United States House of Representatives
Select Committee on the Climate Crisis

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"Cost-Saving Climate Solutions: Investing in Energy Efficiency to Promote Energy Security and Cut Energy Bills"

Questions for the Record

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The Honorable Kathy Castor

1. **How would the electrification investments in the Bipartisan Infrastructure Law, such as the $7.5 billion for electric vehicle charging help advance access to energy-efficient vehicles? How would the House-passed climate investments build on that foundation to increase the energy efficiency of the entire economy?**

Increasing our economywide energy efficiency requires replacing inefficient appliances, equipment, lighting, vehicles, and buildings with energy-efficient alternatives. Ensuring equitable access for all consumers, businesses, and communities—regardless of income, demographic, or location—requires available and affordable energy-efficient options. Whether via retrofit, replacement, or new construction, every purchase decision represents an opportunity to lock in energy-efficient assets that generate near- and long-term energy and cost savings while also providing climate, public health, and economic benefits. Because energy-efficient products and equipment occasionally have a higher upfront price and face other market barriers that prevent widescale adoption, policy plays an important role in leveling the playing field.

As noted in my testimony, all-electric vehicles (EVs), appliances, and equipment have considerable energy efficiency advantages over their fossil-fueled counterparts.[1] Increasing their deployment so that more consumers can benefit from these technologies requires overcoming the primary barriers to adoption: higher upfront cost, limited access to technologies, and limited infrastructure.

The Bipartisan Infrastructure Law (BIL) and the House-passed climate investments included several provisions to address these barriers and support widespread adoption of energy-efficient technologies. The BIL, for example, provides funding to support:[2]

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[1] Testimony of Sara Baldwin at the Select Committee on the Climate Crisis Hearing "Cost-Saving Climate Solutions: Investing in Energy Efficiency to Promote Energy Security and Cut Energy Bills" held on April 7, 2022.

[2] U.S. Department of Transportation, "President Biden, U.S. Department of Transportation Releases Toolkit to Help Rural Communities Build Out Electric Vehicle Charging Infrastructure," February 2, 2022, https://www.transportation.gov/briefing-room/president-biden-us-department-transportation-releases-toolkit-help-rural-communities; and M. Moaz Uddin, "Electric Vehicle Programs in the Bipartisan Infrastructure Bill," Great

- Increased transportation electrification infrastructure investments to benefit rural and urban communities while beginning strategic EV charging buildout via $5 billion in major highway charging investments along the Alternative Fuels Corridor. The dedicated $2.5 billion will support rural charging and measures to improve local air quality in disadvantaged communities.
- These investments will increase consumer confidence in their ability to charge wherever they travel—a barrier that must be overcome to encourage widespread EV uptake.
- Increased adoption of electric school buses through the Clean School Bus Program and electric trucks at ports, both high activity areas that can have a large impact on the air quality and public health of nearby communities. These measures will also provide long-term cost savings over the life of the vehicles.
- Increased domestic production of materials needed for scaled transportation electrification: $140 million for rare-earth elements, $3 billion for battery material processing, and $3 billion for battery manufacturing and recycling.

While the BIL funding is an important step to enable transportation electrification and jumpstart the shift to more energy-efficient vehicles, it's just a down payment to equitably get more EVs on the road. The House-passed climate investments for new and used EVs included caps on income and vehicle costs to ensure that moderate-income households and individuals can access and benefit from EVs (not just those with higher incomes). The House-passed climate provisions also provided a 30 percent tax credit for electric heavy-duty vehicles to help convert the highest polluting vehicles on the road to run on clean, emission-free electricity.

In addition, the House-passed climate investments provided incentives for energy-efficient all-electric appliances and buildings to help reduce upfront costs and make the technologies affordable for more people.[3] These investments would reduce overall energy consumed across the United States, lowering consumer energy bills and improving health in communities due to decreased NOx pollution. For example:

- High efficiency electric home rebates, with targeted investments specifically for low- and moderate-income households, homes in multifamily buildings, and upgrades in underserved and Tribal communities.
- Home Owner Managing Energy Savings (HOMES) Rebates for efficiency retrofit measures that are based on the amount of energy savings provided, with additional incentives for contractors.
- Home Energy Performance-Based Contractor Training Grants that support contractors transitioning to the high-efficiency economy through on-line and in-person training courses.
- Other investments in efficiency upgrades for public housing, affordable housing projects, rural rental housing, public buildings, tribal community housing, and public schools. In addition to funding efficiency upgrades, these investments would also support indoor air quality and increased climate resilience.

Plains Institute, December 6, 2021, https://betterenergy.org/blog/electric-vehicle-programs-in-the-bipartisan-infrastructure-bill/.

[3] Energy Innovation, "Electric Vehicle Incentives in the Build Back Better Act: Provisions Will Save Consumers Money, Boost U.S. Manufacturing, And Protect Public Health," November 2021, https://energyinnovation.org/wp-content/uploads/2021/11/Electric-Vehicle-Incentives-in-the-Build-Back-Better-Act.pdf.

Ensuring more Americans benefit from energy-efficient technologies while shifting our economy to be more energy-efficient requires a combination of policies that address extant barriers to uptake, while also creating the market conditions that make it easy and affordable to choose the more energy-efficient option. The BIL is a good start, but the House-passed climate provisions are still needed to achieve these goals.

2. Could you please describe how efficient electrification could save money for consumers in communities throughout the United States?

Numerous studies show that consumers will save money with electrification:

- Energy Innovation, GridLab, and University of California, Berkeley's 2035 2.0 Report modeling showed that a high electrification transportation scenario powered by a clean grid[4] would create $2.7 trillion in consumer savings through 2050—equivalent to an average U.S. household saving $1,000 per year for the next 30 years. This analysis also accounted for the costs of grid upgrades that may be necessary due to increased electrification and a decarbonized grid.
- Energy Innovation analysis shows that electric vehicles are cheaper to own and finance from day one in most states compared to gasoline-powered counterparts including purchase price, financing, taxes, incentives, maintenance, and operational fueling or charging costs. These savings are contingent the existing federal EV tax credit; if EV incentives in the House-passed climate investments are included then EVs become cheaper in nearly every instance, opening up ownership for all Americans looking to purchase a new car.[5]
- Rewiring America found that 87 percent of U.S. households would save money on their bills through household electrification (104.7 million of 120.7 million households).
    - The average U.S. household would save $356 per year on their energy bills through electrification, for $37.3 billion in collective annual savings.
    - 45 percent of households saving money would be low- and moderate-income, many of which would average $444 in annual savings.
    - Households currently using electric resistance, fuel oil, or propane would average $451 in annual savings.
- Energy-efficient all-electric new construction also offer consumer savings. RMI found that new all-electric homes save consumers on a net present basis and result in long-term energy savings in nearly all cases (the study was conducted across seven American cities with differing climatic conditions). I'd refer you to my written testimony for more details and the link to the full study.

Despite their cost-saving potential, higher upfront costs of efficient all-electric technologies are still a deterrent for many consumers. As such, incentives combined with rigorous performance standards can reduce upfront costs, thus enabling more people to benefit from technologies as they gain market maturity. As noted above, Energy Innovation research shows that federal incentives are necessary for

[4] The DRIVE Clean Scenario: 100% of new passenger vehicles in 2030 would be EVs and 100% of new medium- and heavy-duty trucks would be EVs in 2035. Amol Phadke and Nikit Abhyankar, "2035 2.0 Report," April 2021, https://www.2035report.com/transportation/.

[5] Orvis, "Most Electric Vehicles Are Cheaper to Own Off the Lot than Gas Cars" (Energy Innovation, May 2022), https://energyinnovation.org/wp-content/uploads/2022/05/Most-Electric-Vehicles-Are-Cheaper-Off-The-Lot-Than-Gas-Cars.pdf.

consumers to experience the monthly bill benefits of purchasing electric passenger vehicles.[6] Without these incentives, consumer savings will be left on the table as energy costs rise.

3. Could you please describe how consumers benefit when local governments are free to make decisions that support clean energy and the beneficial electrification of homes, businesses, and vehicles? From your perspective, how could a local government's decision to ban fossil gas hookups actually increase the reliability and affordability of energy for consumers?

Decisions made at the local level directly impact residents' health and well-being as well as community-level resilience. Local governments can also have an outsized impact on emissions. Buildings and transportation currently constitute 13 percent and 27 percent of the U.S. greenhouse gas emissions inventory, respectively.[7] Local governments influence how buildings in their jurisdiction are built since they create the rules governing construction, permitting, inspections, and in some cases utility interconnections. They also influence different types of mobility and the adoption of cleaner vehicles through planning, zoning, incentives, regulations, and educational campaigns. Local building and transportation policies thus have huge potential to slow climate change, bolster resilience, reduce energy and water consumption, multiply consumer savings, and expand jobs and economic development.

Across the country, local governments are adopting clean energy, air quality, environmental justice, and climate goals and using the tools at their disposal to achieve these goals. In the process of assessing local air pollution, many of these governments are realizing that continued fossil fuels reliance will prevent them from achieving their climate goals while adversely impacting their constituents' health and well-being. Many local governments are influencing the adoption of clean electricity and electrified end-uses, along with distributed resources that improve resilience in the face of climate disasters. Achieving these goals at the local level directly impacts consumers, by saving money on energy bills and greater overall community sustainability and resilience. When local governments can choose the course that best fits their priorities, based on the will of their electorate and citizens, they benefit consumers where they live.

To the second part of the question, increased electrification increases grid reliability by enabling demand-side measures that can reduce and manage electricity load, especially during times of grid strain. Whether through programmable thermostats, smart appliances, automated settings responsive to price signals, or vehicle-to-grid charging, technologies are increasingly expanding opportunities to improve grid reliability via electrified end-uses.

Although the rates paid for electricity, natural gas, and other fuels are not determined by local governments (they are far more influenced by state and federal government actions as well as international market forces), local actions to adopt energy-efficient equipment and construct energy-efficient buildings can reduce energy demand and lower monthly energy bills for consumers. Finally, the cost of electricity per unit of energy sold can potentially decrease as the economy electrifies. E3 analysis showed that grid investments required to support the high electrification scenario powered by a clean

[6] Orvis, "Most Electric Vehicles Are Cheaper to Own Off the Lot than Gas Cars."

[7] The 13 percent of greenhouse gas emissions attributed to commercial and residential buildings accounts for both direct (e.g., onsite natural gas combustion) and indirect (e.g., offsite emissions associated with consumed electricity) greenhouse gas emissions. U.S. Environmental Protection Agency, "Sources of Greenhouse Gas Emissions," n.d., https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions.

grid modeled in the 2035 2.0 report would have a nominal impact on rates and could even reduce the overall cost per unit of electricity.[8]

4. **Could you please explain how the normal turnover in appliances and equipment due to their average life expectancy could help reduce any cost impacts to consumers of switching to electric appliances and equipment? How could Federal policy reduce that cost impact even further to make it even easier for consumers to switch to electric appliances and equipment?**

Electrification is an immediately available climate solution that can occur as appliances, vehicles, and equipment are replaced due to old age—the average life of most building appliances, equipment, and vehicles is 10-20 years. An average consumer can switch to all-electric alternatives without replacing all equipment and machines at once. Rather, they can do so as the equipment ages out. The expenses incurred to replace those machines can go towards adopting more energy-efficient options that save consumers over the life of the equipment or vehicle. At the time of replacement, the impact should be measured not in the total cost of the replacement (which they would have to do regardless), but in the incremental cost of the all-electric alternative.

Bringing down this incremental cost with incentives can help efficient all-electric options compete on a level playing field with their fossil fuel-powered alternatives. Incentives that help the efficient appliances or vehicles 'break even' with their fossil fueled counterpart are most effective at influencing the consumer purchasing decisions. Efforts to bring down the upfront cost also impact financing and the monthly cost of ownership, which concerns many consumers. A federal policy can make it even easier to switch to electric appliances and equipment by influencing uptake at the point of purchase, ensuring the all-electric option breaks even with its fossil fueled counterpart, and by accounting for the real-life monthly cost of ownership. Ideally, consumers should see no net upfront cost difference when choosing the all-electric option over the fossil-fueled option.

Federal policy can also help ensure more options are in the market, supporting greater competition which will further reduce upfront costs. Incentives for manufacturers, distributors, and contractors to produce ample efficient electric appliances and equipment such as heat pumps helps meet consumer demand and reduces upfront costs. Consumer incentives provide assurance to manufacturers that increased market demand will exist for their products, prompting them to ramp up production.

The House-passed climate provisions mentioned above would jumpstart the market for all-electric appliances and EVs, while also providing support for contractor training, domestic manufacturing, and supply-chain development.

5. **Any comparative analysis of the efficiency of residential heating options must be done carefully. Could you please explain in detail why electric residential heating systems could have greater efficiency than residential heating systems powered by distributed natural gas?**

From energy production to end-use, generating electricity using renewable energy like solar and wind to power efficient all-electric appliances is the most efficient mode of powering end-uses. Renewable

[8] Eric Cutter and Emily Rogers, "2035 2.0 Report Appendix: Distribution Grid Cost Impacts Driven by Transportation Electrification" (E3 - Energy and Environmental Economics, n.d.), http://www.2035report.com/transportation/wp-content/uploads/2020/05/2035-Transportation-Dist-Cost.pdf?hsCtaTracking=56dd694b-3158-4ad9-8c8e-11c00a78e98f%7C4ffcaa0e-5eee-4028-87ac-cccdd080ced4.

energy is around 97 to 98 percent efficient (meaning they do not generate much wasted energy in the form or heat or other losses to produce a kilowatt-hour of electricity). When renewable energy is stored in batteries and dispatched for later use, it enjoys a roundtrip battery efficiency anywhere from 85 to 90 percent.[9] Comparatively, producing electricity with natural gas ranges from 40 to 60 percent energy-efficient.[10] Regardless of source, the transmission and distribution of electricity results in approximately 5 percent energy loss in the process, which impacts overall efficiency.[11] The natural gas transmission and distribution network incurs around 3 percent losses due to leakage.

Equipment and appliance efficiency also impacts overall lifecycle efficiency. As noted in my testimony, highly efficient all-electric technologies are two to four times more energy-efficient than fossil-fuel counterparts. Determining the lifecycle efficiency of different energy sources for different end-uses, and the assumptions made about transmission and distribution losses, impacts the resulting efficiency figures. For example:

- Using the federal minimum standard for air source heat pumps of 260 percent, and the natural gas production efficiency numbers from the American Gas Association (AGA) report cited in Mr. Schryver's testimony,[12] electric space heating from air source heat pumps powered by 100 percent natural gas, results in a 105 percent lifecycle efficiency. Comparatively, using 100 percent natural gas to fuel a high efficiency (97 percent efficiency)[13] natural gas furnace would result in an 88.8 percent lifecycle efficiency.
- Using 100 renewable energy to power the same air source heat pump (260 percent efficient) would result in a lifecycle efficiency of 240 percent—almost three times more energy-efficient than heating with a gas distribution system fueling a gas furnace.
- The energy trajectory efficiency of energy delivered to the home in AGA's report, which does not include end-use device efficiency, shows that electricity generated by renewable energy results in a cumulative efficiency of around 92 percent, compared with natural gas-based electricity's cumulative efficiency of around 41 percent.[14]

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[9] Susan Tierney and Lori Bird, "Setting the Record Straight About Renewable Energy," May 12, 2020, https://www.wri.org/insights/setting-record-straight-about-renewable-energy.

[10] A standard natural gas turbine for power generation has an efficiency ranging from 40 to 60 percent. Combined-cycle turbines, which provide 85 percent of U.S. natural gas-fired electricity, account for the higher end of the efficiency range. U.S. Energy Information Administration, "Natural Gas Generators Make up Largest Share of U.S. Electricity Generation Capacity," October 16, 2020, https://www.eia.gov/todayinenergy/detail.php?id=45496. Natural gas combined heat and power (CHP) systems achieve higher efficiencies of 80 percent or more. Steven Nadel, "Natural Gas Energy Efficiency: Progress and Opportunities" (American Council for an Energy-Efficient Economy, July 2017), https://www.aceee.org/sites/default/files/publications/researchreports/u1708.pdf.

[11] U.S. Energy Information Administration, "How Much Electricity Is Lost in Electricity Transmission and Distribution in the United States?," November 4, 2021, https://www.eia.gov/tools/faqs/faq.php?id=105&t=3.

[12] "A Comparison of Energy Use, Operating Costs, and Carbon Dioxide Emissions of Home Appliances 2021 Update" (American Gas Association, October 1, 2021), https://www.aga.org/globalassets/research--insights/reports/ea-2021-04-appliance-cost-and-emissions-comparison-2021.pdf.

[13] Based on EIA estimates of existing stock, the average efficiency of a natural gas furnace is 90 percent. U.S. Energy Information Administration, "Annual Energy Outlook 2022," March 3, 2022, https://www.eia.gov/outlooks/aeo/data/browser/#/?id=30-AEO2022&cases=ref2022&sourcekey=0.

[14] "A Comparison of Energy Use, Operating Costs, and Carbon Dioxide Emissions of Home Appliances 2021 Update."

- According to the same AGA report, the end-use of the appliance impacts the overall lifecycle efficiency (emphasis added):

> "For new residential applications, full-fuel-cycle efficiency will be 74 percent for the natural gas space heating option that meets the minimum efficiency rating of 0.80. For electric heat pumps, whose federal minimum standard for fuel utilization efficiency is about 260 percent, the full-fuel-cycle efficiency will be about 98 percent. Less efficient electric resistance heating has a full-fuel-cycle heating efficiency of only 39 percent. The full- fuel-cycle efficiency for an oil furnace averages about 67 percent, due to an energy trajectory efficiency of 84 percent. The propane furnace full-fuel-cycle efficiency measure is also 70 percent. Again, these efficiencies reflect the total of all losses from extraction, processing, transportation, conversion, distribution, and end use of the natural gas, electric, oil, and propane systems."[15]

In summary, the combined energy efficiency of electricity generated from renewable energy and efficient all-electric appliances used for space heating is the most energy-efficient mode of space heating—and this will only increase as the grid becomes increasingly clean and modernized.

6. The reliability of our energy systems is important to maintaining health, safety, and a high quality of life for American families. Could you please expand on how energy efficiency and electrification investments can enhance the reliability of the electric grid? How does a reliable electric grid help unlock the efficiency benefits of electrification?

The U.S. electricity grid and many of its largest utilities and grid operators are subject to numerous regulations and oversight that serve to ensure reliability and affordability. The established National Electricity Reliability Council (NERC) Reliability Standards define the reliability requirements for planning and operating the North American bulk power system that focuses on performance, risk management, and entity capabilities.[16]

According to the latest U.S. Energy Information Administration data, the U.S. electricity grid was fully operational and reliable for the average customer 99.9 percent of the time in 2020.[17] That same year, during the limited time the grid was down for the average U.S. customer, 75 percent of outages were due to major weather events (hurricanes, snowstorms, wildfires)—these climate-related events are only getting worse as we delay climate action. Electrification and efficiency can further enhance reliability by deploying new and existing technologies, while also providing a clear climate solution that can be scaled within this decade:

- Widespread adoption of high-efficiency electric stoves, water heaters, and heat pumps reduces energy waste and overall demand for electricity. Generation resources allocated to serve peak demand can be utilized less frequently, thus ensuring greater longevity of existing capacity and other grid infrastructure components, such as transmission lines and substations.

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[15] "A Comparison of Energy Use, Operating Costs, and Carbon Dioxide Emissions of Home Appliances 2021 Update."

[16] North American Electric Reliability corporation, "NERC Standards," n.d., https://www.nerc.com/pa/Stand/Pages/default.aspx.

[17] U.S. Energy Information Administration, "U.S. Electricity Customers Experienced Eight Hours of Power Interruptions in 2020," November 10, 2021, https://www.eia.gov/todayinenergy/detail.php?id=50316.

- Electrification provides many opportunities for demand-side measures that enhance reliability. For example, some electric appliances can be programmed to respond to grid conditions and price signals. Others, such as energy-efficient air conditioners, can provide valuable grid services via demand response programs.[18] New smart grid funding from the BIL will support continued deployment of these functions and capabilities at scale.[19]
- The increasing number of extreme weather events requires a greater attention to resiliency, and all-electric equipment can be powered directly by distributed and community renewable energy and battery storage to increase resilience when the grid goes down.
- Winter Storm Uri in Texas was largely due to an overreliance on natural gas that failed in the storm due to lack of appropriate weatherization of equipment. Such failures were chiefly responsible for and exacerbated the power outage.[20]
- Most natural gas appliances and modern gas furnaces rely on electricity to operate, even though their primary fuel source is gas. This means that heating with natural gas does not obviate consumer impacts during an outage. For most gas appliances, an electric power outage also renders gas appliances inoperable, and reliability of the gas system does not translate to reliability of using gas-burning appliances. The same is true for gas stations—you cannot pump gas if the power goes out.

Fortunately, the BIL also includes $65 billion in funding to upgrade the grid and bolster grid reliability going forward. This and numerous ongoing efforts by utilities and regulators across the country will ensure our electric grid remains strong, reliable, and resilient.

7. How would maximizing electrification as a climate solution reduce greenhouse gas pollution from the U.S. consistent with limiting average global warming to 1.5 degrees C?

According to several studies, an 80 percent clean grid by 2030 is achievable and would not compromise grid reliability nor affordability.[21] A decarbonized electric grid is the lynchpin to broader economywide decarbonization as we electrify more sectors and end uses; indeed it is the most scalable and affordable pathway to align with a 1.5 degree C climate stable pathway. Rather than wait for a not-yet-existing technology breakthrough or commercializing expensive alternatives, electrification offers a near-term route to decarbonizing sectors still reliant on fossil fuels: namely, the building sector, ground transportation, and much of industry.

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[18] Justin Brant, "Grid-Interactive Efficient Buildings: Providing Energy Demand Flexibility for Utilities in the Southwest" (Southwest Energy Efficiency Project, August 2019), http://swenergy.org/pubs/grid-interactive-efficient-buildings-report.

[19] Ellie Long, "Here's How the Infrastructure Bill Improves The Grid," November 22, 2021, https://www.ase.org/blog/heres-how-infrastructure-bill-improves-grid.

[20] Dan Esposito and Eric Gimon, "The Texas Big Freeze: How a Changing Climate Pushed the State's Power Grid to the Brink," UtilityDive, June 2, 2021, https://www.utilitydive.com/news/the-texas-big-freeze-how-a-changing-climate-pushed-the-states-power-grid/601098/. and

[21] Dan Esposito, "Studies Agree 80 Percent Clean Electricity By 2030 Would Save Lives And Create Jobs At Minimal Cost" (Energy Innovation, September 7, 2021), https://energyinnovation.org/publication/studies-agree-80-percent-clean-electricity-by-2030-would-save-lives-and-create-jobs-at-minimal-cost/.

As noted in my testimony, Energy Innovation modeling with our Energy Policy Simulator shows which sectoral policies would put the U.S. on a 1.5 degree Celsius climate stable pathway through electrification and bring other benefits, for example:

- Buildings: reaching a 100 percent electric appliance sales standard by 2030 would cut 530 million metric tons (MMT) of carbon dioxide per year by 2050, contributing 10 percent of the overall emissions reductions needed to meet the U.S. NDC by 2050.
- Transportation: Achieving 100 percent EV sales for passenger vehicles, medium- and heavy-duty trucks, and buses by 2035 would reduce emissions by 821 MMT per year by 2050, or 16 percent of total emissions reductions needed to meet the U.S. NDC by 2050. This would save consumers $2.7 trillion dollars through 2050.[22]
- Industry: Electrification, paired with supplemental green hydrogen, can reduce emissions by 1,325 MMT per year by 2050, or more than 25 percent of total emissions reductions needed to meet the U.S. NDC by 2050.

8. American innovation is one of our greatest strengths. Could you please expand on how the electrified technologies you mentioned in your testimony are innovative and more efficient improvements over last century's fossil fuel-powered cars and appliances?

Electric technologies are efficient by design. Heat pumps move heat rather than burn fuel to heat or cool space and water. Induction stoves transfer heat directly to pans rather than first letting it dissipate into the air along with harmful air pollution from burning fossil fuels. In vehicles, removing combustion technology to instead rely only on battery storage reduces vehicle weight and total moving parts, thus reducing maintenance expenses and overall wear and tear over the vehicle's lifetime. Relying on battery charging means that users can charge their vehicle at times that suit them—overnight when it's parked in the garage or along the street, at the store as they shop, at work, or any other time the vehicle is parked (assuming charging is available). The new era of technologies has advantages of comfort, performance, and in many cases, long-term affordability. Their biggest advantage, however, is mitigating climate change while improving air quality and creating jobs.

9. How could American leadership on efficient electrification help encourage other countries to follow our example? Could American innovation and exports of clean and electrified technologies facilitate faster adoption of climate solutions in other countries?

As one of the world's top GHG emitters, the actions we take to reduce emissions and lead by example send a strong signal to other countries that we are committed to being part of the global solution to climate change. However, the U.S. must ramp up efforts to remain competitive. From 2010 through 2020, China manufactured the largest proportion of EVs globally at 44 percent, while Europe produced 25 percent. By 2020, the U.S. had manufactured only 18 percent of the global EV stock, a decrease from 20 percent in 2017.[23] Failure to stimulate domestic manufacturing of EVs and batteries, along with clean technology supply chains, will hinder our ability to lead in these critical markets.

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[22] Amol Phadke and Nikit Abhyankar, "2035 2.0 Report," April 2021,https://www.2035report.com/transportation/.
[23] "Update on Electric Vehicle Costs in the United States through 2030," *International Council on Clean Transportation* (blog), accessed April 19, 2022, https://theicct.org/publication/update-on-electric-vehicle-costs-in-the-united-states-through-2030/.

Continued federal leadership can leverage the full capabilities of our domestic manufacturing industries and position the U.S. as a global leader. For example, adopting federal incentives for manufacturers to support the deployment of 100 percent passenger EV manufacturing by 2035 will create jobs and increase affordability for U.S. consumers. Similarly, significantly ramping up manufacturing of heat pumps and heat pump water heaters would support growth of domestic jobs and enhance competitiveness in a clean, electrified future. Doubling down on fossil fuel technologies, on the other hand, would likely render us obsolete in a global economy moving away from fossil fuels and toward decarbonization technologies.

10. How could the EnergyStar program be updated to better support efficient electrification consistent with our national climate goals?

The U.S. Environmental Protection Agency's EnergyStar program recently removed gas-fired appliances from their "Most Efficient" designation, which affirms the efficiency advantage electric appliances have over gas appliances. However, their general Energy-Efficient Products for Consumers list still includes several gas appliances, which may confuse consumers considering which equipment to buy if they are seeking highly energy-efficient, price stable, and climate-friendly options. The EnergyStar program could align their future decision-making to recognize only high-efficiency electric appliances, including air source heat pumps, including those designated for cold climates, and geothermal heat pumps.

11. How could Federal energy efficiency investments promote American energy security? Could increased energy efficiency help reduce demand for globally traded fossil fuels with volatile prices?

The global oil and gas markets are in turmoil amidst the Russian invasion of Ukraine, leading the European Union and the U.S. to reduce reliance on Russian oil and gas. Temporary increases to domestic fossil fuel production are unlikely to offer reprieve, and continued fossil fuel extraction and production will hold the U.S. captive to the inherent volatility and insecurity associated with global energy markets. Reducing demand for these products, however, would have a dampening effect on prices, and limit the power of the petro-state dictators controlling their production and sale. The faster the U.S. moves toward energy-efficient electrification and generation of renewable electricity, the sooner we can achieve greater energy security at home and abroad.