



Electrification
Coalition



Bipartisan Policy Center



SAFE

Commercial Goods Transport: Widening the Road to Electrification

EXECUTIVE SUMMARY

The global transportation sector is embarking on its most important shift since the invention of the internal combustion engine itself: the transition from a gasoline and diesel past to an electric future. This change will benefit the economic and national security of the United States and help the world meet the climate change challenge, but, too often, this transformation is discussed only in terms of personal mobility and passenger vehicles. The medium- and heavy-duty (MHD) trucks on our nation's roadways are underappreciated as a critical component of reaping the benefits of transportation electrification and support for these vehicles should be a national priority.

Congress has an opportunity to put the United States in the lead by creating a pathway for the expedited electrification of commercial goods transport. By providing the incentives necessary to accelerate demand for electrified trucks, the United States can more quickly and effectively achieve the goals of creating more automotive and truck industry jobs, competing with other nations on a global scale, while meaningfully reducing emissions. The 2020s will be a crucial decade for electric vehicle (EV) technology and supply chain maturation, and any strategy should include a focus on the movement of goods, from freight to last-mile delivery vehicles.

THE MHD COMMERCIAL FLEET SHOULD BE A GREATER FOCUS FOR POLICYMAKERS FOR SEVERAL REASONS:

- First, the opportunity in the commercial vehicle segment is significant because MHD vehicles represent a sizable portion of U.S. transportation-related oil demand and emissions. Trucks account for approximately 21 percent of U.S. transportation energy usage, even though they represent little more than five percent of the vehicles on the road.¹ Moreover, in noticeable contrast to the light-duty vehicle segment, energy and oil use by medium- and heavy-duty vehicles is forecast to rise, not fall, eight percent over the next three decades from 2.5 million barrels per day (Mbd) to approximately 2.8 Mbd in 2050.² This rise in demand is attributable to an expected increase in the number of MHD vehicles on U.S. roads, and corresponding increase in total vehicle miles driven. Electrification holds the potential to change this trajectory.
- Second, advancing MHD electrification will benefit the entire EV sector. Unlike internal combustion engines—where each engine type and technology can have different component parts, making achieving scale incredibly difficult—the components of all electric vehicles are essentially the same regardless of size or type. Electrifying the MHD segments, which contain the largest batteries and electric motors, will help the entire EV sector achieve scale more quickly, accelerate the supply chain demand in the United States, and expedite its economic value and domestic formation.
- Third, there is near-term interest from commercial vehicle operators, such as delivery and logistics companies, in electric MHD vehicles. Commercial fleets make purchasing decisions based on the total cost of ownership (TCO), which increasingly favor EVs. Battery prices have fallen substantially in the last several years and will continue to decline. New entrants have produced a number of models that could soon make MHD vehicles economically advantageous for specific use cases and duty cycles. Transitioning to EVs also provides companies with fuel price certainty—as electricity is extremely stable in price relative to diesel—while lowering their operating costs. These characteristics make commercial fleets more likely to value the broader operational savings from electrification.

Many companies are also motivated by sustainability commitments and the opportunities to improve air quality and address equity concerns. Amazon, for

1 SAFE analysis based on data from EIA.

2 SAFE analysis based on data from EIA.

example, has committed to purchasing 100,000 electric vans for deliveries.³ Similarly, FedEx, has committed to achieve carbon-neutral operations by 2040 and will convert its entire parcel pickup and delivery fleet to EVs.⁴ However, there are still significant challenges to adoption in the near term, including higher upfront costs and the fact that these vehicles are not yet being produced (especially in the United States) at the scale or pace necessary—and with the quality and reliability—to meet companies’ needs.

But current economics and technology availability remain a challenge. While enormous progress has been made in closing the cost gap between electric light duty vehicles and their internal combustion counterparts, MHD options have not matured as quickly. This is because of greater investments in light duty technologies by manufacturers and governments and a wider array of supportive public policies. Moreover, because they need much smaller batteries, the single most expensive part of any EV, light duty vehicles have been faster to capitalize on rapidly falling battery costs.⁵ While improvements in battery costs are predicted to lower total cost of ownership for electric freight trucks to half of what it is for diesel trucks by 2030, higher upfront costs will still delay adoption rates over the next decade.⁶

To catch up with the world, the United States must move faster to realize the benefits of electrification. Fleets offer the scale to do just that. The 200 largest private fleets, for example, operate more than 700,000 MHD vehicles.⁷ The small concentration of fleets operating a substantial number of vehicles means the purchasing decisions of just a few companies, with the right incentives, could expeditiously create the demand required to accelerate the development of a domestic supply chain, reduce emissions, and provide improved air quality for communities impacted by pollution.

Expediting the benefits of MHD electrification requires accelerating the processes through which electrifying our nation’s commercial goods vehicles can happen. Three critical recommendations are:

- **Create a manufacturers’ credit.** Establish a 30 percent manufacturers’ credit for the sales of EVs with a gross vehicle weight rating (GVWR) greater than or equal to 14,000 lbs. This is not covered by the existing 30D credit for purchasers of passenger vehicles and light trucks.
- **Expand the EV charging tax credit.** Eliminate the \$100,000 cap on

3 See, e.g., Josh Fisher, “Amazon to add 100,000 electric vans to Prime fleet,” Fleet Owner, September 23, 2019.

4 FedEx, “FedEx Commits to Carbon-Neutral Operations by 2040,” Press Release, March 3, 2021.

5 Ira Boudway, “Batteries for Electric Cars Speed Toward a Tipping Point”, Bloomberg News, December 16, 2020.

6 Silvio Marcacci, “Cheap Batteries Could Soon Make Electric Freight Trucks 50% Cheaper to Own Than Diesel,” Forbes, March 16, 2021.

7 SAFE analysis based on data from FleetOwner.

allowable expenses per site for the 30C alternative fuel vehicle refueling property tax credit that covers 30 percent of the cost for purchasing and installing charging stations.

- **Provide funding for public medium- and heavy-duty vehicle charging stations.** Incentivize states to strategically install heavy-duty charging with a small portion of federal infrastructure funding.

Widespread adoption of electric MHD trucks could take decades to achieve unless supportive policies are implemented. We can continue to rely substantially on petroleum-based transportation fuels to power our commercial goods system for many years to come, exposing the nation to profound economic and national security risks and limiting opportunities to increase our automotive industry's global competitiveness while also addressing climate change. Alternatively, Congress can seize the opportunity to support MHD vehicle adoption and infrastructure deployment, and invest more in MHD transportation, ensuring that an integral part of the U.S. transportation is not ignored.

MEETING CLIMATE GOALS THROUGH FREIGHT ELECTRIFICATION

Three out of four commercial trucks on the road today—and 98 percent of the largest, Class 8, trucks—are powered by diesel.⁸ As the economy expands and growth in goods shipment continues -- including for the e-commerce segment that has intensified under the COVID-19 pandemic -- the number of freight vehicles and total annual mileage of the freight sector are projected to increase dramatically over the next 30 years. Addressing freight transportation emissions therefore presents an opportunity to make a much larger climate and air quality impact more quickly because commercial vehicles have relatively high utilization rates and travel more miles on an annual basis than passenger vehicles. This paper focuses on electrification solutions as a key policy focus for reducing emissions in the medium-and heavy-duty (MHD) vehicles sector.

8 Electrification Coalition, "Electrifying Freight: Pathways to Accelerating the Transition," November 2020, p.1

Why Freight Electrification

<p>Medium- and heavy-duty vehicles represent only 6% of registered vehicles but are responsible for:</p> <ul style="list-style-type: none">• 26% of the transportation sector's fuel consumption• 23% of its GHG emissions	 <p>The US Transportation Sector's is currently dependent on oil</p>
<p>Road freight is projected to increase significantly over the next three decades</p> 	 <p>Electric options are arriving at market, and TCO will continue to drop</p>

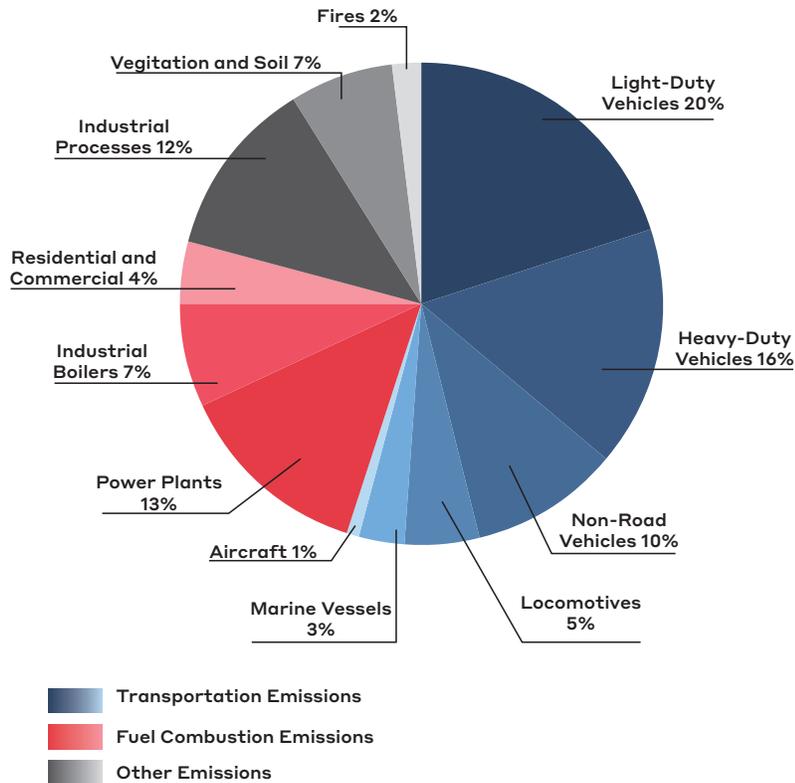


Despite representing a relatively small share of total vehicles, trucks have a disproportionate impact on emissions. They contribute 28 percent of greenhouse gas (GHG) emissions, 46 percent of NOX emissions, and 57 percent of direct PM2.5 emissions resulting from the nation's on-road transportation sector.⁹ Moreover, due to its operational footprint—along highway corridors, in freight depots, and around ports—often near low-income communities and communities of color, freight electrification promises to provide important equity benefits.

9 Union of Concerned Scientists. "Ready for Work: Now is the Time for Heavy-Duty Electric Vehicles," December 2019.



National Emissions of Nitrogen Oxides, By Sector



Initial Source: Ready for Work: Now is the Time for Heavy-duty Electric Vehicles. Union of Concerned Scientists, <https://www.ucsusa.org/sites/default/files/2019-12/ReadyforWorkFullReport.pdf>

Original Data Source: 2014 National Emission Inventory – Version 2 Technical Support Document¹⁰

Electrifying this portion of the fleet will therefore help meet climate change goals and address local concerns with air quality and public health for all communities. Bloomberg New Energy Finance found that for every 1,000 electric buses on the road, 500 barrels of diesel are displaced each day, while the same number of passenger vehicles would only remove 15 barrels.¹¹ Other freight vehicles have higher mileage patterns than buses, and electrification of these vehicles can provide even greater reductions in oil consumption and emissions.

¹⁰ 2014 National Emissions Inventory - Version 2 Technical Support Document. Pg. 2-18, pdf Pg. 48. https://www.epa.gov/sites/production/files/2018-07/documents/nei2014v2_tsd_05jul2018.pdf

¹¹ Bloomberg, "Forget Tesla, It's China's E-Buses That Are Denting Oil Demand," March 2019.

EXPEDITING AN AMERICAN EV SUPPLY CHAIN BUILDOUT

The auto and truck industry is one of the largest manufacturing sectors in the United States, and the industry's extensive supply chains support regional economies while exports improve our balance of trade.¹² If the United States allows other countries a first mover advantage, the economic benefits of commercial vehicle electrification may accrue elsewhere.

The transition occurring in the transportation sector is important because the automotive and truck industry plays a critical role in the economic health and prosperity of the country. Auto and truck manufacturers operate more than 44 assembly plants across 14 states, and the industry has invested \$46 billion in U.S. factories and facilities between 2010 and 2014.¹³ In early 2020, before coronavirus hit, there were close to one million people directly employed in vehicle and parts manufacturing—and at an average hourly wage of more than \$23, those jobs pay more than most other manufacturing jobs.¹⁴ If the United States fails to make commercial EVs, batteries, and other component parts for the next-generation of automotive and trucking technology, American jobs making internal combustion engines, exhaust systems, and fuel pumps, among other components, could all be lost.

China is working to become the undisputed leader in the next generation of vehicles, which may make it more difficult to establish domestic supply chains for EV technology and hinder the United States ability to deploy commercial EVs quickly. Guided by its Made in China 2025 strategy, Beijing has leveraged its status as the world's largest automotive market to become the world's largest EV market, taking a whole-of-nation approach and investing nearly \$60 billion in its EV industry between 2009 and 2017.¹⁵

Moreover, approximately 522,000 electric buses had been deployed globally by late 2018—with roughly 502,000 of those, more than 95 percent, in China.¹⁶ Across the industry, automakers have announced plans to invest close to \$500 billion globally over the next five to 10 years on EV development and production.¹⁷ Tellingly, nearly half of this investment will occur in China—an indicator of where the industry believes demand will be.

12 Hill, Cooper and Menk, "Contribution of the Automotive Industry to the Economies of all Fifty State and the United States," Center for Automotive Research, April 2010, p.1.

13 Auto Alliance, *Cars Move America: State of the Auto Industry*, 2016, at page 7; and U.S. Bureau of Labor Statistics, "Automotive Industry: Employment, Earnings, and Hours," March 2020.

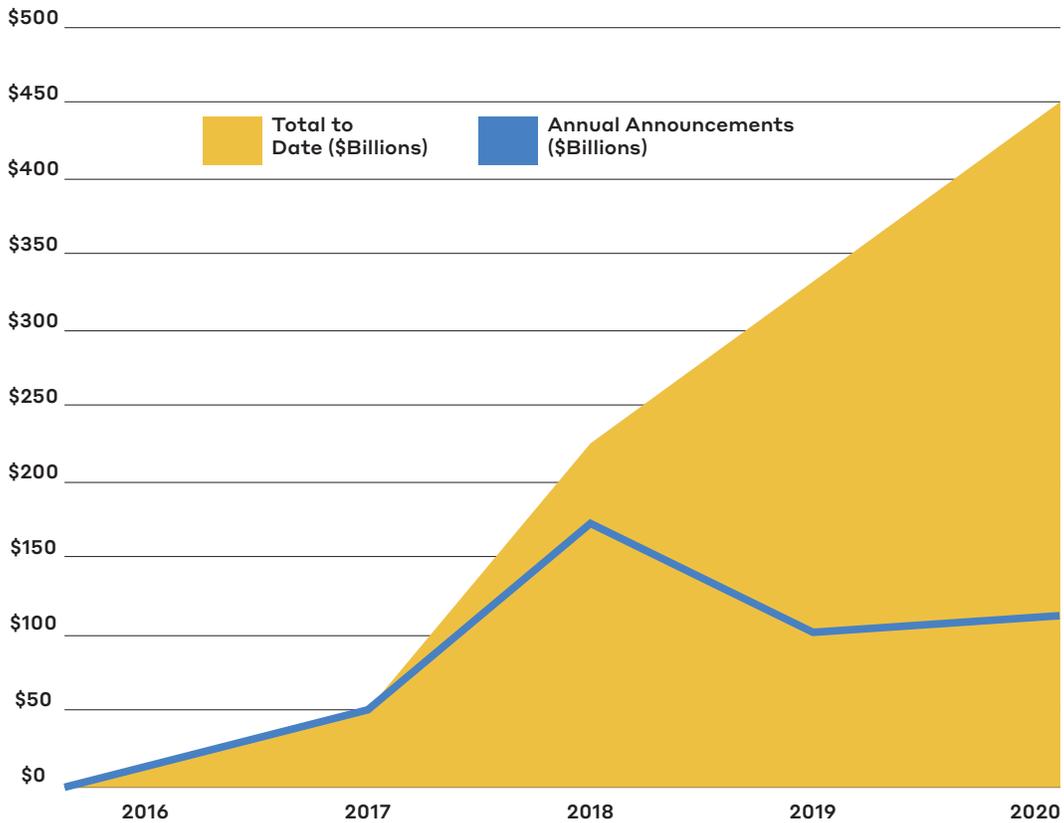
14 U.S. Bureau of Labor Statistics, "Automotive Industry: Employment, Earnings, and Hours," June 19, 2020.

15 Kennedy and Qui, "China's Expensive Gamble on New-Energy Vehicles," Center for Strategic and International Studies, November 6, 2018.

16 SAFE analysis based on data from IEA.

17 Conner Smith, "Automakers Investing \$27 Billion in Domestic EV Manufacturing," Atlas EV Hub, May 3, 2021.

OEM Global EV Investments



Source: Atlas EV Hub – Global Private Investment¹⁸

In the MHD sector, adopting policies that accelerate electrification hold the potential to create nearly 154,000 jobs in the United States.¹⁹ These policies include the creation of an MHD electrification tax credit, expanding the oversubscribed Low- or No- Emissions Grant Program to purchase electric transit buses and accompanying charging infrastructure, and electrifying school buses through the Diesel Emissions Reduction Act school bus rebate program—among many more policy options.²⁰

Increased investment in the end-user MHD market will spur greater investment further up the domestic EV supply chain. This includes the production of larger EV batteries, as well as building out supply chains for critical minerals and other component parts. These supply chains should be developed both domestically and with our allies, thereby increasing U.S. security by onshoring crucial supply chains where possible and working with allies to develop robust supply chains that work in our national interest.

18 Atlas EV Hub - Global Private Investment. <https://www.atlasevhub.com/>

19 SAFE, The Commanding Heights of Global Transportation: Quantifying the Employment Effects, March 2021, p.2.

20 Atlas EV Hub, p.9

CAPITALIZING ON CONSUMER DEMAND

Recognizing the economic and environmental benefits of electrification, freight companies—and companies that operate private fleets—are investing heavily in electrifying their MHD vehicles. Making such a decision requires not only a significant financial outlay, but also a long lead time in development. Long-term federal commitments to electrification therefore provide greater regulatory certainty.

Focusing on the freight sector also requires federal policy to address the demands of a relatively small number of companies, rather than the individual requirements of America’s roughly 218 million motorists in the light-duty segment. Electrification of the freight sector avoids some of the biggest challenges associated with passenger vehicles, including anxiety about battery range and charging times from consumers who don’t operate their vehicles on a fixed route and schedule.

Some of the United States’ largest fleet owners and operators are already beginning to make the switch to EVs, with a variety of commitments, orders, and deployments. This includes on-line retailer Amazon; shippers FedEx, UPS and DHL; and food and beverage companies Nestlé and PepsiCo, Inc, who collectively rely on hundreds of thousands of vehicles to help transport products. Further incentivizing such companies to electrify their vehicle fleets in greater numbers is a fast and reliable pathway to achieve widespread electrification of the U.S. vehicle fleet, and it represents a highly efficient and targeted use of government funds.

As the global shift to electrification continues, more manufacturers are committing to produce heavy trucks across all categories but more policy support is needed to accelerate the transition.²¹ These numbers will increase as battery costs continue to fall toward price parity with conventional internal combustion engine (ICE) models, and manufacturers scale up production, as seen in the table below.

Currently, different segments—and countries—are at varying stages in the commercialization of MHD EVs. Original equipment manufacturers (OEMs) are already deploying light truck EVs in the commercial market, and both U.S. and European OEMs are testing medium-duty EV technologies that are beginning to be implemented in small-scale fleets. However, Chinese OEMs are further along the commercialization curve and have deployed the vast majority of MHD EVs worldwide.²² Companies such as BYD are also building these vehicles outside of China, including Lancaster, CA, and in Canada.

21 Hewlett Foundation, “Zero Emission Road Freight Strategy 2020-2025,” April 1, 2020, p.8.

22 Welch et al., “Moving Zero-Emission Freight Toward Commercialization,” CALSTART, p.13.

FEDERAL POLICY RECOMMENDATIONS

As Congress works to pass a new infrastructure package, it is vital that the final legislation includes robust incentives for MHD vehicles. By focusing on MHD incentives—for both markets and charging infrastructure—the United States can ensure the investment made by the federal government support a full range of energy, economic, and environmental benefits. The adoption of the following three measures present the most impactful ways to expedite MHD electrification at the federal level and complement action by the private sector and state and local governments.

Create a 30 percent manufacturers' credit for the sale of EVs with a gross vehicle weight rating (GVWR) greater than or equal to 14,000 lbs.

- Establish a 30 percent manufacturers' credit for the sales of EVs with a GVWR greater than or equal to 14,000 lbs., which are not covered by the existing 30D credit for purchasers of passenger vehicles and light trucks.
 - This is critical to addressing the near-term higher up-front cost barrier to vehicle adoption and help make lifetime ownership costs comparable to diesel versions where that is not already the case.
- Medium- and heavy-duty electric vehicles will require larger batteries and support for scaled manufacturing of batteries. The MHD battery supply chain is interchangeable with other uses like batteries for cars, so it is an efficient way of building scale quickly with fleet purchasers using these larger batteries. Currently, no such incentive exists in the MHD vehicle space. Spurring greater investment in these vehicles and their supply chain will help to bolster the overall domestic EV supply chain.

Expand the EV charging tax credit by eliminating the \$100,000 cap on allowable expenses per site.

- The federal Alternative Fuel Refueling (“EV charging”) tax credit can help delivery and freight providers accelerate their adoption of EVs by reducing the capital costs necessary to install charging infrastructure for vehicles at their facilities. The EV charging credit provides a 30 percent credit for the costs of purchasing and installing charging stations. However, the credit only covers the first \$100,000 of expenses at each site where chargers are installed.
 - Commercial charging infrastructure costs for 10 or more vehicles can easily reach \$1 million per site. Eliminating the credit's cap would make it much more effective in incentivizing commercial EV charging installation.
- In addition to lifting the cap, reforms should include an additional 5 percent to the applicable tax credit if the charging property has bidirectional power flow.

- By adding an additional incentive for bidirectional charging, this will help ensure that new charging properties constructed can accommodate vehicle to grid power flows, creating a more resilient, future-proof charging network.
- In order to provide more long-term certainty, the tax credit should be extended through December 31, 2025. Under current law, the tax credit expires at the end of 2021.

FUNDING FOR PUBLIC HEAVY-DUTY CHARGING STATIONS

- Reserving a small portion of federal infrastructure funding for high-capacity chargers suitable for heavy-duty trucks is the best way to incentivize states to provide this infrastructure. These public chargers should be installed at strategic locations with necessary parking dimensions and roadway entry/exit geometry to accommodate heavy-duty trucks.
 - This will fill a crucial gap in public “fast charging” infrastructure to enable long-haul trips.
- While most charging will be done on-site, the ability to use electric trucks on long-haul (greater than 200 mile) trips will improve their value for fleets, and their carbon emissions reductions. Publicly available charging near highways (“truck stop charging”) will be necessary to enable these trips. Existing public charging stations are not suitable for charging heavy-duty trucks.
 - The batteries necessary to power these vehicles require 3 times to 20 times the capacity of passenger vehicle batteries. No public charging stations today can charge the high-capacity battery configurations required for these trips in an hour or less.

WHY NOW: THE RIGHT TIME FOR FREIGHT ELECTRIFICATION & SEIZING FEDERAL MOMENTUM ON INFRASTRUCTURE

Members of Congress are working to secure some version of an infrastructure package in the coming months. The White House has placed a major emphasis on improving our nation's infrastructure, voters are in favor of infrastructure legislation,²³ and both parties agree on the need to improve our infrastructure and protect our economic competitiveness in automotive and truck manufacturing.²⁴

The convergence of electrification and a concerted effort to pass large-scale infrastructure legislation provides the United States with a once-in-a-generation opportunity to invest decisively in our nation's economic and national security, and environmental future. Prudent investment during this window of opportunity promises to strengthen U.S. energy security by building a robust EV and battery supply chain beyond China's control, create thousands of well-paying jobs and revitalize communities nationwide, and redress imbalances in our society by removing harmful pollutants from many of our nation's low-income communities. Electrifying the U.S. freight sector allows the nation to make significant progress toward meeting those ambitions.

It is imperative that the policies outlined in this brief are not only enacted into law but also funded to their fullest extent. This is a rare opportunity to meet multiple goals through investment in a single sector and is a chance that we must not let go to waste.

23 Claire Williams, "More Than 3 in 5 Voters Support Corporate Tax Hike to Fund Biden's Infrastructure Plan," Morning Consult, April 7, 2021.

24 Mara Liasson, "Building A Big Infrastructure Plan, Biden Starts with A Bridge to Republicans," NPR, March 23, 2021.



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