

# SPARKING PROGRESS



Making the most of  
federal investment  
in zero-emission  
transportation

A project of

**CHARGE**

## About CHARGE and this report

Coalition Helping America Rebuild and Go Electric (CHARGE) is made up of transportation, industry, environmental, labor, health, equity, and civic organizations that support smart policy to electrify America's transportation system. Together, we support a set of principles for Congress and the administration to ensure we implement smart zero-emission transportation policy. This report provides ideas and examples for how national policy can direct our transition to zero-emissions transportation while delivering multiple benefits.

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## INTRODUCTION

**“We are on the highway to climate hell with our foot on the accelerator.”**

— UN Secretary General António Guterres, opening the COP 27 climate summit, Nov. 6, 2022





The Secretary General's choice of metaphor was hardly accidental. Transportation accounts for the largest share of greenhouse gas emissions in the US.<sup>1</sup> Fossil fuel-powered vehicles also are the largest emitters of health-harming pollutants, with the burden falling disproportionately on people of color, low-income, and other marginalized communities, who are themselves responsible for very little vehicle pollution.<sup>2</sup> These factors, together with the imperative to fully decarbonize transportation by 2050, point to a pressing need to make the transition to zero-emission vehicles as quickly as possible.

It was encouraging to see Congress and the Administration support this transition with the initiatives toward electrifying transportation included in the 2021 Infrastructure Investment and Jobs Act (IIJA) and the 2022 Inflation Reduction Act (IRA). [For highlights of related measures in the two Acts, please see APPENDIX 1].

As the federal government invests in the transition to zero-emission transportation, we need to ensure that the various programs work in concert to create a system that performs seamlessly, cost-effectively and to the benefit of all Americans. This report points the way to some of the key federal actions to make that cross-program coordination a reality.

While funding streams from the IIJA and IRA can be used for a variety of alternative fuels, this report focuses on zero-emission solutions, which is the best pathway to decarbonizing most forms of transportation. Battery-electric vehicles are the most common zero-emissions vehicles today, and electricity from renewable energy is the best zero-emission power-source in the vast majority of use cases. Hydrogen fuel-cell technology powered by green hydrogen has a limited role to play for the hardest-to-electrify heavy-duty vehicles.



Photo courtesy of Electrify America

Electrifying cars, trucks, and buses is a key part of an overall strategy to improve Americans' transportation options and reduce greenhouse gas emissions. But it is important to bear in mind that a more fundamental transition of our nation's mobility sector is required, moving

1 U.S. Environmental Protection Agency. Inventory of U.S. Greenhouse Gas Emissions and Sinks. <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks>

2 Proceedings of the National Academy of Sciences of the United States. Inequity in consumption of goods and services adds to racial-ethnic disparities in air pollution exposure. February 4, 2019. <https://www.pnas.org/doi/10.1073/pnas.1818859116>



away from our reliance on private passenger vehicles to a more balanced distribution that focuses on public transit, shared vehicles, safe biking and walking infrastructure, and micromobility devices.

Federal policies must ensure that investments are not limited to those

who can afford a new vehicle, but in fact deliver the greatest benefits to communities that are most vulnerable to rising costs and climate impacts. While a wholesale transition from internal-combustion vehicles to zero-emission alternatives will take many years, we can deliver solutions in the near term that allow people to take advantage of other, more affordable mobility options. These options come with additional benefits, improving access to jobs and services for people who don't drive while offering alternatives to sitting in congestion.

At the same time, we acknowledge that electric vehicles – whether individually owned or shared – will be part of the mix for a wide range of income levels. For that reason, we must ensure that everyone has access to zero-emission charging infrastructure, regardless of where they live.

Policies to promote the transition of institutional fleets to zero-emission vehicles can deliver benefits with a high return on investment, whether for individuals or businesses. Supporting the availability of clean, shared fleets in cities can give access to a vehicle for those who don't own one when they need it, while helping to reduce congestion. Transitioning government and business-operated, high-mileage fleets to zero emissions will help clean the air, avoid climate impacts and save money on vehicle operations. In addition, eliminating emissions from the trucks and equipment that operate in and around ports will remove the air pollution that harms the health of adjacent communities.

In this report, we focus on three arenas where federal policy and investment can ensure that the benefits of zero-emission transportation will improve the health and economic well-being of the largest number of people:



Photo courtesy of Electrify America



- **Public transit:** Suggestions to reduce carbon emissions from transit while improving service along with air quality. Increasing public transit investments into operations, e-fleets, reliability, maintenance facilities, and workforce development will increase the number of transit riders using this low-carbon transportation option.
- **Electric vehicle charging infrastructure:** Recommendations to ensure our emerging charging network is developed to be seamless and efficient, supports all types of mobility, is located strategically, and effectively serves people in multi-unit dwellings, stand-alone houses, as well as car-share, rental and business fleets.
- **Medium- and heavy-duty vehicles:** Opportunities to spur the conversion of our most polluting vehicles to zero emissions, reducing carbon while sparing the health of all Americans, especially for low-income and communities of color that are disproportionately harmed by air pollution from diesel-powered vehicles.

Throughout, we offer case studies and examples of initiatives deserving of federal support and that can serve as national models. We conclude the report with a survey of additional topics to consider in electrifying our transportation system, including the rise of micromobility – e-bikes, scooters, and myriad other battery-powered devices – and the need to make significant investments in our electric grid.



## PUBLIC TRANSIT





Public transit plays a critical role in reducing transportation emissions, while also providing affordable access to jobs and opportunities for all and serving as the vital circulatory system of our economic centers. Transit also is a critical lifeline for the many low-income residents in rural and tribal communities, though service is often extremely limited and in need of expansion and improvement. People of color disproportionately rely on transit and are most likely to live near polluting transit facilities such as bus depots.

We must provide more and better transit service while eliminating emissions from as much of that service as possible, as quickly as is practical. Federal investment and associated policies can help spur innovation and action toward zero-emission operations while also ensuring that transit operators sustain and improve the service that will make it possible for more people to travel without relying on a polluting vehicle. This requires both capital and operational support.

### **Operations**

Because it will do little good for agencies to transition to zero-emission vehicles if transit service shrinks dramatically or disappears, the first federal priority ought to be to ensure the continuation of robust operations.

### **Case Study: Evie Carshare**

Cars are expensive to buy and maintain, and for many they are not necessary for everyday use. Enter the Twin Cities' Evie Carshare, the nation's first 100% renewably powered, municipally owned network of EVs for hourly or daily rental. Through Evie, people have a car for trips that require one. Don't want a car? Don't need one? Can't afford one? Evie Carshare makes it easier for households to reduce or eliminate car ownership and free up income for other things.

In 2022, Evie operated 120 electric vehicles in a home area covering 35 square miles in Saint Paul and Minneapolis, supported by a network of 71 charging stations. Users can start and end a trip anywhere in the service area; plugging the car in at a charging station at the end of a trip earns the user a credit. Each charging location has spots for car-share vehicles and public charging as well.

The public chargers in the network create the additional benefit of providing charging access for EV owners in nearby apartment buildings. That's likely to make EV ownership more feasible for those who would otherwise be limited to gas-powered cars. Evie is a public-private partnership between the two cities, HOURCAR, Xcel Energy, East Metro Strong, and the American Lung Association.

At the height of the pandemic, in fiscal years 2020 and 2021, Congress and the Administration made special appropriations to transit agencies for formula grants to prevent, prepare for, and respond to the impacts of COVID-19. Available for both capital and operating expenses, these measures represent the rare occasion when the federal government has supported operating costs for both large and small transit systems. They serve as a powerful reminder that the federal government has an important role to play in supporting local transit. When the first of these measures – the Coronavirus Aid, Relief, and Economic Security (CARES) Act – was adopted in the early days of the pandemic, Congress recognized that transit service needed support because it was critical to get essential workers where they needed to go.

**Action:** *Resume federal support for transit operating costs as in the CARES Act. This federal investment to sustain transit helped to keep society functioning while preventing draconian service cuts that would have done lasting damage. Transit finances have historically been insufficient and remain unstable in the post-pandemic world. Although the same workers are still essential and employers have strong need for them, Congress did not continue operating support in the IIJA or IRA. This situation should be addressed as soon as possible, but certainly must be rectified in the next transportation bill.*

*As with previous technological disruptions, the switch to zero-emission infrastructure will cause some jobs to change significantly. At the same time, the demand for trained and qualified workers to operate and maintain service will grow along with our transit investment. Federal policy, then, needs to support essential workforce development.*

**Action:** *Fund workforce development to support the successful transition to a zero-emission transportation future, including training programs for mechanics and other workers impacted by the EV transition. Likewise, we also need to provide workforce education, training, and certification for electricians installing and maintaining EV charging infrastructure.*

### Case Study: Forth — Car sharing in smaller communities

The Oregon-based organization Forth has created the Affordable Mobility Platform (AMP),<sup>1</sup> a national initiative funded by the U.S. Department of Energy with the goal of increasing access to low-cost EVs in underserved communities. Forth recently launched three EV community car-sharing programs.<sup>2</sup> Learn more about GoForth CarShare<sup>3</sup> and CRuSE<sup>4</sup> in Oregon, and SiLVERS<sup>5</sup> in Missouri.

1 Forth. Affordable Mobility Platform (AMP). <https://forthmobility.org/storage/app/media/Press%20Releases/AMP%20National%20Press%20Release.pdf>

2 Forth. Community Carshare. <https://forthmobility.org/community-carsharing>

3 Forth. GoForth CarShare. <https://forthmobility.org/goforth>

4 Forth. CRuSE. <https://forthmobility.org/our-work/CRuSE>

5 Forth. SiLVERS. <https://forthmobility.org/silvers>



*Frontline communities should be prioritized for investments in training for new jobs in manufacturing, installation and maintenance.*

### **Capital Investments: Vehicles, infrastructure and more**

As the collective owners of 70,000 fleet vehicles, transit agencies need significantly increased funding from the federal government to update their fleets to zero-emission vehicles and deploy necessary infrastructure. Beyond that, agencies need to grow and maintain their fleets and provide better, and more equitable, essential service that reduces dangerous air pollution in communities, reduces long-term operating costs, and provides an alternative to personal vehicles.

**Action:** *Promote “no” over “low” emission for transit buses. The Low or No Emissions Vehicle competitive program (Low-No) provides funding to state and local authorities for the purchase or lease of zero-emission and low-emission transit buses as well as acquisition, construction, and leasing of required supporting facilities. The IJA provides \$5.6 billion over five years for the Low-No Program – more than six times greater than the previous five years of funding.<sup>3</sup> A growing number of transit agencies have adopted or are considering goals to transition to zero-emission vehicles. In 2022, transit agencies applied for over four times the funding available in the combined Low or No Emissions and Bus and Bus Facilities competitive grant programs.<sup>4</sup> Federal funding for zero-emissions vehicles should expand to address this demand.*

**Action:** *Invest in development of mobility hubs around transit centers. To make the most efficient use of transit and expand its usability and access, federal policy should promote better integration of micromobility devices, such as shared and individually-owned bikes and electric scooters, with transit systems for “last mile” links to destinations. These hubs and other transit stops should provide user updates as to route timing and availability of shared use devices.*



<sup>3</sup> U.S. Department of Transportation: Federal Transit Administration. Bipartisan Infrastructure Law. <https://www.transit.dot.gov/BIL>

<sup>4</sup> U.S. Department of Transportation: Federal Transit Administration. Biden-Harris Administration Announces Over \$1.6 Billion in Bipartisan Infrastructure Law Funding to Nearly Double the Number of Clean Transit Buses on America’s Roads. August 16, 2022. <https://www.transit.dot.gov/1800buses>

**Action:** Promote frictionless fare payment and safe access for disabled and vulnerable users. Federal dollars should support development of payment systems that are interoperable among various service providers and offer fare-free transfers. We ask Federal agencies to provide continuity of payment methods for public infrastructure such as electric vehicle chargers, micro-mobility, and public transit. For individuals who use alternative financial services such as check-cashing outlets, payday lenders, or third payment platforms, there is potential to expand options for the use of non-traditional banking methods.

### **Planning and implementation**

**Action:** Require transit agencies to complete a plan, within one year, that reflects significant input from the community, and the frontline workforce, for transitioning public fleets to 100% zero-emission vehicles. Each transit agency should establish a timeline and budget that accounts for all costs associated with the transition, such as those for retraining their existing workforce, as well as associated infrastructure costs such as charging stations.



## Case Study: Rural charging as an economic opportunity

Charging is different from gas-station fueling. The average time spent recharging an EV on a DCFC charger is 20-30 minutes. Because of the time required to charge an EV, America's rural towns could benefit from the federal investment in a national charging network by taking advantage of the economic opportunity presented by the time long-distance drivers spend charging in their towns.

To maximize this opportunity, rural communities applying for formula funds granted to their state should strive for "charger-oriented development." New EV charging stations should be strategically located within walking distance of small businesses, increasing the chances of foot traffic from EV drivers to surrounding stores, restaurants, and other locally owned businesses. Rural communities with traditional "main streets" are more likely to have locally owned businesses than communities centered on a highway, where national franchises are predominant. While \$1.25 billion of the Community and Fueling Infrastructure Grant Program is reserved for constructing EV charging stations along major corridors, an equal amount is reserved for communities that are not located within a mile of a highway. The local governments and business owners of these rural towns should advocate to host EV charging stations to attract EV drivers to their local businesses. Here are a couple of examples where communities are already moving in this direction:

**Meeker, Colorado.** The advocacy group White River Electric Association (WREA) assisted the remote mountain town of Meeker, Colorado (population 2,300) in siting and installing its electric charging station within walking distance of local shops, including Meeker Cafe.<sup>1</sup> Since its opening, WREA reports that local businesses have noticed an increase of EV tourists frequenting their businesses, some even calling ahead as they map out their routes.<sup>2</sup> Several studies have revealed that EV charging stations attract new customers and increase the amount of time customers spend within a store or restaurant, which often results in increased sales.<sup>3</sup>

**Canton, New York.** Canton, a village of 7,064 established in 1805 in upstate New York, is a great example of charger-oriented development. The city sited its charging station a half block from the town's historic main street and its local businesses. The operators of Sergi's, a locally owned pizzeria off the main street, reported that they regularly sell pizzas to EV customers while their cars are recharging. Likewise, the owner of Pear Tree, a local gift shop, notes that the EV charging station in Canton is a hub of activity throughout the day, likely because it is the only one along State Route 11 between the settlements of Watertown and Malon, NY. Canton is strategically located to host an EV charging station and the town sited the facility so that it would be economically beneficial.

1 Matt Fitzgibbon, "Leading the Charge: Cooperatives Bringing Electric Vehicle Chargers to Rural Communities," Tri State CoOp, May 20, 2020, <https://tristate.coop/cooperatives-bringing-electric-vehicle-chargers-rural-communities>.

2 Ibid

3 "Are Electric Car Charging Stations Profitable?," EV Connect, August 16, 2022,



## CHARGING INFRASTRUCTURE



Top and Bottom photos courtesy of Electrify America



With the IIJA and IRA, Congress and the Administration took significant steps to spur the creation of a national network for charging electric vehicles. The IIJA included up to \$7.5 billion for EV charging infrastructure, including \$5 billion in formula funds distributed to states to build out EV chargers along highway corridors.

According to one estimate, the federal investment and local match in this National Electric Vehicle Infrastructure (NEVI) Program could lead to the development of more than 34,000 fast-charging stations nationwide.<sup>5</sup> The IRA, meanwhile, extended a tax credit for EV charging stations in low-income and rural areas.

These are important moves toward making it possible for the country to reduce carbon intensive and dirty fuels used in vehicles and incentivize a shift toward electric power. At the same time, much more will need to be done to support a wholesale conversion. In terms of federal investment policy, the question shouldn't be limited to "How do we spur creation of a charging network for personal vehicles?" but rather "How do we create access to electrified transportation for the greatest number?" – especially for those without the means to afford a car or without a dedicated parking space in which to charge one.

In denser urban environments, many people lack a driveway or garage to charge an EV. Low-income communities and communities of color are much less likely to have the kind of dedicated parking where overnight charging from one's own outlet is possible. Innovation and investment are needed to extend charging opportunities to those who cannot charge at home.

Access to charging isn't the only challenge. The physical infrastructure around the charger matters a great deal. The area needs to be plowed and de-iced; the pavement maintained, and trash removed. Also, host site operations must provide adequate lighting and a reasonable level of security. This will matter to everyone but will be even more important to

### **The special power of electric school buses**

Electric school buses (ESBs) with "vehicle-to-everything" (V2X) capabilities have the potential to enhance grid resiliency in times of emergency response. ESBs have large on-board batteries, predictable routes and times of use, and sit idle for many hours at a time. They are also not typically used during extreme weather-related emergencies. Serving as "mobile power units," ESBs can enhance much-needed infrastructure resiliency and aid in emergency planning, preparedness, and response efforts. They could be life-savers for the underserved communities often hit hardest by extreme weather and that may lack robust and resilient infrastructure. Policymakers should be aware of the potential for ESBs and use existing Hazard Mitigation Plan funding under FEMA to cover V2X technologies.

<sup>5</sup> Third Way. Bipartisan Infrastructure Law Will Jumpstart EV Charger Buildout. August 16, 2022. <https://www.thirdway.org/memo/bipartisan-infrastructure-law-will-jumpstart-ev-charger-buildout>

EV customers who are considered at a higher risk to violence, who for good reason, might not be comfortable sitting in their car or standing on the side of a highway at night for the time it takes to charge their car.

In urban areas where there is a proliferation of vehicles that already are or can readily be electrified – shared use vehicles, buses, e-bicycles and e-scooters, delivery vans, and more – federal incentives could promote efforts to integrate charging for many modes and purposes. Overarching federal guidance and support could promote a “dig once” approach, ensuring that needed modifications to the electric grid are coordinated among modes to avoid repeated, wasteful disruptions and added costs. Additional guidance should ensure the stations themselves are powerful enough to charge all manner of vehicles, with sufficient space to accommodate larger vehicles.

**Action:** *Prioritize funds to install charging infrastructure at multi-unit dwellings and workplaces to serve passenger (and other) vehicles. The program should be designed to ensure public access to charging for electric vehicles, three-wheelers, e-bikes and other mobility devices in places without dedicated, off-street parking. The program should make the funds available to state, local, tribal, or territorial governments, private and nonprofit entities, or metropolitan planning organizations. Installation of charging infrastructure at residential buildings whose residents face higher barriers to charging infrastructure installation is critical. Beyond home charging, it is essential to provide charging options at workplaces and other convenient locations, such as grocery stores, government services and parking facilities for public transportation – the last of which will help encourage the use of transit.*



Photo courtesy of Electrify America



### Case Study: Cleaning up the nation's ports

Ports, both coastal and inland, are vital to our economy, but the diesel that fuels them causes pollution that harms health for many miles around, with particular impact on communities of color living nearby. Emissions from idling ships, trucks, locomotives, and cargo-handling equipment cause cancer and trigger asthma attacks, heart attacks and strokes, leading to thousands of premature deaths each year. At the same time, greenhouse gas emissions from shipping activities are significant and trending in the wrong direction. Conversion to a zero-emission future cannot come fast enough for the health of Americans and the planet. The Inflation Reduction Act includes \$3 billion to reduce air pollution and advance zero-emissions technology in ports and another \$1 billion that can be used to help electrify some of the drayage trucks that carry cargo containers.

#### **Developments at two US ports show how critical these, and additional federal investments and policies, will be to clean our ports:**

The ports of Los Angeles and Long Beach together comprise the nation's largest shipping center. Under a Clean Air Action Plan adopted in 2005 and updated in 2017, they have pledged to convert all cargo-handling equipment to zero-emissions by 2030 and all trucks by 2035. The transition is critical for the port's neighbors. The Long Beach port alone is adjacent to about 300,000 residents — half Latinx, 18 percent Asian and 17 percent Black — who visit emergency rooms for asthma attacks at a rate 44 percent higher than the state average. To incentivize a shift from polluting drayage trucks, the ports in April 2022 began charging cargo owners \$20 per loaded container hauled by diesel trucks in and out of the terminals, while containers hauled by zero emissions trucks are exempt. Meanwhile, the ports are testing about 200 pieces of battery-powered equipment including forklifts, locomotives and tugboats. While the IRA funding is a huge boost, port officials estimate it could cost more than \$8.4 billion to replace all 21,000 drayage trucks that carry cargo in and out of the shipping hub.

The Port Authority of New York and New Jersey operates the largest shipping center on the East Coast, attracting about 15,000 trucks per day. The port also manages a Truck Replacement Program that could be a model for incentivizing a more rapid shift from diesel to zero-emission, heavy-duty vehicles. The program offers grants of up to 50 percent (up to \$25,000) toward the incremental cost of purchasing a newer, cleaner truck to replace high-polluting vehicles manufactured before 2007. The program is funded by the federal Congestion Mitigation and Air Quality Improvement (CMAQ) Program and USEPA's Diesel Emission Reduction Program (DERA).

### Case Study: Trends in US production of heavy- and medium-duty trucks

**The manufacture of zero-emissions trucks in the US is a small segment of truck production but is growing by the day.** According to a recent, comprehensive survey of vehicle assembly plants<sup>1</sup> across the country, 52 plants are capable of producing zero-emissions vehicles (ZEV), with 42 already doing so. Additionally, MHDV models have increased by 625% since 2019<sup>2</sup>, providing more options for customers. About half can produce both ZEVs and traditional internal-combustion vehicles, while 19 produce ZEVs exclusively. Additionally, 20 of the 52 MHDV manufacturers are unionized with 14 union plants producing zero emission MHDV. There are well-paying jobs in ZEV and MHDV manufacturing. An investment of \$15.2 billion in exclusively ZEV facilities has created 27,940 jobs in communities across the US, with the highest concentrations in California, Texas, and the Midwest.

**Ford's electric cargo van.** In 2020, Ford Motor Company announced plans to electrify the popular Transit cargo van with annual sales of 150,000. Investing \$100 million dollars to retrofit its Kansas City, MO manufacturing plant, Ford began delivering its brand new E-Transit cargo vans to customers in late 2021. Ford's 2022 production year for its E-Transit vans is sold out, with 10,000 orders on hand. Ford's Kansas City, MO plant hosts 7,500 manufacturing jobs; the addition of the E-Transit cargo van created 150 new union jobs at the manufacturing plant. While automakers reported nationwide declines in auto sales for 2021, including Ford Motor Company, Ford's electric vehicle sales outperformed all other categories in sales growth.<sup>3</sup>

**The Rivian story.** American automaker Rivian manufactures all-electric vehicles at its 2.6 million square foot facility in Normal, IL, employing 5,200 workers in 2022, up from just 250 in 2020.<sup>4</sup> This rapid expansion has been driven by Amazon's 2019 investment of \$700 million into the company and its contract for 100,000 ZEV cargo vans by 2030, with 10,000 due by the end of 2022. Producing the remainder of 90,000 ZEV cargo vans provides job security for workers, who earn an average of \$83,000 a year.<sup>5</sup>

1 Third Way. Mapping the transition to zero emission medium- and heavy-duty trucks. June 28, 2022. <https://www.thirdway.org/memo/mapping-the-transition-to-zero-emission-medium-and-heavy-duty-trucks>

2 CALStart. Zeroing in on Zero-Emission Trucks. The Advanced Technology Truck Index: A U.S. ZET Inventory Report. January 2022. [https://calstart.org/wp-content/uploads/2022/02/ZIO-ZETs-Report\\_Updated-Final-II.pdf](https://calstart.org/wp-content/uploads/2022/02/ZIO-ZETs-Report_Updated-Final-II.pdf)

3 Jordyn Grzelewski, "Ford Reports 4.5% Year-over-Year Sales Decline in May amid Industrywide Drop," The Detroit News, June 2, 2022, <https://www.detroitnews.com/story/business/autos/ford/2022/06/02/ford-sales-down-may-2022-amid-industrywide-drop/748269900>

4 Audrey Henderson, "Rivian Makes EV Vision a Reality in Normal, Illinois," Energy News Network, June 6, 2022, <https://energynews.us/2022/06/06/a-decade-after-evtown-rivian-is-making-an-illinois-citys-electric-vehicle-vision-a-reality/>.

5 "How Much Does Rivian Pay in 2022?| Glassdoor," Rivian Glassdoor, 2022, <https://www.glassdoor.com/Salary/Rivian-Salaries-E630579.htm>.



**Action:** Support EV car sharing that is affordable to lower income individuals and make charging capacity available for individuals who drive for ride-hailing services, such as Uber and Lyft. Today, and for some years to come, the majority of users of the nationally supported electric charging infrastructure are likely to be those who can afford an electric car. Electric car-sharing programs can provide access to an EV for those trips that may require one. (For an example of an existing public car-sharing program, see Evie Carshare on p. 5) Car-sharing programs make it easier for a household to go car-free or cut down on the number of cars, freeing up income for other uses. To the degree that it means people need to own and park fewer cars it solves several problems for denser areas. Federal support could help spur creation of such programs and ensure they are affordable to all incomes. DOT can support car-share programs with community grants by prioritizing charging projects that facilitate car-share services.

Without planning for and commitment to operations and maintenance, we could see our efforts toward a comprehensive charging infrastructure fall short. Safe walking infrastructure will be essential for travelers to access these services while their vehicles are charging. Safe biking infrastructure, along with access to and charging for electric bikes and scooters, could enhance access to additional services for travelers.



**Action:** The Joint Office on Energy and Transportation (JOET) should act as a facilitator and clearinghouse for best practices in procurement, operations, maintenance and placement of charging infrastructure. Reliable and timely operations and maintenance will be critical to establishing public confidence and use of the emerging network. Success also depends on ensuring charging access at key destinations such as grocery stores and shopping areas. The entities responsible for charging facilities will need support in considerations such as selecting sites that are secure from public safety concerns, and protected from weather impacts such as flooding or snowfall and potential impacts of climate disruptions. The US Department of Transportation is providing a framework for needed assistance with a Rural EV Toolkit<sup>6</sup> and its upcoming urban EV toolkit. These resources should be continually updated and coupled with technical assistance and additional resources as needed in support of implementation of NEVI and other charging infrastructure programs.

<sup>6</sup> U.S. Department of Transportation. Charging Forward: A Toolkit for Planning and Funding Rural Electric Mobility Infrastructure. <https://www.transportation.gov/rural/ev/toolkitx>



# MEDIUM- AND HEAVY-DUTY VEHICLES





Medium- and heavy-duty vehicles (MHDVs), including trucks and buses, account for about 22 percent of energy use in the U.S. transportation sector, with commercial trucks contributing about 60 percent of air pollution in cities and towns. There are nearly 23 million medium- and heavy-duty vehicles on U.S. roads being used to haul goods and perform functions other than personal transportation.<sup>7</sup> These include transit and school buses, freight trucks and delivery vans, utility and construction vehicles, and heavy-duty pickups.

The transition to zero-emissions for MHDV fleets would yield significant economic and social benefits to shipping and delivery companies, to the communities surrounding our ports, and to neighborhoods where buses deliver kids to school every day. Diesel and gas-powered trucks and buses not only represent an outsized share of carbon dioxide emissions, but also emit particulates and precursors to health-harming ozone, with particular impact on disadvantaged communities. Federal action to clean up MHDVs would go a long way toward advancing the Biden administration's Justice40 Initiative goal of delivering 40 percent of the overall benefits of relevant investments to disadvantaged communities.



Photo courtesy of Electrify America

The IJJA contains the seeds of a national effort to convert MHDVs to electric, while demonstrating the need for follow-on federal investments and policies. IJJA allocates about \$17 billion toward port infrastructure, with the primary aim of addressing needed repairs and maintenance backlogs. The Act also funds the Clean School Bus Program at the Environmental Protection Agency, offering \$5 billion for school districts to replace old, polluting school buses with zero-emission and lower-emission models. The five-year program opened in August 2022, providing more than \$910 million in rebate<sup>8</sup> funds as of the end of the year.

The IRA also included \$4 billion for two new programs at EPA whose focus is to reduce emissions from the transportation sector. The Clean Heavy-Duty Vehicle program invests \$1 billion to help cover the costs of replacing diesel combustion engine heavy-duty vehicles

7 MJB&A: An ERM Group Company. Medium- and Heavy-Duty Vehicles: Market Structure, Environmental Impact, and EV Readiness. July 2021. <https://blogs.edf.org/climate411/files/2021/08/EDFMHDVEVFeasibilityReport22jul21.pdf>.

8 Environmental Protection Agency. Fast Facts on Transportation Greenhouse Gas Emissions. <https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions>

(Class 6 and 7 vehicles) with cleaner alternatives, deploying supporting infrastructure, and/or training and developing the necessary workforce. At least \$400 million is required to be set aside for areas not meeting National Ambient Air Quality Standards, with grants open to eligible states, municipalities, Indian tribes, nonprofit school transportation associations, and contractors.

Additionally, the IRA included \$3 billion to the EPA for the Clean Ports Investments to electrify our port infrastructure, enhance efficiency, and tackle the dangerous levels of air pollution for communities that reside near ports. These initiatives represent a strong start, but only scratch the surface of the incentives and policy support needed to enable and accelerate the transition of this diverse and complex sector.

### **Why address medium- and heavy-duty vehicles?**

Eliminating emissions from medium- and heavy-duty vehicles will help protect the climate, reduce pollution-related health impacts, save shippers and drivers money, and support domestic manufacturing and jobs. Diesel trucks alone represent the largest contributor to ozone-forming nitrogen oxides in the transportation sector, despite making up less than 10 percent<sup>9</sup> of vehicles on U.S. roads while generating 26 percent of U.S. greenhouse gas emissions<sup>10</sup> – more than aviation, maritime shipping, and rail combined. In addition, MHDVs are a leading source of health-damaging fine particulates, known as PM2.5, the leading environmental cause of death, as well as nitrogen oxides. Research has established that this pollution disproportionately harms communities<sup>11</sup> of color.

### **Challenges that federal support can help to overcome**

Progress toward the electrification of MHDVs has picked up steam over the last three years. Several top MHDV manufacturers (including Volvo, Freightliner, GM, Hyundai and Ford) and a number of newcomers (such as Rivian and Tesla) have launched initiatives to build or repurpose factories to produce zero-emission MHDVs, while owners of large delivery fleets such as Amazon and UPS have made commitments to purchase them.

An in-depth analysis<sup>12</sup> of the sector's readiness for electrification found that there are batteries sufficient to power nearly two-thirds of MHDVs, and that all but long-haul trucking are likely to be charged at their home base, meaning they won't rely to any great degree on public charging stations. That study also found that the lifecycle operating costs are likely to be substantially lower for electric versus conventional vehicles. For long-haul trucking and other unpredictable or extended fleet routes, hydrogen fuel cell vehicles

9 Medium- & Heavy-Duty Vehicles: Market Structure, Environmental Impact & EV Readiness. <https://www.edf.org/sites/default/files/documents/EDFMHDVEVFeasibilityReport22jul21.pdf>

10 U.S. Environmental Protection Agency: Fast Facts on Transportation Greenhouse Gas Emissions. <https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions>

11 Science Advances. PM2.5 pollutants disproportionately and systematically affect people of color in the United States. Vol. 7 No. 18. April 28 2021. <https://www.science.org/doi/10.1126/sciadv.abf4491>

12 Medium- & Heavy-Duty Vehicles: Market Structure, Environmental Impact & EV Readiness. <https://blogs.edf.org/climate411/files/2021/08/EDFMHDVEVFeasibilityReport22jul21.pdf>



powered by green hydrogen may present another opportunity to achieve zero emissions.

However, purchasing costs remain well above those for diesel-powered trucks and buses. Prices are projected to drop with increasing demand, the establishment of the 45W tax credit, and production efficiencies, but the chicken-and-egg quandary is that demand remains relatively low absent an external push or pull toward zero-emission solutions.

Aside from vehicle cost, the initial transition requires planning and upfront capital investments – or working out a shared arrangement with other operators – for charging and refueling infrastructure. For delivery companies it could mean optimizing routes, retrofitting facilities for the supporting infrastructure, and training workers in the new technology.

In order to get the most bang for the buck from provisions in the IRA and IIJA regarding medium- and heavy-duty vehicles, we recommend the following actions:

**Action:** *Coordinate federal agencies, state governments, and relevant in-state entities (like utilities) to ensure that infrastructure for MHDVs is powered proportionately more by renewable, rather than fossil fuel, electricity generation.*

**Action:** *Ensure that the tax credit for commercial vehicles is implemented quickly and equitably.*



Photo courtesy of Electrify America

*The IRA establishes a new tax credit (Section 45W) for qualified commercial vehicles – including “mobile machinery” – acquired after December 31, 2022, and before January 1, 2033. In developing guidance for 45W, the Treasury Department should:*

- *Provide detailed guidance to taxpayers regarding the comparable vehicles determined under the 45W credit. For example, we recommend adopting the approach used*

*in successful state incentives programs.<sup>13</sup> In these programs, to prove eligibility, manufacturers must submit an application that identifies a comparable conventional vehicle and its price. In this way, manufacturers, who have a deep understanding of their products and how fleets use them, suggest the appropriate comparable vehicle to determine incremental cost while the program administrators verify.*

- *The definition of “mobile machinery” should be clarified to make it clear that “cargo handling equipment<sup>14</sup>” is encompassed by this definition. Additionally, any guidance issued by the agency should provide an illustrative list of mobile machinery examples that should include heavy-duty nonroad, self-propelled vehicles or land-based cargo equipment, tools, and vehicles regulated under the U.S. Environmental Protection Agency’s (EPA) nonroad engine rule.*

**Action:** *Congress should require the U.S. Postal Service to electrify as quickly as possible by conducting a proper fleet transition plan. With around 270,000 vehicles, the USPS is, by far, the largest delivery fleet in the US. In its Final Environmental Impact Statement for the Next Generation Delivery Vehicle, the USPS identified that over 90 percent of its routes could be serviced by ZEVs, but has only committed to electrifying 40% of their delivery fleet. USPS should use the \$3 billion available in the IRA to electrify beyond USPS’s original commitment of 40%. A larger expansion of electric USPS vehicles will provide cleaner delivery services while providing highly-visible electric delivery vehicles, encouraging more people to buy zero-emission. Electrifying the entire USPS fleet will provide the federal government a return on equity by lowering long-term operational support for this federal fleet. The first step in ensuring this successful transition is to complete a fleet transition plan to optimize the deployment timeline in a cost-effective manner.*

**Action:** *Fund grants and rebates in the Clean Ports Program that improve air quality and reduce greenhouse gas emissions for both sea ports and inland ports. The zero-emission goals of the program would benefit from an expansion in funding.*

<sup>13</sup> See the New York Truck Voucher Incentive Program (NYTVIP) and California’s Hybrid and Zero-Emission Truck and Bus Voucher Incentive Program (HVIP) as examples of state incentive programs that have established systems for determining comparable vehicles. <https://www.nyserda.ny.gov/All-Programs/Truck-Voucher-Program> and <https://californiahvip.org/>

<sup>14</sup> Environmental Protection Agency, Cargo Handling Equipment (CHE) Best Practices to Improve Air Quality (October 4, 2022) available at <https://www.epa.gov/ports-initiative/cargo-handling-equipment-che-best-practices-improve-air-quality#:~:text=The%20CHE%20sector%20encompasses%20a,vessels%2C%20railcars%2C%20and%20trucks>



## OTHER KEY CONSIDERATIONS





While beyond the focus of this report, there are other important areas to consider in supporting and promoting the electrification of the nation's transportation network. We suggest three of them here:

### **Ensuring a robust, resilient and efficient electric grid**

Grid reliability and resiliency is a key issue as we electrify many end uses of energy, including transportation. Grid operators and policy makers must plan and invest in a clean, robust, and efficient grid that can serve EV charging and the many other demands on it. That planning and related investments must also account for extreme weather. There is little doubt that the increasingly extreme weather from a changing climate will stress the nation's power grid, even as we strive to convert our transportation system to electricity. The scale of land and resources required to meet all of our electricity demand with renewables is substantial.

On the one hand, while we are making progress, and there are encouraging technological innovations on the horizon, we must prioritize the efficient use of vehicles to reduce the energy those vehicles need to get from the grid. That includes encouraging the use of right-sized vehicles, rather than less fuel-efficient, oversized vehicles, and intentionally developing communities in ways that reduce the need for more and longer car trips. It means we should conserve where we can while investing in giving people mobility options beyond low-occupancy passenger vehicles.

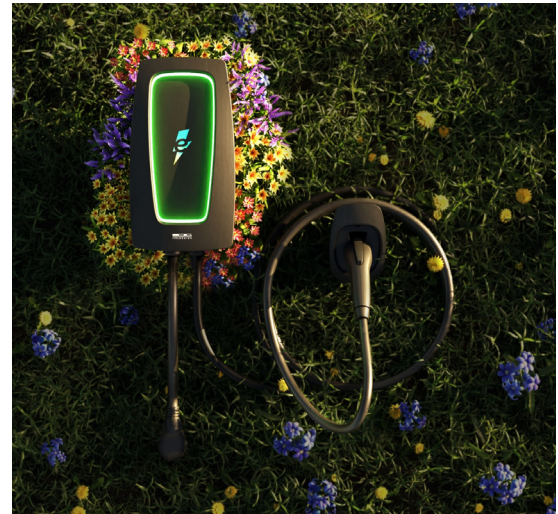


Photo courtesy of Electrify America

At the same time, the federal government should encourage technologies such as bidirectional or “vehicle-to-grid” charging and “time-of-use” rates that make it cheaper to charge at times when the grid is less taxed and at times of high renewable energy generation. Vehicle-to-grid technology, which is being piloted in some states, is especially promising because it would allow vehicle batteries to provide enhanced grid services, including backup power during extreme-weather events or periods when renewable energy is less available. The added benefit that EVs provide in terms of grid resiliency could have been tapped during California's record 2022 heat wave, when officials urged residents to stop unnecessary energy usage—including EV charging—to avoid rolling blackouts. Had there been the right bidirectional charging capability with the EVs, EVSE and communication protocols with the local utilities, EVs could have provided the needed power. EVs could also be used to power their owners' homes, and thereby reduce stress on the power grid.



### Applying Justice40 to electrification of transportation

In his first year in office, President Biden signed Executive Order 14008<sup>15</sup>, aimed at tackling the climate crisis and creating jobs. In this order, the president established Justice40, later described as “a whole-of-government effort to ensure that federal agencies work with states and local communities to [...] deliver at least 40 percent of the overall benefits from federal investments in climate and clean energy to disadvantaged communities.”

Justice40 is meant to focus on federal support for clean energy, energy efficiency, clean transit, affordable and sustainable housing, training and workforce development, the remediation and reduction of legacy pollution, and the development of critical clean water infrastructure.

Now that resources are available under the IRA and IIJA, the federal government should expand support for under-resourced communities to include aid for applying to programs such as community charging grants and electric school buses. Funds being made available to promote clean ports and freight facilities should also be directed to support those in neighboring communities who want to better understand, advocate for and participate in initiatives to clean up the air quality impacts that disproportionately affect their own and their children’s health.



<sup>15</sup> U.S. Environmental Protection Agency. Executive Order 14008: Tackling the Climate Crisis at Home and Abroad. March 15, 2021. <https://www.regulations.gov/document/EPA-HQ-OPPT-2021-0202-0012>

**The importance of electric micromobility**

To date, federal policy and investment are largely silent on the fastest-growing segment in clean transportation – the electric bikes, scooters and other vehicles that make up the category of micromobility. Personally owned electric bicycles, including cargo models that can carry children and groceries, are outselling electric and hybrid vehicles combined, in part because they are affordable to many times more households and are useful for replacing car trips.

While electric vehicles qualify for a tax incentive, e-bikes and similar devices were left out of the IRA. Shared e-bikes and e-scooters have also been shown to serve as a first/last mile solution, increasing connections to transit, and encouraging multi-modal travel options in place of single-occupancy vehicle trips. Electric bikes and scooters can be key players in the shift to climate-friendly transportation, because they use significantly less energy than cars, and account for a fraction of an electric car's lifecycle carbon footprint.

Charging for micromobility is also a critical aspect of future urban transportation. In one positive move, the IRA did expand the Internal Revenue Code Section 30C tax credit for electric vehicle charging stations to include those that provide for 2- and 3-wheeled vehicles used on public roads. However, much remains to be done to ensure that public charging stations in more-developed areas include charging for micromobility and the network is established in ways that make this cheap, clean form of transportation available to people of all incomes, especially less-affluent communities.



## CONCLUSION





The recent federal investments in the transition to zero-emission transportation are a critical down-payment on the vital transition to a more equitable, cleaner, healthier, and more affordable network. As we have noted, ensuring that outcome requires smart and interconnected policies to implement and build on those investments. At the same time, we have pointed to areas that have not yet seen the required investment.

In highlighting the possibilities for progress in public transit, more equitable vehicle-charging infrastructure and cleaner heavy-duty vehicles, we hope we have shown how our nation can deliver the greatest benefits to all, and especially to communities that are most vulnerable to rising costs and climate impacts. While acknowledging that replacing polluting vehicles with zero-emission alternatives will take many years, our recommendations and case studies demonstrate how we can deliver near-term solutions that provide more affordable mobility options with a wider range of other benefits, including greater access to jobs and services for people of all incomes and abilities.



## [APPENDIX 1] Zero-emissions Provisions in IIJA an IRA

**Infrastructure Investment and Jobs Act (2021)**

## Charging

- The National Electric Vehicle Infrastructure (NEVI)<sup>16</sup> program: \$5 billion in formula funding to all 50 states, D.C., and territories for publicly accessible charging infrastructure (FHWA)
- Charging and Fueling Infrastructure Grants<sup>17</sup> (also known as Corridor and Community grants) provide \$2.5 billion in competitive grants to states, local governments, metropolitan planning organizations, and other public entities for installation of charging or alternative fuels infrastructure, with half prioritized for rural and low- and moderate-income communities (FHWA)
- Surface Transportation Block Grants (STBG)<sup>18</sup>: Expansion of STBG includes newly eligible projects including EV charging infrastructure and features enhancements in resiliency. States can use up to 15% of funds for eligible projects on non-Federal aid highways in rural areas.

## Bus conversion

- Low or No Emission (Low-No) Grant Program<sup>19</sup>: \$5.5 billion over 5 years for transit agencies to buy or lease U.S.-built low- or no-emission vehicles, including related equipment or facilities<sup>20</sup>. (FTA)
- Clean School Bus Program<sup>21</sup>: \$5 billion over 5 years (FY 2022–2026) to replace existing school buses with zero-emission and low-emission models (EPA)

## Ports

- Port Infrastructure Development Program<sup>22</sup>: \$2.25 billion for improvements at coastal ports and inland waterways, including projects to reduce or eliminate port-related pollutants or greenhouse gas emissions (US DOT Maritime Administration)
- Truck Emissions Reduction Study and Grant at Port Facilities<sup>23</sup> establish a plan and program to reduce idling at port and intermodal port facilities, including electrification of port operations

16 U.S. Department of Transportation. Federal Highway Administration. National Electric Vehicle Infrastructure Formula Program. [https://www.fhwa.dot.gov/bipartisan-infrastructure-law/nevi\\_formula\\_program.cfm](https://www.fhwa.dot.gov/bipartisan-infrastructure-law/nevi_formula_program.cfm)

17 U.S. Department of Transportation. Federal Funding Programs. <https://www.transportation.gov/rural/ev/toolkit/ev-infrastructure-funding-and-financing/federal-funding-programs>

18 U.S. Department of Transportation: Federal Highway Administration. Surface Transportation Block Grant (STBG) fact sheet. <https://www.fhwa.dot.gov/bipartisan-infrastructure-law/stbg.cfm>

19 U.S. Department of Transportation: Federal Highway Administration. Low or No Emission Vehicle Program – 5339(c). <https://www.transit.dot.gov/lowno>

20 U.S. Department of Transportation: Federal Highway Administration. Grants for Bus and Bus Facilities Program. <https://www.transit.dot.gov/bus-program>

21 United States Environmental Protection Agency. Clean School Bus Program. <https://www.epa.gov/cleanschoolbus>

22 United States Department of Maritime Administration. Bipartisan Infrastructure Law: Maritime Administration. <https://www.maritime.dot.gov/about-us/bipartisan-infrastructure-law-maritime-administration>

23 U.S. Department of Energy: Energy Efficiency & Renewable Energy. Alternative Fuels Data Center. Bipartisan Infrastructure Law (Infrastructure Investment and Jobs Act of 2021).

- Electric or Low Emitting Ferry Pilot Program<sup>24</sup>: \$250 million in grants for the purchase of “alternative” fuel and electric ferries.

#### Travel options

- Congestion Mitigation and Air Quality (CMAQ)<sup>25</sup>: Program (\$13.2B) – Adds \$13.2 billion and makes micromobility and EV-related projects eligible (FHWA)
- Carbon Reduction Program<sup>26</sup>: \$6.4B in formula grants to states to support non-polluting travel, including transit, walking, biking and deployment of low- and no-emissions infrastructure (FHWA)
- Safe Streets and Roads for All<sup>27</sup>: \$5.0B in discretionary spending to support local initiatives to prevent transportation-related death and serious injury on roads and streets. Referred to as “Vision Zero” or “Toward Zero Deaths” initiatives.

#### Battery Processing and Manufacturing

- Battery Material Processing Grants and Battery Manufacturing and Recycling Grants<sup>28</sup>: \$6.135 billion in grants for battery recycling research, collection, manufacturing and domestic processing capacity of minerals necessary for battery materials and advanced batteries

### Inflation Reduction Act of 2022

#### Tax credits

- Clean Vehicle tax credit<sup>29</sup>, or 30D: Provides a \$7,500 credit for new electric vehicles. (IRS)
- Alternative Fuel Infrastructure Tax Credit (30C)<sup>30</sup>: Establishes a tax credit of 30% of the cost of electric and other alternative fueling infrastructure; includes charging for 2- and 3-wheeled vehicles. (IRS)
- Qualified Commercial Clean Vehicle Tax Credit (45W)<sup>31</sup>: Up to 30% for commercial vehicles not powered by gasoline or diesel (IRS)
- Previously-Owned Clean Vehicles Tax Credit (25E)<sup>32</sup>: Up to 30% of the sale price of a used clean vehicle, with a max of \$4,000. Income caps apply, and the vehicle must be less than \$25k overall. (IRS)

24 U.S. Department of Transportation: Federal Highway Administration. Electric or Low-Emitting Ferry Pilot Program. <https://www.transit.dot.gov/grants/grant-programs/electric-or-low-emitting-ferry-pilot-program-ijja-ss-71102#:~:text=The%20Electric%20or%20Low%2DEmitting,of%20emissions%20from%20existing%20ferries>.

25 Transportation for America. What does the new infrastructure law mean for micromobility? February 23, 2022. <https://t4america.org/2022/02/23/the-new-infrastructure-law-micromobility/>

26 U.S. Department of Transportation: Federal Highway Administration. Carbon Reduction Program (CRP). [https://www.fhwa.dot.gov/bipartisan-infrastructure-law/crp\\_fact\\_sheet.cfm](https://www.fhwa.dot.gov/bipartisan-infrastructure-law/crp_fact_sheet.cfm)

27 U.S. Department of Transportation. Safe Streets for All (SS4A) Grant Program. <https://www.transportation.gov/grants/SS4A>

28 U.S. Department of Energy. Battery Manufacturing and Recycling Grants. <https://www.energy.gov/bil/battery-manufacturing-and-recycling-grants>

29 Congressional Research Service. Clean Vehicle Tax Credits in the Inflation Reduction Act of 2022. <https://crsreports.congress.gov/product/pdf/IN/IN11996>

30 U.S. Department of Energy. Alternative Fuels Data Center: Alternative Fuel Infrastructure Tax Credit. <https://afdc.energy.gov/laws/10513>

31 U.S. Department of Energy: Loan Programs Office. Inflation Reduction Act of 2022. <https://www.energy.gov/lpo/inflation-reduction-act-2022>

32 Congressional Research Service: Clean Vehicle Tax Credits in the Inflation reduction Act of 2022: <https://crsreports.congress.gov/product/pdf/IN/IN11996>



### Ports and heavy-duty vehicles

- Grants to Reduce Air Pollution at Ports<sup>33</sup>: \$3 billion in to purchase & install zero-emission technology and develop climate action plans (EPA)
- Clean Heavy-Duty Vehicles<sup>34</sup>: \$1 billion for grants, rebates, and contract support to replace heavy duty vehicles with zero emission alternatives (EPA)

### Environmental justice

- Environmental and Climate Justice Block Grants<sup>35</sup>: \$3 billion to enable disadvantaged communities to reduce greenhouse gas emissions, mitigate risks from extreme heat, improve climate resiliency and reduce indoor air pollution (EPA)
- Neighborhood Access and Equity Grant Program<sup>36</sup>: \$3 billion to deploy technologies that reduce surface transportation-related air pollution, including greenhouse gas emissions. Specific set-aside for disadvantaged communities. (FHWA)
- Greenhouse Gas Reduction Fund<sup>37</sup>: \$27 billion split into 3 core areas for either grants, loans or technical assistance to enable low-income and disadvantaged communities to deploy or benefit from zero-emission technologies and to carry out other greenhouse gas emission reduction activities, including EV deployment and EV charging infrastructure deployment. (EPA)

### Postal service

- Postal Service vehicle replacement<sup>38</sup>: \$1.29 billion for the purchase of zero-emission delivery trucks, plus \$1.71 billion for charging and other support infrastructure. Additionally, \$15M to the Office of the Inspector General for oversight of the implementation of these provisions by USPS. (USPS)

### Energy loan guarantees

- Department of Energy Loan Programs Office<sup>39</sup>: Under Title 17 provides \$3.6 billion to guarantee loans up to \$40 billion for investments in innovative clean energy technologies. IRA also creates a new program to guarantee up to \$250 billion in loans for investments to avoid emissions of greenhouse gasses. IRA also removed a cap on Advanced Technology Vehicles Manufacturing (ATVM) Direct Loan Program and expanded uses to include medium- and heavy-duty vehicles. (DOE)

33 U.S. Environmental Protection Agency. Inflation Reduction Act (IRA) Overview: Climate and Clean Air-related Provisions. <https://www.epa.gov/system/files/documents/2022-09/IRA%20Overview.pdf>

34 U.S. Environmental Protection Agency. Clean Heavy-Duty Vehicle Program: <https://www.epa.gov/inflation-reduction-act/clean-heavy-duty-vehicle-program>

35 U.S. Environmental Protection Agency. Advancing Environmental Justice. <https://www.epa.gov/inflation-reduction-act/advancing-environmental-justice>

36 Construction Dive. Inflation Reduction Act includes \$3B to improve roads. <https://www.constructiondive.com/news/inflation-reduction-act-ira-3b-neighborhood-access-equity-grants-roads/630285/>

37 U.S. Environmental Protection Agency. Greenhouse Gas Reduction Fund. <https://www.epa.gov/inflation-reduction-act/greenhouse-gas-reduction-fund>

38 Postal Times. The IRA Gives USPS Billions to Buy Electric Vehicles. August 18, 2022. <https://postaltimes.com/postalnews/the-ira-gives-usps-billions-to-buy-electric-vehicles/>

39 U.S. Department of Energy: Loans Programs Office. Innovative Clean Energy Loan Guarantees: <https://www.energy.gov/lpo/innovative-clean-energy-loan-guarantees>

## Manufacturing

- Advanced Technology Vehicle Manufacturing (ATVM)<sup>40</sup>: Provides \$3 billion for loans for re-equipping, expanding, or establishing a manufacturing facility in the U.S. (DOE)
- Advanced Manufacturing Production Credit – Section 45X<sup>41</sup>: provides specific incentives for the production of batteries and minerals, among other technologies.
- Domestic Manufacturing Conversion grant program<sup>42</sup>: Provides \$2 billion for grants for converting existing facilities to manufacture EVs, requires a 50% cost share match.
- Advanced Energy Project Credit – Section 48C: Extends the Section 48C<sup>43</sup> program to \$10 billion with specific inclusion for EVs, EVSE, and minerals processing.

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40 U.S. Department of Energy: Loan Programs Office. Advanced Technology Vehicle Manufacturing Loan Program. <https://www.energy.gov/lpo/advanced-technology-vehicles-manufacturing-loan-program>

41 U.S. Department of Energy: Office of Energy Efficiency and Renewable Energy. Federal Tax Credits for Solar Manufacturers. October 2022.

42 U.S. Department of Energy: Office of Energy Efficiency and Renewable Energy. Energy Department Announces Approximately \$123.6 Million in Funding for 46 Projects to Bolster Domestic Manufacturing through Innovation. January 13, 2021. <https://www.energy.gov/eere/articles/energy-department-announces-approximately-1236-million-funding-46-projects-bolster>

43 [https://www.energy.gov/sites/prod/files/FACT\\_SHEET -- 48C MANUFACTURING TAX CREDITS.pdf](https://www.energy.gov/sites/prod/files/FACT_SHEET_-_48C_MANUFACTURING_TAX_CREDITS.pdf)





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