches that can deliver it. The faster we decarbonize the power sector, the more we can use it to decarbonize other sectors—like transportation and buildings, by converting fossil fuel burning to electricity.

The next largest opportunity lies in addressing **super-pollutants** (methane and fluorinated gases), which tie closely with other policies to reduce emissions from the U.S. industrial sector. Heavy industry produces a large share of U.S. GHGs today, but the path to zero is less clear for industry – policies included here will get us a good start, but more research and development (R&D) is needed to support industry decarbonization.

Major opportunities to reduce GHG emissions via policy also exist in the **transportation sector** – including a mix of electric vehicle incentives, supporting infrastructure, and strong standards for traditional internal combustion engine vehicles.

Another important chunk of emissions reductions comes from upgrading the energy efficiency of **existing buildings** and also switching from burning gas or oil on-site to using electricity.

Agriculture also presents emission reduction opportunities, and support for agriculture-related R&D can help identify options to drive additional emissions reductions.

A **carbon price** adopted at the federally-estimated social cost of carbon would offer additional potential emissions reductions alongside these sector-specific policies.

Finally, the list of policies below includes important enabling policies, such as support for rural Americans in the energy transition, as well as expanded clean energy and carbon reduction R&D.

ELECTRICITY

The electricity sector is currently the second-largest source of U.S. GHG emissions, but it has the clearest path to zero emissions. We have the technology (and it's increasingly cheaper to deploy clean rather than polluting power plants), we have the know-how, we just need to get this moving—and quickly.

Leaning into this sector where we are already making progress will have knock-on benefits for other sectors: A decarbonized electricity system can be used to replace fossil fuels in other parts of the economy, via electric vehicles, electrifying buildings that would otherwise burn natural gas, and electrifying parts of factories that would otherwise burn fuel onsite.

CREATE A 100 PERCENT NATIONAL CLEAN ENERGY STANDARD

A 100 percent clean energy standard for the electricity sector by 2045¹ is one of the most effective policies for reducing U.S. GHGs. The standard could include all sources of zero-carbon electricity (solar, wind, biomass, hydro, geothermal, nuclear, carbon capture and storage, and any other source of zero-carbon electricity developed between now and 2045). It should include interim targets at least every five years, or better yet, an annual improvement rate of two percent per year from 2020-2045. Special attention must be paid in early years to develop low-cost options for squeezing the last 10 percent of GHGs out of the power system.

EXTEND AND EXPAND TAX CREDITS FOR SOLAR, WIND, AND ENERGY STORAGE

Extending tax credits² for solar, wind, and energy storage is another strong mechanism to support clean electricity, particularly if a national clean energy standard is not part of a final policy package. These kinds of incentives help spur the market for newer technologies with great potential, driving sufficient scale to bring down costs and make new options available for Americans. Offshore wind and energy storage are two of these newer technologies, but have huge market potential if they can achieve enough scale to bring costs down just a bit more.

In addition to traditional tax credits, the federal government could address up-front capital costs for clean energy technologies by leveling the playing field with fossil fuel infrastructure through additional financing mechanisms such as Master Limited Partnerships, Real Estate Investment

¹ Note that it would be useful to structure this as an incentive-driven race to the top; in the past, state officials have balked at federal requirements on their electricity mix.

² Note that taxable cash incentives are much more efficient than tax credit structures—with some analyses suggesting the same federal dollar could achieve twice as much in the form of a taxable cash incentive as in the form of a tax credit (see <https://climatepolicyinitiative.org/wp-content/uploads/2012/09/Supporting-Renewables-while-Saving-Taxpayers-Money.pdf>). The financial efficiency of tax credits may even decline further given recent tax reform, as large businesses have less tax appetite and the already-tight market for tax equity will likely become even tighter.

Trusts, Clean Renewable Energy Bonds, and securitization of project debt (similar to how Fannie Mae does this in the housing market).³

ISSUE A STRONGER MANDATE FOR FERC TO MODERNIZE POWER MARKETS AND MAKE THEM TECHNOLOGY NEUTRAL

The wholesale power markets regulated by the Federal Energy Regulatory Commission (FERC) were established in an era when coal and other fuel-burning power plants dominated the U.S. electricity system. Naturally, rules and structures were designed with the power plants of the day in mind, but many more options are available today and the power markets must evolve to take advantage of them. FERC should inventory market rules and structures with an eye toward updating them to be truly technology neutral given the swath of new options available today.⁴ FERC should also consider complementary reforms to the governance of regulated power markets to ensure decision-making processes reflect today's needs.

The federal government should further clarify that FERC should consider benefits of GHG emission reductions in its gas infrastructure and electricity market design rulemakings. In the absence of a clean energy standard, the federal government should articulate its intention that FERC-jurisdictional markets assist state efforts to reduce GHG emissions.

SPUR TRANSMISSION: GET MORE FROM THE EXISTING SYSTEM, SMOOTH THE WAY FOR MORE

Transmission is the platform that allows our nation's electricity system to function. As renewables provide increasing amounts of the U.S. electricity supply, we need to move it from the places with the greatest solar and wind resources to the places where people and businesses need to use it. We can do that by getting more out of our existing system⁵, and by adding new lines.

The federal government could build on the National Interest Electric Transmission Corridors⁶ to overlay priorities for GHG reduction goals, aligning transmission incentives with GHG objectives, then partner with states to increase capacity on existing rights of way or build new lines. President Lyndon Johnson provided a model for this in the 1960s with the build-out of the Pacific Intertie.⁷ Texas also provides a model by pre-approving and building out transmission to

³ For more on what would need to be done to make these structures as useful as possible, see: <https://www.nrel.gov/docs/fy14osti/60413.pdf>.

⁴ See this paper we wrote: https://energyinnovation.org/wp-content/uploads/2017/10/A-Roadmap-For-Finding-Flexibility-In-Wholesale-Power-Markets_FINAL.pdf.

⁵ Dynamic line rating gets more out of the system than existing practices in much of the country (for more, see <https://issues.nawindpower.com/article/using-grid-weve-got>). Where needed, we can beef up transmission capacity on existing rights of way.

⁶ See this factsheet from the Department of Energy: https://www.energy.gov/sites/prod/files/edg/media/NIETC_Fact_Sheet.pdf.

⁷ See this article from the board chair of PJM, the nation's largest electricity market: <http://www.orkas.com/the-future-of-electric-transmission/>.

“Competitive Renewable Energy Zones” where clean energy resources are abundant. Market mechanisms can then select the lowest cost projects to build clean power in those zones.

While transmission allows electricity to travel across space, energy storage can allow electricity to travel across time, alleviating congestion on transmission lines. The federal government could direct FERC to consider establishing structures to plan and pay for energy storage in a similar way to transmission.

CREATE A NATIONAL DEMAND RESPONSE PROGRAM

“Demand response” is the term for when consumers and businesses shift when they use electricity to take advantage of low-cost or low-emissions sources. This can reduce the need to build costly new power plants, and can help get the most from renewable energy. A national program focused on scaling demand response could kick start the market—perhaps via pay-for-performance matching funds for states or municipalities that establish programs. Loans may also be considered since well-designed demand response programs should pay for themselves in short order.

SUPER-POLLUTANTS

Bolstering efforts to reduce carbon dioxide with programs to address methane and fluorinated gases (“F-gases”) is an efficient way to drive near-term reductions in U.S. contributions to climate change. Per molecule emitted, methane warms the climate at least 28 times more than CO₂, and F-gases can be thousands of times stronger contributors to climate change.

RAPIDLY PHASE OUT F-GASES BY RATIFYING THE KIGALI AMENDMENT AND GIVE EPA AUTHORITY

Ratifying and implementing the Kigali Amendment to the Montreal Protocol would create a requirement to reduce F-gas consumption in America. The U.S. Environmental Protection Agency (EPA) has already attempted to regulate F-gases under the Significant New Alternatives Policy (SNAP), but the ruling was remanded. Expressly directing EPA to regulate these gases, with the flexibility to use other approaches beyond SNAP, would allow it to move forward with requiring the use of lower GHG-emitting substitutes. U.S. companies would be at a competitive advantage with a strong new F-gas phase-out policy, as they are the primary manufacturers of the chemicals that could substitute for climate-warming F-gases.⁸

SET A STEADILY DECLINING STANDARD FOR METHANE EMISSIONS FROM OIL AND GAS, INCLUDING EXTRACTION AND DISTRIBUTION

The federal government could strengthen Obama-era standards for methane leakage, methane leak detection, and mitigation systems to push methane leakage rates toward zero. A 2050 target of zero leakage throughout the system, along with strong interim targets, will encourage the natural gas industry to invest in the system upgrades and monitoring equipment necessary

⁸ For example, the case brought against EPA resulting in remand of SNAP was brought by Mexichem Fluor, Inc., a Mexico-based chemicals manufacturer.

to significantly cut emissions. Canada’s methane rules could serve as a template for early action—it aims to reduce methane emissions from the oil and gas sector 40-45 percent from 2012 levels by 2025.

The federal government could dedicate resources to measuring methane leakage, include leakage estimates into GHG inventories, and reward gas utilities for targeting leakiest equipment first.

INDUSTRY

Federal options for reducing industry sector GHG emissions are less well-established than some of the other economic sectors. However, it is very important for any comprehensive climate plan to address emissions from the industry sector, as industry produces about as many GHGs as the whole U.S. transportation sector today, as well as a large share of the projected remaining GHG emissions in 2050. The U.S. needs a plan to address this sector and develop further options to drive down emissions. The following policy proposals are a good start.

ESTABLISH CARBON INTENSITY STANDARDS FOR CEMENT, STEEL, CHEMICALS, AND NATURAL GAS AND PETROLEUM SYSTEMS; ALLOW TAX CREDITS FOR SOME SHARE OF UPGRADE COSTS

New emissions intensity standards could drive industry energy and emissions savings.⁹ A program that sets new output-based standards every few years based on the top industry performers could drive a race to the top and encourage continuous improvement in U.S. factories. Standards could be set based on emissions or energy per unit of output (e.g., CO₂ per ton of cement or BTU per ton of ethylene produced). Tax credits based on performance could be made available to businesses that invest to meet new standards. This policy could be coupled with a border adjustment to level the global playing field for U.S. industries.

CREATE A FEDERAL “BUY CLEAN” PROGRAM

A federal “Buy Clean” program would set standards for cement, iron, steel, and other products used to build federally-funded infrastructure, based on the emissions intensity of those inputs. A model policy is in place in California (Assembly Bill 262), which includes suppliers’ emission intensities in government procurement decisions.¹⁰ The federal government could ensure a national program considers material substitution opportunities (e.g., using timber instead of steel for buildings less than 20 stories).¹¹

⁹ Note that this has not been done in the U.S. to date, but other countries have used this approach with some success. For example, see Ontario, Canada’s proposed industry performance standards: https://prod-environmental-registry.s3.amazonaws.com/2019-02/EPS%20Regulatory%20Proposal%20%28EN%29_0.pdf

¹⁰ See <https://buyclean.org/2017/10/16/gov-jerry-brown-signs-buy-clean-law/>.

¹¹ See http://www.energy-transitions.org/sites/default/files/ETC_MissionPossible_FullReport.pdf.

INCENTIVES FOR INDUSTRIAL COGENERATION AND WASTE HEAT RECOVERY

New incentives for industry facilities to cogenerate electricity and heat, and to use waste heat, would improve the efficiency of U.S. factories. Incentives for cogeneration should not be offered for coal-fired industrial equipment.

INCREASE INCENTIVES FOR CARBON CAPTURE AND STORAGE AND PROVIDE FINANCING AND TECHNICAL ASSISTANCE

Carbon capture and storage (CCS) could be a critical part of decarbonizing the industry sector. Section 45Q tax credits were recently increased and expanded to cover smaller industries, but these tax credits could be increased to kick-start industrial sector CCS, which has fewer decarbonization options than the electricity sector. Complementing these tax credits with loan guarantees and technical assistance would help industries access the capital and expertise needed to install CCS, which is a relatively new technology with high upfront capital costs and little monetized payback.

BUILDINGS

Improving America's buildings can result in better comfort and energy service for citizens and business owners, while also reducing greenhouse gas emissions. Buildings can be a tough nut to crack since there are so many dispersed decision-makers, but that is precisely the reason this sector provides a way to reach voters with something tangible that can make their lives better.

INCENTIVES FOR BUILDING ELECTRIFICATION AND EFFICIENCY RETROFITS, WITH SOME IMPORTANT EXCLUSIONS

Buildings can decarbonize by using energy more efficiently, and then converting essential uses to clean energy. Because the majority of existing U.S. buildings will still be standing in 2050, the federal government must find ways to incent retrofits combining appliance electrification, efficiency, and on-site clean power generation (e.g., rooftop solar) if practical. By and large, existing buildings could be much more efficient, but the upfront cost of upgrades dissuades building owners.

A national program with financial incentives including low interest loans or on-bill financing for building retrofitting could significantly accelerate the pace of retrofitting; current programs vary in their effectiveness but generally reach only a fraction of one percent of eligible customers each year.¹² A national program to target a package of decarbonization retrofits in one percent of U.S. homes per year would be reasonable and in line with Germany's retrofit rate.

Such programs should encourage efficiency retrofits to include electrification and clean on-site generation, reducing the total cost of all decarbonization measures. Programs should also encourage pay-for-performance, increasing the value of efficiency measures to the grid.¹³ On the flip side, gas appliance retrofits should not receive federal funding; while they reduce

¹² See <https://link.springer.com/article/10.1007/s12053-018-9661-5>.

¹³ <https://www.brookings.edu/research/advancing-inclusion-through-clean-energy-jobs/>

emissions in the short term only in coal-heavy states, they also lock in gas consumption for the 15-20 year appliance lifespan, and create upstream methane leakage.

Like renewable energy 20 years ago, all-electric retrofits come at a premium today, but hold huge long-term potential for cost and carbon reductions. When contractors get in the door of a building for an efficiency retrofit, they should also seize the moment to drive electrification. Building electrification incentives could include tax credits for demand response-enabled heat pumps for space and water heating and cooling (which in addition to replacing natural gas, enable a huge efficiency improvement for space and water heating), heat pump clothes dryers, and electric induction stoves, at the point of sale.¹⁴ The federal government can also increase customer access to these technologies by encouraging utilities to finance them on customers' bills.¹⁵

Electrification-induced efficiency improvements of this kind have a knock-on benefit of lowering household energy costs while delivering the same comfort and service. In addition, as more of these products are deployed, costs are likely to decline. A higher incentive could be offered to electrify buildings with oil-fired space and water heating, which is more polluting and less efficient than natural gas. To measure progress, the federal government can set a target for the carbon footprint of the U.S. building stock (e.g. 50 percent below 2020 levels by 2035), and delegate authority for sizing the incentives to the U.S. Department of Energy (DOE) to achieve the target as cost-effectively as possible.

DIRECT DOE TO ACCELERATE THE STANDARDS PROCESS FOR APPLIANCES AND EQUIPMENT

DOE has a strong appliance and equipment standards program, but it is underfunded and years behind schedule in keeping standards up-to-date. This may sound like a small opportunity, but it can deliver energy savings, cost reductions for citizens, and pollution reduction. Additional funding for this critical program, along with a directive to accelerate this process would improve appliance and equipment efficiency.

REPAIR AND ACCELERATE THE BUILDING CODE PROCESS

The federal government could maintain and promote an advanced model code for states and regions to choose to adopt, and a federal code could even serve as a backstop for the remaining states with no code.¹⁶ A national model code could be based on California's model, where today's most efficient approaches become the standard every seven years and the building code is automatically reviewed and revised every three years. Advanced codes also offer alternative compliance pathways based on performance, rather than the usual list of prescriptions.

¹⁴ It would be important to only offer these incentives for heat pumps that use working fluids with very low global warming potential – otherwise, some of the chemicals in heat pumps can be dangerous for climate change.

¹⁵ https://aceee.org/sites/default/files/pdf/conferences/eeff/2016/Weeks_Session4A_FF16_5.24.16.pdf

¹⁶ Building codes are adopted and enforced at the state and city levels, but a federal code could act as a model for smaller jurisdictions to adopt.

Finally, codes may need to be updated to include GHG considerations in addition to efficiency. Codes should support fuel switching in buildings from oil and gas to electricity, and restrict the build-out of new natural gas infrastructure and hook-ups. They should also require building electrical equipment to be sized to accommodate an appropriate level of on-site EV charging.

MAKE FUNDS AVAILABLE FOR STATES AND CITIES TO ADOPT STRETCH BUILDING CODES AND TRAIN BUILDERS AND INSPECTORS

Federal matching funds could encourage states and cities to adopt stronger building codes to make buildings even more efficient. Funds could also be made available to train builders and inspectors, which would allow more regular building inspections and help drive best practices into building construction, increasing the share of buildings that actually adhere to code.

TRANSPORTATION

The U.S. transportation sector has eclipsed the power sector and is now the largest source of GHG emissions. The move to electric vehicles (EVs) is exciting and many policies can accelerate the shift, but millions more fuel-burning vehicles will still be sold, so we cannot take our foot off the pedal of efficiency improvements for those vehicles, even as we electrify. A complementary infrastructure program focused on transit can reduce emissions by supporting alternatives to personal cars and charging stations for electric vehicles of all kinds.

SET AN ANNUAL IMPROVEMENT RATE FOR VEHICLE EMISSION STANDARDS AND MOVE AUTHORITY TO EPA

Vehicle standards (i.e., fuel economy or GHG emission standards) are key to reducing transportation sector CO₂ emissions. Even with aggressive policies to promote EV sales, millions of internal combustion engine cars will still be sold between now and 2050, and efficiency standards can help drive down emissions from these vehicles. Rather than specify a mile-per-gallon target in the future, standards should specify an annual improvement rate, building on existing standards for light- and heavy-duty vehicles. An annual improvement rate of about seven percent per year from 2026-2040 for light-duty and 1.7 percent per year from 2028-2040 for heavy-duty vehicles¹⁷ would enable U.S. vehicles to become super-efficient, while pushing manufacturers to ramp up sales of plug-in hybrid electric and full electric vehicles.

Moving authority over these standards from the National Highway Traffic Safety Administration to EPA would drastically decrease the administrative burden on the auto industry for following these standards.

ESTABLISH A TRANSPORTATION INFRASTRUCTURE PROGRAM FOR PUBLIC TRANSIT, NON-MOTORIZED TRANSPORT, AND EV CHARGING INFRASTRUCTURE

An infrastructure program could help reduce transportation emissions. U.S. cities need improved public transit options and support for a new wave of EVs. The federal government could provide

¹⁷ Note these annual improvement rates assume compounding improvements, not a simple division of improvements through a final year.

matching funds (or even greater than 50 percent cost sharing) for states or cities that want to invest in EV chargers at public and multi-family buildings, electric buses, electric light rail, bike lanes, and efforts to make cities more walkable. On interstate highways, an exception could be made in the prohibition of commercial activities at rest stops for fast-charging EV infrastructure, and federal funds could support highway fast-charging infrastructure to help make it easier for drivers to go electric.

REPAIR EV TAX CREDITS BY ELIMINATING 200K SALE CAP

EV incentives have been a major contributor to growth in recent years. Incentives should continue to be offered at existing levels by eliminating the current cap of 200,000 credits per manufacturer, at least for the next five years. To increase accessibility for low- and middle-income Americans, the tax credit system should be amended to allow for cash grants at the point of sale.

AGRICULTURE

The U.S. agricultural sector produces about the same amount of emissions as our nation's buildings sector, but the path to zero emissions in agriculture is much less clear. The following policies can help.

INCREASE INCENTIVES FOR AGRICULTURAL PRACTICES TO REDUCE GREENHOUSE GASES

Increased incentives can expand low-GHG agricultural practices, such as low-till methods, cover crops, and water conservation. Conversion to these practices may have high upfront or ongoing costs as well as some loss of revenue, so government incentives can encourage farmers to adopt these practices. The federal government could fund a national experiment to explore whether farmers could be paid directly for increasing the carbon content of their soil.

INCREASE TECHNICAL ASSISTANCE FOR PRECISION AGRICULTURE DEPLOYMENT

The federal government could increase technical assistance for deployment (e.g., farmer-to-farmer workshops) of precision fertilizer, soil supplements, and other practices aimed at reducing costs, chemical input, fertilizer, and soil erosion. Government assistance in the form of incentives and cooperative formation can also help increase precision agriculture deployment.

FUND R&D AND IMPLEMENTATION OF COW METHANE EMISSIONS REDUCTIONS

Cows are a major source of agriculture sector GHG emissions, but the best management practices typically suggested are rotational grazing—which creates struggles with accurate deployment and scalability—and expensive feed change. New R&D is needed for improved options.

CARBON PRICING

CONSIDER A HYBRID CAP-AND-TRADE/CARBON PRICING SYSTEM

Carbon pricing would create an additional incentive to decarbonize the economy, particularly the electricity and industry sectors. The federal government could consider establishing a hybrid cap-and-trade system with cap levels reflecting scientifically based targets, a price floor and ceiling to manage price variability, and a significant investment of revenue in reductions from sectors that respond less to price changes (such as transportation, buildings, and agriculture). Another option is a hybrid carbon tax, whereby the tax level varies based on progress reducing emissions.

An important caveat: Existing sector-specific policies should be not discarded in favor of carbon pricing. Rather, carbon pricing should be used as a complementary policy to help achieve additional emissions reductions. It is not a substitute for performance standards.

RURAL AMERICA AND THE ENERGY TRANSITION

Federal support for rural Americans can be very powerful. These supports include taking care of frontline communities where polluting energy infrastructure has made an impact over the years, as well as sharing the new energy economy's benefits with those who host its infrastructure.

MATCHING FUNDS FOR RURAL COMMUNITIES HOSTING ENERGY AND TRANSMISSION INFRASTRUCTURE

To the extent that new energy and transmission projects include a payment to local communities for hosting infrastructure, a federal matching fund could be created to help support these communities. This can compensate communities and increase public support for these projects.

FEDERAL FUNDS FOR TRANSITION SUPPORT FOR COAL MINERS AND POWER PLANT WORKERS

The clean energy transition will result in fewer Americans working in coal mines and coal power plants. The total number of Americans working in these industries is already relatively small – roughly 50,000 Americans are employed in the coal mining industry¹⁸ – so a federal fund would not need to be large to assist communities and individuals through this transition.

CREATE INVESTMENT INCENTIVES FOR CLEAN ENERGY IN COAL AND FRACKING COMMUNITIES

Local clean energy resources are cheaper than keeping two-thirds of U.S. coal plants running,¹⁹ and can sustain economic development through the clean energy transition. Incentives for clean energy manufacturers and developers to invest in communities that have historically hosted fossil fuel infrastructure can help those frontline communities during this transition. New investment can help create jobs and reinvigorate local economies affected by the transition.

¹⁸ See <https://data.bls.gov/timeseries/CES1021210001>

¹⁹ <https://energyinnovation.org/publication/the-coal-cost-crossover/>

HEALTH CARE FOR COAL MINERS

Federal support for health care for coal miners can help those most harmed by helping America achieve the economic prosperity we enjoy today.

RESEARCH AND DEVELOPMENT

TRIPLE CLEAN ENERGY AND CARBON REDUCTION R&D FROM \$2.5 BILLION TO \$7.5 BILLION PER YEAR

The U.S. lags far behind on spending on clean energy and carbon reduction R&D. The budget for clean energy and carbon reduction R&D – note this is not the total energy research budget, but just the share going to clean energy and carbon reduction – should be tripled to at least \$7.5 billion per year. Research areas that need more attention include: software advancements to plan and run a zero-carbon grid; opportunities to decarbonize heavy industry; hydrogen generated from clean electricity and used to meet both stationary and mobile energy needs; biochemistry and synthetic chemistry; materials efficiency and advanced recycling; new materials like low-carbon cement, steel, and plastic substitutes; as well as carbon capture and removal.^{20,21}

EXPAND CRADAS

The federal government could support broader use of cooperative research and development agreements (CRADAs) between the private sector and national labs. CRADAs demand commitment from the public and the private sector, and are effective at stimulating private research, patents, and accelerating important technologies toward commercialization.

²⁰ See: http://www.energy-transitions.org/sites/default/files/ETC_MissionPossible_FullReport.pdf.

²¹ On carbon removal programs, see also: <https://www.wri.org/blog/2018/12/wanted-325-million-federal-rd-jumpstart-carbon-removal>.