

**TRANSPORTATION INVESTMENTS FOR
SOLVING THE CLIMATE CRISIS**

HEARING
BEFORE THE
**SELECT COMMITTEE ON THE
CLIMATE CRISIS**
HOUSE OF REPRESENTATIVES
ONE HUNDRED SEVENTEENTH CONGRESS

FIRST SESSION

HEARING HELD
JUNE 30, 2021

Serial No. 117-6



www.govinfo.gov

Printed for the use of the Select Committee on the Climate Crisis

U.S. GOVERNMENT PUBLISHING OFFICE

WASHINGTON : 2021

45-342

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CONTENTS

STATEMENTS OF MEMBERS OF CONGRESS

	Page
Hon. Kathy Castor, a Representative in Congress from the State of Florida, and Chair, Select Committee on the Climate Crisis:	
Opening Statement	1
Prepared Statement	3
Hon. Garret Graves, a Representative in Congress from the State of Lou- isiana, and Ranking Member, Select Committee on the Climate Crisis:	
Opening Statement	4

WITNESSES

Hon. Margaret Anderson Kelliher, Commissioner, Minnesota Department of Transportation	
Oral Statement	6
Prepared Statement	8
Bill Van Amburg, Executive Vice President, CALSTART	
Oral Statement	10
Prepared Statement	12
Robert Bryce, Visiting Fellow, Foundation for Research on Equal Opportunity	
Oral Statement	18
Prepared Statement	20
Beth Osborne, Director, Transportation for America	
Oral Statement	28
Prepared Statement	30

SUBMISSIONS FOR THE RECORD

Report from the White House Environmental Justice Advisory Council, <i>Final Recommendations: Justice40 Climate and Economic Justice Screening Tool & Executive Order 12898 Revisions</i> , submitted for the record by Mr. Cren- shaw	58
Report from Save on Energy, <i>The SaveOnEnergy.com® Electricity Bill Report: Who paid the most, least?</i> , submitted for the record by Ms. Brownley	58
Report from the University of California, Berkeley, Goldman School of Public Policy, <i>2035: The Report—Transportation Executive Summary</i> , submitted for the record by Ms. Castor	58

APPENDIX

Questions for the Record from Hon. Kathy Castor to Hon. Margaret Anderson Kelliher	59
Questions for the Record from Hon. Kathy Castor to Bill Van Amburg	64
Questions for the Record from Hon. Anthony Gonzalez to Robert Bryce	69
Questions for the Record from Hon. Kathy Castor to Beth Osborne	71
Questions for the Record from Hon. Garret Graves to Beth Osborne	73

TRANSPORTATION INVESTMENTS FOR SOLVING THE CLIMATE CRISIS

WEDNESDAY, JUNE 30, 2021

HOUSE OF REPRESENTATIVES,
SELECT COMMITTEE ON THE CLIMATE CRISIS,
Washington, DC.

The committee met, pursuant to call, at 1:35 p.m., in Room 210, Cannon House Office Building, Hon. Kathy Castor [chairwoman of the committee] presiding.

Present: Representatives Castor, Bonamici, Brownley, Huffman, McEachin, Casten, Neguse, Escobar, Graves, Palmer, Miller, Armstrong, Crenshaw, and Gonzalez.

Ms. CASTOR. The committee will come to order.

Without objection, the chair is authorized to declare a recess of the committee at any time.

Today, we will hold our first hybrid hearing with members appearing in person and remotely and witnesses appearing remotely.

Pursuant to the latest guidance from the attending physician, anyone present in the hearing room today must wear a mask covering their mouth and nose if they are not fully vaccinated. The committee has masks available for any member who needs one. It is my hope that with everyone's cooperation we can protect the safety of members and staff and their families at home, and continue to have more opportunities to work together in person.

As a reminder, members participating in the hearing remotely should be visible on camera throughout the hearing. Members appearing remotely are responsible for controlling their own microphones and can be muted by staff only to avoid inadvertent background noise. Statements, documents, or motions must be submitted to the electronic repository to SCCC.repository@mail.house.gov.

Finally, members or witnesses experiencing technical problems should inform the committee staff immediately.

Well, good afternoon. Thank you all for joining this hybrid hearing. Today, we will talk about transportation investments for solving the climate crisis. And I now recognize myself for 5 minutes for an opening statement.

Well, this week an extraordinary heat wave pummeled the West Coast while heavy rain fell across the central United States. Cable car power lines melted in Portland halting public transit. A highway flooded in Detroit stranding drivers. The hazards of the climate crisis on transportation was all too clear. So it is fitting today that our hearing will focus on transportation investments critical for solving the climate crisis.

And, you know, after World War II, our country and Congress made national infrastructure a priority. A network of roads, bridges, and transit systems connecting businesses and communities coast to coast. And at the time, it was an historic achievement that quite literally transformed our economy and the way we live. But that infrastructure no longer meets the challenges of today and the needs of the 21st century. More than 40 percent of our public roadways today are in poor or mediocre condition and more than 46,000 bridges across America are structurally deficient.

Motorists are spending nearly \$130 billion a year on extra repairs and costs, and they are forced to drive on deteriorating roads. Not only are roads and bridges in disrepair, our transportation sector is making these problems worse. The transportation sector is the top source of carbon pollution in the United States, accounting for nearly a third of all emissions in our country in 2019.

Ironically, our transportation infrastructure is both vulnerable to the impacts of climate change while contributing to its causes. We face another historic moment in our history: will we continue the failing status quo or, once again, transform and improve the way we live our lives? I think the answer is clear: We must respond with generational investments to help communities adapt and become more resilient to the challenges of the climate crisis at the same time that we modernize our transportation systems to cut carbon pollution and create new family sustaining jobs.

That means expanding manufacturing of American-made low- and zero-emission vehicles. It means investing in a national network of chargers to make electric vehicles a reality for millions of Americans. It means investing in public transit and redesigning roads that are safe for walking and biking. And we must not repeat the mistakes and injustices of the past.

Communities of color and low-income communities suffer the consequences of climate disruptions disproportionately. When extreme weather hits, the harshest impacts are felt by Americans who have limited access to transportation and other essential community services, or who are already facing economic hardship.

What is worse, the same Americans already face harsher climate risks, including the negative health outcomes associated with poor air quality. And in many cases, they are the same Americans whose communities were divided as highways were paved right through their neighborhoods. That is why as we invest in 21st century infrastructure, we must center environmental justice. We must heal the harms of the past using this opportunity to elevate historically excluded communities.

But thankfully we have solutions at hand. The INVEST in America Act, which the House is debating today, takes important steps to clean up our transportation sector, including investing more than \$8 billion in highway transit and rail projects that will reduce carbon pollution. It also invests in programs to mitigate the threats posed by extreme weather before disasters strike and it will expand clean transportation choices for millions of Americans. It is all part of President Biden's vision for solving the climate crisis which he outlined earlier this year in the American Jobs Plan.

As a major pillar of the plan, President Biden has called on Congress to make a historic investment in world-class transportation

infrastructure as we also enter justice for vulnerable Americans and lead America to our clean energy future. Today, we will discuss how we can use this historic opportunity to modernize the transportation sector in a way that reduces pollution, builds resilience, centers environmental justice, and strengthens our economy. So I look forward to our discussion.

At this time, the chair now recognizes the Ranking Member, Mr. Graves of Louisiana, for 5 minutes for an opening statement.

[The statement of Ms. Castor follows:]

Opening Statement of Chair Kathy Castor
Hearing on “Transportation Investments for Solving the Climate Crisis”

Select Committee on the Climate Crisis

June 30, 2021

As prepared for delivery

This week an extraordinary heatwave pummeled the West Coast while heavy rain fell across the central United States. Cable car power lines melted in Portland, halting public transit. A highway flooded in Detroit, stranding drivers. The hazards of the climate crisis on transportation was all too clear. So it is fitting today that our hearing will focus on transportation investments critical for solving the climate crisis.

After World War II, our country and Congress made national infrastructure a priority—a network of roads, bridges, and transit systems connecting businesses and communities coast to coast. At the time, it was an historic achievement that quite literally transformed our economy and the way we lived.

But that infrastructure no longer meets the challenges of today and the needs of the 21st century. More than 40 percent of our public roadways today are in poor or mediocre condition and more than 46,000 bridges across America are structurally deficient. Motorists are spending nearly 130 billion dollars a year on extra repairs and costs, as they’re forced to drive on deteriorating roads.

Not only are our roads and bridges in disrepair, our transportation sector is making these problems worse. The transportation sector is the top source of carbon pollution in the United States, accounting for nearly a third of all emissions in our country in 2019. Ironically, our transportation infrastructure is both vulnerable to the impacts of climate change while contributing to its causes.

We face another historic moment in our history, will we continue the failing status quo, or once again transform and improve the way we live our lives?

I think the answer is clear: we must respond with generational investments to help communities adapt and become more resilient to the challenges of the climate crisis at the same time that we modernize our transportation systems to cut carbon pollution and create new family sustaining jobs.

That means expanding manufacturing of American-made low- and zero-emission vehicles. It means investing in a national network of chargers to make electric vehicles a reality for millions of Americans. It means investing in public transit and re-designing roads that are safe for walking and biking.

And we must not repeat the mistakes and the injustices of the past. Communities of color and low-income communities suffer the consequences of climate disruptions disproportionately. When extreme weather hits, the harshest impacts are felt by Americans who have limited access to transportation and other essential community services, or who are already facing economic hardship.

What’s worse, these same Americans already face harsher climate risks, including the negative health outcomes associated with poor air quality. And in many cases, they’re the same Americans whose communities were divided as highways were paved right through their neighborhoods. That’s why, as we invest in 21st century infrastructure, we must center environmental justice. We must heal past harms, using this opportunity to elevate historically-excluded communities.

Thankfully, we have solutions at hand. The INVEST In America Act, which the House is debating today, takes important steps to clean up our transportation sector, including investing more than 8 billion-dollars in highway, transit, and rail projects that will reduce carbon pollution. It also invests in programs to mitigate the threats posed by extreme weather before disasters strike, and it will expand clean transportation choices for millions of Americans.

It's all part of President Biden's vision for solving the climate crisis, which he outlined earlier this year in the American Jobs Plan. As a major pillar of the plan, President Biden has called on Congress to make a historic investment in world-class transportation infrastructure, as we also ensure justice for vulnerable Americans and lead America to our clean energy future.

Today, we'll discuss how we can use this historic opportunity to modernize the transportation sector in a way that reduces pollution, builds resilience, centers environmental justice, and strengthens our economy. I look forward to our discussion.

Mr. GRAVES. Thank you, Madam Chair. And Madam Chair, I want to apologize for being tardy today. Mr. Palmer told me the hearing started at 1:35 and he apparently told Mr. Armstrong it started at 1:40. I apologize for that.

Seriously, great to be here today. This is a really important topic and good to see some of the witnesses, including fellow Louisianan and former co-worker, Ms. Osborne. Good to see you today. Looking forward to hearing from you.

Madam Chair, as you noted in your opening statement, the extraordinary progress we have made in the energy sector in terms of reducing emissions and keeping costs down and continuing to largely meet the need of U.S. energy demand, it has been extraordinary within the power sector. As a matter of fact, as a result of some of the efforts that have taken place in the power sector, the United States is leading the world in reducing emissions. And as we have discussed here on numerous occasions, we have reduced emissions in the power sector in the United States more than the next 12 emissions reducing countries combined. And I do believe, as we move forward, we have much opportunity in the transportation sector to see some important and great successes.

As a matter of fact, I want to thank Chairman DeFazio on the transportation bill that is under consideration on the floor just this week. I know it was something that my friend Mr. Huffman is really excited about, a provision that is in that bill that that would actually revolutionize the transportation planning by taking anonymous and aggregate data, from perhaps companies like Uber and other TNCs, and companies like Waze and Google, which are the same thing.

And taking aggregate data and looking at folks—where folks are originating their routes, and where they are destined to, where they are trying to get to and figuring out, instead of just laying that rubber hose down in roads and saying, hey, we need a new lane here, more capacity, and just laying more concrete or asphalt and adding more roads. Instead, let me say it again, revolutionizing transportation planning by saying where are people trying to start their destination, where they trying to end it, and let's build roads in those places, trying to more efficiently connect people where you get lower emissions, you get greater fuel efficiency, and you get significantly less miles driven.

So Mr. Huffman, I know you are a big supporter of that. Another opportunity in the transportation sector that is being advanced under the legislation under consideration on the House floor is one that would do a better job trying to communicate to ITS systems and traffic lights that let the lights know how many cars are coming in different directions that way you can begin setting proportional red and green lights and arrows and things like that that way you don't have all the stopping and starting of cars which is

where you have the greatest emissions is in that acceleration process.

So, look, I know that the main focus has been on electrifying our vehicles and moving to EVs, which clearly long-term is an important part of a lower emission strategy, but there are other technologies that we must keep in play because I do think when you look at the existing state of technology and the performance of these vehicles, you have got some big challenges.

Look, Ms. Osborne and I are from south Louisiana and, as you know, you got a lot of trucks pulling boats around going fishing in the Gulf of Mexico and the current capabilities of EVs pulling a load like that, you can get in your new electric vehicle and you can drive your boat pulling it both miles and then you can get back out and charge it again and get moving.

In fact, not just the lack of capacity or power density, even though that has improved in recent years for electric vehicles, but the amount of time it is going to take to charge, even a fast charge, when you have it. And there are only 4,000 charging stations around the country today that have the full capacity to do the full quick charge. I believe you are still looking at 45 minutes.

Well, consumers aren't going to accept lower—and I was being a little dramatic on my 2 miles of driving pulling a boat, but it is significantly less than a gasoline vehicle today. The performance comparison is not going to be accepted by consumers. So we must continue innovating and continue looking at other options like fuel cell vehicles.

When this plays out, we have got to make sure that we are looking from A to Z at the energy supply chain. Looking at the fact that you are going to have to have roads and strategic minerals, looking at the fact that you are going to have more impacts on roads. For example, just the battery set for the new Hummer is 2,500 pounds, which according to my math which Mr. Huffman is going to correct me on, is around 14 additional passengers. That is the equivalent—14 additional passengers, which then puts more impact on roads because of the weight of the vehicles.

How are we going to address all of these issues looking holistically? Supply chain, not having China steal our intellectual property, making sure that we have performance that is comparable to existing combustion engines, and other factors that must be considered end to end to ensure we are truly moving in a right direction that is acceptable to consumers and keeps the trajectory of lower emissions.

So, Madam Chair, thank you. Appreciate you having this hearing. Looking forward to witness testimony.

Yield back.

Ms. CASTOR. Without objection, members who wish to enter opening statements into the record may have 5 business days to do so.

Now, I would like to welcome our witnesses. We will hear from a panel of experts and practitioners about how investments in transportation infrastructure can curb harmful pollution, increase climate resilience, redress historical inequities, and increase quality of life in our communities.

First, the Honorable Margaret Anderson Kelliher is the Commissioner of the Minnesota Department of Transportation. She pre-

viously served in the Minnesota House of Representatives for 12 years, including 4 years as Speaker, and has served as the President of the Minnesota High Tech Association and Chair of the Governor's Broadband Task Force.

Mr. Bill Van Amburg is the Executive Vice President of CALSTART, a national nonprofit focused on accelerating clean transportation. Mr. Van Amburg leads CALSTART's initiative on medium- and heavy-duty trucks and off-road equipment. His teams operate projects in multiple states and with the U.S. Army.

Mr. Robert Bryce is a Visiting Fellow at the Foundation For Research on Equal Opportunity and a Texas-based author, journalist, podcaster, film producer, and public speaker. He spent 12 years as a reporter for the Austin Chronicle and was the managing editor of the Houston-based Energy Tribune. From 2010 to 2019, he was a Senior Fellow at the Manhattan Institute.

Ms. Beth Osborne is the Director of Transportation for America where she leads an alliance of leaders from across the country working to ensure that states and the Federal Government invest in smart, homegrown transportation solutions. She previously served as the acting Assistant Secretary for Transportation Policy at the U.S. Department of Transportation.

Without objection, the witnesses written statements will be made part of the record.

With that, Commissioner Anderson Kelliher, you are now recognized to give a 5-minute presentation of your testimony. Welcome.

STATEMENTS OF THE HONORABLE MARGARET ANDERSON KELLIHER, COMMISSIONER, MINNESOTA DEPARTMENT OF TRANSPORTATION; BILL VAN AMBURG, EXECUTIVE VICE PRESIDENT, CALSTART; ROBERT BRYCE, VISITING FELLOW, THE FOUNDATION FOR RESEARCH ON EQUAL OPPORTUNITY; AND BETH OSBORNE, DIRECTOR, TRANSPORTATION FOR AMERICA

**STATEMENT OF
THE HONORABLE MARGARET ANDERSON KELLIHER**

Ms. ANDERSON KELLIHER. Good afternoon, Chair Castor, Ranking Member Graves, and members of the subcommittee. Thank you for the opportunity to testify regarding transportation and climate effects in Minnesota.

My name is Margaret Anderson Kelliher, and I am honored to serve as the Commissioner of the Minnesota Department of Transportation. Climate change is already impacting Minnesota from our people, wildlife, plants, to waters, historic resources, outdoor recreation areas, and our infrastructure. Minnesota is getting warmer and wetter.

Average temperatures in Minnesota have increased by nearly three degrees Fahrenheit statewide. Warmer temperatures mean more maintenance costs, more dangerous ice on our roads, less time to transport heavy loads during the winter months. Extreme heat events are also a major concern and problem. This year alone we saw over 43 incidents of pavement buckling or exploding due to extreme heat already.

Minnesota is experiencing more damaging rains, 65 percent increase in the number of three-inch rain events, and mega rain events which are more than six inches are four times more frequent than the prior three decades.

Heavy precipitation creates many challenges and can literally wash away our roads and bridges or result in increased debris flow that causes bridges and culverts to fail. We also know that climate change does not impact all communities equally. Low-income people, often those who are Black, indigenous, and people of color, are the most likely to be negatively impacted despite contributing the least amount of carbon pollution.

MNDOT has dedicated resources to understanding the current and future climate change in our state and we are working to make our system more resilient in a way that centers on equity and public health. In particular, we are working to develop a statewide extreme flood vulnerability analysis tool to improve local, downscaled data for evaluating future flood risks to our bridges, large culverts, and pipes.

This helps us to make better data informed decisions about projects based on the likelihood and magnitude of climate risks and seriousness of factors such as traffic volumes, evacuation routes, access to medical services, freight needs, and detour lengths.

State Departments of Transportation are the primary agencies responsible for transportation, planning, and programming. We believe it is our responsibility to lead in reducing carbon pollution from transportation. Like the United States as a whole, transportation is the number one source of carbon pollution in Minnesota.

In 2017, MNDOT adopted greenhouse gas emission reduction goals for the transportation sector to align with statewide carbon and greenhouse gas emission goal reduction.

In 2019 and 2020, our MNDOT pathways to decarbonizing transportation project and our Sustainable Transportation Advisory Council engaged with the public-private nonprofit and citizen leaders and businesses to identify and implement strategies to reduce carbon pollution. We believe that long-term ongoing partnerships between the public and private sector can be a model to help avoid the most catastrophic consequences of climate change.

Today, MNDOT is leading the way on several initiatives, including setting a goal to reduce vehicle miles traveled, promoting electric vehicles, and EV charging, re-evaluating our approach to congestion management and deprioritizing lane capacity, which both induces demand and causes new costs to a woefully underfunded system. Minnesota is not on track to achieve our greenhouse gas emission goals. MNDOT is working hard to change that, but Federal support and partnership is needed, which is why we are encouraged by the proposals in the INVEST in America Act proposed by the House.

In 2016, we led a multi-state effort to encourage Federal Highway Administration to modernize performance measures. We are encouraged to see similar reporting considered now and encouraged to see Federal, technical, and financial support for states who do this as a new task. We recommend financial incentives rather than penalties for states that can develop the capacity.

The proposed new pre-disaster mitigation program would go a long way to help modernize Federal climate risk standards. We also encourage regular updates to historical data in Atlas-14 and Federal estimates of future climate data. We also need improved data and tools beyond Atlas-14 that are downscaled and consistently updated and actionable.

Of course, electric vehicle charging and infrastructure is critical as well, and we also support urging the consideration of broadband as transportation infrastructure.

Finally, we encourage Federal investment to improve accuracy of travel demand modeling and this will help us ensure more accurate travel forecast and help states achieve performance targets and make cost effective sustainable decisions for the use instead of the general purpose lane expansion.

Madam Chair and members, thank you for the opportunity to speak with you today. Future generations are relying on us to make these important decisions to address climate change and transportation. I will be happy to answer any questions.

[The statement of Ms. Anderson Kelliher follows:]

Testimony of

**Commissioner Margaret Anderson Kelliher
Minnesota Department of Transportation**

Transportation Investments for Solving the Climate Crisis

Before the

House Select Committee on the Climate Crisis

Wednesday, June 30, 2021

Introduction

Chair Castor (D–FL), Ranking Member Graves (R–LA), and Members of the Subcommittee, thank you for the opportunity to testify regarding transportation and climate action in Minnesota.

My name is Margaret Anderson Kelliher and I am honored to serve as Commissioner of the Minnesota Department of Transportation.

Climate change is already impacting Minnesota—from our wildlife and plants to our people, waters, historic resources, outdoor recreation areas, and infrastructure. Minnesota is getting warmer and wetter, and we are projected to be one of the states most impacted by climate change in the future.

According to the Minnesota State Climatology Office, average temperatures have increased by nearly three degrees Fahrenheit statewide. Our winter temperatures are warming even faster, resulting in fewer nights of extreme cold. These changes have real, costly impacts, such as increasing maintenance needs to address more dangerous ice on our roads and less time for freight operators to transport heavy loads, since highways are strongest during the cold winter months.

Extreme heat events are also a major safety problem—during the recent extreme heat just a few weeks ago, we saw *at least 43 incidents* of pavements buckling or exploding.

Minnesota is also experiencing more damaging rains, including a *65% increase* in the number of three-inch rain events and the frequency of mega rain events: widespread rains over six inches that are now *four times more frequent* than in the three decades prior. Heavy precipitation directly causes flooding that closes and damages roads and bridges; disrupts travel and commerce; creates slope and embankment failures from saturated soils, and can lead to debris flows that block or damage culverts and bridges and, in some cases, literally wash away roads and bridges.

We also know that climate change does not impact all communities equally. Low-income people and those who are Black, Indigenous, and people of color are most likely to be negatively impacted despite often contributing the least to carbon pollution.

Resilience

MnDOT has dedicated resources to understanding current and future climate change in our state and working to make the system more resilient in a way that centers equity and public health.

In particular, we are working to develop a Statewide Extreme Flood Vulnerability Analysis tool to improve local, downscaled data and processes for evaluating future flood risks to our bridges, large culverts, and pipes—and then make better, data-informed decisions about projects based on the likelihood and magnitude of climate risks and criticality of different roadways—factors such as evacuation routes, access to medical services, freight needs, and detour length.

Mitigation

State departments of transportation are the primary agencies responsible for transportation planning and programming and we believe it is our responsibility to lead in reducing transportation carbon pollution. Like the US as a whole, transportation is the number one source of carbon pollution in Minnesota.

- In 2017, MnDOT adopted greenhouse gas emission reduction goals for the transportation sector to align with statewide goals.
- In 2019, we launched a project called *Pathways to Decarbonizing Transportation* that engaged citizens and businesses. This effort resulted in the state pursuing low- and zero-emissions vehicle standards, creating incentives for electric vehicles, including climate change in the environmental review process, and supported development of low carbon biofuels.
- And in 2020, we created the *Sustainable Transportation Advisory Council*—a group of public, private, nonprofit, and citizen leaders and elected officials to advise the agency on strategies to reduce carbon pollution, promote economic development, and support equity.

We believe that this type of ongoing partnership between the public and private sector can be a model to help avoid the most catastrophic consequences of climate change. This advisory council is helping MnDOT lead the way on several initiatives, including setting a goal to reduce vehicle miles traveled, promoting electric vehicles and EV charging, re-evaluating our approaches to congestion, and de-prioritizing adding lane capacity, which can not only induce demand but also adds new costs to our woefully-underfunded system.

Federal Action

Minnesota is not currently on track to achieve our greenhouse gas emission reduction goals. MnDOT is working hard to change that, but federal support and partnership is needed—which is why we are encouraged by proposals in the INVEST in America Act proposed by the House.

- In 2016, MnDOT led a multi-state effort to encourage the Federal Highway Administration to modernize performance measures to include reporting greenhouse gas emissions and are encouraged to see similar reporting reconsidered now. While some agencies have developed the internal capacity for this type of reporting, it will be new to others. We encourage federal technical and financial support for states to whom this is new and recommend financial incentives rather than penalties as states develop this capacity.
- Modernizing federal climate risk standards and tools is also critical as these directly impact state and local transportation investments. The proposed new pre-disaster mitigation program would provide much needed investment for this national issue. We also encourage updating the federal flood risk standard to shift from the 100-year, or 1%, risk to focus on the number of feet above the base flood, updating the 100-year flood risk more regularly, and estimating the future 100-year flood risk level for the future. We need improved data and tools beyond Atlas-14 that are downscaled, consistently updated, and actionable.
- Electric vehicle charging, transit, and infrastructure for people walking and biking are critical to meeting our climate goals. Minnesota welcomes new federal EV infrastructure investment to expand our network of charging stations in a way that benefits the electric grid and electricity rate payers to ensure benefits of EVs are widespread and support climate and equity goals for transportation and electricity generation.
- EVs alone will not provide the carbon reduction needed or address the inequities of our current transportation system that requires people to own a personal vehicle to have convenient and affordable access to jobs, worship, education, and recreation. We support increases in safe and frequent transit service, infrastructure and non-infrastructure funding for biking and walking, and consideration of broadband as transportation infrastructure. The COVID-19 pandemic has shown the potential for internet access to reduce and shift travel patterns.

- Finally, we encourage federal investment in improving the accuracy of travel demand modeling to ensure more accurate travel forecasts and better understanding of investment impacts. These tools will help projects achieve performance targets and make cost effective, sustainable decisions in place of general-purpose lane expansion.

Madam Chair and Members, thank you for the opportunity to speak with you today. Future generations are relying on us to make important decisions today to seriously address climate change and transportation.

I would be happy to answer any questions.

Ms. CASTOR. Thank you, Commissioner.

Mr. Van Amburg, you are now recognized for 5 minutes to give a 5-minute presentation of your testimony. Welcome.

STATEMENT OF BILL VAN AMBURG

Mr. VAN AMBURG. Thank you very much. Chair Castor and Ranking Member Graves, distinguished members of the Select Committee, thank you for this opportunity to discuss transformative transportation policies that can combat the climate crisis.

I serve as the Executive Vice President of CALSTART, the nation's largest and oldest clean transportation technology industry consortia. Our mission is to create and support an industry that cuts emissions while creating good jobs. Our members, nearly 300, including all of America's major car, truck, and bus makers, plus the new electric only manufacturers, their major and emerging component suppliers, as well as leading U.S. fleets, utilities, and others.

Today, I want to stress the benefits of the product revolution emerging in zero-emission commercial vehicles, trucks, and buses, and their benefits beyond climate change. Spurring these technologies is critical to American technology leadership and competitiveness to creating good-paying jobs from assembly line to infrastructure installation and the reducing harmful air quality impacts from goods movement borne too long by disadvantaged communities. We have submitted detailed [inaudible] comments to the Select Committee just on these points to realize these benefits, the time to accelerate the deployment of zero-emission commercial vehicles congressional action.

Medium- and heavy-duty trucks represent only about 4 percent of total vehicles on the road worldwide, but they have an outsized contribution to climate and air emissions, including nearly 30 percent of on-road greenhouse gas emissions and between 60 and 70 percent of nitrogen oxides, or NOx, a major component of air pollution.

E-commerce adds to this, thus decarbonizing this relatively small number of vehicles provides big paybacks in emissions reductions. Second, truck manufacturers are bringing these zero-emission vehicles to the early market in low volumes sooner than many anticipated. Every major North American truck maker has zero-emission trucks in early production. Not just delivery vans, but also full class A big rig tractors used to haul goods around regions such as from ports to distribution sites.

Fleets are interested because these vehicles show the potential of a better business case. Now, CALSTART has developed a beach-head strategy to fast track this transformation by focusing on those

applications best suited for this success first, then moving into heavier and longer range segments next. Electric transit buses were America's beachhead. Now the technology is expanding to school buses and delivery and heavy distribution trucks.

Now, we have a tool to track the global number of models coming to market. By 2023, the available models will expand by 30 percent. Heavy-duty models will expand by 80 percent.

Third, global competition is not idle. Our global commercial vehicle drive to zero program allows us to track the significant Asian and European investments being made in infrastructure and purchase incentives, investments aimed at owning technology and manufacturing leadership for these nations.

So, fourth, there is a strong need for Federal leadership and a strong partnership with industry in the U.S. to support tech demonstration, to expand domestic manufacturing, and to incentivize our fleets to deploy these vehicles in communities that need them most.

Now, the Select Committee's majority staff report last year recommended several approaches that CALSTART's companies support, including the need to create commercial vehicle incentives, an approach we have long advocated and we are pleased to see included in the President's American Jobs Plan, as well as the need for charging and refueling infrastructure along highway corridors and manufacturing supply chain supports. Several of these recommendations are moving forward.

The INVEST in America Act proposes significant investment for the zero-emission bus grant program putting us on track to meet the deployments called for by Congresswoman Brownley's Green Bus Act of 2021. It also proposes robust funding for alternative fuel corridors and we thank the chair for her amendment to the INVEST in America Act to give states more flexibility to support the purchase of zero-emission commercial vehicles and infrastructure.

However, in the early market when volumes are low and costs are higher, there is nothing more critical than point of sale or cash in lieu of vehicle purchase incentives. Truck makers and fleets consistently tell us that traditional tax incentives do not influence commercial vehicle purchase decisions. Fleets need the vehicle cost reduced at the time of sale.

In our written testimony, we have described the success of this model at the state level in several states in which we have put this practice into play, but a truck purchased tax incentive coupled with direct pay component at the Federal level, as we recommend, would accelerate zero-emission fleet integration in all states, deploying nearly 480,000 clean trucks and buses providing the emissions equivalent to taking 4.5 million cars off the road and supporting 55,000 direct and indirect jobs over the next decade.

We thank the Select Committee for its good work to date, but really stress the important work yet to do. I look forward to answering questions.

[The statement of Mr. Van Amburg follows:]

Written Statement of
Bill Van Amburg
Executive Vice President
CALSTART
Before the
Select Committee on the Climate Crisis
United States House of Representatives
“Transportation Investments for Solving the Climate Crisis”
June 30, 2021

Chair Castor, Ranking Member Graves, and distinguished members of the Select Committee, thank you for this opportunity to speak with you today on the topics of climate change, transportation and clean air, and American jobs in the context of Congress’s ongoing consideration of infrastructure legislation this year.

I am Bill Van Amburg, Executive Vice President of CALSTART.¹ Today I will share some data on the technical and product revolution underway in zero-emission technologies for commercial vehicles—trucks and buses—and how these vehicles can play a major role in reducing the harmful effects of climate change.² But I also want to emphasize the co-benefits of this sector to our nation that go beyond the climate crisis. These vehicles are critical to American technical leadership and competitiveness. They provide a growing source of good-paying jobs, from assembly to supply chain to infrastructure installation, that are in many cases hyper-local. And importantly, these same technologies can cut to zero the pollution load born disproportionately by communities of color. We want to commend the good work this Committee and Congress have put in motion; but we also hope to make clear what still is left to be done.

For ease of organization, my statement will follow this structure: I will discuss CALSTART’s background and membership, provide an overview of the rapidly changing industry, and the “beachhead” strategy that helps to explain these vehicle’s rapid advancement and progression both domestically and globally, as well as some tools we use to help track that progress. Then I will turn to the need for federal leadership in zero-emission commercial vehicle policy, including some of the Committee’s own recommendations in this space; discuss some of CALSTART’s federal recommendations within the surface transportation process and in support of the Administration’s American Jobs Plan; and will close with a brief discussion of what is still left to do to advance our industry.

Background. CALSTART is the nation’s largest and oldest clean transportation technologies industry consortium. Nearly 300 companies and organizations are members of the CALSTART industry network.³ They range in size and role from:

- Major established car, truck and bus makers, such as Ford, General Motors, Toyota, Audi, Freightliner, Navistar-International, Volvo, Kenworth, Peterbilt and New Flyer;
- Innovative new electric manufacturers, such as Tesla, Rivian, Arrival, Proterra and Lion Electric;
- Leading companies in the automotive and truck component supply chain, where the bulk of the industry’s jobs reside, such as Eaton, Meritor, Dana, Siemens and Danfoss;
- The world’s leading fleets, such as UPS, FedEx, DHL, Pepsi-FritoLay, and Ikea; and
- A broad base of hundreds of small to mid-size technology companies who represent America’s powerful emerging supply chain for advanced, clean and zero-emission vehicles.

CALSTART’s non-profit (501(c)(3)) mission since its founding nearly 30 years ago has been to support and grow this clean transportation technology industry. Our mission and goals are even more resonant today than when we launched: to ensure we have both a healthy environment and a healthy economy. Jobs and clean air and climate action must go hand-in-hand. Our thirty years of experience show they can.

¹ See www.calstart.org

² <https://globaldrivetozero.org/site/wp-content/uploads/2021/05/How-Zero-Emission-Heavy-Duty-Trucks-Can-Be-Part-of-the-Climate-Solution.pdf>

³ See <https://calstart.org/members/>

By manufacturing and using the world’s cleanest vehicles, communities most impacted by transportation pollution can breathe free, while also working in good-paying jobs. Clean air for all citizens, high-quality jobs and economic opportunity, maintaining American technology leadership and competitiveness, cutting climate impacts today—this is what our industry is dedicated to.

With offices in New York, Florida, Michigan, Wisconsin, Colorado and headquarters in California, we support this industry’s success and growth in four key ways:

- Developing and managing world-leading technology demonstration and validation programs, to keep America’s pipeline of innovation on the cutting-edge;
- Supporting faster adoption of early production clean vehicles with fleet assistance and incentive programs. One key example is the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP), a zero-emission commercial vehicle purchase incentive program CALSTART has helped administer with the California Air Resources Board (CARB) for the last decade since the program’s inception;
- Working with industry to develop and secure supportive policies that invest in America’s technologies and products; and
- Providing our member companies, fleets and organizations with market, technical, funding opportunity and networking assistance to grow their development and production.

Rapid Industry Change. Let me share a quick context of the pace of change we are seeing in advanced, zero-emission technologies, and why their rapid deployment is so important. First, while commercial vehicles—medium- and heavy-duty trucks and equipment—represent just a fraction or about four percent of total vehicles on the road worldwide, they represent an outsized contribution to climate and air pollution emissions. Commercial vehicles account for nearly thirty percent of on-road greenhouse gas emissions, and, just as importantly, more than 60 percent of nitrogen oxides (NOx), a major component of what causes air pollution.⁴ In some U.S. cities, the contribution of NOx is as high as nearly 70 percent.⁵ Few vehicles; big impact. That’s why trucks are a prime segment for targeted, cost-effective emissions reduction.

Importantly, trucks are also undergoing a revolution in the availability of low-carbon, low-emissions technologies that means they can deliver out-sized reductions sooner than many have anticipated. Today, every major North American and European truck maker has zero-emission trucks in early production or final stages before production. Volvo, Kenworth, Peterbilt, Navistar, Mack and Freightliner all are producing at least one, and in some cases several, zero-emission trucks. These are not just small delivery size vans. They include heavy Class 6 “box” trucks used to carry goods around cities and towns and full Class 8 “big rig” tractors, used to haul trailers around larger regions, such as from warehouses to stores or ports and railyards to distribution facilities.⁶

“Beachhead” Strategy to Drive Change. CALSTART has developed a fast-track strategy for accelerating the successful deployment of zero-emission trucks by first focusing on those applications that are best suited for success immediately, and outlining the subsequent, rapid phases into heavier and longer-range segments achievable as advanced truck technology advances and production costs drop. It was developed in partnership with CARB to help identify investment strategies to speed zero- and near-zero vehicles to market. Called the “beachhead” strategy, it identifies a first market success, or beachhead, and expands from there by transferring technology and reducing cost by building higher supply chain volumes.⁷

America’s first beachhead segment is electric transit buses, now representing a meaningful percentage of new bus purchases in the United States.⁸ The underlying powertrain—electric motors, power electronics and battery packs or fuel cell systems—are highly transferrable to other medium- and heavy-duty applications, such as delivery, distribution and regional heavy freight trucks. This technology transfer helps unlock these next beachheads, allowing new market segments to take hold faster than ever before.

Learnings from Real-World Applications. To support this work, CALSTART has developed multiple practical tools to support adoption and track progress, in-

⁴ <https://globaldrivetozero.org/site/wp-content/uploads/2021/05/How-Zero-Emission-Heavy-Duty-Trucks-Can-Be-Part-of-the-Climate-Solution.pdf>; page 2

⁵ <http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2022-air-quality-management-plan/presentation-2022-aqmp-mobile-sources-printer-friendly.pdf?sfvrsn=12>

⁶ <https://californiahvip.org/vehicles/>

⁷ <https://globaldrivetozero.org/publication/the-beachhead-model/>

⁸ <https://calstart.org/zeroing-in-on-zeps-2020-edition/>

cluding tools to assess the business case (commonly referred to as Total Cost of Ownership),⁹ to plan for infrastructure needs,¹⁰ and a matrix of successful policy instruments.¹¹ To help fleets and policy makers assess vehicle availability, we developed the Zero Emission Technology Inventory (ZETI), which tracks zero-emission commercial vehicles (ZECVs) in production or coming to market three years out.¹² ZETI Analytics projects that the number of ZECV models will grow globally by 30 percent by 2023; and the number of heavy-duty models will grow by a staggering 80 percent.¹³

Global Alignment and Competition. However, the beachhead strategy is not unique to the United States. Indeed, as global market demand and zero-emission commercial vehicle market opportunities grow, we have had visibility to the significant investments in this technology and jobs being created in Asia and Europe. These regions have also been able to apply this theory of change. To support of industry partners, CALSTART developed a worldwide program, the Global Commercial Vehicle Drive to Zero (Drive to Zero) program,¹⁴ that has to date organized nine nations and more than 100 international industry, fleet, utility and government partners around the common goal of creating the supporting conditions for faster ZECV adoption. This policy ecosystem includes purchase incentives for the early market; investments in charging and refueling infrastructure installation; expanding technology development and demonstration programs to assist industry; and smart regulations.

Earlier this month, eight Drive to Zero nations agreed to develop a Global Memorandum of Understanding (Global MOU) to achieve specific zero-emission deployment targets for commercial vehicles to keep pace with climate change emissions. The Global MOU, modeled on the 15-State MOU in the United States, establishes a goal of 30 percent ZECV sales by 2030 and 100 percent by 2040, with specific actions to meet those goals. By the time of the international climate summit in November (Conference of the Parties, or COP26) we hope to have 15 to 20 nations announce their commitments to these goals.¹⁵

The policy ecosystems we helping other nations to establish, and which we are strongly recommending at the federal level for the United States, derive directly from our experience working with industry and fleets to understand which policies best support faster production and purchase of zero-emission trucks and buses—and with them, job creation and cleaner air in our most impacted communities.

As one example, both manufacturers and fleet operators have consistently told us that traditional tax incentives do not influence commercial vehicle purchase decisions; fleets need the vehicle cost reduced at the time of sale. Potentially reduced taxes later in the year do not overwhelmingly influence vehicle choice. But incentives directly reducing vehicle cost work.¹⁶ Validated through ten years of real-world results at the state level in Illinois, New York, and California where we administer significant point-of-sale purchase incentive programs, we have put thousands of clean and zero-emission trucks and buses on U.S. roads. Earlier this month, the largest such program we help administer, HVIP in California, was fully subscribed in a period of just three hours with requests for over a thousand zero-emission trucks. Thirty percent of the requests were for heavy-duty Class 8 electric tractors for use in drayage, goods movement and regional distribution.¹⁷ Successful public policy that can drive decarbonization of commercial vehicles resonates globally, as we have seen with Drive to Zero. It also demonstrates both where the United States can lead our partner nations by its example and where we have an opportunity to maintain a domestic competitive advantage.

The Need for Federal Leadership. Individual state actions creating a patchwork of supportive policies is not enough: our industry needs a consistent national program so all regions can take part. Shaped directly with our industry partners and proven in the laboratory of the states, CALSTART leads three major national industry coalitions that are making specific federal policy recommendations to advance zero-emission medium- and heavy-duty vehicle (MHDV) deployment and infrastructure: the National Zero-Emission Truck (ZET) Coalition; the Zero-Emission Bus & Innovative Mobility Coalition; and the Clean Corridors Coalition.

⁹ <https://californiahvip.org/tco/>

¹⁰ <https://californiahvip.org/purchasers/#infrastructure>

¹¹ <http://toolkit.globaldrivetozero.org/>

¹² <https://globaldrivetozero.org/tools/zero-emission-technology-inventory/>

¹³ <https://globaldrivetozero.org/tools/zeti-analytics/>

¹⁴ See www.globaldrivetozero.org

¹⁵ <https://globaldrivetozero.org/2021/05/31/cem12announcement-5-31-21/>

¹⁶ https://calstart.org/wp-content/uploads/2020/09/CALSTART_VIP_White_Paper.pdf

¹⁷ “Funders Forum Update 061621”, PowerPoint briefing to Funders Forum meeting

A number of these groups' policy recommendations will be familiar to this Committee, showing a broad base of support in industry for advancing clean transportation technologies and good-paying jobs. The Select Committee's majority staff report from last year, "Solving the Climate Crisis: The Congressional Action Plan for a Clean Energy Economy and a Healthy, Resilient, and Just America,"¹⁸ hits on several key points supported by our consensus-driven industry coalitions. Let me quickly summarize a few of these areas:

- The Select Committee's majority staff report first identified the need to pass legislation creating new purchase incentives, such as voucher programs or manufacturer tax credits, for zero-emission heavy-duty vehicles. We are now seeing this idea gain some traction at the federal level, as discussed below.
- The majority staff report, throughout its recommendations, emphasizes the historic opportunity and responsibility to invest in projects in deindustrialized and under-invested communities, including low-income communities and communities of color. This recommendation is particularly apt for a discussion of how to decarbonize goods movement since frontline communities often bear the brunt of the air quality impacts of heavier vehicle movement.
- The Select Committee's majority staff report also calls for the new grants to states and local and tribal governments to facilitate installation of electric vehicle charging stations and hydrogen fueling infrastructure along designated corridors along the National Highway System.
- The Select Committee's majority staff report also recommends increasing funding for the Low-No Grant Program by at least tenfold, including prioritizing projects in environmental justice communities; as well as expanding public transit access.
- The majority staff report prioritizes the role of the U.S. Department of Energy (DOE) in advancing research, development, demonstration, and deployment (RDD&D) to make high-efficiency, zero-emission, long-range trucks commercially viable, including through robust demonstration and pilot deployment of components, vehicles and infrastructure; and to help states through the DOE State Energy Program include transportation electrification planning and guidance in their state energy transportation plans.
- Finally, the Select Committee's majority staff report makes clear that the United States needs to double down on the zero-emission vehicle supply chain, from battery cell and pack technological innovations, to investment in upstream process innovations to provide a sustainable, domestic source of materials and components for battery electric vehicles in particular.

We commend the Committee for making these policies a priority and look forward to helping advance these priorities with our members this Congress.

Surface Transportation Reauthorization and the American Jobs Plan.

There is an opportunity to advance a number of these areas through the surface transportation reauthorization process currently underway; there are also a number of items that go beyond the surface bill as Congress considers elements of the Biden-Harris Administration's American Jobs Plan. As noted above, several of these recommendations are either moving forward in the Surface Transportation Reauthorization legislation or are in various stages of being included in other legislative packages. But while good progress is being made, more remains to be done.

Industry Needs and Recommendations. Below are the core recommendations we have provided to this Committee, to Congress and the Administration to incentivize the adoption of ZECVs.

For Zero-Emission Trucks:

- **Point-of-sale or cash in-lieu of purchase incentives for zero-emission MHDVs,** the proposal advanced early on by this Committee, was incorporated into the Biden-Harris Administration's Fiscal Year 2022 Request in support of the American Jobs Plan. The Committee should be commended for helping elevate this policy over the last year. The Proposal in the FY22 Green Book includes a business tax credit for new medium- and heavy-duty zero-emission vehicles, including battery electric vehicles and fuel cell electric vehicles in Classes 3 through 8, and the incentive steps down over 5 years. One important element that makes this policy the most aggressive incentive to advance zero-emission trucks currently proposed at the federal level: users would have the option to elect a cash payment in-lieu of a general business credit (i.e., a direct pay

¹⁸ <https://climatecrisis.house.gov/sites/climatecrisis.house.gov/files/Climate%20Crisis%20Action%20Plan.pdf>

option).¹⁹ Allowing the incentive to be elected as a cash payment builds on similar successful point-of-sale incentives at the state level and provides more access to the incentive to fleets of all sizes, closer to the point of purchase, and more quickly. We hope to work with this Committee, the Committee on Ways & Means, and the Senate Finance Committee to support elements of the Administration's proposal in any tax incentives for zero-emission MHDVs advanced through budget reconciliation this Congress.

- We recommend **expanding existing Highway Trust Fund programs, such as the Congestion Mitigation and Air Quality Improvement program (CMAQ)**, to include as an eligible use of funds the purchase of zero-emission MHDVs, related infrastructure, and zero-emission operations equipment. We were pleased to see and thank the Chair for her leadership on an amendment to the House's surface transportation reauthorization legislation, the INVEST in America Act, along these lines that was filed last week.
- We encourage Congress to **support Department of Energy investment in zero-emission truck and bus innovations**, including new RDD&D investment to support 1) robust zero-emission truck demonstrations and pilot deployments in real-world settings; 2) zero-emission truck component innovation, including battery and fuel cell innovation; and 3) zero-emission truck charging and refueling infrastructure. Encouragingly, the President's FY22 DOE Budget Request included \$595 million for the Vehicle Technologies Office, a 45 percent increase from 2020 enacted levels. This additional money will help RDD&D of new, efficient, and clean mobility options and enable widespread adoption of hydrogen and fuel cell technologies. The Request also supports increased investments to develop new innovations in vehicle technologies, leveraging the unique capabilities and world-class expertise of the National Laboratory system while deemphasizing support for RDD&D designed to expand the use of fossil-fueled internal combustion engines. Finally, the Request includes increased support for demonstration efforts to transition medium and heavy trucks to electrified platforms and improve efficiency of the entire freight system. We look forward to working with Congress to make these needed investments.
- Finally, in line with the Committee's own recommendations, we are calling on Congress to **create a new technical assistance program at the Department of Energy** to help states, regulators, utilities, and fleets plan for MDHV electrification and make-ready investments; and to ensure that model MHDV electrification guidelines and best practices are developed with stakeholders and disseminated widely.

For Zero-Emission Buses:

- **CALSTART recommends an at least twofold increase in Low and No Emission Program (Low-No) to \$360 million/year starting in FY 2022.** The House Committee on Transportation & Infrastructure, under the leadership of Chairman Peter DeFazio, has advanced a framework under the INVEST Act that would go well beyond this, including \$4.1 billion for FY23 through FY26 for the Zero-Emission Bus grant program, an increase of 1,500 percent above FY20 enacted levels. Robust investment in Low-No will put the federal government on a path to supporting greater and greater deployments of zero-emission buses by the end of the decade, as called for by Select Committee member Congresswoman Julia Brownley's Green Bus Act of 2021. As an interim goal, Low-No should continue to provide funding for both low- and no-emission vehicles, with a growing emphasis on zero-emission vehicles by the middle of the decade to achieve 1,000 zero-emission buses (ZEBs) deployed per year by 2025. Finally, we would support efforts by the Committee to direct the Department to partner with transit agencies and other stakeholders to provide a transition roadmap of needed innovations, infrastructure requirements, and market acceptance factors needed to support this transition through the end of the decade.
- Provide robust investment in systems innovation and vehicle technologies through Federal Transit Administration (FTA) Innovation and Technical Assistance²⁰ by **authorizing \$50 million/year in funding and \$5 million/year for technical assistance specifically dedicated to support of ZEB integration.** We encourage investment across a wide range of critical technologies, including but not limited to electric and more efficient fuel-fired heating and air conditioning systems for use in extremely cold and hot climates; advanced elec-

¹⁹ U.S. Department of Treasury, "General Explanations of the Administration's Revenue Proposals," May 2021, <https://home.treasury.gov/system/files/131/General-Explanations-FY2022.pdf>, pp. 46–47.

²⁰ 49 U.S. Code § 5312

tric bus charging solutions; integration of transit buses and micro-mobility, and mobility on demand; and hydrogen fuel cell and storage technologies, among other areas. We also believe that, during this period of rapid technological development, transit operators will need technical assistance from entities with specialized knowledge in evaluating, transitioning to, and implementing new technologies. FTA should continue to encourage partnerships between transit operators, fleet suppliers, and qualified nonprofit entities to encourage effective, accelerated adoption of low- and no-emission buses.

- Finally, we encourage Congress to authorize and fund a **new \$200 million/year competitive grant for innovative mobility research, development, and demonstrations**, make proven innovative mobility projects eligible for formula funding, and designate an Innovative Mobility Leader. Within the \$200M/year program, Congress should prioritize an equity-focused and community-led shared mobility services pilot, modeled after the Clean Mobility Options Voucher Pilot program,²¹ to jumpstart the adoption of innovative modes of transportation and transit in disadvantaged or underserved communities, in line with the Biden administration’s Justice40 Initiative goal of delivering 40% of the overall benefits of relevant federal investments to disadvantaged communities. This investment should also include authorize a competitive grant program to demonstrate and validate targeted examples of comprehensive multi-modal transportation networks of infrastructure for active transportation, advanced public transit systems, and their interconnectivity in cities and towns.

For Zero-Emission Commercial Vehicle Infrastructure:

- We encourage Congress to **authorize robust funding for the Federal Highway Administration (FHWA) Alternative Fuel Corridor competitive grant** to build out infrastructure along highway corridors, including a portion for infrastructure to support zero-emissions goods movement nationwide. The INVEST Act again makes strides in this area, calling for \$4 billion in electric vehicle charging and hydrogen refueling infrastructure, helping the United States make a full transition to clean transportation. In line with the American Jobs Plan’s goals of creating a national network of 500,000 charging stations across the United States, the INVEST Act would provide \$1 billion per year clean corridors program to provide formula funding to states for electric vehicle charging and hydrogen fueling infrastructure and establishing a new alternative fuel infrastructure freight corridor designation process. We were also encouraged by the provision in the Senate Environment and Public Works Committee’s Surface Transportation Reauthorization Act (STRA), reported unanimously out of Committee earlier this month under the leadership of Chairman Carper, which included a new consideration in the grant making process specifically for zero-emission medium- and heavy-duty vehicle charging and refueling. That provision, championed by Senator Alex Padilla, would help emphasize the need for investment in zero-emission infrastructure to support decarbonizing goods movement along freight corridors nationwide.
- We also call on Congress to **advance a new program to provide zero-emission MHDV infrastructure rebates for depot and on-route charging and hydrogen refueling**, and to **extend and reform the § 30C alternative fuel infrastructure tax credit**.

For the Electric Vehicle Supply Chain:

- **CALSTART is leading the U.S. Battery Leadership Initiative, involving several key OEM and battery supply chain members focused on advancing incentives and workforce development programs** to support domestic manufacturing supply chain for electric vehicle batteries—from upstream technologies for the sustainable, domestic processing of minerals, to downstream battery cell and pack innovations, to battery recycling manufacturing processes.
- As part of this effort, we are organizing key EV industry voices to support Congress’s efforts to invest in **manufacturing investment tax credits, grants, and loans** to retool, equip, and incentivize battery cell, pack, and material manufacturers of all sizes; **invest in innovation** to bolster the domestic ZEV battery supply chain competitiveness; and **train and bolster the U.S. battery supply chain manufacturing and assembly workforce**.

What is Still Left to Do. We thank the Committee for its work to date, but the work is not yet done. There are several critical elements for industry, such as the point-of-sale incentive, that have yet to move forward. We strongly encourage the

²¹ See “Clean Mobility Options: About the Program,” <https://www.cleanmobilityoptions.org/about/>

Committee to continue to highlight the need to support and invest in American technology competitiveness; to support and create U.S. jobs by encouraging the production and purchase of these technologies with incentives that match market needs; to ensure America leads the world in building the new infrastructure these zero-emission vehicles need; and to prioritize deploying zero-emissions commercial vehicles in under-invested communities and communities of color, who have born the bulk of the burden of air pollution.

We are at a unique period of inflection for our nation and the world in how we address our climate imperative, and whether we do so in a way that will keep American industry competitive, provide U.S. workers future-proof jobs and clean the air in communities too long left behind. America has invented many of the technologies now being manufactured elsewhere but has often not supported or spurred our own manufacturers to make and our fleets to buy these best-in-class technologies. Asia and Europe are investing deeply in zero-emission technology and the critical component manufacturing leadership it brings. We have the unparalleled opportunity and the national capacity to lead this next phase of transportation. Zero-emission commercial vehicles are a powerful and focused segment that enables targeted policies and investments to make outsized impacts in our nation and world. Our world requires it; our workers deserve it; and equity demands it. Let us not lose this chance to change transportation for good.

We appreciate the opportunity you have given us to provide this information and recommendations. We remain committed to being an asset to the Committee and its staff at any time, and are happy to answer any questions you may have.

Ms. CASTOR. Thank you very much.

Mr. Bryce, you are now recognized for 5 minutes.

STATEMENT OF ROBERT BRYCE

Mr. BRYCE. Yes. Thank you. Good afternoon. For the past 15 months, I have written a book—published a book, I have coproduced a feature-length documentary, and I have launched a podcast, all of which talk about the importance of electricity to humans and society. Darkness kills human potential and electricity nourishes it.

I am pro-electricity, but I am adamantly opposed to the idea that we should electrify everything and that includes transportation. I will focus on three issues here—affordability, resilience, and supply chains.

But first just a bit of context. EVs are cool, they are gaining in popularity, but they are not new. In fact, the history of electric vehicles is a century of failure tailgating failure. In 1911, the New York Times wrote: The electric car has long been recognized as the ideal solution.

In 1990, the California Air Resources Board mandated that 10 percent of car sales be zero-emission vehicles by 2003 and yet today, 31 years later, only about 6 percent of the cars in California have an electric plug.

So now let me talk about affordability and social equity. There is a problem here with affordability for the vehicles themselves. The average household income for EV buyers in America is about \$140,000. That is roughly twice the U.S. average. And yet these Federal tax credits for EV purchases are forcing low- and middle-income taxpayers to subsidize effectively the Benz and Beamer crowd.

Lower-income Americans are also facing huge electric rate increases for grid upgrades to accommodate EVs, even though, they are unlikely to ever own one or even drive one. This can be seen by looking at a report that was issued earlier this month by the California Energy Commission, which estimated the state just—

this is California alone will need 1.3 million new public charging stations by 2030 with the likely cost of something on the order of \$13 billion.

The same report says California may need 5,000 megawatts of new generation capacity just to recharge EVs. Meanwhile, blackouts in California are almost certain this summer and electricity prices, as I wrote in my piece on Real Clear Energy last Friday, are absolutely exploding. Last year alone California's electric rates went up 7 and a half percent and the state estimates they will rise by another 40 percent by 2030.

This in a state with the highest poverty rate and largest Latino population in America. How is racial justice or social equity being served by these regressive policies? California demonstrates how not to manage an electric grid and how difficult and how expensive it is to deploy EVs at scale.

Now let me talk about resilience. Electrifying everything is the opposite of antifragile. Electrifying transportation will put all of our energy eggs into one basket. It will make the grid an even bigger target for terrorist, cyber thieves, or bad actors. It will reduce resilience and reliability in case of a prolonged grid failure, in cases of natural disaster, equipment failure, or human error, all of which are inevitable.

Attempting to electrify transportation also makes little sense given the ongoing fragilization of our grid due to increased use of weather dependent renewables and just-in-time natural gas.

Since 2016, the number of grid outages per year, what the DOE calls major disturbances and unusual occurrences, has nearly tripled. The blackout here in Texas, which I suffered through in February, as well as the blackouts in California, are indicative of the fragilization of our grid.

Finally, let me talk about supply chains. Mass adoption of EVs will make the U.S. more dependent on China. Electrifying half of the U.S. auto fleet would require, in rough terms, nine times the world's current cobalt production, four times global neodymium, three times global lithium, and two times global copper. Except for copper, China has a majority share in the processing of all of those materials, including a 90 percent share in rare earths, which includes, of course, neodymium.

The conclusion here is that oil's dominance in transportation is largely due to its high-energy density. That density and ongoing improvements internal combustion engines and hybrids assures that oil will be fueling transport for decades to come. If Congress wants to reduce emissions, it should be focused on increasing the fuel efficiency of the entire automotive fleet. It should be fostering micromobility particularly in low-income neighborhoods, and, finally, Congress should preserve existing nuclear plants.

The April 30 closure of the Indian Point Nuclear Plant in New York was a travesty. Congress must do whatever it can to prevent the closure of other nuclear plants, including Byron and Dresden in Illinois and Diablo Canyon in California. Powerful lobby groups want Congress to spend billions on electrification, but these schemes will increase regressive taxation on low-income Americans, reduce our resilience, and increase our reliance on China. That, unfortunately, is a dubious trifecta.

Thank you.
[The statement of Mr. Bryce follows:]

**Testimony Before the United States Congress
House Select Committee on the Climate Crisis
Transportation Investments for Solving the Climate Crisis**

Robert Bryce

Visiting fellow, The Foundation for Research on Equal Opportunity

June 30, 2021

The Foundation for Research on Equal Opportunity (FREOPP) is a non-partisan, non-profit, 501(c)(3) organization dedicated to expanding economic opportunity to those who least have it. FREOPP does not take institutional positions on any issues. The views expressed in this testimony are solely those of the author.

INTRODUCTION

Good afternoon. Thank you for inviting me to testify.

I have been writing about the energy sector for more than 30 years. I am pro-energy and pro-electricity.

Over the past 15 months, I've published a book, co-produced a feature-length documentary, and launched a podcast, all of which focus on the importance of electricity to humans and society.¹ The defining inequality in the world today is the enormous gap between the electricity rich and the electricity poor. Darkness kills human potential. Electricity nourishes it.

Increased electricity use means higher living standards, always, everywhere. Increased electricity use in developing countries is essential for human flourishing, and in particular, for women and girls. While I am adamantly pro-electricity, I am also a student of energy transitions and I'm adamantly opposed to the notion that we should attempt to "electrify everything." Enacting such a sweeping policy must be preceded by careful analysis, including the economic and strategic implications of the policy, to avoid unintended disruptions or societal harm.

Electrifying parts of our transportation system may result in incremental reductions in greenhouse gas emissions. But a look at history, as well as an analysis of the supply-chain issues involved in manufacturing EVs, the resource intensity of batteries, and the increasingly fragile state of our electric grid—which is being destabilized by bad policy at the state and national levels—shows that a headlong drive to convert our transportation systems to run on "green" electricity could cost taxpayers untold billions of dollars, increase greenhouse gas emissions, be bad for societal resilience, make the U.S. more dependent on commodity markets dominated by China, make us less able to respond to extreme weather events or attacks on our infrastructure, and impose regressive taxes on low and middle-income Americans in the form of higher electricity prices.

Many challenges must be addressed as policymakers consider the electrification of our vast transportation networks. In this testimony, I will focus on three issues: affordability, resilience, and supply chains.

Before going further, I will stipulate two obvious facts: electricity is making real and valuable contributions in "micromobility" and EV sales are growing rapidly.²

The use of e-bikes, e-scooters, and e-skateboards is making a significant difference in cities at the neighborhood level. Between 2019 and 2020, electric bicycle sales in the U.S. increased by 145%.³ I have seen how e-micromobility has changed transit on the streets near my home in Austin, Texas. But it is essential to remember that the rapid growth in e-micromobility has not been fueled by government mandates or subsidies. Instead, companies like Trek, Specialized, Lime, Boosted Boards, and others have deployed high-quality products that consumers want and they are buying or renting the mobility solutions that fit their needs. Further, EV sales are growing. Between 2016 and 2020, the number of EVs on U.S. roads tripled and now stands at about 1.8 million vehicles.⁴

¹ See, respectively: *A Question of Power: Electricity and the Wealth of Nations*; *Juice: How Electricity Explains the World*; and the Power Hungry Podcast.

² <https://www2.deloitte.com/us/en/insights/focus/future-of-mobility/micro-mobility-is-the-future-of-urban-transportation.html>

³ <https://cyclingindustry.news/e-bike-sales-3-7m-17m-2030-industry-experts/>

⁴ <https://www.pewresearch.org/fact-tank/2021/06/07/todays-electric-vehicle-market-slow-growth-in-u-s-faster-in-china-europe/>

But policymakers must be cautious. While that growth in EV sales is notable, EVs still account for less than 1% of the 276 million registered vehicles in the U.S.⁵ Of all the EVs on U.S. roads, about 42% of them are in California.⁶ By contrast, states like South Dakota, North Dakota, Montana, and Wyoming each have less than 1,000 registered EVs.⁷ Furthermore, in 2020, fewer than 300,000 EVs were sold in the U.S.⁸ For comparison, Ford Motor Company sold nearly 800,000 F-series pickup trucks last year.⁹

So, yes, EV sales are growing rapidly. But the history of EVs is littered with big claims and false starts. Indeed, the history of electric vehicles is a century of failure tailgating failure. Despite decades of positive media coverage, the takeover of the auto fleet by EVs has long been parked just beyond the next traffic signal. For instance:

- In 1901, the *Los Angeles Times* declared “The electric automobile will quickly and easily take precedence over all other” types of motor vehicles. “If the claims which Mr. Edison makes for his new battery be not overstated, there is not much doubt that it will make a fortune for somebody.”¹⁰
- In 1911, the *New York Times* said that the electric car “has long been recognized as the ideal solution” because it “is cleaner and quieter” and “much more economical.”¹¹
- In 1915, the *Washington Post* reported that “prices on electric cars will continue to drop until they are within reach of the average family.”¹²
- In 1959, the *New York Times* said that the “Old electric may be the car of tomorrow.” The story said that electric cars were making a comeback because “gasoline is expensive today, principally because it is so heavily taxed, while electricity is far cheaper” than it was back in the 1920s.¹³
- In 1979, the *Washington Post* reported that General Motors has found “a breakthrough in batteries” that “now makes electric cars commercially practical.” The new zinc-nickel oxide batteries will provide the “100-mile range that General Motors executives believe is necessary to successfully sell electric vehicles to the public.”¹⁴

The history of EVs in California provides context for the rest of the country. In 1990, the California Air Resources Board passed a measure that required 10% of all auto sales in the state be zero-emission vehicles by 2003.¹⁵ But today, 31 years after California implemented the ZEV mandate, the state has nearly 15 million automobiles, and of that number, less than 900,000, or about 6%, have an electric plug.^{16 17}

Over the past century, the history of the EV sector in California and the rest of the country can be summarized as lots of government push, but not enough consumer pull.

Of course, things may have changed. EVs may be near a tipping point and will soon dominate the auto market. Battery technology has improved dramatically over the past 100 years and battery makers continue making improvements in cost and energy density. But 90% of all U.S. transportation energy still comes from refined oil products. Another 9% comes from biofuels and natural gas. Meanwhile, according to an April 2021 report by the U.S. Energy Information Administration, “Electricity provided less than 1% of total transportation sector energy use and nearly all of that in mass transit systems.”¹⁸

Policymakers must also be aware that future EV adoption rates depend heavily on the ability of automakers to continue cutting costs and improving the utility of

⁵ <https://www.statista.com/statistics/183505/number-of-vehicles-in-the-united-states-since-1990/>

⁶ <https://afdc.energy.gov/data/10962>

⁷ <https://afdc.energy.gov/data/10962>

⁸ <https://www.spglobal.com/platts/en/market-insights/latest-news/electric-power/012821-us-ev-sales-tumble-in-2020-but-ev-load-increases-with-more-charging-stations>

⁹ <https://www.torquenews.com/9539/ford-f-series-finishes-2020-where-it-s-been-last-44-years-best-selling-truck-america>

¹⁰ *Los Angeles Times*, “Edison’s New Storage Battery,” May 19, 1901, 8.

¹¹ *New York Times*, “Foreign Trade in Electric Vehicles,” November 12, 1911, C8.

¹² *Washington Post*, “Prophecies Come True,” October 31, 1915, E18.

¹³ Joseph C. Ingraham, “Old Electric Car May Be the Car of Tomorrow,” *New York Times*, July 26, 1959, X19.

¹⁴ Jerry Knight, “GM Unveils Electric Car, New Battery,” *Washington Post*, September 26, 1979, D7.

¹⁵ <https://>

[docs.google.com/document/d/1g8bOvDAMeWkAcuMt3_E1M6r6zKQYW3XePTISEUFxjJ0/edit](https://www.statista.com/statistics/196010/total-number-of-registered-automobiles-in-the-us-by-state/)

¹⁶ <https://www.statista.com/statistics/196010/total-number-of-registered-automobiles-in-the-us-by-state/>

¹⁷ <https://insideevs.com/news/506502/california-plugin-car-sales-2021q1/>

¹⁸ <https://www.eia.gov/energyexplained/use-of-energy/transportation.php>

EVs. Earlier this month, Jeremy Michalek of the Vehicle Electrification Group at Carnegie Mellon University, questioned the ability of the industry to continue slashing costs. In an article titled, “I’m an EV expert, and I’m skeptical about how quickly electric cars will go mainstream in the U.S.” Michalek explained that:

economies of scale drove early reductions in battery costs, but now they are all but exhausted, and we shouldn’t expect big factories or growing demand alone to make EV batteries much cheaper. Second, production process improvements have also driven cost reductions, but even a utopian production process can’t push battery prices below material costs. Third, prices can temporarily dip below costs when firms leverage subsidies, take temporary hits to establish a foothold in the market, or cross-subsidize to comply with regulation, but prices can’t stay below costs for long.

He concluded that we should, “remain skeptical about predictions of exactly how fast battery costs will drop and how quickly EVs will be adopted in the future.”¹⁹ Michalek’s conclusion brings me to my first point: affordability.

AFFORDABILITY AND SOCIAL EQUITY

In 2019, the National Bureau of Economic Research published a study that found the average household income of EV buyers was about \$140,000.²⁰ That’s twice the median household income in the U.S., which was nearly \$69,000 in 2019.²¹ The average owner of a Tesla Model S has a household income of about \$153,000.²²

EVs have fallen in price. But they are still, for the most part, luxury cars that are too expensive for low and middle-income consumers. In 2020, a Costco store in Austin was advertising a Chevy Bolt EV with a sticker price of \$46,450. As I noted in an article for *Real Clear Energy*, “For that much cash, consumers could buy a brand new BMW 3 series. Or they could pick up a Mercedes-Benz C-class for less than \$39,000. In fact, for the price of a single Chevy Bolt, thrifty shoppers could buy a pair of Toyota Corollas, which sell for about \$18,000.”²³

In addition to their high purchase price, EVs also impose other societal costs that are likely to exacerbate inequality and lead to more energy poverty. Those costs include taxpayer-funded subsidies given to EV buyers, publicly funded charging stations, and the grid upgrades that will be needed to support the electrification of light and heavy-duty vehicles. Those costs will impose a significant cost burden on low and middle-income consumers, even though those consumers are unlikely to purchase EVs.

Wealthy EV buyers are being subsidized by low and middle-income consumers. In 2016, two academics at the University of California at Berkeley, Severin Borenstein and Lucas W. Davis published a paper that concluded the majority of the money being collected under federal programs aimed at promoting energy efficiency and alternative transportation was going to wealthy Americans. They found “the most extreme disparity is in the program aimed at electric vehicles, where we find that the top income quintile has received about 90% of all credits.” They continued saying that taxpayers who had adjusted gross incomes “in excess of \$75,000 have received . . . about 90% of all credit dollars aimed at electric cars.”²⁴

Another example of the regressive nature of EV subsidies can be seen by looking at the distribution of those subsidies. Last year, I published an article in *Forbes* which analyzed data published by the Clean Vehicle Rebate Project. That analysis found that residents of California’s Senate District 13 in the Bay Area, had collected more than 23,000 rebates from the state worth a total of some \$55.3 million. That sum was more than what was rebated to residents of *seven other California senate districts, combined*.²⁵ Last August, Assemblyman Jim Cooper, a Democrat from the Sacramento area, published a letter in which he said the EV rebates reflect years of environmental racism in the state and that the state’s environmental groups are not paying attention to the needs of low and middle-income residents because “promoting policies that benefit coastal Tesla drivers has been more important.”²⁶

¹⁹ <https://www.marketwatch.com/story/im-an-ev-expert-and-im-skeptical-about-how-quickly-electric-cars-will-go-mainstream-in-the-u-s-11623770187>

²⁰ <https://cityobservatory.org/electric-vehicle-subsidies-inefficient-inequitable/>

²¹ <https://www.census.gov/library/publications/2020/demo/p60-270.html>

²² <https://www.evunite.com/blog/teslademographics/>

²³ https://www.realclearenergy.org/articles/2020/11/29/five_reasons_why_internal_combustion_engines_are_here_to_stay_651051.html

²⁴ <https://www.journals.uchicago.edu/doi/full/10.1086/685597>

²⁵ <https://www.forbes.com/sites/robertbryce/2020/09/24/california-assemblyman-says-states-push-for-electric-vehicles-fuels-environmental-racism/?sh=7773fbeb2b9a>

²⁶ <https://twitter.com/AsmJimCooper/status/1290431726221578240/photo/2>

In addition to helping pay for the subsidies given to EV buyers, consumers are also facing increases in electricity rates to pay for the public charging stations. That can be seen, again, by looking at California, which has banned the sale of gasoline-fueled vehicles by 2035 and is pushing hard for EV adoption.²⁷

On June 9, the California Energy Commission (CEC) released a report which found that the state “will need nearly 1.2 million public and shared chargers by 2030 to meet the fueling demands of the 7.5 million passenger plug-in electric vehicles (EVs) anticipated to be on California roads.” It went on to say that “157,000 chargers will be required by 2030 to support 180,000 medium and heavy-duty electric trucks and buses.”²⁸ Therefore, the state’s ratepayers will likely be required to pay for the cost of roughly 1.3 million new EV charging stations. (The state currently has about 73,000 stations.) If we assume a cost of \$10,000 for each new charging station, California ratepayers could soon be on the hook for some \$13 billion in new infrastructure costs.²⁹

Low and middle-income ratepayers will also be forced to pay for the generation capacity and grid upgrades needed to accommodate electrification of transportation. The same CEC report found that by 2030, “electricity consumption from passenger EV charging could reach about 5,500 megawatts (MW) around midnight and 4,600 MW around 10 a.m. on a typical weekday, increasing electricity demand by up to 20–25 percent at those times.”³⁰ To put that 5,000 MW or so of new generation capacity in perspective, *it is roughly equal to the rated output of all of California’s existing geothermal and nuclear plants, combined.*³¹ It must be noted here that the state is slated to close its last remaining nuclear plant, the Diablo Canyon Power Plant, by 2025.

The California grid will have difficulty providing electricity from midnight until the early morning hours because it is heavily dependent on solar energy to meet demand. Thus, it is highly likely that to meet the power demand needed to charge EVs, the state will have to deploy more natural gas-fired capacity. The timing of EV charging will have a big effect on greenhouse gas emissions. If the state has to rely on gas-fired generators to charge EVs at night, the climate benefits of widespread EV adoption may be negated.

In addition, the cost of building 5,000 MW of new generation capacity, as well as the transmission and distribution infrastructure needed to deliver that juice to customers, will add many billions of dollars to California ratepayers’ bills at a time when electricity prices in the state are in the words of energy analyst Mark Nelson of the Radiant Energy Fund, “absolutely exploding.”³²

In 2020, California’s electricity prices jumped by 7.5%, making it the biggest price increase of any state in the country last year and nearly seven times the increase that was seen in the United States as a whole. According to data from the Energy Information Administration, the all-sector price of electricity in California last year increased to 18.15 cents per kilowatt-hour, which means that Californians are now paying about 70% more for their electricity than the U.S. average all-sector rate of 10.66 cents per kWh.³³

Between 2010 and 2020, the state’s electricity prices jumped by 39.5%, which was, the biggest increase of any state in the U.S. Even more worrisome: California’s electricity rates will soar over the next decade. In a report issued in February, the California Public Utility Commission (CPUC) warned that the state’s energy costs are growing far faster than the rate of inflation, and that “energy bills will become less affordable over time.” The surging cost of electricity will increase the energy burden being borne by low and middle-income Californians.³⁴ High energy costs have a particularly regressive effect in California, which has the highest poverty rate—and

²⁷ <https://www.greentechmedia.com/articles/read/california-to-ban-all-internal-combustion-engine-vehicles-by-2035>

²⁸ <https://www.energy.ca.gov/news/2021-06/report-shows-california-needs-12-million-electric-vehicle-chargers-2030>

²⁹ https://afdc.energy.gov/files/u/publication/evse_cost_report_2015.pdf

³⁰ <https://www.energy.ca.gov/news/2021-06/report-shows-california-needs-12-million-electric-vehicle-chargers-2030>

³¹ In 2020, California had 2,700 MW of geothermal and about 2,400 megawatts of nuclear capacity. See: <https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/electric-generation-capacity-and-energy>

³² <https://robertbryce.com/episode/mark-nelson-managing-director-at-radiant-energy/>

³³ https://www.realclearenergy.org/articles/2021/06/24/blackouts_loom_in_california_as_electricity_prices_are_absolutely_exploding_782903.html

³⁴ <https://www.energy.gov/eere/slsc/low-income-community-energy-solutions>

some of the highest electricity prices—in the country.³⁵ In 2020, California’s all-sector electricity prices were the third-highest in the continental U.S., behind only Rhode Island (18.55 cents per kWh) and Connecticut (19.19 cents per kWh.)

What’s driving up prices? The report says that “electrification goals and wildlife mitigation plans are among the near-term needs . . . that place upward pressure on rates and bills.” The “electrification goals” mentioned by the CPUC include the added cost of charging stations. In addition, California consumers could face significant costs to rewire their homes and businesses to accommodate the growing number of bans on natural gas in the state. According to the Sierra Club, about 46 communities in the state have imposed bans or restrictions on new natural gas connections.

The same CPUC report projects that residents living in hotter regions (that is, those who can’t afford to live close to the coast) who get their electricity from San Diego Gas & Electric (SDG&E) could see their monthly power bills increase by 47% between now and 2030. When future gasoline-price increases are included, overall energy costs for that same consumer are projected to increase by 60%. Furthermore, the CPUC expects residential ratepayers in SDG&E’s service territory will be paying close to 45 cents per kilowatt-hour by 2030.³⁶ For reference, that is more than three times the current average price of residential electricity.

In short, California’s aggressive decarbonization policies, and in particular, its EV policies, are imposing significant regressive taxes on the state’s low and middle-income consumers. Add in the proposed closure of the Diablo Canyon Power Plant—which by itself produces nearly 10% of all the juice consumed in the state—and the fact that the state’s grid operator, CAISO, is already warning of electricity shortages this summer, and it becomes clear that California *provides an object lesson in how not to manage an electric grid, particularly if the goal is to reduce greenhouse gas emissions by electrifying transportation.*³⁷ In addition to the closure of Indian Point, the state will also have to grapple with mandates that require the closure of its gas-fired power plants.³⁸

Before finishing this section about affordability and equity, I must underscore the uneven distribution of EVs among the states and how that uneven distribution reflects the urban-rural divide and the class divide. California’s large number of EVs (over 400,000 vehicles in 2020) reflects its wealth. The median household income in the state is over \$80,000.³⁹

Meanwhile, in Mississippi, where the median household income is less than \$46,000, the state has fewer than 800 EVs on the road. West Virginia, where median household income is just under \$49,000, the state has just 600 EVs on the road. If Congress is going to encourage EV adoption, it must consider this disparity and make sure that taxpayers in lower-income states are not subsidizing motorists in wealthy states.

SOCIETAL RESILIENCE

As I explained in a piece I wrote for *Forbes* in February during the deadly blizzard that hit Texas, “Electrifying everything is the opposite of anti-fragile.”⁴⁰

Attempting to halt the use of liquid motor fuels and replace them with electricity will make our transportation system more vulnerable to disruptions caused by extreme weather, saboteurs, equipment failure, accidents, or human error. Electrifying our transportation system will reduce societal resilience because it will put all our energy eggs in one basket. Electrifying transportation will reduce fuel diversity and concentrate our energy risks on a single grid, the electric grid, which will make it an even-more-appealing target for terrorists or bad actors.

Furthermore, and perhaps most important, attempting to electrify transportation makes little sense given the ongoing fragilization of our electric grid. The closures of our nuclear plants is reducing the reliability and resilience of the electric grid

³⁵ https://www.thecentersquare.com/california/california-continues-to-have-the-highest-poverty-level-in-the-nation/article_45a6e2fc-f9f8-11ea-a19d-cf1649965470.html

³⁶ https://www.cpuc.ca.gov/uploadedFiles/CPUC_Website/Content/Utilities_and_Industries/Energy/Reports_and_White_Papers/Feb%202021%20Utility%20Costs%20and%20Affordability%20of%20the%20Grid%20of%20the%20Future.pdf

³⁷ https://www.pge.com/en_US/safety/how-the-system-works/diablo-canyon-power-plant/diablo-canyon-power-plant.page

³⁸ <https://www.sacbee.com/news/local/environment/article235401372.html>

³⁹ <https://www.census.gov/library/visualizations/interactive/2019-median-household-income.html>

⁴⁰ <https://www.forbes.com/sites/robertbryce/2021/02/15/this-blizzard-exposes-the-perils-of-attempting-to-electrify-everything/>

and making it more reliant on gas-fired power plants and weather-dependent renewables.

In April, the Indian Point Energy Center, which was providing about 25% of all the electricity used in New York City, was prematurely shuttered. Its output has since been replaced by power generated by gas-fired power plants. Later this year, two more nuclear plants, the Byron and Dresden plants in Illinois, are slated for premature closure. In California, the Diablo Canyon Power Plant is slated for premature closure in 2025.

Policymakers need not look far to observe the ongoing fragilization of our electric grid. The deadly blackouts that hit Texas in February, as well as the blackouts that hit California last year, are the latest indicators that our electricity supplies are increasingly vulnerable to disruptions. Those blackouts provide a preview of what may be in store as grid operators around the U.S. are forced to incorporate large amounts of new, heavily subsidized, weather-dependent renewable generation plants.

Data published by the Department of Energy's Office of Cybersecurity, Energy Security, and Emergency Response illustrates the declining reliability of our electric grid. In 2002, there were 23 "major disturbances and unusual occurrences" on the domestic electric grid. Those outages were caused by things like ice storms, fires, vandalism, and severe weather. By 2016, the number of disturbances and unusual occurrences had increased six-fold to 141. In 2020, the number of events jumped to 383—an increase of 270% in just four years.⁴¹ Even more alarming: through the first two months of 2021, there have been 122 of these outages.

Last month, the Colonial Pipeline, which delivers motor fuel to the Eastern Seaboard, was shut down by Russian hackers. The shutdown immediately snarled transportation networks. Four states declared states of emergency.⁴² Fortunately, the pipeline was able to resume delivery of motor fuel after a few days. But the shutdown demonstrated the delicacy of one of our most important energy networks—the underground pipeline system—and how even a brief interruption in transportation fuel supplies can paralyze our society. If such a brief interruption of a motor fuel pipeline can have such devastating effects, it is not difficult to imagine what would happen if a society that has electrified its transportation sector was hit with an extended electrical blackout. The results could be catastrophic.

Shortly before World War I, Winston Churchill, who was then serving as the First Lord of the Admiralty, discussed the need for energy security as Britain was switching its warships from coal-fired propulsion to oil-fired engines. He famously said, "Safety and certainty in oil lies in variety and variety alone."⁴³ While Churchill was talking about warships, the same sensibility applies to our energy supplies and energy grids. Concentrating our transportation fuel needs onto a single grid will achieve the opposite of what Churchill was warning about more than a century ago. A society that has a variety of energy sources—for transportation as well as electricity generation—will be more resilient than one that relies on a single source.

As this section is focused on resilience and reliability, I am compelled to make an additional point: if this committee is serious about reducing greenhouse gas emissions while improving societal resilience and the reliability of the electric grid, it should be laser-focused on keeping all of our existing nuclear plants open and operating for as long as possible. Instead, Congress is standing idly by as our nuclear plants—our most reliable, safest, and most power-dense form of electricity production—are being shuttered. Nuclear plants are, as writer Emmet Penney recently put it, our "industrial cathedrals."⁴⁴ If policymakers want to decarbonize our transportation system while enhancing the resilience of our society, the best option would be to have a grid that is heavily reliant on nuclear energy.

If we could engineer a system in which our cars were fueled with electricity produced by nuclear plants, I would be inclined to support it. That is not happening.

Instead, our nuclear (and coal-fired power plants) are being prematurely shuttered at the same time that powerful lobby groups are pushing for the electrification of transportation. They are doing so at the same time our electric grid is becoming less reliable and more dependent on renewables and power plants that depend on the delivery of just-in-time natural gas. This shift in the electric generation mix is not enhancing societal resilience, it is undermining it. Adding large amounts of new transportation-related load to the electric grid will further undermine our resilience.

⁴¹ https://www.oe.netl.doe.gov/OE417_annual_summary.aspx

⁴² <https://www.axios.com/colonial-pipeline-shutdown-fuel-shortages-lines-ef087928-de36-41b4-ba26-a7fc0bf74439.html>

⁴³ <https://www.foreignaffairs.com/articles/2006-03-01/ensuring-energy-security>

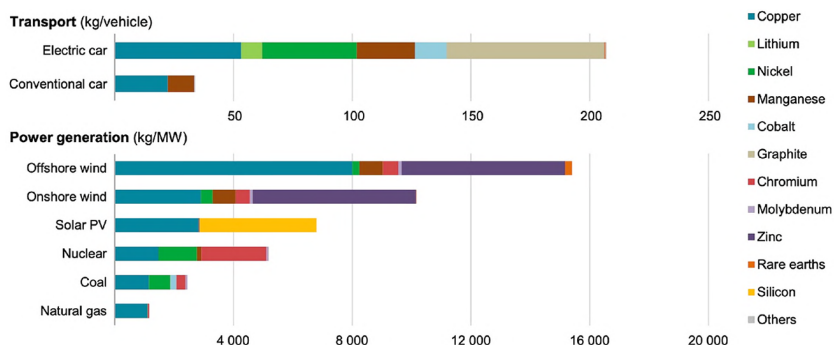
⁴⁴ <https://www.theamericanconservative.com/articles/nuclear-power-plants-our-industrial-cathedrals/>

SUPPLY CHAINS

Mass adoption of EVs will make the U.S. transportation sector more dependent on commodities like copper, cobalt, lithium, manganese, and rare earth elements. That fact presents a national security challenge because the markets for many of those critical minerals are dominated by China.

A recent report by the International Energy Agency (IEA) found that EVs require roughly six times more of what it calls “critical minerals” than conventional vehicles. In particular, the report says that every EV needs about 55 kilograms of copper, 10 kilograms of lithium, nearly 40 kilograms of nickel, 25 kilograms of manganese, and about 70 kilograms of graphite. In a summary, the agency explained that the rapid deployment of EVs “implies a significant increase in demand for minerals.”⁴⁵

Figure 1. Energy Transition Minerals in Transport and Power Generation



(Source: IEA)

The vast scale of the potential demand for critical minerals in the U.S. can be understood by looking at a 2019 analysis done by Professor Richard Herrington of the Natural History Museum in London. Herrington and his colleagues looked at the U.K.’s climate goals and the requirement that all its vehicles be converted to electricity by 2050. They then calculated the volume of commodities that would be needed to convert all the U.K.’s 31 million motor vehicles to electric drive. (Rare earths are a group of 17 elements that includes neodymium, which is an essential ingredient in electric motors.) They found that doing so would require “two times the total annual world cobalt production, nearly the entire world production of neodymium, three quarters the world’s lithium production and at least half of the world’s copper production during 2018.”⁴⁶ Recall that these numbers only cover the auto fleet in the U.K.

The U.S. has about 276 million registered motor vehicles or roughly nine times as many vehicles as the U.K. If Herrington’s numbers are right, *electrifying just half of the U.S. motor vehicle fleet* (roughly 140 million vehicles) would require about nine times the world’s current cobalt production, about four times global neodymium output, about three times global lithium production, and about two times world copper production.

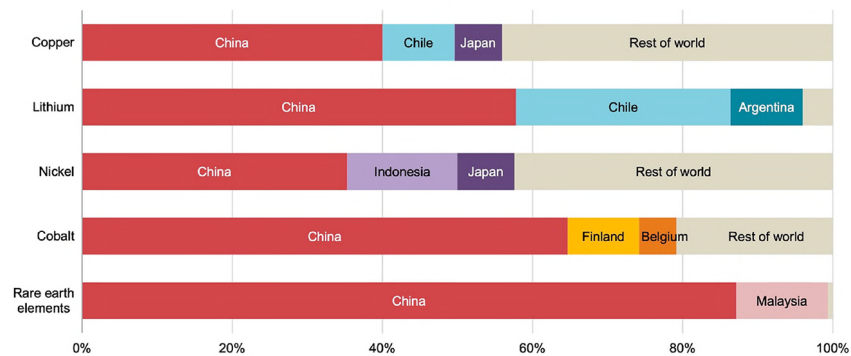
Those eye-popping numbers matter because deploying millions of new EVs will require close cooperation with China, which, according to the IEA, controls nearly 40% of global copper processing, 60% of global lithium processing, about 35% of global nickel processing, 65% of global cobalt processing, and nearly 90 percent of rare earth element processing.⁴⁷

⁴⁵ <https://iea.blob.core.windows.net/assets/24d5dfbb-a77a-4647-abcc-667867207f74/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf>, 26.

⁴⁶ <https://thehill.com/opinion/energy-environment/460496-electric-vehicles-wont-save-us-from-climate-change>

⁴⁷ <https://iea.blob.core.windows.net/assets/24d5dfbb-a77a-4647-abcc-667867207f74/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf>, 31.

Figure 2. Share of Processing Volume for Selected Minerals, 2019



(Source: IEA)

CONCLUSION

The dominance of refined petroleum products in the transportation market is largely due to a basic metric in physics: energy density.

Yes, batteries are getting better and so are the cars that use them. But today's batteries are still no match for oil when it comes to gravimetric energy density, which is the amount of energy contained per kilogram of fuel. Gasoline and diesel contain about 80 times more energy per unit of weight than the best lithium-ion batteries. Even if you assume that EVs are twice as efficient as internal combustion automobiles, the energy density of gasoline and diesel is still 40 times better than that of batteries. Oil has other advantages over electricity in transportation, including its relatively low cost, abundance, geographic distribution, ease of handling, and speed of refueling. That latter characteristic, quick refueling, is a critically important factor. Unlike EVs, which can take hours to recharge, conventional vehicles can be refueled in less than five minutes.⁴⁸

If cutting transportation emissions is the goal, federal policymakers should—according to a recent analysis by John DeCicco, a research professor emeritus who recently retired from the University of Michigan—focus on increasing the efficiency of the entire automotive fleet. In a piece published in *Scientific American*, DeCicco explained that “the media spotlight on EVs can lend them outsized importance in discussions of the car-climate challenge.” He continued, saying that despite their popularity, “EVs are not yet close to having a measurable net impact on CO₂ reduction ... even as EVs have gained market share, carbon-cutting progress has ground to a halt.”

Why haven't EVs reduced emissions? The answer is simple: consumers are voting with their wallets. Instead of EVs, they prefer to drive pickups and SUVs. DeCicco explained that as more drivers are driving bigger vehicles, their adoption has “swamped potential CO₂ reductions from electric vehicles by a factor of five.” DeCicco concluded that “it is crucial to greatly improve the fuel economy of the gasoline vehicles that will still be sold in the years ahead.”⁴⁹ Those incremental gains in efficiency, including the use of more hybrid vehicles, says DeCicco, will achieve greater greenhouse gas reductions than continuing the decades-long push for electrification.

Federal policymakers should also consider how they can foster e-micromobility, particularly in low-income neighborhoods. In a 2019 report, analysts at Deloitte found that “limited survey data suggests that support for e-scooters tends to be highest among lower-income users.”⁵⁰ Consumers are embracing micromobility. Be-

⁴⁸ https://www.realclearenergy.org/articles/2020/11/29/five_reasons_why_internal_combustion_engines_are_here_to_stay_651051.html

⁴⁹ <https://www.scientificamerican.com/article/want-greener-cars-focus-on-fuel-efficiency/>

⁵⁰ <https://www2.deloitte.com/us/en/insights/focus/future-of-mobility/micro-mobility-is-the-future-of-urban-transportation.html>

tween 2017 and 2019, the number of “microtransit” trips in the U.S. jumped nearly four-fold to 136 million.⁵¹ Those microtransit excursions reduce the number of automobile trips in a cost-effective way. In addition, e-bikes and e-scooters generally use low-voltage rechargers, which means micromobility programs can be expanded without costly upgrades to local electric grids.

Finally, and it is beyond the scope of the caption of this hearing, Congress must be looking at the lowest-cost options when it comes to reducing emissions. The lowest-cost way to do that—as shown by Reiner Kuhr, an adjunct professor at the University of Massachusetts Lowell who worked in the electric power sector for 45 years—is to keep existing nuclear plants open and operating. Kuhr, an energy technology economist, has determined that carbon-dioxide mitigation costs range “from under \$20 per ton to keep existing nuclear running longer, to over \$800 per ton for rooftop solar.”⁵² Given the enormous disparity in costs, Congressional leaders must consider the overall cost of mitigating emissions and support the methods that provide the most mitigation bang for the buck.

Congressional leaders must also be wary of adding yet more demand on an electricity grid that is being fragilized by increasing reliance on intermittent renewables and just-in-time delivery of natural gas. Attempting to electrify transportation will not, as the caption of this hearing boldly suggests, “solve the climate crisis.” Instead, it could result in the waste of many billions of dollars on technologies and infrastructure that consumers don’t use or don’t want to buy while making our transportation network more dependent on commodities controlled by China.

In summary, efforts to decarbonize transportation are laudable. But as author Vaclav Smil has rightly pointed out, energy transitions “are protracted affairs” that occur over decades, not years.⁵³ Before allocating billions of dollars on infrastructure and more subsidies for EVs, policymakers must have frank and transparent discussions about how efforts to decarbonize transportation will impact low and middle-income Americans, many of whom are already struggling to pay their energy bills. Higher energy costs are a form of regressive taxation. At a time when policymakers are grappling with inequality and social justice issues, they must be careful not to impose regressive policies that will exacerbate inequality.

Over the past century, the American transportation network has flourished because market forces were allowed to provide the best solutions. Congress should not be picking winners in the transportation market. If EVs are, in fact, better than conventional vehicles, then policymakers should let consumers drive their adoption.

Ms. CASTOR. All right. Ms. Osborne, you are now recognized to give a 5-minute presentation of your testimony. Welcome.

STATEMENT OF BETH OSBORNE

Ms. OSBORNE. Thank you so much. Good afternoon, Chairwoman Castor and Ranking Member Graves, and thank you for inviting me to today’s hearing. I am the Director of Transportation for America, a national nonprofit committed to a transportation system that connects people to jobs and essential services by all modes of travel no matter their financial means or physical ability. We do our work through direct technical assistance, research and analysis of how the existing transportation system is working, and advocacy.

We have heard already and we will hear many more times today that transportation is the sector emitting the most carbon and it is going in the wrong direction. To address it, we need to reduce vehicle emissions and we need a transportation system that allows for shorter trips and less vehicle use. I am here to talk about the latter.

While we talk a lot about vehicles, we have mostly ignored the impact of our transportation priorities and investments on travel.

⁵¹ <https://usa.streetsblog.org/2020/08/31/micromobility-trips-explode-60-percent-in-one-year-but-bikeshares-lag/>

⁵² <https://www.forbes.com/sites/robertbryce/2021/04/29/the-indian-point-closure-means-more-emissions--and-more-cynicism-about-climate-action/?sh=6a367f415349>

⁵³ https://home.cc.umanitoba.ca/~vsmil/pdf_pubs/oecd.pdf

Our system forces people to travel alone more and farther, and they are traveling farther every year. Not only is that an expensive imposition on the traveling public, it undermines the great work we are doing on vehicles.

But let me be clear, Transportation for America strongly supports transitioning to zero-emissions vehicles; in fact, we colead an electrification coalition with the Clean Cars Campaign called CHARGE. But it is worth remembering that past improvements in vehicle efficiency had been severely undermined by increases in driving, leading a net increase in emissions.

Electrifying the fleet is essential, but we simply do not have the luxury of stopping there no more than we could improve the efficiency of HVAC systems in our building while leaving the windows open. The climate will not be so impressed by the electrification of our fleet that it will forgive a big spike in carbon emissions along the way.

Additionally, we don't want a surgical fix to carbon that leaves other emissions in the air. A vehicle tailpipe is not the only emitter. Electric vehicles still generate particulate matter through brake dust and a breakdown of rubber tires. The pavement itself emits dangerous pollutants on hot days. Roadways create storm water runoff, add to the amount of impervious surfaces, and contributes to heat island effect. If people aren't pushed to drive more every year, we could stop adding more and more pavement.

Addressing the transportation system so that people can take shorter trips, share them, and make more trips outside of a car also pays dividends to the consumer through lower household transportation costs.

Transportation is usually the second largest household expense making it possible, for example, for a family of five to function with two cars instead of four, like mine did growing up, can save substantial funds that could be better used for home ownership, household improvements, retirement, and education.

Most concerning, the roadway system has gotten more dangerous for those outside of a car with pedestrian fatalities increasing year over year and all fatalities spiking greatly last year. That burden is not shared equally.

Black and Native Americans are significantly more likely to be struck and killed as a pedestrian as are older Americans. Risking your life to cross the street is not much of a choice. There are huge equity and climate implications when we require even short distances to be traversed only through driving. To improve roadway safety, we need to update our roadway designs to include those both in and out of a car.

Overall, we must provide more reliable, high-quality transit, and locate the things people need close to where they live. And our various infrastructure programs from transportation to housing to economic development should be optimized to provide those choices not, as is often the case now, to cut them off.

We need to update our methods of measuring the performance of the transportation system to include everyone traveling, particularly using multi-modal access to jobs and essential services as Ranking Member Graves pointed out, which both the House and

Senate reauthorization proposals address, though, the House does it better.

Rather than view this as an overwhelming effort to restructure the built environment, let's start with two basic ideas. One, the built environment is changing all of the time and that will continue whether we engage or not. So we might as well harness it for lowering costs, improving access to economic opportunity, lowering emissions, and improving public health benefits.

Two, we need only start by getting out of our own way. We could remove regulatory barriers to town center and in fill development, and update roadway designs for safety. We can look at areas where it is destination rich, but there is low access due to dangerous crossings, barriers, and winding driving routes.

And we could create better connections, usually through low cost simple interventions. If we take this approach to decarbonizing our transportation system, along with cleaning up vehicles, we will achieve way more than just addressing climate emissions.

I thank you for your time, and look forward to the discussion and questions.

[The statement of Ms. Osborne follows:]

**Testimony for Beth Osborne
Director, Transportation for America**

**Transportation Investments for Solving the Climate Crisis
House Select Committee on the Climate Crisis**

Wednesday June 30, 2021

Good afternoon Chairwoman Castor and Ranking Member Graves and thank you for inviting me to today's hearing. It is my pleasure to testify before this select committee today regarding the nexus of transportation, land use, and the emerging and evolving climate crisis our nation and our global community is facing. This issue is incredibly important as the climate crisis will affect our access to food, water, and quality of life, especially in our nation's most vulnerable communities.

I am the director of Transportation for America, a national nonprofit committed to designing the transportation system to connect people to jobs and essential services by all modes of travel. We do our work through direct technical assistance to local and state agencies, research and analysis of how the existing transportation system is working, and policy development and advocacy.

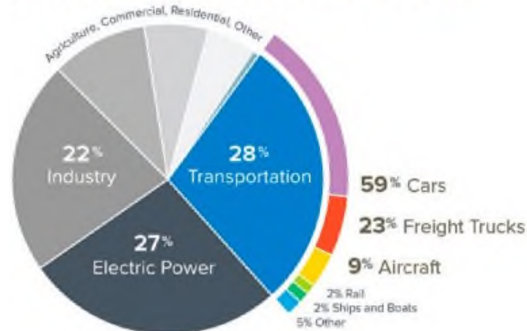
I am here to talk about transportation and land use primarily because transportation is one of the sectors where emissions have been growing the fastest—nearly a third of all US emissions come from the transportation system that moves us and the goods that we consume. But the large majority of those transportation-related emissions come from the vehicles we drive and the dramatic increase in miles-traveled per person are directly related to our land use decisions. Today, I want to make the basic case that we cannot limit our climate efforts within transportation merely by reducing or eliminating emissions from the vehicles themselves—we must also find ways to encourage shorter trips and allow for less driving overall, while also making our transportation system work far better for the millions of Americans who today either choose not to or cannot drive.

Whereas other sectors are becoming more efficient and reducing emissions, the transportation sector has been going in the wrong direction. To decarbonize transportation, we will need more than new tech or new regulation.

Transportation emissions are driven by two major factors. The first factor is the efficiency of the vehicles we use. While we usually think of the cars that people drive, we also need to consider the trucks that carry the goods we consume. Think how e-commerce has exploded in the past few years. That increase in e-commerce has fueled additional demands for goods mobility, also contributing to emission increases. Without skipping a beat, we can make a huge dent in our transportation emissions through a marked shift towards zero-emission vehicles (such as electric and hydrogen vehicles) for our national fleet of cars and trucks. That means moving

towards zero emission, electric vehicles for our public transit fleets, our freight carriers, and incentivizing the consumer shift towards zero emission vehicles. Addressing vehicle emissions is the part of the equation that gets the lion's share of attention.

2018 U.S. GHG EMISSIONS BY SECTOR & SOURCE⁶



The second factor in transportation emissions gets significantly less notice or time. It doesn't have the same allure as new tech. This has to do with how our transportation and development patterns decisions have led to a dramatic increase in the amount each American drives on average, the growing length of those trips, and the inability to make trips safely or conveniently by any mode other than driving. This factor is just as important as the first one; and successfully addressing it involves making changes to the transportation system and the built environment in general to remove the many existing barriers to shorter direct trips, shared trips and non-driving trips. Part of this means getting the government out of the way so that the market can meet the booming demand for more housing in places where trips are shorter or can be accomplished without having to get in a car for every single trip.

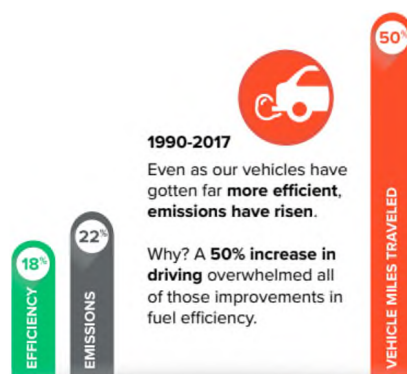


This second factor gets less attention is because there's a perception that the built environment around us is permanent and unchanging, and we just can't control it. In actuality, it is changing all around us all the time, and we've made proactive decisions in recent decades to cut off short trips and make travel without a car extremely dangerous. Rather than disregard it or get frustrated by our past and ongoing mistakes, we can look at the actions that have created problems and instead harness the vibrant and changing built environment to make the transportation system more efficient. In doing so, we can also make the system less expensive for both government and people, safer, and more equitable, as we discuss in our report from 2020, *Driving Down Emissions*.¹

¹ <https://t4america.org/wp-content/uploads/2020/10/Driving-Down-Emissions.pdf>

To the credit of this committee, your report “Solving the Climate Crisis” released last summer got into these issues and covered the various impacts of the transportation system on the climate (and safety, repair and equity) quite well. Additionally, the House transportation reauthorization proposal addresses climate (and safety, repair and equity) by providing funding to fix the current problems in the transportation system but also by seeking to prevent future projects from creating additional problems. We have a history of creating challenges through the larger core programs while fixing them with other smaller programs.

There is a danger in an approach that focuses only on the technology of our vehicles. We have talked for years about making cars more efficient, and we have made some strides. However, our technology-only approach has led to the transportation system becoming less efficient at getting people where they need to go, undercutting the good work we have done at making vehicles more efficient. We can’t afford to continue that pattern. Let me be clear: Transportation for America strongly and enthusiastically urges decarbonizing vehicles. We co-lead an electrification coalition called CHARGE², and I was personally involved at the staff level in crafting legislation to increase CAFE standards—then went to USDOT and worked on implementing them. Even with those gains in efficiency, increases in overall driving wiped out those gains, leaving us with a net increase in emissions. Electrifying the fleet is essential and we absolutely must do it. But we do not have the luxury of stopping with vehicle efficiency, no more than we could improve the efficiency of the HVAC systems in our buildings while leaving the windows open.



We need an approach to climate change that considers both of these factors, bringing the most opportunity to improve the system for everyone who depends on it, while also lowering emissions. About two-thirds of all trips in our communities are under three miles, many of which could be made by biking or walking if it was safe and hospitable. Considering that people pay a premium to live in walkable areas³ and near transit⁴, there is clearly high demand. It is the government that stands in the way of meeting that demand by making it very challenging to build and collocate housing near jobs, retail, groceries and restaurants. Government also employs a one-size-fits-all approach to roadways that applies high speed highway designs in developed areas. [The whole reason we built Interstates separated from the surface streets is because it was obvious that they would be both ineffective and unsafe if there were cross streets and traffic lights every 500 feet. Somehow we lost that clarity and started designing roadways as highways through areas with cross roads, driveways, and pedestrians, producing places where traffic is both terrible and walking is dangerous.] Government could get out of the way by deregulating development and updating to roadway designs appropriate to the surrounding area. This way we could build roads that service all users of the system—including local travel, thru-trips, drivers, freight, transit, bicyclists and pedestrians.

Such an approach would not just reduce carbon emissions, it would improve other environmental and public health effects of the transportation system. We often for-

² <https://www.chargingusforward.com/>

³ <https://www.nar.realtor/newsroom/real-estate-story-ideas/the-value-of-walkability#:~:text=The%20more%20walkable%20the%20community,homes%20in%20less%20walkable%20areas>

⁴ <https://realtorparty.realtor/community-outreach/transit-property-values>

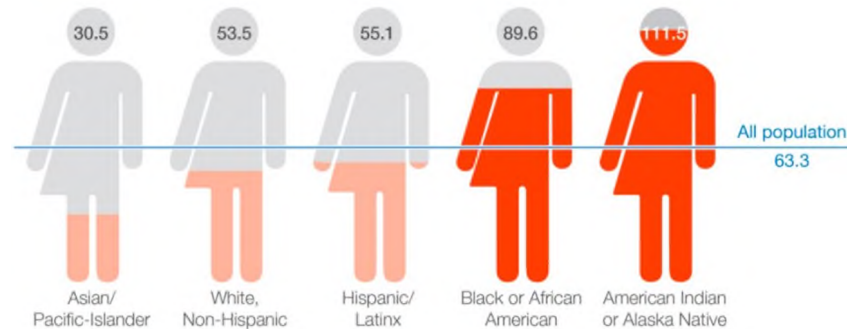
get, but a vehicle's tailpipe is not the only problem caused by our transportation system. Electric vehicles still generate particulate matter through brake dust and the breakdown of rubber tires. That is in addition to the other environmental damage that roads bring to cities through their construction, including the loss of green space, the increase in impervious surface, and the addition of surfaces that can increase the urban heat island effect. In fact, the roads themselves have been found⁵ to emit as much pollution as cars on a hot day, days that are occurring more often.

This approach also pays dividends to the consumer through lower transportation costs. Transportation is usually the second largest household expense⁶. By making it possible for a family of five to function with two cars instead of four (like mine required growing up) can save substantial funds that could be better used for property investment, household improvements, education, and retirement.

As someone who struggled to find work as a college student in Baton Rouge for lack of a car but could not afford a car for lack of a job, our car-only system is a massive barrier to economic opportunity. Those who try to get around without a car may not have any alternative, and they risk their lives walking on roads that are more dangerous than they have been in 30 years. This burden is not shared equally: Black and Native Americans along with older Americans are more likely to be struck and killed as a pedestrian. Risking your life to cross the street is not much of a choice, but that is the choice we have given too many people in too many communities. There are huge equity and climate implications when we require even short distances to be traversed only through driving.

The burden is not shared equally

Relative pedestrian danger by race and ethnicity
(2010-2019)



If we ignore our overall patterns of development, the built environment, and transportation, we could end up with the terrible outcome of mostly decarbonizing our cars while doubling down on the danger, public health and inequity of the current system. Instead, we can and should remove the barriers that make it so hard to get around without a car, driving shorter and more direct routes, and sharing trips. We can do this by meeting demand for more walkable communities, designing our streets for safety over speed, measuring the carbon impacts of our transportation investments, providing high quality transit, and both measuring and focusing on connecting people—no matter how they travel—to jobs and opportunity.

If we take this approach to decarbonizing our transportation system, we will reduce carbon emissions, improve public health outcomes, improve roadway safety, save people a lot of money, and improving equitable access to economic opportunity.

I thank you for your time and look forward to the committee discussion and questions.

⁵ <https://www.smithsonianmag.com/smart-news/hot-days-asphalt-may-release-much-air-pollution-cars-180975756/#:~:text=During%20heat%20waves%2C%20pavement%20can,harmful%20particles%20into%20the%20air&text=The%20study%2C%20published%20by%20a,being%20released%20into%20the%20air.>

⁶ <https://htaindex.cnt.org/map/>

Ms. CASTOR. Well, I want to thank all of our witnesses for their insightful and informative testimony. And I am going to go ahead and recognize Mr. Casten of Illinois because he has a bill up in another committee.

Rep Casten, you are recognized for 5 minutes for questions.

Mr. CASTEN. Thank you, Chair Castor, and thank you to all of my friends on the committee for allowing me to hop the order a little bit.

Mr. Van Amburg, I would like to start with you. Number one, I cannot thank you enough for stressing that it is vehicle first costs that really drives these decisions.

I come from 20 years in the power industry and maybe it is my curse, but I always think of a car as a power plant you don't run very often. And for power plants you run all the time, you think a lot about your operating cost and, therefore, fuel efficiency. For power plants that don't run, it is the first cost.

And I introduced last term the Efficient Vehicle Leadership Act, which was essentially Senator Jeff Bingham's old bill but updated for modern vehicle technologies, and we will be reintroducing that shortly. The economics, I think, is easy to understand that the overwhelming majority of the cost of a vehicle is the cost of a vehicle, not the operating cost.

Have you done any research on actual that, you know, consumer behavior to flesh that out as far as what really drives consumer choices, particularly as we think about how aggressively to shape these feebate structures?

Mr. VAN AMBURG. Yeah. It is a really good question. I think—and it is different, to be real frank with you, between consumers on the passenger car side who make a set of decisions based on different things than what a fleet decides on. A fleet is very much driven by total cost of ownership. So they really do kind of factor in, how do I make this tool pay off for me? And in that case, it is upfront cost, but it is also looking at the life cost of the vehicle on fuel and maintenance and the like. And that is really why in the commercial world fleets are starting to look at electric drive. So there is one set of tools, I think, I would suggest for the heavy duty or the commercial space, and maybe a slightly different set for passenger vehicles.

You know, passenger vehicle buyers are really sensitive to what is this vehicle going to do for me. There is a range issue involved. So there are some of those issues they want to factor in for themselves, but they actually do want to say, hey, look, I am getting—a feebate is really interesting because it gives you a reward for one choice and if you want to make another choice, that is fine, but you pay for the privilege. It is kind of allowing people to pay for their choices based on a new set of metrics. And I think that signal is actually really important to somebody. They will go, well, wait a minute. I could buy this one that is more fuel efficient and I might get a kickback, or I buy this thing that is less efficient and I am going to have to pay a little surcharge. That is a pretty powerful signal to a consumer.

Mr. CASTEN. I am a stickler for market forces, so I appreciate that.

I want to shift to Ms. Osborne and see if you can solve a thorny problem in the Chicago area for me.

Ms. OSBORNE. No problem.

Mr. CASTEN. I love your idea about, like, we need to not only, you know, shift to more efficient vehicles, but get vehicle miles traveled down. One of the great frustrations in Chicago is I think something like 40 percent of rail freight traffic comes through the city. And so, you know, people where I live do not want to spend all day in traffic on the Eisenhower, but because our rail line, the commuter rail fights for service with the freight rail service, they don't have a lot of other choices.

There are obvious solutions, they cost a lot of money, and they pick a lot of nimby fights. Have you heard any really robust solutions for the Chicago area specifically, but also for regions like Chicago where you have this wonderful rail network, but a rail network that really wasn't designed with commuters in mind?

Ms. OSBORNE. Yeah. It is a very good question and you really gave me a tough one, too.

Mr. CASTEN. I gave you a minute and twenty seconds.

Ms. OSBORNE. So I should fix all the rail problems in Chicago. I grew up in New Orleans and we also have a confluence of a ton of rail lines that go through areas that, you know, don't necessarily work with the community that exists there now. It is a complicated issue and especially in these urban areas that need to accommodate not just the traditional modes of rail from—or modes of transportation from freight rail and commuter rail, but all kinds of new modes of travel. It is getting more complicated and it is one of the reasons, I think, our old tools that we continue to rely on are so unhelpful in addressing some of these circumstances.

But when it comes to these cities that have a confluence of not just freight and people moving, but people coming in and out of the region, I think, we are probably going to have to put some real money into separating those various users.

Mr. CASTEN. So with 20 seconds left, this is totally unfair, Commissioner Kelliher, but do you have any thoughts on—I know you have put some thought into shifting to a BMT based fee structure, and I am always struck by the fact that people will willingly give private information to Google that they don't want to give to the United States Government.

Any guidance on how—what have you done to ease the uptick to a BMT system in Minnesota?

Ms. ANDERSON KELLIHER. Well, thank you for the question. And I think that the first thing is we are working in partnership with our other states around the country on the issue of what is going to be the replacement for what typically is called, you know, the fuel tax cliff at some point into the future. I think we shouldn't overblow that cliff, though, right now. It is still a workhorse of what we do. We are working on voluntary pilots with Missouri, with Kansas, with Iowa, to work on these issues of particularly how rural users feel about vehicle miles traveled and adoption of vehicle miles traveled. Not so much focused on what the fee will be, but focused on the technology and comfort with the technology.

So I think that is one of the main places that we are going to put our effort is working with our rural and suburban users on how we can share information.

Mr. CASTEN. Thank you, and I am over time. I appreciate the chair's indulgence.

I yield back.

Ms. CASTOR. Mr. Armstrong, you are recognized for 5 minutes.

Mr. ARMSTRONG. Thank you, Madam Chair. I think this is just a perfect example of difference in districts. I don't so much view my car as a mobile power plant. I don't use those very often as my office in district, my apartment in district, my occasional storm shelter in district, and a place that, just by the nature of the district I represent, I have to spend a lot of time in.

And commodity-based economies like North Dakota rely on all-of-the-above energy to get our goods to market. We utilize rail, pipeline, roads, highways, but if we are going to have the conversation about mass adoption of electric vehicles, particularly in the heartland, and particularly for commercial use, then we have to consider how we are going to deal with the increased wear and tear on our surface and infrastructure and how we are going to pay for that.

In 2019, when the President of Cummings Distribution Business testified before this committee, he noted that in order to have a tractor head that would have the same range and power as today's diesel engine and fuel tank, weight would need to increase by a factor of three to five times to accommodate enough batteries to give the same power and range. And Volvo's mid-sized regional truck for short routes weighs 8,000 pounds more than its diesel component.

So when we are dealing with these things, it is not just a Federal deployment of this, we have—we have dealt with all of these things in North Dakota. We have weight restrictions on state roads, we have weight restrictions on county roads. We have all of those things. So one of two things has to happen. We either have to increase the weight restrictions, which means we are going to have to rebuild up every single county road in North Dakota or we are going to haul less product per trip.

Now, if we are going to haul less product per trip and we are going to deal with charging stations, all of these different issues, we haven't even talked about the regulations for hours of service for transport, for all of those things. But the bottom line to this is, if you live in Grafton, North Dakota and you are taking load of potatoes to Minnesota, two things are going to happen: You are going to be able to haul less of that product, which is going to increase the price and it is going to take you twice as long to get there and back under current rules and regulation.

So what does that mean? We are going to increase the cost for ag products which we produce and provide to the entire country and the world, and none of that increase in cost is going to go to the producer. In fact, we are going to actually increase the cost to the producers as well.

So the people in the middle, if we are going to make this, are going to be dealt with in transportation. And so when we talk about increasing the cost not only about charging stations, giving subsidies to \$80,000 Teslas, we have to recognize that as we deploy

this under current technology, the costs of the goods we haul in those trucks is going to go up.

So Mr. Bryce, in your testimony, you discuss taxpayer funded subsidies given to EV buyers, publicly funded charging stations, and grid upgrades needed to support electrification. But it is not just those subsidies that benefit EV drivers at the expense of those who drive internal combustion engines. Every time someone purchases fuel, they pay a tax which funds infrastructure. EV drivers don't pay into this system, but operate vehicles that are heavier than their internal combustion engine counterparts.

Can you discuss how this pushes the burden of road maintenance on to drivers who do pay fuel taxes?

Mr. BRYCE. Yes. Thank you, Representative Armstrong. Yes, this is one of the thorny problems with electrification of transportation is that you have unequal distribution of benefits. I was noticing in Colorado they passed some electrification legislation and they talked about reduced maintenance costs for those automobiles. Well, those reduced maintenance costs accrue to the owners of the EVs themselves not to society as a whole.

So I think this issue of the motor fuel tax is one that, again, that Congress is going to have to take on. And it is a difficult one because the Congress already, as I recall, the Biden administration is not in favor of increasing the gasoline tax. So some of the states do have, as memory serves, about two dozen states have enacted some higher fee on EV drivers, but, again, that is highly—it is differentiated among the states. I will make one point quickly about North Dakota, sir, which is that the adoption of light-duty vehicles, EVs, in North Dakota has been very low. If memory serves, less than a thousand EVs in the entire state. So there is also a very uneven distribution of EVs among the states, and North Dakota/South Dakota, the northern states there, there are very few of them.

Mr. ARMSTRONG. It is very cold in North Dakota and a lot of people drive long distances. And that is—and that is just—those are the restrictions. We know this is going to deploy faster in urban areas and I understand all of that, but as we continue to have this conversation in moving forward, I think it is important to recognize that there is a difference between a school bus in a school district in New Jersey and a school bus in a school district that covers 260 miles not because people want to drive more, because that is how far we go to get groceries sometimes.

And with that, I yield back.

Ms. CASTOR. Thank you. Rep Bonamici, you are recognized for 5 minutes.

Ms. BONAMICI. Thank you, Chair Castor and Ranking Member Graves, and thank you to our witnesses. This is a timely hearing as we are marking the one year anniversary of releasing the comprehensive Climate Action Plan and also as the House considers the INVEST in America Act to reauthorize surface transportation programs.

I do want to note that my home state of Oregon, we have been doing great work in vehicle miles traveled. So people can look there for another example of where it is working to first pilot and then implement a program. We know, as we have heard this morning,

that transportation sector is the largest source of energy related carbon dioxide emissions in the country and our most vulnerable communities are disproportionately affected by the resulting pollution.

Fortunately, our Climate Action Plan and the INVEST in America Act will help change this reality. We have a once in a generation opportunity to build back better, by investing in zero-emission buses, transit, electric vehicle charging stations, pedestrian and bike infrastructure, and decarbonize the transportation sector.

These efforts as we know will create good-paying jobs and also support frontline communities. I want to start with Mr. Van Amburg.

In northwest Oregon, Daimler trucks and Portland's General Electric recently opened a new heavy-duty electric truck charging site in Portland Swan Island Industrial District, the site, which is known as Electric Island, is designed to accelerate the development, testing, and deployment of electric commercial vehicles. It is of particular interest to our region given the significant air pollution from traffic on the I-5 corridor, which disproportionately affects communities of color living in adjacent neighborhoods as a result of historically racist red lining policies.

So Mr. Van Amburg, what are the current challenges in deploying charging infrastructure for heavy-duty electric trucks and how can Congress help address these obstacles to reduce emissions?

Mr. VAN AMBURG. Well, thank you so much for the question. And I think it is important for Congress to see that it is a phased out strategy. And in recognition of the points made by the previous Congressman, these aren't going to be vehicles—trucks that are going to be driving in every duty cycle immediately right away. They are going to be phased out as the technology improves, but what we could be doing, the first charging is going to be at the truck depots and the bus depots, and their return to base fleets.

The next round of charging really needs to be in fast charge hubs in our cities and towns. And then kind of that next phase, which is what Congress is really looking at, and is right, is charging along our corridors as in the key corridors so that we can connect key cities together like Portland with Salem or Salem to Eugene.

So these kind of things where we can start to build out from our depots to our cities to key corridors is really the next line. And what we need to do is seed that early market. Private industry will jump into this, but they need some help to start seeding those first applications as volumes come up.

Ms. BONAMICI. Thank you. That is very helpful.

Ms. Osborne, the Pacific Northwest, as everyone knows, faced a record-breaking heat wave the past several days with temperatures exceeding 100 degrees for multiple days. It was 115 degrees at my house 2 days ago.

TriMet, Portland's metro area transit agency temporarily suspended the MAX Light rail service after the unprecedented temperatures pushed the systems cables, which contain copper, to its limit and TriMet noted that the MAX system is designed to operate in conditions of up to 110 degrees, which should be all right because the average high temperature in Portland is usually 77, but, of course, it exceeded that.

So Ms. Osborne, how can Congress help local transit agencies better prepare for the increasing consequences of the climate crisis and what steps do we need to take immediately to make sure that our transportation system is more resilient?

Ms. OSBORNE. Yeah. It is a really important question. I have a colleague, one of our staffers, is located in Portland and has been keeping us abreast of the difficult situation out there, but clearly we are going to have to start to anticipate and plan for these kinds of events because they are going to become more frequent all across the country.

We here in D.C. are also experiencing pretty high temperatures for the time. So I think some of the things that the House bill has included in terms of planning for resilience and incorporating climate change in our planning is going to be essential, putting real money into retrofitting these systems to be able to handle the conditions they are going to see more frequently, whether it be high temperatures or fires or flooding or whatever else is going to come with climate change is going to be important.

And I think what is even more important is making sure we don't put out anything new into the world that isn't equally as prepared. What we don't want to do is continue to create problems that need to be retrofitted with our programs that we are creating now to retrofit past problems.

Ms. BONAMICI. Thank you so much.

And as I yield back, Madam Chair, I just want to address the issue that was raised about the weight of electric vehicles. I serve on the Science, Space, and Technology Committee, and I know with the combination of the research and the increasing consumer demand, I am sure that the weight issue is going to be addressed so that we are lowering the weight of electric vehicles.

And with that, I yield back. Thank you.

Ms. CASTOR. Mr. Crenshaw, you are recognized for 5 minutes.

Mr. CRENSHAW. Thank you, Madam Chair. Thank you for holding this hearing. Being about transportation and in context of the broader conversation on environmental justice and how to define that, you know, I want to narrow down or zero in on how these two issues might conflict.

Ms. Anderson Kelliher, you talk about environmental justice quite a bit in your testimony. I am curious what legal definition you are operating off of and how you use that to plan projects in Minnesota?

Ms. ANDERSON KELLIHER. Well, thank you for the question. We are working off of a set of communities that have historically been impacted negatively by transportation. So I am going to point to one in particular, the I-94 corridor between Minneapolis and St. Paul, the historic Rondo neighborhood that was destroyed. A Black neighborhood destroyed by the Interstate Highway System. No legal definition is needed because every ounce of wealth out in the middle of that community was taken out of it.

So now we are working on the rethinking I-94 project, which it has a number of goals. One of the goals is to lessen the health impacts of the highway system on the community. It is also to increase the economic wealth of the community by reconnecting potential land bridge—

Mr. CRENSHAW. Okay. This sounds like good development and planning, just generally speaking, but that is not an environmental justice definition as you said. There is no legal definition.

And this matters quite a bit because, as we exalt this notion of environmental justice to such an extent that it becomes fodder for groups to sue, it becomes fodder for the Federal Government to perhaps sue states and stop certain expansions based on a definition that apparently does not exist, and so you got to define it at some point.

The White House has sought to define it with their Council on Environmental Justice Report from Gina McCarthy. Would you generally agree with that report?

Ms. ANDERSON KELLIHER. Madam Chair, was that a question for me?

Mr. CRENSHAW. Yes, yes. We are still—you and I are still talking.

Ms. ANDERSON KELLIHER. Okay. Thank you, Representative. We actually use the definition from the 1994 environmental justice order as our legal definition of environmental justice.

Mr. CRENSHAW. All right. Okay. Can you explain what that is then? What are some of the definitions involved in that one?

Ms. ANDERSON KELLIHER. So Representative, I will have to get back to you on the legal definitions in the 1994 environmental justice order.

Mr. CRENSHAW. Okay. Look, the White House has come out with something and I imagine you guys will probably agree with it. I know I find it a little troubling because it specifically says that Federal investment dollars that flow towards things like, quote, road improvements or automobile infrastructure would not benefit communities and wouldn't meet the do-no harm standard required under environmental justice. And I would like to insert this report into the record. So—

Ms. CASTOR. Without objection.

Mr. CRENSHAW [continuing]. Can you comply with recommendations like that? How can you develop anything in your home state with recommendations such as that? How would the construction project and the I-35 projects in downtown Minneapolis be affected by guidance like this?

Ms. ANDERSON KELLIHER. Representative, we are on track to deliver the I-94/35W project in September of this year fully complete after 4 years with bus rapid transit, as well as increased biking and walking lanes and increased HOV capacity. These types of—

Mr. CRENSHAW. You would be in direct conflict with the White House guidance, which is what I am pointing out here. I mean, it says on page 59, examples of types of projects that will not benefit a community and would go against environmental justice standards, No. 5, research and development. That is just research and development. Not good. No. 10, sorry, No. 9, road improvements or automobile infrastructure other than electrical vehicle charging stations.

So you might want to write the White House and ask them what they are doing and why this would be part of the standards. It is important to define these things. I am out of time.

And I yield back.

Thank you, Madam Chair. You are free to respond if the chair will allow it.

Ms. CASTOR. Go ahead.

Ms. ANDERSON KELLIHER. Madam Chair, we actually are developing a number of tools in Minnesota that will help meet these standards and one of them is a health impact assessment that will directly fit into the White House's parameters that will help us as Minnesota be able—and we will share with other states—be able to do the assessment of how communities who have historically been overburdened with transportation infrastructure will be impacted, and then we will make our decisions from there, including more transit, more biking, walking, other facilities, HOV facilities as well.

And further more, the other part of this is resilience and making sure communities are not harmed by runoff, flooding, and a number of other things that come with the building of roadways.

Ms. CASTOR. Thank you very much.

Rep. Brownley, you are recognized for 5 minutes.

Ms. BROWNLEY. Thank you, Madam Chair, and thank you for having this important hearing. And it is certainly a timely hearing as well, so thank you for that.

Mr. Van Amburg, first, I want to thank you for your plug on my green bus bill, so thank you very much for that. And it sounds like—based on your testimony today, it sounds like buses are really helping to lead the way for heavy trucks and, you know, the big rigs and so forth, in terms of moving in that direction. So I hope—most of the provisions of the green bus bill got into the INVEST in America Act. And so, hopefully, that will certainly make a difference in terms of cities transitioning to zero-emission buses.

I wanted to ask you—Mr. Casten was asking you about sort of market drivers or signals, and you were talking about it was different for personal vehicles versus light-duty or heavy-duty trucks. And so, you know, I would like for you to talk a little bit about that, if you could.

And it is astonishing to me that, you know, the development of heavy-duty vehicles, as you describe them, the speed at which that has moved along is—is quite a big success. And I was wondering, other than, you know, providing resources and investment at the point of purchase, are there any other—are there any other things that you would credit to that speed?

Mr. VAN AMBURG. Well, thank you very much, Representative Brownley. And you definitely deserve a head nod for the great work that you are doing on the Green Bus Act.

So I think what is exciting right now is I think what we have found is the degree of technology transfer, that is much higher than we have ever seen, not just between heavy-duty vehicle types, but actually from light duty into heavy duty, and that includes things like battery cells, battery packs, power electronics—I don't need to get into the minutiae, but some of the speed is attributable to the fact that we actually are getting components that are capable of being transferred into these larger and heavier vehicles.

When it comes to the purchase decision, the biggest thing for the commercial user is looking at that total cost of ownership, and they do factor in the reduced cost of the fuel, the reduced cost of mainte-

nance. But, right now, the upfront cost is a little higher, and they need some help. That is one.

Number two, though, is really starting to give some assistance either to utilities, or to the fleets, to really start to put infrastructure in place faster. That is really going to be the next issue. And it is not going to have to be super expensive infrastructure all over the place to start, but it definitely has to be helping the fleets at their depots where they bring their vehicles back, and then expanding into cities and corridors.

Ms. BROWNLEY. Terrific. And you also—I think in your written testimony, you reference the important co-benefits that will result from transitioning our nation to zero-emission vehicles beyond just the climate. So could you just expand a little bit on that?

Mr. VAN AMBURG. Yeah. Thank you for that question. And it really struck me with some of the previous questions that were being asked by Representative Crenshaw, particularly on equity and environmental justice. These—you know, as opposed to cars, big trucks operate—a lot of the time, they operate a lot of hours, and generally they are operating in places where people are bearing the brunt of that higher pollution load from those vehicles.

And disadvantaged communities actually exist. You can see them really clearly on the map. You can see where the emission load is. You can see where the lower economics are. And you can layer that and see it.

We have really targeted, in all of our work—and just an example from California. In the incentive program, 60 percent of the trucks that get incentive funding in California actually are trucks that are operating in the [inaudible] not only something [inaudible], you know, and it also is good for jobs, but it actually is getting more microfocused emissions reduction in the key communities that count. And so I think that is really an important one.

Ms. BROWNLEY. Thank you for that.

And I just really have a half a minute, but quickly to Commissioner Kelliher. I was curious to know how Minnesota has deployed vehicle charging stations to maximize their impact while keeping equity in mind.

Ms. ANDERSON KELLIHER. Thank you.

Ms. BROWNLEY. So I have—

Ms. CASTOR. You can answer.

Ms. ANDERSON KELLIHER. May I respond?

Mr. CASTOR. Please answer briefly. Thank you.

Ms. ANDERSON KELLIHER. Okay. We have over a thousand level 2 charging stations, over 200 fast chargers. We have about 20,000 vehicles on the road right now that are electric vehicles. We have a report of a dealer near the Canadian border who has 50 orders for the F-150 Lightning truck.

I think that helps answer where we are going, and we will have more deployment after this legislative session.

Ms. BROWNLEY. Thank you, Madam Speaker—or Madam Chair.

Ms. CASTOR. Thank you.

Next, Rep. Palmer, you are recognized for 5 minutes.

Mr. PALMER. Thanks, Madam Chairman.

I want to go back to Mr. Bryce and talking about how the plan put forward by my Democratic colleagues and the Biden adminis-

tration will impact rural communities, particularly the transportation bill. There is no funding for new roads. Those are—and there is a huge amount of funding for mass transit. That really doesn't help people in rural communities, what many of my liberal friends consider flyover country.

Doesn't that create, not only an economic injustice, but an energy injustice for families and households in those areas?

Mr. BRYCE. Well, Representative, this is one of the big challenges that Congress has to deal with, is the urban-rural divide. And this is present in—of course, in our politics, where mostly Democratic voters live—or a lot of Democratic voters live in cities, and more conservative Republican voters live in—in what you call flyover country. But it becomes particularly, I think, problematic when it comes to the transportation sector, because as you point out rightly, a lot of this money is directed toward projects that will benefit people who live in cities and provide more mobility in cities.

But I talked about California in my written testimony and also my spoken—

Mr. PALMER. Yeah.

Mr. BRYCE [continuing]. Testimony, because it is another example there of some of these inequities about the concentration of EVs being—a lot of takeup in urban areas but not in rural areas.

Mr. PALMER. You have written an article that was in the New York Post entitled, Lower- and middle-class Americans will pay a fortune for Biden's wind-power plan, and you talk about some of that.

But I also would like to bring to the committee's attention a letter from Jim Cooper, who I believe is an African-American member of the Budget Subcommittee in the California Assembly. And he talks about the Public Policy Institute of California reports that California residential electric power rates are almost 56 percent higher than the average in other states.

And he really talks about how—a point you just made about the electric vehicles, about the renewables, and how most of the benefit of that is going to the coastal cities, and the brunt of the cost is being borne by people who really can't afford it.

Mr. BRYCE. You are right.

Mr. PALMER. I want to move—

Mr. BRYCE. Go ahead.

Mr. PALMER [continuing]. To something else—

Mr. BRYCE. Sure.

Mr. PALMER [continuing]. In particular going back to—as we think about our transportation grid, how important it is to build new roads, and particularly in urban areas.

We talk about the amount of pollution that—and emissions in those areas, but one of the reasons we have so much—and there is a great report from the University of Alabama. They have been doing a study with Texas A&M University, and it is based on data taken every 15 minutes at hundreds of locations for almost every mile of major roads in 494 U.S. urban areas, looking at the amount of—the impact of congestion.

And the way you reduce congestion is not to try to force every urban area to adopt mass transit and get people out of their cars and then on trains and buses. It is to improve your infrastruc-

ture—your transportation system, reduce the amount of time of—that people spend in congestion in their cars, and it reduces emissions.

Do you want to comment on that?

Mr. BRYCE. Well, I don't know the study you are talking about, sir, but I would make one quick comment about the issue of vehicle miles traveled, which, you know, I have been—I am just studying what is going on in California. Latino groups—a group called The 200, which is a coalition of Latino leaders in California, have sued the state over their VMT rules, because they are saying that these are regressive, that they are increasing costs and reducing mobility for low- and middle-income consumers and that that is a problem, because mobility is essential for people who are, you know, working-class folks.

And they want to own a home, and having higher VMT charges means that it limits their ability in terms of home ownership because it limits their mobility.

Mr. PALMER. I recommend people read your articles in the Post, but I have got one other thing.

In your testimony, you commented on the threat that we have to our power grid. And there is a report from Lloyd's of London on the solar storm risk to the North American electric grid. And I keep telling people that we have got other issues that we need to address that are—that I think are more pressing than CO₂ emissions.

And I will just quickly tell you that the total U.S. population at risk of extended power outage from a Carrington-level event—that was a severe event in 1859—is between 20 million and 40 million, with durations of 16 days to 1 to 2 years, and a cost of \$600 billion to \$2.6 trillion. We have got to prepare for things like that.

Mr. BRYCE. I agree with you, Representative, and this is one—it is an issue I bring up in my new book, that the electric grid is very fragile, and we have seen the fragilization of the grid, these extended outages. It is one reason why more Americans are buying stand-by generators.

But, yes, the solar flares or the Carrington Event could be catastrophic for the U.S., and this is something that a lot of people have talked about, about the need to invest in grid protection and grid adaptability and resilience.

Mr. PALMER. I would appreciate seeing your work on that.

I yield back.

Mr. BRYCE. Thank you.

Ms. CASTOR. Next, Mr. Huffman, you are recognized for 5 minutes.

Mr. HUFFMAN. Thank you, Madam Chair.

It is so appropriate that we are taking up this subject of decarbonizing the transportation sector in a week when the INVEST Act is on the floor of the House of Representatives. We know how hugely important the transportation sector is for our interconnected lives, our jobs, and commerce, but it is also number one when it comes to greenhouse gas pollution.

So we have to tackle this part of the climate crisis, and we have got to transform this sector from something dependent almost entirely on fossil fuels to something that is a lot cleaner and more re-

silient. And I think we are having an important part of that conversation here today.

We know that we are going to need to be very aggressive on fuel efficiency, zero-emission vehicles, reducing vehicle miles traveled. These aren't just priorities from Democrats. We are seeing industry already leading the way and moving in this direction, with exciting announcements from General Motors and Ford, among many, many others.

Zero-emission vehicles makes sense from a business case. It is where the industry is heading. And I can tell you, as an EV driver, it is just a better way to get around too.

So I am excited about it, but I am confused, frankly, about Mr. Bryce's testimony. You know, on a week when we have got 120-degree weather in the Pacific Northwest, I was hoping that we would begin to hear some solutions from our friends across the aisle that match the scale of the crisis that is just increasingly obvious. What we continue to hear, unfortunately, are just things that they are against.

And Mr. Bryce brought up a whole bunch of creative—really loaded up a lot of creative arguments against electric vehicles. I found it really confusing, then, when, in his testimony, he said, but notwithstanding all these terrible things about EVs, if we could just power everything with nuclear, he would be for them. That is some cognitive dissonance.

But I just want to announce—or I just want to invite our friends across the aisle that, at some point, instead of just vilifying green new deals and proposals to electrify vehicles, we have got to get you in the game of coming up with solutions that match the scale of this crisis. We really have to change that conversation.

But, Mr. Van Amburg, since Mr. Bryce did bring up this specter of electric vehicles causing the California grid to collapse, I am going to just—

Mr. BRYCE. May I respond, since you—

Mr. HUFFMAN [continuing]. Start there with you and invite you to—

Mr. BRYCE. Since you have addressed me, Mr. Huffman, can I respond to your—

Mr. HUFFMAN. Well, this is my time, Mr. Bryce.

Mr. BRYCE. Okay.

Mr. HUFFMAN. And, yeah, I am going to ask Mr. Van Amburg—

Mr. BRYCE. By all means.

Mr. HUFFMAN [continuing]. To respond to what you said in your testimony, if you will allow me to do that.

So, Mr. Van Amburg, are we going to put an excessive strain on the grid? Can the grid handle this move toward electrification that we are seeing on transportation in California?

Mr. VAN AMBURG. Yeah. It is—you know, it is always a—it is a good question. Thank you, Representative Huffman. It is always worth our looking and taking a deep look at this.

From the point of view of the transmission grid, there really is no issue with having sufficient electricity even to start putting the big rig trucks onto the grid as that starts to happen.

The utility sector does need to really grow out, and this is part of something that I think we can all agree on, is modernizing our grid. And the distribution grid is in great need of further beefing up, because even as we put in new load for buildings and businesses and the like, the utilities often don't have enough power in their distribution grid. Plenty of power at the transmission site, not enough at distribution.

And we need modernization for a variety of things. We are concerned about cybersecurity, much less, you know, Carrington-level events. So, I think, you know, we are all—I think can agree on that.

But, no, the grid is not going to suffer some cataclysm from transportation. In fact, one of the beauties, I think, that we are seeing is that a lot of, say, bus depots, as they are starting to put in, say, 50 to 100 electric buses onsite, are starting to put in backup power that can actually add resiliency to the grid.

Mr. HUFFMAN. Yeah.

Mr. VAN AMBURG. It is distributed energy resources and backup power.

Mr. HUFFMAN. I was going to ask you about that.

Mr. VAN AMBURG. Even the Ford F-150.

Mr. HUFFMAN. Yes. The Ford F-150 video showed a truck that was powering a home and pushing power in the opposite way onto the grid.

I was going to ask you, is there a scenario in the future where EVs plugged into the grid actually become something that fortifies the grid?

Mr. VAN AMBURG. Absolutely. We are already seeing it with school buses. As they are parked during the day and charging, they actually become a backup power source. Some vehicles have been used in disasters actually to power forward the relief crews.

So, yes, we are already seeing this. And, basically, when they are plugged in, they become backup power assets to the grid and adding resiliency to it. So, yes, this is already starting to happen, and it is part of the future grid build we need.

Mr. HUFFMAN. Thank you, Madam Chair. I yield back.

Ms. CASTOR. Thank you.

Mrs. Miller, you are recognized for 5 minutes.

Mrs. MILLER. Thank you, Chair Castor and Ranking Member Graves. And thank you all for being here today.

The topic before us is so important. As most of our discussions this year have centered around infrastructure, it is critical that we focus on how to address this issue in a bipartisan manner. High tax increases and unachievable mandates will neither fix our crumbling infrastructure, nor will they help to improve our environment. Rather, these tax increases will force businesses to go offshore to places with lower labor and environmental standards.

The climate goals set by this administration require an enormous amount of critical minerals. From electrification of vehicles to powering the grid with renewable energy, we need to secure our supply chains. Unfortunately, we are not able to get most of these minerals from the United States, and, instead, we rely on corrupt regimes for our future energy.

Above all, the energy strategy is not only what is best for America's economy and national security, but ensure that we have options and baseload energy to keep the wheels turning and the lights on no matter what.

Mr. Bryce, do you know how many different types of critical minerals are required to create an electric engine battery?

Mr. BRYCE. Well, cobalt is a big one. Lithium, the—I believe—well, I can't give you that list straight off the top of my head, but as I point out in my written testimony, the mineral intensity of an electric vehicle is something on the order of six times that of an internal combustion engine fueled vehicle, so—

Mrs. MILLER. Well, there are 1,400 chips in a car. So what are the top countries the United States has to purchase these critical minerals from?

Mr. BRYCE. Well, as I mentioned in both my written testimony and in my spoken remarks, China controls, by far and away, the vast—the overwhelming majority of the rare earth metals that are needed: neodymium, praseodymium, et cetera.

And, you know, as I have thought about this in advance of this hearing, for most of my life, the United States and Congress have been talking about getting off of OPEC, and demonizing OPEC, demonizing oil, foreign oil, and yet this idea that we are going to transition to electric vehicles means we will—we are going to hand our supply chain control to the Chinese? I just don't understand.

Mrs. MILLER. Exactly. So what does our reliance for these critical minerals do for our national security?

Mr. BRYCE. Well, I think it clearly jeopardizes that national security, if we are going to make EVs the only option. And, therefore, that is one of the reasons why—and I was—you know, I understand Representative Huffman doesn't necessarily like me talking about California, but California—why is it that the state has only—they only have 6 percent of electric vehicles on their road today? Is it possible that consumers don't want them in the volumes that the state has mandated? I mean, this is—

Mrs. MILLER. Well—

Mr. BRYCE [continuing]. A critical issue.

Mrs. MILLER [continuing]. I would rather talk about our supply chain and how—

Mr. BRYCE. Okay.

Mrs. MILLER [continuing]. In the world we are going to secure our supply chain.

Mr. BRYCE. Well, I think in many—if you are serious about it, I just don't think it is possible for the kind of ramp-up globally of the volumes of critical minerals—copper, neodymium, cobalt, et cetera—that are—will be required to meet this demand for EVs.

And I cite in my written testimony the work that Professor Richard Herrington of the Museum of Natural History of London did in 2019 in his letter to the British Government underscoring this problem.

Mrs. MILLER. Absolutely. Thank you.

The clock got messed up, and I would like to yield the rest of my time to Mr. Palmer.

Ms. CASTOR. Go ahead.

Mr. GRAVES. That is a lot of time.

Ms. CASTOR. You are recognized, Mr. Palmer, for 2 minutes.

Mr. HUFFMAN. How did you do that? I want to do that.

Mr. PALMER. This is awesome.

Mr. GRAVES. Shows the vulnerability of the grid.

Mr. PALMER. Yeah. No. Let's pretend it is 2 minutes. How about that?

Ms. CASTOR. Yes.

Mr. PALMER. Okay. Thank you.

Mrs. MILLER. That is what it was.

Mr. PALMER. I try to be fair.

Ms. CASTOR. That is what it was.

Mr. PALMER. Mr. Bryce, in your testimony, you highlighted how current EV policies lead to energy poverty, and I want to touch on that a little bit more.

I grew up dirt poor. I understand the strain and stress on family incomes, how hard it is to make ends meet. And can you explain briefly, because I have got less than 2 minutes now, how these policies lead to that inequality?

Mr. BRYCE. Well, I think, first and foremost, sir, it starts with the purchase price of the vehicles themselves. I have—I went to the Costco near my house a few months ago. There was a Chevy Bolt in front. It cost \$46,000.

For that much money, I could buy a new Mercedes-Benz or a new BMW. I could buy two Toyota Corollas. I mean—

Mr. PALMER. Okay.

Mr. BRYCE [continuing]. You know, working-class people just simply can't afford the initial purchase price.

Mr. PALMER. Well, apparently, wealthy people can't afford them, because they are the ones taking advantage of these enormous government subsidies that—for these vehicles. Aren't we still subsidizing the purchase of these vehicles?

Mr. BRYCE. The Federal tax credit is, in fact. And I will just add one other point, sir. For many—many homeowners, many residents, they don't have an ability to recharge electric vehicles at their homes. This is a point that the General Accounting Office has made over and over, that the refueling infrastructure, the recharging infrastructure for EVs simply isn't there. And as I mention in my written remarks and in my testimony—

Mr. PALMER. Yeah.

Mr. BRYCE [continuing]. Just a few minutes ago, the scale of the chargers that are going to be needed is just—it is almost beyond—

Mr. PALMER. I want to stick—I want to stick to, though, the cost to lower-income families, because they can't afford to charge the vehicles there. They can't afford to buy the vehicle, but—and their utility rates—they are helping pay for the people who can't afford those charging stations. Is that a fair assessment?

Mr. BRYCE. That is a fair assessment. It was a point that was made by Assemblyman Jim Cooper, who I wrote about him in—a few months ago. There is one Senate district in California, the Senate district in the Bay Area, that got—by itself, got nine times as—or I am sorry. It got as much in EV rebates in California as nine other Senate districts combined. That is just not—it is not fair.

Mr. PALMER. I think that was mentioned in Mr. Cooper's letter.

And I appreciate——

Mr. BRYCE. Yes.

Mr. PALMER [continuing]. You yielding time. And I yield back.

Ms. CASTOR. Thank you.

Next, we will go to Rep. McEachin. You are recognized for 5 minutes.

Mr. MCEACHIN. Thank you, Chairwoman Castor, for convening us today. And to the witnesses, I thank each of you for joining us.

As we look to transform our economy and move towards a net-zero carbon future, it is critical that we prioritize decarbonization of our nation's transportation sector. This will, of course, help us tackle the challenges of the climate crisis and lower carbon emissions. Maybe more important, though, are the opportunities we have to reduce air pollution, which often impacts disadvantaged and environmental justice communities disproportionately.

We can also rethink what transportation means for our communities, reconnecting areas which have long been segmented and isolated due to careless highway planning. In Richmond, this led to Interstate—this led to Interstate 64 intersecting the Shockoe Hill African Burial Ground, another and, unfortunately, long list of desecrations of the site.

This Select Committee laid out key recommendations to move our transportation system towards a clean energy future in our action plan, and I am optimistic that we will be able to make the necessary investments we need to solve the climate crisis.

Commissioner Kelliher, again, thank you for being with us today. As we look towards the implementation of the Justice 40 initiative, one thing I have continued to stress is the importance of community input in whatever investments may result from this initiative. You mentioned in your testimony the creation of a Sustainable Transportation Advisory Council created, in part, to support equity.

What has been the result of the Council's work towards equity, and how have you ensured that communities, environmental justice communities in particular, have a voice in advising Minnesota's DOT—in advising Minnesota's DOT? What lessons have you learned that may be helpful for us at the Federal level?

Ms. ANDERSON KELLIHER. Thank you. On the Sustainable Transportation Advisory Committee, first of all, it is co-chaired by industry, with the president of Xcel Energy in Minnesota being with me on that journey of being able to lead the work.

The other piece of this is equity is in every single element of what we are doing on the Sustainable Transportation Advisory Committee. Equity is not a set-aside. Equity is a through piece of the cloth, the entire way we are looking at it. So we are looking at—we are deploying right now a sustainable transportation grant program across the state that will both—look at both urban and rural communities and equity in urban and rural communities.

We have equity issues in rural Minnesota as well, both income and based on our indigenous population, as well as in urban areas with the Black and Latinx population. And so we are specifically looking to make sure that those communities get to participate in that transportation pilot program.

Mr. MCEACHIN. I appreciate your answer, and thank you.

Mr. Van Amburg, I would like to talk to you about port electrification for just a few moments, if you don't mind. And are there specific policies that Congress should be supporting to reduce emissions from drayage trucks moving containers in and out of our ports and other equipment operating in our ports?

Mr. VAN AMBURG. Yes. Thank you for that question, and it is a really good one, because ports are such a nexus of our transportation and goods movement system. They are also a hotspot of transportation emissions, particularly for disadvantaged and priority communities.

One of the things that could be done is—and it is in the INVEST in America Act—is really looking at what can we be doing to put in infrastructure around port complexes and warehouses and distribution centers. This is going to be where the first of the cleanest trucks will operate best in any respect.

Secondly, I think the ports would do really well to start looking at electrifying their off-road or goods—their cargo handling equipment. We are starting to see new equipment coming out that can be near or zero emissions in that space too.

Mr. MCEACHIN. No, please. I was just—please continue. If that is your answer—I wasn't trying to wave you off. Unfortunately—

Mr. VAN AMBURG. No, that is okay.

Mr. MCEACHIN. A climate-denying bug flew across my screen.

Mr. VAN AMBURG. No. I think those are real opportunities, particularly to get investment in for infrastructure and support, because it is co with industry. I mean, the load is just being shared a little bit by the public sector and—but very much by the private sector, so that they can deploy these vehicles more quickly in the regions of need.

Mr. MCEACHIN. I thank you, and I thank you for your answer.

Madam Chair, I yield back to you.

Ms. CASTOR. Thank you.

Next, we will go to Rep. Gonzalez. You are recognized for 5 minutes.

Mr. GONZALEZ. Thank you, Madam Chair. And thank you to our panel for being here today.

I do feel the need to address one claim that was made, which is we are just against everything and we are against the Green New Deal, we don't have any solutions. I mean, I will admit I am passionately against the Green New Deal, primarily because it is a horrible policy and it is impossible. And it is scientifically impossible. It is mathematically impossible.

If you read the Green New Deal, it is impossible. So I am not for impossible things. And I don't think anybody should be for impossible things. I think we should be for real things.

I am also against a tax and regulatory push to solve every problem that we have in society, climate included. I am for innovation and I am for markets.

I would also remind this committee that Congress just passed the bipartisan Energy Act of 2020. That was bipartisan, and it was the first comprehensive investment in next-gen energy technologies in 13 years. I personally think we should all be really proud of that.

Is it exactly what my Democratic colleagues wanted? No. Did it go further than some of my Republican colleagues? Yes. But it was a bipartisan bill that made substantial investments that I think are going to help us lead on climate going forward internationally, as we have already done through—primarily through innovation.

But I want to shift to Mr. Bryce for questions.

Mr. Bryce, I do want to thank you for your testimony, particularly the section on preserving our existing nuclear fleet, which is, again, something I am for, as opposed to just being against everything. So, in any event, couldn't agree with you more on this, and I am equally troubled by the efforts to preemptively close plants in New York, Illinois, and California. It was a horrible idea.

What can we do to improve the public's perception of nuclear and address some of the fears associated with nuclear?

Mr. BRYCE. Well, Representative Gonzalez, you only have 5 minutes. Unfortunately, the nuclear industry is—I will be blunt—has not been a good advocate for itself, and the opponents of nuclear—and I am going to call them out. The Natural Resources Defense Council played a key role in the closure of the Indian Point nuclear plant in New York State, in Buchanan.

This is ridiculous. If we are facing a climate crisis, an existential crisis, the Democrats and Republicans, government should be doing all it can to keep these existing nuclear plants open and operating. I make clear in my written testimony I would be more inclined to support the electrification of transportation if it was—if our grid was more reliant on nuclear. Instead, we are losing our nuclear plants, which are—it is a travesty what is happening.

And Mr. Huffman, you know, launched his diatribe at me. Keep Diablo Canyon open. Why are you closing that plant? Why are you allowing the Natural Resources Defense Council to force the state to close that plant? It makes no sense. It is 10 percent of the state's electricity.

So, I mean, to me, this is such an easy decision, and yet the states are fumbling it and Congress is not really doing much to stop it.

Mr. GONZALEZ. Yeah. It is an interesting—yeah. I couldn't agree with you more. I think it is a horrible idea for the State of California. I hope that the rest of the country is watching and not going to repeat that mistake.

In your testimony, you also highlighted the supply chain problem with electric vehicles. Given the regulatory hostility to mining in the U.S., a battery-centric energy future virtually guarantees more mining in places like China, Russia, and Congo, countries with horrible human rights records and worse emission standards than the U.S.

China dominates global battery manufacturing, nearly two-thirds of all production, while fueling 70 percent of its coal. If China remains the leader in battery manufacturing and we rely on them for supply, is it fair to assume that overhauling our transportation sector with batteries could actually raise carbon emissions in the near term?

Mr. BRYCE. I think in the global context, sure, that is absolutely a possibility. And I can't give you the carbon balance on batteries and the carbon intensity of battery manufacturing off the top of my

head, but I would just add one quick point, is that batteries are kind of like Goldilocks. It can't be too hot, it can't be too cold. You can't recharge them too fast. You can't discharge—they require very tender handling.

And they are getting better, there is no doubt, but in my view, let—and Mr. Van Amburg talks about the adoption in the heavy duty sector. Let those industries lead that adoption. I am all for it. Let consumers lead the adoption. There needs to be less government push and more consumer pull.

Mr. GONZALEZ. Yeah. No, I couldn't agree more, and I think it screams, frankly, as—of another way that we need to invest in the American economy. I think the clean energy future creates an enormous set of opportunities on this—I think hopefully everybody agrees—for our economy, but we have to make the right investments. We have to reshore this mining. We have to make sure that we have the right production and supply chain materials here in the U.S., where feasible. This will create good-paying jobs, it will make us more resilient, and it will do more to reduce climate emissions globally than if we were producing these same things in other countries.

And, with that, I yield back.

Ms. CASTOR. Thank you.

Next, we will go to Rep. Neguse for 5 minutes. You are recognized.

Mr. NEGUSE. Thank you, Madam Chair, first and foremost, for holding this very important hearing today.

By reducing carbon emissions from the transportation sector, as we have currently heard—or as we have heard today, rather, currently the largest source of greenhouse gas emissions in the United States, we can take much-needed action to solve the climate crisis. And this is especially timely as the House is considering the INVEST in America Act today, which I know some of my colleagues have referenced, which I believe to be bold legislation that will invest in our nation's roads and bridges while preparing our infrastructure for the impacts of climate change.

As we are seeing in my home state of Colorado, highways, transportation, infrastructure are not immune to, ultimately, the impacts of climate change. I-70, a major highway through the mountains of Colorado, is really critical for Colorado residents, tourists, and commercial traffic. It has seen repeated closures due to mudslides over the burn scar of last year's devastating Grizzly Creek Fire.

So we know that smart investments in transportation can reduce our emissions, improve our climate resiliency, and address historic inequities in health and quality of life across communities.

I might also say to my good friend and colleague from the State of North Dakota that our state is also very cold, or can be, and our state also has very long distances. My congressional district is bigger geographically than the entire State of New Jersey. So—but, nonetheless, Colorado has made great strides in terms of electrifying its vehicle fleet, and Colorado should be applauded for that, and I know that state leaders look forward to being part of the national conversation as we seek to do so at the Federal level.

My questions would be primarily for Commissioner Kelliher. I want to say thank you for your testimony. I appreciate your dedication to reducing emissions, to increasing climate resiliency, and to addressing environmental justices—justice issues, rather, across the transportation sector.

My district, like many others, faces challenges to our transportation infrastructure because of climate change, in particular from extreme wildfires, and the result—a result in increased flood risk in those areas post-fire, as I mentioned, and obviously to the communities that are downstream.

I was interested to read in your written testimony about your work to develop a statewide extreme flood vulnerability analysis tool, and I wonder if you might be able to expound on that a bit further and discuss perhaps how that data will be used to make Minnesota's transportation infrastructure more resilient to climate change and the future flood risk.

Ms. ANDERSON KELLIHER. Representative, this is one of the most important things we can be doing right now to be able to use the data that is available, to update that data of Atlas 14, to be able to make sure that the flood measurements that we are using in this data can really help us analyze the impact of high water, flood, and debris-related events on bridges, culverts, and pipes across the system, because that is a true vulnerability in what we are facing today.

And so we have been working on developing this model. It will be built into our asset management system so that we will know—because we don't have enough money to build new roads in Minnesota. We have barely enough money to fix the roads we have. And when we have a catastrophic event—and I think many DOT commissioners across—and secretaries across the country would tell you this—they have to go scrambling to find those resources or lean on the Federal Government. Having this as part of the asset management set would be very important and a very important tool.

Mr. NEGUSE. Well, I certainly agree with you there. I applaud the ingenuity and innovation of your team, and my hope is that the tool can be emulated across different states, including my home state of Colorado.

But I know that votes were just called, and so, Madam Chair, I want to be respectful of the time and ensure that any others are able to pose questions as well. So I would thank the witnesses again for their testimony and yield back the balance of my time.

Ms. CASTOR. Thank you, Rep. Neguse.

Next, we will go to Ranking Member Graves for 5 minutes. You are recognized.

Mr. GRAVES. Thank you, Madam Chair.

Witnesses, I want to thank you all for the testimony. It has been very helpful and insightful.

Mr. Bryce, I want to ask, looking back from 2001 to the current time, the trade deficit with China has increased by about 342 percent. Somewhere over that same timeframe, spending for defense within China has increased from a range of \$15 billion to perhaps \$18 billion to in excess of \$220 billion annually. There has been

concern expressed here in this hearing about our dependence upon OPEC.

Number one, I think the decisions that were made over the last 20 years that have moved in more of a China direction, I think most of us would now, with the benefit of hindsight, view as flawed decisions. I think that our dependence upon OPEC, many would view as flawed decisions.

Right now, based at the time that we are at in regard to this evolution of new technology, looking back at this dependence upon China and growing dependence upon them, aren't—are we sort of moving in a direction of replacing, you know, OPEC with China to some degree if we are not careful about how we move forward on supply chain, keeping in mind also their theft of our intellectual property?

Mr. BRYCE. Well, yes, Representative, I think that that is certainly one of the possibilities. And I mentioned that earlier, that, since 1973, Congress has been—promulgated policy after policy aimed at limiting our reliance on foreign supplies of energy, and now we are looking at a—an electric vehicle sector that is going to be almost wholly dependent on China.

And, to me, it is not necessarily a question of whether they will sell it; it is whether there is going to be enough supply, because as has been discussed earlier, limits on mining are real, and new mines take a very long time to develop. And so this idea that we are going to make some quick and easy transition to electric vehicles, I think it is going to be a long transition.

As I mentioned in my written testimony, I cited Vaclav Smil. He says energy transitions “are protracted affairs,” and that is just exactly the case.

And one last point. The idea—electric vehicles are getting better, but the idea that—internal combustion engines are not standing still. We have the new HCCI engines, the new hybridization of engines, new diesel engine. Toyota announced a few years ago a 20 percent increase in efficiency in one iteration. These are remarkable.

Oil is going to be dominant in transportation for a long time to come. And it is not some conspiracy; it is just physics and basic math.

Mr. GRAVES. Thank you, Mr. Bryce. You actually introduced a topic that I wanted to ask Commissioner Anderson Kelliher about.

So according to, I think, your—Minnesota's DOT—DOT's plan, you have launched a project called Pathways to Decarbonizing Transportation. And, of course, that would be a significant dependence upon electrifying the vehicles in Minnesota as part of that solution.

Right now, some of the minerals that are needed for that to happen include copper. Current copper reserves are projected to be depleted in as few as 14 years from the present. There is a projection that the increased demand in copper could increase by 350 percent or more.

In your own state, there is a project, PolyMet, that mining operation that has been trying to get underway for 14 years. It is adjacent to two other mining operations. I understand the State Su-

preme Court approved it, but it looks like there are continued lawsuits and obstacles being put in front.

Keeping in mind the importance of those critical minerals and rare earths for you to achieve your plan, is that a operation that you support, or how do you suggest we balance that?

Ms. ANDERSON KELLIHER. Well, water is one of the most treasured things, Representative, in Minnesota, and that mine is right along the Boundary Waters. And so that is, I think, the issue that you see being played out in the courts and the regulatory framework.

Our plan actually is not only electrification; it is also biofuels, which helps the ag community as well, marketing biofuel.

Mr. GRAVES. Could I interrupt you real quick? I just—

Ms. ANDERSON KELLIHER. There also is—

Mr. GRAVES. Commissioner, if I could just interrupt you real quick. I just want to get clarity. So are you opposed to the mining project because of the threat to the water? Is that you all's position?

Ms. ANDERSON KELLIHER. Representative, I don't have a position on PolyMet, because that is not part of the Department of Transportation.

Mr. GRAVES. So I would like to continue this for a minute, though. I just think it is so important. So many people—we keep talking about what our goals are, but we are not looking at the steps that are needed to actually get there. And we can't just suddenly say, hey, we want electric vehicles, or we want charging stations to pop up.

Ms. ANDERSON KELLIHER. Well—

Mr. GRAVES. You have got to produce the electricity. You have got to have the manufacturing capacity.

I am out of time, and I know there are vote calls. I want to yield back, but I just—it is so important that we think about the execution and how you can possibly do this and do it in a way that is based on America's resources.

I yield back.

Ms. ANDERSON KELLIHER. Madam Chair, if I could, I think it would be important to read—

Ms. CASTOR. I am sorry, Commissioner, we have a—

Ms. ANDERSON KELLIHER [continuing]. The Pathways to Decarbonization Report.

Ms. CASTOR. We have a vote. We have a vote, so we are not—we are going to have to move on here. But I—

So I will recognize myself for 5 minutes for questions, and just say that this is really an exciting moment in time, because after years of talk about modernizing our transportation systems across the country, our infrastructure, we are actually going to do it this week.

The House is going to vote on the INVEST in America Act that will, at the same time, really help us reduce greenhouse gas pollution that is fueling catastrophic impacts from climate change. And at the same time, we are going to create jobs. We are going to fix and modernize our transportation and infrastructure. I mean, this is a win, win, win.

And we look forward to working with this committee on the solutions for the materials that we are going to need for clean energy. We had a good roundtable about that this month on critical minerals, and I think we will have more to do in this area.

But there are a few—there are a few things in our climate crisis action plan where we called on Congress to prioritize maintaining and improving existing highways, and the INVEST in America Act does just that.

And I would like to ask Ms. Osborne, because you have been central to the development of the INVEST in America Act all along the way. How does the fix-it-first approach tackle pollution and resilience? At the same time, I think folks out there across the country are interested, how are we going to fix our highways and help solve the climate crisis?

Ms. OSBORNE. I appreciate that question. First off, it focuses on our existing communities and gives us a chance to update infrastructure where we are so that we can remove barriers to short trips—the ability to cross the street in some places is very difficult—and to just allow people to walk around their own communities. That alone will have a big impact.

It also—in focusing on repairing what we have before we build new—I believe that Representative Palmer said there was no money in this bill for additional highways, which is inaccurate. It just says that before you are allowed to build new highways, you have to have a plan for maintaining what you build, and you have to make progress on your backlog, which I don't consider to be anything radical. I just question why that hasn't always been the policy.

And by doing that and focusing where people are, we are meeting their needs, instead of pushing people further away from the things they need, which extends their travel shed, makes them travel more often for more things and further, and with that comes all the emissions.

So, you know, a focus on the fix it first, other than just being responsible caretaking of the taxpayer dollar, gives us a chance to update the system and ensure we keep investing where people are and keeping them closer to the things they need.

Ms. CASTOR. And, Ms. Osborne, you know, small towns, large towns all across America, they are hungry for better connections, safer streets. I mean, in the Tampa Bay area, we have an extraordinarily high fatality rate because of bicycle and pedestrians trying to share the road with cars. It is not safe. But this is happening all across the country.

I know that the INVEST in America Act modernizes the Federal design standards to support Complete Streets. Can you help explain what Complete Streets are and how they will make communities all across this country safer?

Ms. OSBORNE. Yeah. The notion of a complete street is one that is designed to accommodate everyone who is allowed to be on it. Again, it is a policy that, when you say it out loud, you wonder how that is not already our policy. But right now, you can have a roadway that is open to bicyclists and pedestrians and not provide them any facility to safely use it. They would have to actually walk in traffic to be able to utilize it.

So Complete Streets is just making sure that there is space and safety for everyone on that roadway, and after what we saw last year with the massive increase in crashes and fatalities—basically, as congestion went away, we saw people drive much, much faster, which leads to more mistakes and leads to those mistakes being deadly more often. I think we can agree that there is something in those—in the design of those roadways that is just out of date with the demands for today.

Ms. CASTOR. And we care about that in the Climate Committee because, if we can avoid people getting into their cars and, instead, walking on a safer trail or biking, that cuts pollution. And that is what the name of the game has to be—cutting greenhouse gas pollution if we are going to avoid the catastrophic impacts of the climate crisis.

Well, I want to—I will complete my questioning here and thank the witnesses for your very insightful testimony.

Without objection, we are going to enter a few things into the record. I know, Congresswoman Brownley, you wanted to offer a request.

Ms. BROWNLEY. Yeah. Thank you, Madam Chair.

I just—I wanted to enter this report into the record showing that California's average electricity bill is lower than half of the states in the United States. Everybody tends to say California has the highest. That is not true.

Some of the higher states are Connecticut, Florida, Mississippi, South Carolina, Texas, West Virginia. As a matter of fact, West Virginia is the second—had the second largest increase in the country in terms of its electricity—electricity bill.

So if we could insert this into the record—

Ms. CASTOR. Without objection—

Ms. BROWNLEY [continuing]. I would appreciate it.

Ms. CASTOR [continuing]. We will enter that into the record.

We are also going to enter into the record, at the request of Congressman Crenshaw, the White House Environmental Justice Advisory Council Final Recommendations on Justice 40, Climate and Economic Justice Screening Tool, dated May 21, 2021; and the executive summary of the April 2021 report from the University of California, Berkeley, titled, 2035 The Report, Transportation, which finds that transitioning to 100 percent zero-emission vehicle sales by 2035 will save consumers money and that we can scale up the EV supply chains and add more clean energy to the grid to make that happen.

I also want to note—so, without objection, we will enter those into the record.

[The information follows:]

Submission for the Record
Representative Dan Crenshaw
Select Committee on the Climate Crisis

June 30, 2021

ATTACHMENT: White House Environmental Justice Advisory Council. (2021, May 21). *Final Recommendations: Justice40 Climate and Economic Justice Screening Tool & Executive Order 12898 Revisions*.

The report is retained in the committee files and available at:
<https://www.epa.gov/sites/default/files/2021-05/documents/whiteh2.pdf>

Submission for the Record
Representative Julia Brownley
Select Committee on the Climate Crisis

June 30, 2021

ATTACHMENT: Save on Energy. (2021, March 2). *The SaveOnEnergy.com® Electricity Bill Report: Who paid the most, least?*

The report is retained in the committee files and available at:
<https://www.saveonenergy.com/learning-center/post/electricity-bills-by-state/>

Submission for the Record
Representative Kathy Castor
Select Committee on the Climate Crisis

June 30, 2021

ATTACHMENT: University of California, Berkeley, Goldman School of Public Policy. (2021 April). *2035: The Report—Transportation Executive Summary*

The report is retained in the committee files and available at:
<http://www.2035report.com/transportation/wp-content/uploads/2020/05/2035Report2.0-1.pdf>

Ms. CASTOR. I would also like to note at this time that this is the 1-year anniversary of the—of announcement of our Solving the Climate Crisis Majority Staff Report issued exactly 1 year ago that made recommendations for action in the Congress to solve the climate crisis, reduce carbon pollution, and make our communities more resilient.

Today, we are announcing a new tracker so you can track our progress at climatecrisis.house.gov/tracker. I encourage you to do that, because we have a whole lot more to do when it comes to clean energy and solving the climate crisis.

So, without objection, all members will have 10 business days within which to submit additional written questions for the witnesses. I ask our witnesses to please respond as promptly as you are able.

Thank you all very much. The committee is adjourned.
[Whereupon, at 3:24 p.m., the committee was adjourned.]

**United States House of Representatives
Select Committee on the Climate Crisis**

**Hearing on June 30, 2021
“Transportation Investments for Solving the Climate Crisis”**

Questions for the Record

**The Honorable Margaret Anderson Kelliher
Commissioner
Minnesota Department of Transportation**

THE HONORABLE KATHY CASTOR

1. Commissioner Anderson Kelliher, in your testimony, you highlighted the role that the Pathways to Decarbonizing Transportation project and the Sustainable Transportation Advisory Council play in mitigating transportation carbon pollution. How are these MnDOT initiatives producing concrete steps to achieve decarbonization and resilience goals?

Minnesota passed the bipartisan Next Generation Energy Act in 2007 to establish economy-wide goals to reduce greenhouse gas (GHG) emissions from a 2005 baseline year by 15% in 2015, 30% by 2025, and 80% by 2050. In 2017, MnDOT adopted the state goals for the transportation sector, the first state agency to adopt economic sector specific goals in Minnesota. In 2019, the agency led a multi-agency *Pathways to Decarbonizing Transportation* effort to develop specific strategies to make progress towards the transportation sector goals established in 2017. The *Pathways* project took the following approach that is outlined in detail in the 2019 report.

- Host workshops with state and national transportation stakeholders to identify potential strategies to make progress towards state goals.
- Model a suite of strategies that could achieve the state’s 2050 goal for 80% reduction of GHG emissions from the transportation sector by 2050.
- Host in-person and virtual public engagement around the state to get feedback on the overall modeled suite of actions, individual strategies, and hear about new strategies that were missing.

The final actions and recommendations were developed based on feedback from the public and stakeholders from around Minnesota.

- Create the first electric vehicle (EV) incentive for managed lanes in the US (\$250 credit)
- Adopt a new process to evaluate GHG emissions from transportation projects and climate change impacts to projects during environmental review (e.g., NEPA).
- Develop a new funding program to support clean transportation investments by rural and environmental justice communities.
- Encourage more investment and support for low carbon biofuels.
- Recommend the state adopt Clean Cars Standards (i.e., low and zero-emissions vehicle standards) that went into effect on July 26, 2021.
- Create a Sustainable Transportation Advisory Council (STAC) for local leaders to advise MnDOT on additional strategies to reduce carbon pollution from transportation with a focus on economic development, environmental justice, and equity.

More information about the MnDOT Pathways to Decarbonizing Transportation is available here: <http://www.dot.state.mn.us/sustainability/pathways.html>

The STAC is co-led by the MnDOT Commissioner and the President of Minnesota’s largest utility, Xcel Energy, and includes leaders from the public, private, and nonprofit sectors, construction contractors, city and county government, and community-based organizations. State elected officials serve in ex-officio capacity. MnDOT facilitates the STAC group but does not contribute to the recommendations. Each year, the STAC presents recommendations to MnDOT and then MnDOT issues a formal response that indicates if/how the STAC recommendation will be adopted and implemented. The following are examples of recommendations that were accepted in whole or in part by MnDOT in 2021.

- Accept recommendation to develop a preliminary goal to reduce vehicle miles traveled (VMT) 20% by 2050.

- Collaborate with external groups on efforts to understand specific opportunities and challenges to co-locating broadband and electricity transmission infrastructure in highway rights-of-way.
- Re-evaluate the MnDOT approach to congestion management, including clarifying existing policy that uses highway expansion as the last priority/final option to address congestion.
- Agree to collaborate with other Midwestern states on memorandums of understanding to promote EVs, including Medium- and Heavy-Duty EVs.
- Agree to lead public engagement to help develop a low carbon fuel standard (Clean Fuels Standard) in Minnesota.

More information about the MnDOT Sustainable Transportation Advisory Council can be found here: <http://www.dot.state.mn.us/sustainability/advisory-council.html>

Both highlighted processes were successful in developing specific actions to decarbonize transportation because they included the public and the private and nonprofit sectors in the decision making. Despite these efforts, it should be noted that the state is still not yet on-track to meet the state goals for GHG emission reduction.

2. Commissioner Anderson Kelliher, you testified that your approach to environmental justice is guided by President Clinton’s 1994 Executive Order “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.” This Executive Order aimed to identify and address disproportionately high and adverse human health or environmental effects of Federal programs, policies, and activities on minority populations and low-income populations. How has MnDOT pursued equitable and fair treatment and meaningful engagement of these communities in its planning and projects to reduce carbon pollution and increase climate resilience?

Along with President Clinton’s 1994 Executive Order “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), required more collaboration and partnership for state DOTs with affected communities and partner agencies. As a result, MnDOT created the Area Transportation Partnership (ATP) model for planning and programming that adds to the federally required continuing, comprehensive, and cooperative (3C) multimodal transportation planning process for state DOTs and metropolitan planning organizations (MPOs).

Working with ATPs and MPOs is complimented by planning and project development with communities and stakeholders. MnDOT approaches engagement for planning and project development with a holistic approach to community health, recognizing that communities of color and low-income communities have been and continue to be impacted disproportionately by construction projects, particularly by unhealthy air quality from transportation-related emissions.

MnDOT works to pursue fair treatment and meaningful engagement in project development and construction mitigation that recognizes climate change, physical health, accessibility options, safety, and equity. This work is specifically addressed where MnDOT is building more infrastructure for people walking, biking and using transit, implementing road diets (reducing lanes), reducing idle time for all motor vehicles with improvements (such as signal timing coordination, roundabouts, HOV lanes), stormwater management improvements, and other considerations. A few recent projects highlight this work:

- Rethinking I-94 is a robust, multiyear engagement, visioning, and project development endeavor that is currently in Phase 2 of completing the environmental documentation process. MnDOT started Rethinking I-94 in 2016 to develop a new vision for I-94 between Minneapolis and St. Paul to prioritize the well-being of those who live, work and play along the corridor with the goal of enhancing mobility, safety and interconnectivity. Rethinking I-94 intends to reconnect neighborhoods, support communities, and ensure residents have a meaningful voice in transportation decisions that affect their lives. Livability is a main goal and theme in this work in which economic vitality, sense of place, safety, equity, and public health and the environment are all considerations. Engagement with the communities around I-94 include the historic African American Rondo neighborhood in St. Paul and other communities and is paramount to this work.
- In addition to major highway projects like Rethinking I-94, MnDOT works on projects on state-owned roads that function more like city streets. An upcoming project in St. Paul is the East 7th/Arcade St (Hwy 5 and US Hwy 61) project that will improve pavement condition, safety, bicycle and pedestrian facilities,

streetscape, reconfigure lanes with a road diet and incorporate green infrastructure solutions. Working with the City of St. Paul and community organizations in the engagement process, MnDOT used an equity lens and worked to minimize barriers to participation. One example is working with the Indigenous Roots Cultural Arts Center, to reach diverse communities within the project area, as well as offering project materials and a survey in languages spoken throughout the corridor including English, Spanish, Somali, Hmong, and Karen. These engagement approaches reduced barriers to participation in the process. From that engagement, MnDOT learned about the community desire for sidewalks and street crossing improvements and additional streetscaping like trees and other greening to help combat urban heat island impacts.

MnDOT also has a variety of agency-wide policy and planning initiatives underway that support equitable and meaningful engagement of historically underserved communities. These efforts recognize that transportation decision-makers need to consider how actions will impact our people, economy, and environment. Examples include:

- In 2021, the MnDOT Office of Communications and Public Engagement and the Office of Civil Rights updated the department's Public Engagement Policy (<http://www.dot.state.mn.us/policy/operations/oe008.html>) and created a companion Public Engagement Planning Handbook (<http://www.dot.state.mn.us/publicengagement/documents/planning-process/PEplanninghandbook.pdf>). The updates more explicitly articulate MnDOT's commitment to ensuring full and fair participation of all communities, including those that have been historically underrepresented in the public engagement process. The guidance document contains strategies, worksheets, and resources MnDOT staff can use to develop and execute inclusive public engagement plans.
- MnDOT is in the process of updating the highest transportation policy plan in the state—the Statewide Multimodal Transportation Plan (SMTP). The SMTP identifies the state's transportation objectives and strategies from 2022–2041. Information from the 2017 SMTP is being used to frame the 2022 update. Public engagement for the 2017 SMTP highlighted climate change and equity as key trends in transportation, and were selected as two focus areas for the 2022 SMTP. As a result, public engagement materials for the 2022 SMTP highlight climate change and equity considerations (<https://minnesotago.org/stories/#10098479399>). A work group was established for each focus area to develop strategies for inclusion in the final plan. Conversations with partners, stakeholders, and the public have deepened considerations for climate change and equity even further to identify specific actions and call outs in the 2022 SMTP. The document format is expected to clearly communicate MnDOT's commitments to climate action, transportation equity, and the intersection of these two topics.

3. Commissioner Anderson Kelliher, you previously chaired the Governor's Broadband Task Force, and you testified that broadband should be thought of as transportation infrastructure. Highway rights-of-way represent prime locations for infrastructure like broadband, electric transmission, and solar energy. How is Minnesota approaching the opportunity to deploy multiple types of climate-critical infrastructure at the same time?

Broadband

With nearly 90% of the costs of broadband infrastructure stemming from the construction of middle mile, long-haul fiber installation, highway rights-of-way pose unique and significant opportunity to leverage public investment to benefit broader communities. Minnesota recently completed a year-long study to assess the fiber optic infrastructure in its highway rights-of-way to assess gaps and analyze the feasibility of partnering with communities, local governments, and private industry to advance broadband. Studies like these look at how public-private broadband partnerships can support the buildout of middle-mile fiber and small cells to connect government facilities, and community anchor institutions like schools and hospitals. These opportunities also allow states to invest in fiber that supports future advancements like intelligent transportation systems (ITS) and connected and automated vehicles, all of which aim to reduce the impacts of climate change in addition to supporting transportation safety and equity.

When states make the investment to install conduit along their highway rights-of-way, private companies can use excess conduit which leads to significant return on investment for governments, but it also allows state and local governments to leverage private infrastructure at a fraction of the cost of installing it on their own. This infrastructure has enormous benefit to cost: it helps to support the expanded

grid and charging infrastructure for EVs, it allows DOTs to install sensor technologies like road weather information systems to detect floods and other weather events, and it also supports technologies in connected and automated vehicles that are being developed on EV platforms—all of which support the U.S. goals of climate resiliency and sustainability.

States like Minnesota are looking into the opportunity to partner with industry to share their infrastructure along highway rights-of-way in a variety of ways, through partnerships, leasing, resource sharing agreements and others. In Minnesota we take a novel approach to these partnerships to expand broadband, using a P4 concept—instead of a traditional public-private partnership (known as a P3), we look at how these partnerships can benefit communities in a public-private-people partnership. This allows us to leverage highway rights-of-way in innovative ways to advance underlying fiber infrastructure that supports expansion of the grid, while also supporting new and innovative technologies like connected and automated vehicles.

Due to the above, broadband should be considered critical transportation infrastructure to support our goals of growing a more sustainable, equitable society, while also advancing goals to support future transportation technologies like autonomous vehicles.

Transmission Lines

Additionally, MnDOT has recently joined a feasibility assessment evaluating the technical and regulatory considerations for adding buried HVDC transmission lines to highway right of way, to leverage the full value of existing highway assets. As studies have shown, new power transmission is climate-critical infrastructure needed to enable both grid decarbonization [1][2][3] and transportation electrification [4][5]. Through its NextGen Highways work [6], MnDOT is evaluating whether its existing highway right-of-way can be used to dramatically accelerate the siting and permitting of new transmission. If possible, this could reduce the decade-long transmission development timeline down to one-two years—an 80–90% reduction. Without a significant reduction in the transmission development timeline, Minnesota will not have the electric grid it needs for the state, its cities, and its corporations to achieve their climate goals. Considerations around relocation expenses, safety and dig-once coordination are central to the analysis. MnDOT's action steps in the short term will include greater coordination with statewide broadband expansion plans, updates to MnDOT utility accommodation policies and process, and analyzing priority corridors to pilot the co-location of fiber with buried HVDC transmission lines.

Solar

Finally, MnDOT is exploring how solar energy development on our right-of-way can help meet MnDOT energy needs, reduce long-term operational costs, and reduce GHG emissions. The agency worked with solar developers to install 2 MW of community solar gardens at two locations on MnDOT right-of-way. Community solar gardens allow individuals, businesses, and government agencies to purchase solar energy and receive bill credits for the energy produced. MnDOT also receives bill credits for 7.4 million kWh produced annually from community solar gardens on non-MnDOT property throughout Minnesota. This is equivalent to approximately 24% of the agency's total annual electricity use. Community solar garden development in Minnesota reduces energy costs for the agency, creates a cleaner electricity grid, and supports climate resilience by allowing community members to subscribe to a local energy resource. MnDOT will continue to seek out opportunities to support solar energy on and off the MnDOT right-of-way.

[1] ESIG. Transmission Planning for 100% Clean Energy. (April 2021) <https://www.esig.energy/transmission-planning-for-100-clean-electricity/>

[2] Brown, P. and Botterud, A. *The Value of Inter-Regional Coordination and Transmission in Decarbonizing the US Electricity System*. Joule. (2020). <https://doi.org/10.1016/j.joule.2020.11.013>

[3] NREL. Interconnection Seam Study. (November 2020). <https://www.nrel.gov/analysis/seams.html>

[4] West Coast Clean Transit Corridor Initiative. Fact Sheet. (June 2020) <https://westcoastcleantransit.com/>

[5] National Grid. 'Full Speed Ahead: Enabling Future Fleet and Highway Electrification.' D-TECH+ Series, July 22nd, 2021

[6] MnDOT. Responses to Sustainable Transportation Advisory Council Recommendations—Executive Summary. (April 2021). <http://www.dot.state.mn.us/sustainability/docs/advisory%20council/STAC-response-exec-summary.pdf>

4. Commissioner Anderson Kelliher, your testimony notes the role that incentives and Federal investment can play in decarbonizing transportation. For decades, the U.S. tax code has provided the oil and gas sector billions of dollars in subsidies. For example, oil companies have been able to write off “intangible drilling costs” since before World War I. These subsidies have a high cost for Americans—nearly \$650 billion in 2015, according to a report from the International Monetary Fund.

What benefits do you expect Minnesotans to see from investments to decarbonize the transportation sector?

In Minnesota, we view our actions from the shared lens of climate action, equity, and economic development. The opportunities for co-benefits in all these areas are immense, even if they are currently difficult to quantify.

Clean energy economy

There are currently an estimated 60,000 clean energy jobs in Minnesota. Clean energy jobs in Minnesota have grown 2.5 times faster than overall state employment and supporting clean energy job growth is a priority for the state. According to the 2020 Clean Jobs Midwest Report, advanced transportation is Minnesota’s third-largest clean energy sector with 3,191 jobs, including an estimated 742 tied to EVs (more information on EV jobs outlooks and information from the Bureau of Labor Statistics and the International Energy Agency).

Minnesota industry has a small but growing footprint for EV-related jobs, but several national and Minnesota-based firms have a growing presence in Minnesota.

- New Flyer (Crookston, Saint Cloud) is North America’s largest transit bus manufacturer and develops EV charging and mobility solutions. About 7,300 of their 41,000 in-service transit buses are electric and 1,600 are zero-emission. The Crookston team of over 300 people builds 20 buses a week, including all three zero-emission types: fuel cell-electric, battery-electric, and trolley-electric.
- Tesla (Brooklyn Park) has over 200 full-time employees in Minnesota; most working in EV manufacturing.
- Zeus Electric Chassis (Chisago City) specialize in medium-duty electric trucks for utilities and government fleets. They are the only medium-duty electric work truck chassis manufactured in North America.
- Niron Magnetics (Minneapolis) spun out of the University of Minnesota. They are developing the first advanced manufacturing process to mass produce permanent magnets with iron nitride that can be made at lower cost than rare-earth magnets. The magnets could revolutionize design of new electric motors.
- ZEF Energy (Edina) develops and deploys EV chargers and software for drivers, utilities, and businesses.
- Thermo King (Minneapolis) develops transport refrigeration and heating for trailers, trucks, buses, rail cars and shipboard containers. Products include electric options for auxiliary power units, electric standby for refrigeration units, and electric HVAC systems for coach and transit applications.

Most recently, Synapse Energy Economics, Inc. studied the likely macroeconomic effects of the adoption of LEV and ZEV standards in Colorado. The analysis accounted for the effects associated with increased up-front costs of lower emitting vehicles, reduced gasoline expenditure, and increased spending on electricity, and found that the rule would result in average annual increases of approximately \$72 million in Colorado’s GDP and an increase of 1,700 jobs in the state. Based on the composition of Minnesota’s economy and general similarities to Colorado’s economy, we would expect similar macroeconomic effects of LEV and ZEV standards in Minnesota. Moreover, another recent study for Minnesota, but not specifically analyzing the impact of a ZEV standard, found overall net social and economic benefits from increased adoption of EVs in Minnesota. (<https://www.pca.state.mn.us/sites/default/files/aq-rule4-10m.pdf>)

Another example of economic benefits from decarbonizing transportation includes jobs from the biking industry, where Minnesota is a national leader. A survey of bicycling-related manufacturers, wholesalers, retailers, non-profit and advocacy groups found the industry produced a total of \$779.9 million of economic activity in 2014 (<http://www.dot.state.mn.us/research/TS/2016/201636.pdf>).

Further, while difficult to quantify, the potential to reduce carbon pollution from transportation through reducing congestion and vehicle miles traveled presents a tremendous opportunity to reduce long-term transportation system costs. Reducing the need to build new roadways, reducing wear and maintenance on existing roadways, and exploring lower cost options for reducing the need to add lanes and capacity to roads and bridges presents a major costs savings opportunity. As we evaluate data from the massive shift to telework during the COVID-19 pandemic, we are see-

ing opportunities to reduce trips and shift when travel is occurring, which can eliminate the need to expand road and bridges which is frequently done to address peak period travel needs.

Health benefits from lower pollution

Decarbonizing transportation also presents opportunities to improve health outcomes through the design and construction of safer multimodal streets and safe, convenient, and affordable transit, especially electric transit.

Recent data from the Minnesota Pollution Control Agency (MPCA) as part of their rulemaking process to adopt low- and zero-emission vehicle standards indicates that the rule would result in an annual emission reduction of 998 tons of NMOG + NOx and 637 tons of PM in 2034. These emissions reductions equate to 6,059 tons of NMOG + NOx and 3,245 tons of PM reduced over the first 10 years of implementation. Of these estimates, 3,032 tons of PM reductions would occur from the tailpipe of the vehicles.

Over the first 10 years of implementation of these standards, the MPCA estimated the emissions reductions could prevent between 62–348 premature deaths from the respiratory and cardiovascular health impacts of air pollution. Numerous less severe health outcomes caused by air pollution, including emergency room visits, hospital admissions, non-fatal heart attacks, acute bronchitis, respiratory symptoms, asthma exacerbation, and work-loss days, could also be avoided. The economic value of all these avoided health impacts is estimated to be between \$560 million to \$3.2 billion.

Over the same 10-year period, MPCA estimates the rule reduce carbon dioxide equivalent (CO₂e) emissions by 8.4 million tons of GHGs reduced over the first 10 model years of implementation. Using the 3% discount rate fSCC values, MPCA estimates the total reduction of GHG emissions resulting from the proposed rule over the first ten years of implementation would equate with an economic benefit of approximately \$500 million. (<https://www.pca.state.mn.us/sites/default/files/aq-rule4-10m.pdf>)

Additional benefits being explored in Minnesota and nationally include the potential for decarbonization efforts to reduce the cost and time burden to all families, especially those with lower incomes and from BIPOC communities, from a dependence on single occupancy vehicles. As an example, for the average Minnesota driver, a 20% VMT reduction could mean driving about 45 fewer miles (or about 1 hour less) per week in 2050 (29 years from now) than they do right now.

References

<https://www.pca.state.mn.us/sites/default/files/aq-rule4-10m.pdf>

Questions for the Record

Bill Van Amburg
Executive Vice President
CALSTART

THE HONORABLE KATHY CASTOR

1. Mr. Van Amburg, your testimony makes it clear that with the right Congressional investments, we can deploy significantly more zero-emission vehicles. Similarly, the 2035 Transportation Report from the University of California Berkeley finds that that there are “no insurmountable barriers” to significant scale-up of EV supply chains. The report also highlights the potential for recycling to improve materials efficiency and create jobs. How is the electric vehicle industry responding to supply chain challenges around critical minerals, and how can we strengthen electric vehicle supply chains and support American workers?

Chair Castor, thank you very much for the question. Several of these topics were raised during the hearing on “Transportation Investments for Solving the Climate Crisis” and CALSTART and its nearly 300 member companies are very involved in the underlying issues.

First, there is no more critical supply chain issue than the production and manufacturing of energy storage—batteries—in the United States. CALSTART believes this needs to become a strategic priority for the nation and the Biden Administration has signaled strong intent here. This manufacturing also needs to take place at the core level of the battery cell, which is the fundamental building block of batteries and where the core value of the battery lies. Currently most cells are manu-

factured in Asia, predominately China, South Korea and Japan, and Europe has been investing heavily and will become a major manufacturing center over the next decade.

The U.S. is not keeping up, despite the fact that some companies, such as Tesla, are producing packs at large volumes and are committing to manufacture cells, and the US Department of Energy has outlined key steps to succeed¹. As part of directing focus and funding to this need, CALSTART has formed the non-partisan **US Battery Leadership Initiative**² to secure the nation's long-term competitiveness in this critical supply chain component via effective federal policy and investment. Some of the core priorities of the Initiative include:

- *Investment in Battery Innovation:* The US has been a leader in developing new battery chemistries and designs and needs to remain at the forefront of this dynamic and rapidly changing industry segment. We call for:
 - *Materials Research:* **\$2.3B** for early-stage research and development on battery electrodes, electrolytes, cells and chemistries at U.S. Department of Energy (DOE).
 - *DOE National Lab Consortium:* **\$2B** to establish DOE-led Battery Manufacturing Laboratory Consortium, modeled after the Grid Modernization Laboratory Consortium.
 - *Industry-Led Manufacturing Institutes/Hubs:* **\$500M** to create industry-led manufacturing innovation institutes modeled after the Manufacturing USA innovation institutes.
- *EV Battery Manufacturing Incentives:* We must do more than just create the next generation of technologies, we must manufacture them in America to reduce costs and control supply chain disruptions as well as create leading-edge US jobs. We support:
 - *Battery and EV Component Supply Chain Manufacturing Grants:* **\$5B over 10 years** for 1:1 cost share match with private sector for establishing or enhancing battery and EV component supply chain manufacturing facilities
 - *Investment Tax Credits:*
 - i. Passing the “American Jobs in Energy Manufacturing Act of 2021” introduced by Senators Debbie Stabenow (D-MI) and Joe Manchin (D-WV) to reauthorize the 30% Section 48C investment tax credit (ITC) for EV battery manufacturing, assembly lines, and facility buildout and retooling.
 - ii. Creating a 30% ITC to support EV battery manufacturing equipment-level investment by firms of all sizes to bolster participation in and competitiveness of a strategic domestic supply chain.
 - *Direct DOE Loans:* Expand the DOE Advanced Technology Vehicles Manufacturing (ATVM) Program to emphasize that projects supporting the light-duty and medium- and heavy-duty vehicle EV supply chain are eligible for direct loans.
- *EV Battery Workforce Development:* We must both plan a smart and just transition to these new technologies but train and support American workers to take on these critical jobs. We outline these steps:
 - *Training:* **\$100M** to create new training programs to target workers that have lost jobs because of the clean energy transition underway
 - *Standards:* **\$100M** to develop industry standards to ensure battery manufacturing workers are fully trained and qualified across the EV battery value chain.

The timing for these actions is critical, as the industry is poised on the cusp of the emergence of a next generation of battery technologies, such as solid-state batteries, that can become the basis for a renewal of American manufacturing leadership in the battery technologies the world will need next.

As a second point to address your question, managing the full life cycle of batteries and other electric drive components is an important consideration that is a key part of the manufacturing process and the rich value proposition of these products. Batteries are not simply “manufacture and recover” products. The life cycle of batteries is a complex one, from the core raw materials (which we will discuss later), to the first life in a vehicle or other use, to its second life re-use potential in other applications, such as grid storage, micro-grid power and back-up power, to its eventual re-conditioning and finally recycling/materials recovery.

¹ <https://www.energy.gov/articles/fact-sheet-biden-harris-administration-100-day-battery-supply-chain-review>

² <https://calstart.org/securing-americas-leadership-in-battery-technology-and-supply-chain-operations/>

It's important to note that a battery pack can power a car, truck or bus for over a decade while still retaining 70-to-80 percent of its capacity. This means that while it may no longer be as valuable as a vehicle component, it can perform other and multiple on-going valuable roles. For example, these can include providing off-grid renewable energy storage during high-production periods or providing home storage combined with solar (for example, Nissan has designed Leaf vehicle batteries to be re-purposed for a second life³).

Different battery chemistries—the core material combinations from which they derive their storage capabilities—have different re-manufacturing, re-use and recycling needs. At this point, most energy storage is based on lithium as a core material, combined with other valuable materials. Several CALSTART member and other companies are focusing on this space not as a waste issue but as a valuable part of the full electric vehicle industry supply chain. For example, members Redwood Materials⁴ and Li-Cycle⁵ have both invested in facilities to make batteries a fully “closed loop” supply chain, able to retrieve, recycle and recirculate 95 percent or more of raw materials such as cobalt, copper and nickel from end-of-life cells.

Third, concerns have been raised surrounding sourcing of strategic materials, such as rare-earth minerals, for the EV supply chain. It is certainly appropriate to raise these issues—indeed, if we had at the beginning of fossil fuel use been more questioning of the massive impacts caused from sourcing, extracting, transporting, distributing and burning petroleum products we might have avoided today's climate crisis. That said, some of the issues raised during the recent Select Committee hearing were based on old or out-of-date information on materials being used and their sources. As component and battery volumes increase, the EV industry is refining product designs for cost and sourcing issues to reduce or render some of the concerns moot.

For instance, while it is true that China controls a significant supply of some key rare-earth materials used in some common electric motor designs (permanent magnet motors), the industry is responding in several ways. The U.S. was until the 1980s a major supplier of these minerals; several companies are investing in this process again domestically, either in raw or recovered materials. U.S. allies, such as Australia, are also emerging as strong alternative producers.⁶ Several manufacturers are already shifting to other motor designs that greatly reduce the use of such materials or are not dependent on them, such as using alternative metals in the motor windings or AC induction and switched reluctance designs, which in many cases are strengths of U.S. manufacturing.

When it comes to strategic sourcing of materials for batteries, the shift may be occurring even faster. Tesla has recently announced plans to eliminate cobalt in its batteries, which has the additional benefit of reducing cost.⁷ Lithium is a material for which the supply chain is diverse, including Australia, Argentina, Bolivia and Chile. The U.S. itself actually has some of the largest world reserves of lithium and focusing on sustainable extraction and processing practices for U.S. assets should become a major focus. Indeed, there are also opportunities for re-use and re-purposing of U.S. tin and other mines to lithium production, giving mining communities new jobs and economic life. North Carolina's Piedmont Lithium⁸ is one example of this innovative approach.

Finally, CALSTART would stress that one of the most powerful enablers of building a strong electric vehicle supply chain and U.S. jobs is to build and support the domestic market for these vehicles and place a priority on American production and use. We strongly recommend, and the Select Committee's Majority report has supported in its recommendations, the enactment of a point-of-sale purchase incentive for commercial vehicles, through a “grant-in-lieu-of” design in the tax code or directly. Such an incentive would jump-start the domestic market for these vehicles, justify industry investing in production, maintenance and infrastructure and create a supply chain representing thousands of U.S. jobs.

2. Mr. Van Amburg, you testified that electric vehicles can act as resources for our electric grid, highlighting a way in which transportation

³ <https://global.nissanstories.com/en/releases/4r>

⁴ <https://www.redwoodmaterials.com/>

⁵ <https://li-cycle.com/>

?gclid=Cj0KCQjw6s2IBhCnARIsAP8RfAhUcXlbrRxfXiCP8ed94QQJGYiW9AdVLbto-JM0fJ3vXqzO_UAkKYMaAuwlEALw_wcB

⁶ <https://www.cnbc.com/2021/04/17/the-new-us-plan-to-rival-chinas-dominance-in-rare-earth-metals.html>

⁷ <https://>

www.theverge.com/2020/9/22/21451670/tesla-cobalt-free-cathodes-mining-battery-nickel-ev-cost

⁸ <https://piedmontlithium.com/>

decarbonization can support electricity decarbonization. Electricity decarbonization is also critical to transportation decarbonization. Recent analysis from BloombergNEF confirms what many other studies have shown: that electric vehicles produce significantly less carbon emissions than conventional fossil-powered vehicles on a lifecycle basis, and that the gap will only grow as more clean energy is deployed. Do you agree that electric vehicles are significantly less polluting than conventional vehicles? Will the carbon intensity of electric vehicles continue to decrease as we transition to a net-zero electricity sector and expand American battery manufacturing?

Thank you, Chair Castor, for this question. There are multiple elements to it, so let me begin with the issue of decarbonization. Yes, multiple research studies have confirmed that over their full life cycle, electric vehicles are significantly lower in carbon emissions than conventional internal combustion engine vehicles.⁹¹⁰ According to the most recent study from the International Council for Clean Transportation (ICCT), the reduction is 60–68 percent lower than combustion vehicles in the United States, 66–69 percent lower in Europe and lower in all other regions even today. This even includes cases in regions where power production is heavily coal-based.

Electric vehicles will also continue to improve in their ability to drastically reduce carbon over time. The reason for this is relatively simple: the electrical power grid is rapidly decarbonizing worldwide, including in the United States. Besides the critical emissions reduction imperative, simple economics are also accelerating this change. It is now cheaper to install renewable solar and wind power production than to operate fossil fuel power plants for nearly half the world's power production, and this is increasing yearly.¹¹

Several factors are involved. The electric vehicle powertrain is significantly more efficient than an internal combustion powertrain in turning energy into work¹²; studies see this as from between two and a half to five times more efficient. The core fuel is lower in carbon than conventional fuels and is becoming increasingly decarbonized over the next two decades (several jurisdictions, including California, have set goals of fully decarbonized grids by 2045¹³). The full life cycle is lower in carbon, including materials, manufacturing, operation and recovery. Importantly, in operation these vehicles have zero tailpipe emissions and are also lower in overall criteria, or smog-forming, emissions. This is a critical issue for equity in terms of the ability of large scale deployments of electric vehicles to significantly and quickly reduce emissions impacts on low income and communities of color which have traditionally born a disproportionate burden of transportation emissions. Zero emission commercial vehicles in the goods movement sector can be a particularly powerful strategy for this result.

The second part of your question is just as important. Zero emission (electric drive) vehicles can be a significant enabler and supporter of a deeply and fully decarbonized grid. This is true for a variety of reasons.

Providing connections and power to electric vehicles creates an entirely new user base across which to spread fixed costs in the utility industry. Over time this should lead to stabilized or even reduced costs to consumers because of a much broader customer base.

Electric vehicles, especially commercial vehicles at fleet sites, such as bus yards and truck depots, often benefit from locating energy storage on site to buffer the grid from peak demand loads as well as to store cheaper or renewable energy, such as from solar arrays, during off peak times. Creating a network of these distributed storage and generation assets, also known as distributed energy resources (DER), are critical elements for a modernized grid. They provide not only distributed storage to collect renewable energy during production peaks (such as during peak daytime solar hours) while also providing greater resiliency and stability to the grid by having backup and additional short-term generation assets, as well as ancillary services such as voltage stabilization. Utilities are only just starting to explore and integrate these assets. They could have been powerful tools to help manage impacts on the grid from recent freezing weather and fire events induced by climate change extreme weather.

⁹ <https://theicct.org/publications/global-LCA-passenger-cars-jul2021>

¹⁰ <https://www.transportenvironment.org/what-we-do/electric-cars>

¹¹ <https://www.bloomberg.com/news/articles/2021-06-23/building-new-renewables-cheaper-than-running-fossil-fuel-plants>

¹² <https://www.nrdc.org/experts/madhur-boloor/electric-vehicles-101>

¹³ <https://www.npr.org/2018/09/10/646373423/california-sets-goal-of-100-percent-renewable-electric-power-by-2045>

The vehicles themselves can also be powerful sources of a renewable grid strategy. Several electric bus manufacturers are offering optional two-way power transfer technology in their buses to enable vehicle-to-grid (V2G) capabilities. Navistar's IC Bus is actually providing this V2G capability as a standard feature.¹⁴ Manufacturers see this capability as a powerful emerging feature. Ford has excited the world with its new electric F-150 Lightning pick up truck. In addition to its enticing range (230 miles standard) and field power generation (multiple power outlets), it also has the capacity to power a home for up to three days from its battery pack. Ford is planning to also introduce technology to allow homeowners to use the truck as a buffer to store abundant renewable electricity when it is cheap and use it during higher cost periods.¹⁵ EVs will be a core enabler and asset of a modernized, resilient and renewable grid.

3. Mr. Van Amburg, your testimony highlights incentives that will support deployment of zero-emission vehicles. For decades, the U.S. tax code has provided the oil and gas sector billions of dollars in subsidies. For example, oil companies have been able to write off "intangible drilling costs" since before World War I. These subsidies have a high cost for Americans—nearly \$650 billion in 2015, according to a report from the International Monetary Fund. How does Congressional support for the deployment of zero-emission vehicles create benefits for all Americans?

Chair Castor, this is an important topic, thank you for raising this. The fossil fuel industry continues to benefit from substantial incentives, subsidies, tax benefits and other support that are no longer aligned with smart policy for climate, air quality or the future of U.S. jobs. It is worth pointing out one continuing source of undocumented subsidy that comes via the deployment of thousands of American men and women in the armed forces to patrol and protect oil supply lines worldwide, a risky and costly endeavor.

On the electric vehicle front, incentives to jump-start the electric vehicle market would have significant direct benefits for Americans domestically via:

- Cleaner local air quality immediately due to zero emissions from the tailpipe;
- More quickly stabilizing the worst climate impacts that we are already facing, and
- Creating a new generation of jobs in design, engineering and manufacturing throughout the supply chain, including hyper-local jobs in installation and maintenance of recharging and refueling infrastructure that would take place directly in our communities and towns.

One state's example is quite illustrative on this issue. California has established policies to require electric vehicles and also instituted significant investments for purchase incentives, infrastructure installation and manufacturing support. There has been a direct correlation between these policies and investments and the growth of companies and jobs manufacturing and supporting these components, vehicles and their service in the state.¹⁶

America benefits strategically, as well. Electric vehicle technologies have become the new high ground for global competition as most major economies, in particular China and the European Union, are investing heavily in this technology via purchase incentives, production support and infrastructure deployment. The U.S. needs to invest to maintain global competitiveness in this strategic technology. America has long led the world in inventing leading technologies in electric drive, including core components of energy storage batteries. But then we have ceded manufacturing leadership to other nations. We cannot afford to let this continue.

When it comes to clean air, electric vehicles are overall significantly cleaner even including powerplant emissions and have zero emissions from the vehicle themselves.¹⁷ As electricity production becomes increasingly based on renewable energy, this gap and benefit only increases.

4. Mr. Van Amburg, recent analysis from the Congressional Budget Office finds that a \$100 annual fee on electric vehicles would cover less than 2% of the shortfall in the Highway Trust Fund, confirming that EV fees are not a solution to the shortfall. Furthermore, a report from the Institute of Transportation Studies at the University of California finds that an annual electric vehicle fee of \$100 could decrease EV sales by 24%. Given the

¹⁴ <https://www.busandmotorcoachnews.com/ic-introduces-electric-school-bus-in-2-week-tour/>

¹⁵ <https://media.ford.com/content/fordmedia/fna/us/en/news/2021/05/19/all-electric-ford-f-150-lightning.html>

¹⁶ <https://calstart.org/calstart-california-zev-jobs-study/>

¹⁷ <https://www.eea.europa.eu/highlights/eea-report-confirms-electric-cars>

health, environmental justice, and climate benefits of zero-emission vehicles that you identified in your testimony, do you agree that Congress's near-term focus should be on incentivizing, rather than disincentivizing, EV adoption?

This is an important and misunderstood issue, Chair Castor, and worth discussing. While Congress needs to address the Highway Trust Fund shortfall, this is more of a structural issue with the fund itself that is not at all related to electric vehicles. It will also not be addressed by penalizing electric vehicles with a flat fee not related to their impact. Quite frankly, the approach is a distraction being used by some as a way to delay or disincentivize electric vehicles.

There are several approaches that could work better. The Trust Fund is currently funded through fuel fees applied by paying at the pump. Rather than levy a flat fee on an EV, one could instead create more of an apples-to-apples situation and apply the equivalent per gallon Trust Fund fuel tax converted to electricity or hydrogen at the point of charge or refueling. This would at least treat EVs equally, and not unfairly.

An even more equitable way to restructure the Highway Trust Fund might be to allocate costs by use and impact. Vehicles driving more miles, and causing more impacts by weight, emissions and climate and energy impacts, could pay more than those causing fewer impacts. In any event, the Trust Fund is broken; it needs a structural fix, not a distraction that is not a fix. We support real solutions.

But to return to your core question; yes, CALSTART and its nearly 300 member companies and agencies wholeheartedly agree that now is the time to be investing in and growing the EV market and supply chain, and its resulting benefits to America. We have worked closely with this Select Committee to highlight the key areas of highest focus where these investments can do the most good:

- Purchase incentives for electric vehicles (battery electric and fuel cell electric) that use the right tool to support the right market segment, from passenger cars (tax credits), to transit buses (though structural changes in the FTA purchase formula and through grant programs such as Low and No Emissions) and for commercial vehicles (point-of-sale incentives, as called for by President Biden);^{18 19}
- Infrastructure investments for passenger cars, transit buses and commercial vehicles both via the tax code and through accelerated grant programs, including funding clean fuel corridors through the Federal Highway Administration;²⁰ and
- Funding via the Department of Energy and the Department of Commerce for continued technology improvement, innovation, deployment validation and manufacturing support.²¹

In summation, these investments and incentives, proven out in the laboratories of the States and in other regions of the world, make up a powerful portfolio of progress for the United States to jumpstart the domestic electric vehicle industry. They will create a powerful economic driver for a new generation of jobs, focus clean air action and faster outcomes in communities most in need of them, and make the nation globally competitive and a net exporter of the advanced technologies and products the world will need for the decades of the climate battle to come.

Questions for the Record

Robert Bryce

Research Fellow

Foundation for Research on Equal Opportunity

THE HONORABLE ANTHONY GONZALEZ

1. The United States continues to be the world leader in production of natural gas, though we fall behind other countries in use of natural gas for transportation. Increased use of natural gas in transportation will not only clean our air and reduce our emissions, it will use a clean energy source

¹⁸ <https://calstart.org/administrations-2022-budget-request-reflects-calstarts-recommended-cash-payment-incentive-option-for-medium-and-heavy-duty-commercial-vehicles-may-28-2021/>

¹⁹ <https://calstart.org/broad-coalition-calls-on-congress-to-act-june-17-2021/>

²⁰ <https://calstart.org/zero-emission-commercial-vehicles-and-infrastructure-prioritized-in-federal-surface-transportation-bill-may-26-2021/>

²¹ <https://calstart.org/letter-to-congress-national-zero-emission-truck-coalitions-stimulus-recommendations/>

that is domestic, abundant, and runs in engines manufactured in the United States, which is the cleanest heavy-duty engine in the world. What role do you see natural gas playing in our clean transportation future?

Answer: Natural gas is a clean-burning fuel that emits almost no criteria pollutants and emits less CO₂ during combustion than refined oil products. And while nat gas has made inroads in the transportation sector, it has only captured about 4% of the domestic transportation fuel market. Refined oil products have about 90% of the domestic market.

See: <https://www.eia.gov/energyexplained/use-of-energy/transportation.php>

Various companies have sought to use more nat gas in the form of CNG or LNG in fleet vehicles. This option could become more attractive over time if nat gas retains a cost advantage over refined oil products.

2. Renewable Natural Gas (RNG) is naturally-occurring biomethane captured from farms, landfills, and wastewater facilities and used in the cleanest heavy-duty engines in the world, which are 90% cleaner than the cleanest diesel trucks and 90% cleaner than the latest EPA standard. The United States has increased production of renewable natural gas over 267% in the past five years and RNG use in transportation reduced 3.5 million tons of CO₂ equivalent in 2020 alone. When used in transportation, RNG can be carbon neutral or carbon negative, depending on the feedstock. It also removes emissions from dairies and other necessary agricultural activities. Considering that RNG is cleaner than battery electric vehicles and relies less on foreign supply chains, are you concerned with the push toward electrification, rather than policies that utilize RNG and other innovative fuels?

Answer: As I pointed out in my testimony, I am very concerned about the headlong rush to electrify transportation given the many problems with affordability, resilience, and supply chains.

See: <https://docs.house.gov/meetings/CN/CN00/20210630/112853/HHRG-117-CN00-Wstate-BryceR-20210630.pdf>

RNG does have some advantages over conventional natural gas, including its lower CO₂ emissions. However, we must be clear about the issue of scale. Last year, total RNG production in the US was about 50 trillion Btu. See: <https://www.russoonenergy.com/sites/default/files/RussoMay2020WileyColumn.pdf>. That is roughly equal to 1/100 of the quantity of gas needed to supply the U.S. residential sector, which now consumes about 5 trillion cubic feet of gas (roughly 5 quadrillion Btu) per year. Some reports are projecting that RNG production will grow rapidly over the coming years.

See: <https://www.biocycle.net/rapid-expansion-of-the-u-s-rng-industry/>. But even if we see a doubling or tripling of RNG production, the overall output will remain relatively small compared to total US demand.

In addition, it's not clear how much RNG can be profitably produced in the US. The constraints on its growth including the availability of suitable production facilities, which often depend on confined animal feeding operations or municipal solid waste facilities.

3. A recently published review of existing studies evaluated natural gas and electric buses and found that natural gas buses are more affordable, more reliable and deliver greater environmental benefit than electric buses. A comparison of natural gas versus electric refuse trucks also found that refuse collection using ultra-low-NOx natural gas trucks fueled with renewable natural gas (RNG) reduces more criteria pollutant (NOx) and greenhouse gas (GHG) emissions than collection using a battery electric alternative, at a much lower cost. Isn't it a better investment of taxpayer funds to reduce emissions through deployment of NGVs fueled by RNG rather than investing in more costly, less-effective electric vehicles?

Answer: I am not familiar with the studies being referenced. That said, the use of natural gas in fleet vehicles can result in significant reductions in operating costs and criteria pollutants. Natural gas helps decarbonization because it emits about half as much carbon dioxide during combustion as diesel fuel or fuel oil. See: <http://naturalgas.org/environment/naturalgas/>.

Furthermore, the maintenance regimes, longevity, and operating costs for fleets that use conventional NG are well known. As mentioned in the previous question, RNG has the potential to displace some conventional NG, but it remains unclear how big the RNG market might become.

All-electric buses and trucks may have some merits, but some of the value of the all-electric vehicles could be matched by the use of hybrid-drive systems which do not need expensive recharging infrastructure. In addition, it remains to be seen how manufacturers and buyers of all-electric vehicles—including heavy-duty EVs—will manage those vehicles once their batteries are depleted. Many EVs use lithium-ion batteries which are notoriously difficult to recycle. Indeed, about 99 percent of all lead-acid batteries are now being recycled. By contrast, in 2018, only about 3 percent of lithium batteries were being recycled.

See: <https://www.latimes.com/business/technology/la-fi-lithium-ion-battery-recycling-20180316-story.html>.

In summary, over the past century, the US transportation sector has been fueled almost exclusively by refined oil products. That dependence is due to oil's high energy density, relatively low cost, fast refueling time, and ease of storage and handling. All-electric vehicles have been around since the days of Thomas Edison and Henry Ford. EVs are making inroads in the marketplace, but their adoption and deployment at large scale—that is, in the tens of millions of vehicles—will likely take decades and will depend on expensive upgrades to the electric grid and the mining of vast amounts of critical minerals like copper, lithium, cobalt, and rare earths.

Questions for the Record

Beth Osborne
Director

Transportation for America

THE HONORABLE KATHY CASTOR

1. Ms. Osborne, your testimony noted that Black Americans, Native Americans, and older Americans face disproportionate risk of injury as pedestrians. How has previous transportation policy failed to prioritize the well-being and meaningful engagement of all people, and which communities have been most impacted? How can we ensure that these communities are first in line to see the benefits of our transportation investments?

Engagement of any member of the community has never been a strong point of transportation agencies. Transportation agencies are run by engineers and often lack the funding for expertise in public engagement. It shouldn't be the job of an engineer to run engagement, but that is what happens. It does not set us up for success.

But the inequities in transportation go far beyond engagement. The top most priority in our nation's transportation policy (and continued in the Bipartisan Infrastructure Deal) is to move vehicles quickly. Not to move people to their destination. The goal is to ensure that cars are moving fluidly, even if that fluidity on a corridor comes at the expense of a direct route for the driver, drivers trying to cross the corridor, the safety of all people along the corridor or creating a place attractive for local investment. Our desire to move cars quickly often lengthens auto travel. Think of those corridors with no left turn signs all the way down that force drivers to go out of their way to reach your destination. That is done because it makes the speeds better on the corridor and counts as "travel time savings," even though you might have a travel time penalty due to the route you were forced to take.

High-speed car travel means that drivers have a narrower field of vision to spot conflicts, less time to respond to it when they see a conflict, and more deadly results when they crash. The focus on speed allows for fewer places to cross and less activity at the curb. The problems of this approach, as explored in *Dangerous by Design*¹, falls heaviest on older adults, people of color, and people walking in low-income communities.

Black pedestrians are struck and killed by drivers at an 82 percent higher rate than White, non-Hispanic Americans. For American Indian and Alaska Native people, that disparity climbs to 221 percent. People age 50 and up, and especially people age 75 and older, are also overrepresented in these deaths. These age groups are more likely to experience challenges seeing, hearing, or moving, and the increasing fatalities indicate that we are not devoting nearly enough attention to the unique needs of older adults when we design our streets.

We don't really measure safety or pedestrians when we design roadways. Engineers start by asking how fast the traffic should go. Then they consider how many cars will be on the road. Then they consider how to make it safe for those inside the vehicles, making space for typical driver mistakes. (The last issue is cost.) Con-

¹ <https://smartgrowthamerica.org/dangerous-by-design/>

sidering people outside their vehicle is not standard. It is considered extra and added cost.

In the federal program, states must set targets for fatalities, including pedestrians. But they can set a target for *more* fatalities. By doing so, as long as they don't exceed that higher target, they can use their safety funds for non-safety purposes. This is how you create a system that is inherently dangerous, especially to those outside a car. Last year without traffic congestion to slow traffic, the fatality rate jumped more than it has in over 90 years. Traffic congestion appears to be our most effective safety intervention. Yet it is the problem we are most eager to get rid of. Our priorities are out of whack.

The best thing we could do to rectify this, and make it easier to travel by the least polluting mode, is to measure what matters: how well the transportation system gets people to jobs and essential services, whether they drive or not. A particular look at lower income people and people of color will truly show us how well we are doing. Such a lens (rather than speed of vehicles) will capture not just how well we are doing in creating equitable access to opportunity but improving safety especially for those outside a car, lowering household transportation cost, providing areas for physical activity, and lowering emissions that impact public health and the environment. We know that poor performance in all of these areas impact underrepresented and vulnerable members of the population first. Measuring the impact of the transportation system on them and designing project to improve it will create economic, public health, climate and equity benefits for everyone.

But we should also demand that safety be the primary measure for roads designed with federal money, not vehicle speed and fluidity. We should update federal standards and guidelines to support this, including the MUTCD and federally supported design standards. That does not mean providing flexibility to build safety. It means making the safe build the standard. Right now we create danger then puzzle at why people don't "choose" to get out of a car.

2. Ms. Osborne, recent analysis from BloombergNEF confirms what many other studies have shown: that electric vehicles produce significantly less carbon emissions than conventional fossil-powered vehicles on a lifecycle basis, and that the gap will only grow as more clean energy is deployed. As you highlighted in your testimony, electric vehicles are only a piece of the puzzle to decarbonizing transportation. How does rethinking our approach to building and maintaining roadways make transportation options like public transit, cycling, and walking safer, less polluting, and more accessible?

It is hard to choose a mode of transportation that doesn't exist or is difficult to access. So a very important step to reducing pollution is providing people with safe and convenient ways to travel less, take shorter trips, share rides or take less polluting alternatives—while still accomplishing everything they need to.

The most important part of making these options available is redesigning roadways to make them functional and safe. We cannot simply layer new options on top of an auto-centric system and expect that a true choice has been created. We lay out how to design a system where people can get around without polluting in our report *Driving Down Emissions*.² As we point out, this approach also has a very positive impact on household cost savings, public health, safety and equitable access to opportunity.

3. Ms. Osborne, your testimony highlights the importance of investments to cut carbon pollution in the transportation sector. For decades, the U.S. tax code has provided the oil and gas sector billions of dollars in subsidies. For example, oil companies have been able to write off "intangible drilling costs" since before World War I. These subsidies have a high cost for Americans—nearly \$650 billion in 2015, according to a report from the International Monetary Fund. What are some of the benefits Americans will see from Congressional investments to support multiple modes of transport like public transit, cycling, and walking?

Safety is the top benefit. By requiring road investments in areas with development to be designed for the most vulnerable user first, we will create the multimodal system we want and save lives—both in and out of vehicles. We will also improve public health, provide better access to jobs and essential services, and lower emissions.

²<https://t4america.org/wp-content/uploads/2020/10/Driving-Down-Emissions.pdf>

Additionally, the National Association of Realtors regularly reports on how high the demand is for walkable communities. Many realtors publish the walkscore on their listings for this reason. The fact that there is so little supply to meet demand drives up property values and makes it harder for lower income people (the ones most likely to benefit from high access without driving) to afford to live in these areas and benefit. Funding projects to meet that demand would provide immediate climate, equity, public health and economic development benefits. Failing to ramp up funding for the projects that are in such high demand and low supply will both exacerbate inequities and pass a golden opportunity to reduce GHG emissions by letting people travel the way they are showing in the market they would like to.

The government has kept the market from responding to demand by building a one-sized-fits-all transportation system and through its antiquated values made it hard to travel through less polluting modes. Doing so has driven up prices in the areas people would like to live. If we change course and build more multimodal streets then we will get climate, economic development, public health, and equity benefits.

4. Ms. Osborne, recent analysis from the Congressional Budget Office finds that a \$100 annual fee on electric vehicles would cover less than 2% of the shortfall in the Highway Trust Fund, confirming that EVs fees are not a solution to the shortfall. Furthermore, a report from the Institute of Transportation Studies at the University of California finds that an annual electric vehicle fee of \$100 could decrease EV sales by 24%. Given the health, environmental justice, and climate benefits of zero-emission vehicles that you identified in your testimony, do you agree that Congress's near-term focus should be on incentivizing, rather than disincentivizing, EV adoption?

I don't believe that having EV owners contribute to the transportation system on which they rely is a disincentive. In fact, charging them a small user fee (a fuel fee can work on any kind of fuel) could be used to build out the charging system needed, removing a large barrier to EV ownership and deployment. However, by avoiding this, we have ended up placing the charge on registration or annually in one big lump and using the money for purposes that do not help with EV deployment. That created a disincentive for ownership because an up-front charge is a greater burden than a small user fee paid over time (especially on lower income car owners) and because of the lack of ability to recharge without a garage (also more likely to impact lower income owners).

On top of creating a funding stream to build and maintain EV charging stations (which is made possible for private charging operators in the Bipartisan Infrastructure Package), we can guarantee a robust charging system that supports people who won't have access to charging at home and for those who need to charge up when away from home.

However, in the early days, the cost of EVs will be higher than internal combustion engine cars, and we should help defray the up-front costs for lower and middle-income households. Tax credits are certainly an important part of that. Even better are investments that help Americans avoid the money-losing enterprise of owning and operating a vehicle, which is usually the second largest household transportation cost. That money would be better spent on home ownership, retirement, education, and savings.

On the other hand, the focus on user fees is part of the tradition in the US to pay for transportation with a trust fund. This makes multi-year funding easier because transportation is funded outside of the annual appropriations process. As Congress moves further and further from user fees, it will require transportation to be funded through special funding packages and through regular appropriations. Many countries fund transportation through regular appropriations, so we could certainly head in that direction and stop charging user fees as we electrify.

THE HONORABLE GARRET GRAVES

1. A point to consider is the weight of the battery for electric vehicles—especially for electric SUVs and trucks, which can be significantly heavier than for similar gasoline-powered vehicles. For example, the Ford F-150 Lightning will weigh about 1,600lbs more than a similar gas-powered F-150 truck. This will lead to a greater impact on our local roads without the owners of these vehicles paying any kind of gas tax for the upkeep. In your testimony, you state that, “we can make a huge dent in our transportation emissions through a marked shift towards zero-emission vehicles (such as electric and hydrogen vehicles) for our national fleet of cars and trucks.

That means moving toward zero emission, electric vehicles for our public transit fleets, our freight carriers, and incentivizing the consumer shift towards zero emission vehicles.”

Since they don't use gasoline or diesel and therefore are not paying the gas tax, do you believe that such a fleet of electric vehicles should pay some kind of user fee considering they will have a greater impact on the roads and infrastructure in our country? If so, what would be the best mechanism to collect this user fee?

This is a very important point. There is also a huge safety issue related to vehicle weight, especially trucks and SUVs. Trucks have been built heavier and heavier and, now with electrification, they will be heavier still, with huge blind spots. Further SUVs and pick up trucks are being designed with an extra tall grill and hood (for no reason except the superficial), blinding the driver to objects and people in front of them, like in the picture to the right (credit to Tom Flood³). An Indiana local TV investigation⁴, they found that drivers of some kinds of SUVs couldn't see an entire kindergarten class in front of them. This is one of the causes of increases in fatalities to vulnerable users, as the Detroit Free Press found in 2018⁵. Safety is *far* from our highest priority. Electric or not, it is far past time to address the cost in human life of building heavier and deadlier trucks and SUVs.



In terms of paying for our transportation system, we have a fuel charge now. A fuel fee works on gasoline, diesel and ethanol, and it can work on hydrogen and electricity. In fact, such a fee could be used to build out the charging system people need, removing a large barrier to EV ownership and deployment. However, by avoiding this, we have ended up placing the charge on registration or annually in one big lump and using the money for purposes that do not help with EV deployment. That created a disincentive for ownership because an up-front charge is a greater burden than a small user fee paid over time (especially on lower income car owners) and because of the lack of ability to recharge without a garage (also more likely to impact lower income owners).

On the other hand, registration and user fees are necessary to sustain the US system of paying for transportation using a trust fund. This makes multi-year funding easier because transportation is funded outside of the annual appropriations process. As Congress moves further and further from user fees, it will require transportation to be funded through special funding packages (like the bipartisan infrastructure package) and through regular appropriations. Many countries fund transportation through regular appropriations, so we could certainly head in that direction and stop charging user fees as we electrify.

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³ <https://www.creativebyrovelo.com/>

⁴ <https://www.wthr.com/article/news/investigations/13-investigates/13-investigates-millions-vehicles-have-unexpected-dangerous-front-blind-zone/531-9521c471-3bc1-4b55-b860-3363f0954b3b>

⁵ <https://www.freep.com/story/money/cars/2018/06/28/suvs-killing-americas-pedestrians/646139002/>