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CHARGING AHEAD

How Government Agencies Can Support the Electrification of Private Fleet Vehicles

MOMENTUM

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HOW CAN GOVERNMENT AGENCIES PROMOTE PRIVATE FLEET ELECTRIFICATION?

Transportation is one of the largest sources of greenhouse gas emissions and the sector makes up approximately one-third of emissions in the United States.[1] Climate change presents consequences for individuals worldwide, including in our transportation infrastructure and mobility. Creating emission-reducing pathways for the sector is instrumental in mitigating the effects of climate change and creating a transportation system that is cleaner, more efficient, and more resilient for all users. This toolkit is a resource for government agencies seeking ways to encourage private fleet operators and private sector stakeholders to transition to electric vehicles (EVs). It is designed to help government agencies consider, plan, coordinate, and support this adoption. Government agencies can use the toolkit to identify key partners, advance high-impact policy tools, and assist firms in pursuing or advancing fleet electrification.

EV technologies are emerging as a realistic replacement for conventional internal combustion engine vehicle fleets. Converting fleets to EVs is an emission-reducing strategy that fleet managers can pursue to achieve firm-wide climate goals, and provide social, financial, and environmental benefits to individuals, businesses, and communities. Many cities, states/provinces, and national governments are adopting climate objectives to green the transportation sector, often centered on transitioning passenger and commercial vehicles to battery electric models. EVs have zero emissions, which can directly improve local air quality and energy security by reducing dependence on oil. Public and private fleet operators can play a critical role in advancing a sustainable transportation sector through fleet electrification.

This toolkit provides a roadmap of considerations for national and sub-national government agencies to adopt a proactive and collaborative approach to promoting EV transition among private vehicle fleets. The toolkit will cover central topics related to adopting battery electric vehicle technology, including installing supporting infrastructure, identifying specific operational considerations related to deployment, and interdisciplinary planning. The toolkit is intended for use by government entities as they coordinate with stakeholders to develop plans to transition private fleets to EVs.

[1] Climate Action, U.S. Department of Transportation

ADVANTAGES AND DISADVANTAGES OF ELECTRIC VEHICLES

Like most products and equipment, EVs come with opportunities and challenges for fleet operators to consider when electrifying their fleets.

Advantages

- Several charging setup options available
- Regenerative braking technology to extend vehicle range
- Total Cost of Ownership has the potential to be lower than traditional diesel vehicles due to reduced operational costs associated with maintenance and fuel savings
- Well-suited to local service routes with more stop/starts

Disadvantages

- Upfront costs are more expensive than ICE vehicles
- Charging can be time intensive, depending on charging method
- Have limited range on a single charge
- Very high and very low external temperatures have a negative impact on battery aging and performance

Types of Ground Transportation Fleets:

- **Local Delivery:** Vehicles that take goods from transit centers to deliver them locally.
- **Car Rental:** Companies that keep vehicles on hand to rent, including larger vehicles for moving purposes.
- **Long-Haul Trucking:** Fleets of trucks used for long-haul shipping regionally or nationwide.
- **Limousine, and For-Hire**: Deployed as for-hire service vehicles, most commonly for local passenger travel.
- **Public Utility**: Deliver repair and maintenance services
- **Commercial Fleets**: Companies can have thousands of vehicles that are used for different daily tasks.

Types of Fleet Vehicles:

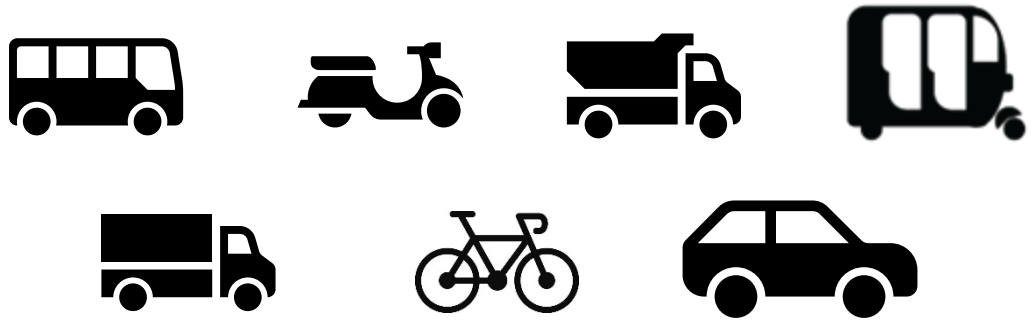
- Sedans
- Sport Utility Vehicles
- Minivans
- Light Duty/Pickup truck
- Cargo or Passenger vans
- Walk-in vans
- Cargo/box trucks
- Pickup trucks
- Refrigerator trucks
- Semi-trucks/tractor-trailer
- Tank truck
- Two-wheeled vehicles (e.g., electric scooter, bicycle)
- Three-wheeled vehicles (e.g., rickshaws, tuk-tuks)

WHAT ARE COMMON CONCERNS ABOUT VEHICLE ELECTRIFICATION?

While there is growing availability and uptake of EVs, many consumers and businesses cite concerns or constraints regarding electrification. Transitioning commercial operations to rely on electric vehicles can be instrumental in scaling up EV adoption more broadly.

Only for Four-Wheeled Passenger Vehicles

EVs are increasingly available and accessible for various trip purposes, distances, and preferences, not just for passenger travel. The fuel economy of EVs is optimized during the stop-and-go driving conditions common in many fleet applications, such as for-hire transportation and delivery. As of 2021, over 500 different electric car models were on the market, double the amount in 2018.[2] Nearly 840 medium- and heavy-duty vehicle models were announced in 2022.[3] The Zero-Emission Technology Inventory Data Explorer is a publicly available tool to track and compare electric vehicle model availability. Electrification is also not just for four-wheeled passenger vehicles; battery electric models currently exist for bikes; powered two-wheelers (e.g., scooters, mopeds, motorbikes); rickshaws or tuk-tuks; medium and heavy-duty vehicles, like cargo vans, buses, and semi-trailer trucks; and off-road applications like tractors, mowers, and forklifts.



Upfront Costs

Upfront costs are among the most cited barriers preventing personal and commercial EV purchases. Electric vehicle markets sold 10 million units in 2022. A total of 14 percent of all new cars sold globally were electric in 2022, up from around 9 percent in 2021 and less than 5 percent in 2020.[4] The United States aims to increase the market share to 20 percent by the end of the decade. Electric car sales are generally low outside the major markets, but 2022 was a growth year in India, Thailand,

[2] Executive Summary – Global EV Outlook 2023, International Energy Agency
[3] Ibid.
[4] Ibid.

and Indonesia.[5] The costs of EVs is expected to continue declining. As the EV market grows, used vehicles will become more common and available at lower price points for consumers. Additionally, EVs typically have lower life-cycle costs when compared to similar internal combustion engine vehicles, largely due to the lower cost of energy (versus an internal combustion engine vehicle) and the reduced maintenance cost over the vehicle's lifetime.

Private sector actors are pursuing a variety of pathways to encourage EV purchases and access. Some firms, like Uber, are partnering with rental vehicle providers, like Hertz, to establish an incentive scheme and reduce cost barriers for Uber drivers to drive EVs. There are also many local, state/provincial, and national rebate and tax incentives programs to help ease the purchase costs. However, many of these schemes ease the financial burden post-purchase, which can be less helpful for firms without the capital resources to initially purchase the vehicles. Promoting a broader uptake of electric vehicles will require EVs to become more affordable and cost-competitive with internal combustion engine vehicles.

Availability of Charging Infrastructure

Globally, there are 2.7 million public charging points, one-third of which were installed in 2022.[6] Drivers of EVs can charge at home, workplaces, public facilities, grocery stores, shopping centers, and other locations that might have chargers available with parking. Publicly accessible charging infrastructure is increasingly available, but still has a way to go to align with the needs of every service model and vehicle type. For example, electric charging for heavy-duty trucks and emergency vehicles requires high-power charging equipment to support the vehicles' high-capacity batteries that must recharge quickly to avoid costly downtime. These types of high-power charging systems are still being developed and standardized.

The build-out of the charging infrastructure is instrumental to achieving electric mobility for any region. Many fleet operators will opt to install chargers onsite and charge their vehicles at their facilities. Still, charger accessibility on service routes is imperative for ensuring efficiency, performance, and comfort for driving-heavy professions like delivery and for-hire transportation.

For fleets purchasing EVs from different manufacturers, interoperability can be an issue. If a fleet operator procures vehicles from different manufacturers, it can be the case that a vehicle from one manufacturer does not align with the charger from another. The Canadian Urban Transit Research & Innovation Consortium (CUTRIC) launched the Pan-Canadian Battery Electric Bus Demonstration and Integration Trial in 2016 to explore the gaps in standardization in EV charging systems. Along with their project partners, CUTRIC developed a set of standards to ensure buses and chargers from different manufacturers were built to the same specifications to ensure the battery electric buses from multiple manufacturers could utilize the same chargers.

[5] Ibid.
[6] Trends in Charging Infrastructure, International Energy Agency

For more information:

- Electric Vehicles for Fleets, U.S. Department of Transportation
- EV Uptake in the Transport Fleet: Consumer Choice, Policy Incentives & Consumer-Centric Business Models, The Oxford Institute for Energy Studies
- Charging Forward: A Toolkit for Planning and Funding Urban Electric Mobility Infrastructure, U.S. Department of Transportation

WHAT ROLE CAN GOVERNMENTS PLAY IN SUPPORTING PRIVATE FLEETS TRANSITIONING TO EVS?

Governments can play a crucial role in enabling private fleets to electrify their vehicles. Converting commercial fleets to electricity can help local, state/provincial, and national government agencies meet GHG emissions reduction and electrification goals.

Encourage Dialogue and Establish Dedicated Support

For one, government can be an avenue for conversation and partnership. Government agencies should invite local fleet operators, planning authorities, Original Equipment Manufacturers (OEMs), power providers, property managers, and other relevant stakeholders to work together on a shared path toward fleet electrification. Collaboration between governments and private stakeholders can facilitate the development of a resilient, intentional, and interconnected EV ecosystem.

In July 2022, the U.S. Department of Transportation and the Joint Office of Energy and Transportation hosted the "Charging Forward" symposium, bringing together 300 stakeholders from different parts of the electrification spectrum, including vehicle and charging equipment manufacturers, academics, government officials, fleet operators, and researchers. The event showcased current vehicle models and charging setups, as well as provided a forum for stakeholders to coordinate technical assistance pathways, public funding opportunities, and strategic approaches to large-scale transportation electrification. Willing and able government partners can work to facilitate coordination among all the relevant stakeholders in the process. Agencies should establish an EV transition officer, unit, or even an email address to centralize support and questions from stakeholders as well as be a signal to relevant parties that the agency is a helping hand in the process.

Investments in Research and Technology

Government agencies can invest and bolster research and development in advancing EV technology, such as expanding EV models, improving battery efficiency, and developing design standards that promote interconnected EV systems. Public investment in EV research and product development can contribute to reducing the costs and increasing the accessibility of EVs. Governments can also help develop and distribute data on key concepts and trends such as existing charging infrastructure locations, forecasted travel demand, current EV model availability in specific areas, etc. Assessing future trends can help fleets future-proof their electrification strategies.

There are gaps in data availability for charging infrastructure and EV demand, especially for regions or communities that heavily rely on informal transit systems.[7] Government agencies have a role to play in investing in data collection procedures and standardization and promoting the use of data in

[7] Electromobility in the Global South: An Equitable Transition toward Road Passenger Transport Decarbonization, Sustainable Mobility for All

decision-making processes. Established and streamlined data management processes can contribute to the effective and widespread adoption of EVs and the implementation of charging infrastructure.

Education, Outreach, and Training

Government agencies have a role to play in educating on the benefits and advantages of electric vehicles and how to continue planning for the future. Outreach can include several different pathways, such as social media or in-person events, and can be used to share information on the benefits of EVs, dispel myths, and provide information on available incentives and support programs. Agencies can also help connect fleet operators for sharing lessons learned and best practices.

Agencies should consider how they can support private firms' workforce development programs when hiring drivers and operations and maintenance staff and when building out charging infrastructure. Operating and maintaining electric vehicles requires regular education and training, especially for drivers, facilities staff, and mechanics/service technicians.

Public Policy Measures

Government agencies can support fleet electrification through policy measures, like mandates or guidance, or providing financial incentives for EV adoption. When developing or evaluating electrification promotion strategies, public agencies should coordinate with relevant stakeholders, including fleet operators, to determine whether the programs reflect current vehicle availability, electric grid capacity, current and future charging networks, timelines for procurement and installation of charging infrastructure at fleet facilities, and the service needs of companies and operators.

At the city, state/provincial, and national levels, policy measures can include:

- Developing and promoting electrification goals and roadmaps, including hyperlocal goals, such as for a neighborhood or corridor.
- Requiring a certain number of parking spaces to accommodate EV charging infrastructure.
- Tax credits, rebates, or grants to help offset vehicle purchase or charging equipment costs.
- Emissions standards for fleets to encourage the adoption of EVs, potentially coupled with penalties or rewards based on performance.
- Low or no cost measures, such as reserving curb space along busy intersections for last-mile delivery EVs, allowing EVs to access High-Occupancy Vehicle lanes, or prioritizing for-hire EVs for airport rides.

WHAT ARE LOW-COST, IMMEDIATE CHANGES GOVERNMENTS CAN IMPLEMENT?

In the short term, there are low-cost, highly effective actions that national, state, and city-level authorities can take to incentivize private commercial fleet electrification.

Source: Electric taxi pick-up bay opens at Bengaluru airport

1. Designate In-Demand Space: There are tangible, low- or no-cost "bucket of paint" tactics agencies can employ to prioritize curbside space and travel lanes for EVs. Some examples include:
    a. The U.S. Federal Highway Administration Agency developed and proposed uniform regulatory signs for EV Charging and Parking Facilities as a part of the *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD)[8].
    b. The Kempegowda International Airport in Bengaluru, India established an exclusive curbside pick-up area for BluSmart Mobility's electric taxis.
    c. California Legislature passed two bills that allowed drivers of EVs and plug-in hybrids access to utilize the High-Occupancy Vehicle (HOV) lanes.
2. **Establish a EV Transition Office**: A dedicated office can serve as an EV transition focal point for fleet operators and stakeholders and be an access point within the agency to address permitting and other challenges. An EV transition office can help connect fleets to the right planning partners to help reduce regulatory and planning barriers to transition and improve deployment planning. An office can initiate or promote conversations happening among fleets, OEMs, power providers, and other relevant stakeholders working toward electrification in the relevant jurisdiction.
3. **Centralize Resources**: Government agencies can quickly and easily establish a centralized webpage hub for resources, trainings, policies, policies, financial incentives, grant opportunities, and research. Providing a digital collection of core resources can help ensure fleets are planning with the most current research and lessons learned to elevate their approaches.

Source: Regulatory Signs for Electric Vehicle Charging and Parking Facilities

[8] Manual on Uniform Traffic Control Devices for Streets and Highways, U.S. Department of Transportation, Federal Highway Administration

4. **Provide a Forum**: Similar to assembling existing resources, agencies can provide forums – such as lunch and learns with local experts or fleet operators, web-based discussion boards, blog posts, and webinars – to allow stakeholders and community members to explore and share information on strategy building, operational considerations, and emerging applications for electric vehicle technologies.
5. **Assess Needs**: To understand how to be the best partner to private fleets, government agencies can establish regular communication with private fleet operators in the area to hear their hesitations, concerns, burdens, and barriers to electrification. The conversations can also help agencies better understand what kinds of regulatory and financial policies have been effective in incentivizing the transition.

Case Study: Grupo Bimbo Rolls Out Mexico's Largest EV Fleet

In 2023, the Mexico City government presented the Environmental Self-Regulation and Electromobility Program as a measure to encourage private companies operating in Mexico to commit to transitioning at least 5 percent of their fleet to electric vehicles each year. Grupo Bimbo, one of the companies involved in the program, is currently the company with the biggest fleet of electric delivery vehicles in Mexico and one of the largest in Latin America. Their fleet consists of passenger vehicles, cargo vans, heavy-duty trucks, and tractors. By the end of 2023, Grupo Bimbo aims to double their electric vehicle delivery fleet to a total of over 2500 vehicles. Additionally, the charging infrastructure for their electric fleet is powered by wind energy generated by a wind farm in Oaxaca. To further their GHG emissions reductions, the company has set a goal to cut emissions to 50 percent by 2030 and become a net-zero carbon emissions company by 2050.

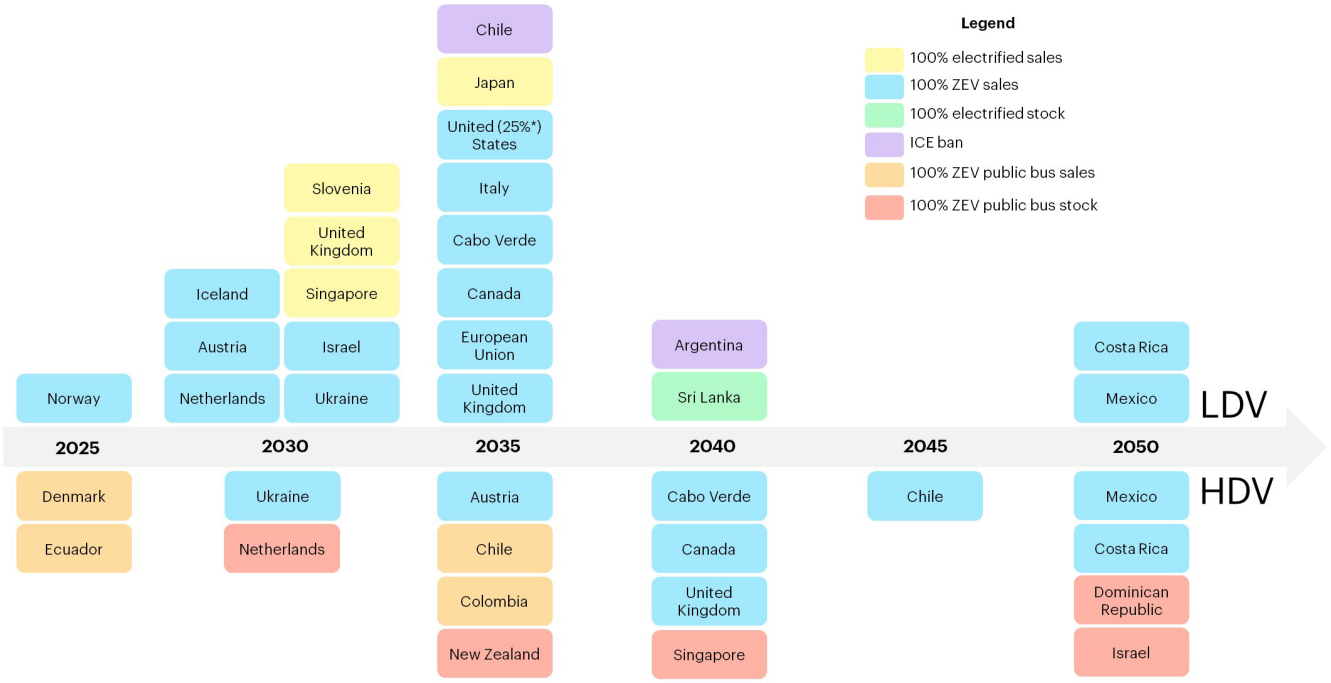
Source: Grupo Bimbo will double its fleet of electric vehicles in Mexico this year

For more information:

- Grupo Bimbo announces the incorporation of 4,000 new electric-powered vehicles, Grupo Bimbo
- Charging Forward: A Toolkit for Planning Urban Electric Mobility Infrastructure, U.S. Department of Transportation
- How the US Can Electrify Its Public Fleets, from City Buses to Garbage Trucks, World Resources Institute

WHAT ARE FINANCIAL AND POLICY LEVERS GOVERNMENTS CAN UTILIZE TO CREATE PATHWAYS FOR PRIVATE FLEET ELECTRIFICATION?

To encourage the widespread adoption of EVs, new business models and tax policies will be required to incentivize businesses and consumers to switch. Countries, states/provinces, and cities are putting forth electrification goals for surface transportation, but these visions for a fully electrified vehicle market can struggle to align with the upfront costs and logistics of EV ownership. There are many variations, found in many different regions of the world, of policies, standards, regulations, and incentive structures to encourage consumers to take the leap. Policy programs can be strong signals to the industry and to the market that EV adoption is underway and is likely to grow. Designing effective incentive and disincentive policy programs requires an understanding of where the critical barriers are to EV adoption and what pain points can be managed to influence consumer behavior.



[Global zero-emission vehicle mandates and internal combustion engine ban]

In India, EV manufacturing is on the rise, partly thanks to the Faster Adoption and Manufacturing of (Hybrid and) Electric vehicles (FAME) financial scheme for promoting EV manufacturing and buying. Phase I of the program was launched in 2015 to provide subsidies for two-, three-, and four-

wheeled electric and hybrid vehicles and buses.[9] Thailand and Indonesia are both developing and implementing EV incentive programs and stand to be examples for other emerging economies looking to promote EV adoption. The policies, regulations, and guidance promoting EV uptake are varied globally and among city, state/provincial, and federal levels.

Examples of Policies & Regulations

Policy	Applicable Area/Region	Description
Alternative Fuels Infrastructure Regulation	European Union	An agreement between the European Investment Bank and the European Commission will make over EUR 1.5 billion available by the end of 2023 for alternative fuel infrastructure, including electric fast charging.
Clean Miles Standard and Incentive Program	State of California, U.S.	The mandate stipulates that emissions from passenger miles traveled, including ride hailing, must be zero and 90 percent of all vehicle miles traveled must be powered by EVs.
National Electric Vehicle Infrastructure Standards and Requirements	United States	Establishing national minimum standards for the installation, operation, or maintenance of EV charging stations.
Switch Delhi	New Delhi	The policy target aims to convert 25% of vehicle sales in 2024 and 50% of all new buses to battery electric by 2024.
ZEV Emission Vehicles Act	British Columbia, Canada	The mandate sets phased targets for automakers to increase the sale of zero-emission vehicles: 10% by 2025, 30% by 2030, and 100% by 2040.
Green Deal Industrial Plan	European Union	By 2030, the EU will meet 40% of its manufacturing capacity needs through renewable or alternative energy sources.

Examples of Financial Incentives

Incentive	Applicable Area/Region	Description
Clean Vehicle Tax Credits (Inflation Reduction Act)	United States	Individuals purchasing new electric vehicles may be eligible for a tax credit of up to $7,500 and used electric car buyers may qualify for up to $4,000 in tax breaks.
Charging and Fueling	United States	Grant opportunity for projects deploying electric vehicle charging and hydrogen/propane/natural

[9] Electric Vehicle Incentives, Accelerated e-Mobility Revolution for India's Transportation

Infrastructure Grant Program (Bipartisan Infrastructure Law)	United States	gas fueling infrastructure along designated alternative fuel corridors or installing electric vehicle charging and alternative fuel in locations on public roads, schools, parks, and in publicly accessible parking facilities.
Production Linked Incentives on Advanced Chemistry Cell (ACC) Battery Storage	India	The government of India aims to reach a cumulative 50 GWh in domestic manufacturing capacity by providing funding to companies based on the sales of batteries manufactured in India.
National Electric Vehicle Infrastructure (NEVI) Formula Program	United States	Funding is available for: • The acquisition, installation, and network connection of EV charging stations to facilitate data collection, access, and reliability; • Proper operation and maintenance of EV charging stations; and, • Long-term EV charging station data sharing.
Alternative Fuel Vehicle Refueling Property Credit	United States	Property owners installing vehicle refueling and recharging property in their homes or businesses can qualify for an alternative fuel refueling property tax credit.
U.S. State Tax credits	Various U.S. States	Nineteen states offer an incentive ranging from a $1,000 incentive in Alaska and Delaware to a $7,500 credit in California, Connecticut, and Maine.[10]
London Congestion Fee (***Disincentive***)	London	Electric and hydrogen vehicles are exempt from £15 daily charge if you drive within Congestion Charge zones on certain times during the week and bank holidays until December 25, 2025.
Import Tax Exemption	Mexico City	A temporary import tax exemption for electric vehicles has been granted until 2024.
Registration Fee Exemption	Vietnam	Effective March 1, 2022, battery electric vehicles are exempt from registration fees for the first 3 years and can obtain a 50% fee reduction for the next 2 years.

[10] How Are Electric Vehicles Taxed in Your State?, Tax Foundation

Case Study: New York City Taxi & Limousine Commission Rideshare and Taxi Electrification Efforts

The New York City Taxi & Limousine Commission (TLC) is looking to promote electric vehicles among their drivers. In October 2023, the "Green Rides" rule was passed, requiring the city's rideshare companies to dispatch exclusively to either zero-emission or wheelchair-accessible vehicles by 2030. As of October 2023, about 2 percent of vehicles licensed by TLC are electric. In 2018, TLC stopped issuing licenses for new for-hire vehicles, with the exception being wheelchair-accessible vehicles and drivers in lease-to-own agreements. In early 2023, TLC released 1,000 new electric vehicle licenses. In October 2023, TLC announced that in addition to wheelchair-accessible vehicles, it would re-open applications for electric vehicle licenses, indicating that all licenses moving forward would be for either wheelchair-accessible or zero-emission vehicles.

Source: Tesla Model 3 becomes more popular as NYC yellow cab

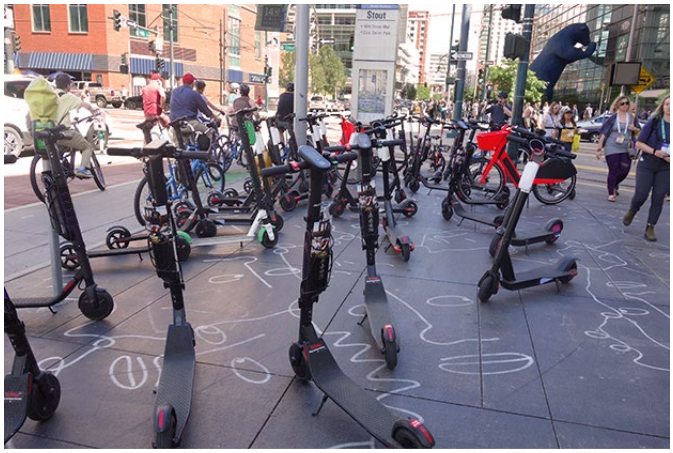
From 2021 to 2022, TLC implemented a pilot program to evaluate the feasibility of electrification among its 13,587 yellow medallion taxi vehicles. As a part of the Battery Electric Vehicle (BEV) Taxi Pilot Program, TLC allowed three new EV models to be put into service taxis (the Tesla Model 3 was already taxi-eligible). Participating drivers reported utilizing fast chargers near the end of their shifts before returning to the garage. The program results showed positive reviews from passengers and ultimately saw EV taxis as delivering the same level of service as their conventional taxi vehicle counterparts, though limited fast charging infrastructure was cited as a longer-term concern. As a result of the pilot, TLC implemented new rules to allow more EV makes and models to be options for taxi owners.

For more information:

- Executive Summary, Global EV Outlook 2023, International Energy Agency
- Partnership Opportunities for EV Infrastructure, U.S. Department of Transportation
- Interview with James Digiovanni, Allison Gao, and Maya Zamek, New York City Taxi & Limousine Commission
- Interview with Andrew Okuyiga and Sarah Ong, United Parcel Service
- BEV Taxi Pilot Evaluation, New York City Taxi and Limousine Commission
- Charged Up! Report, New York City Taxi and Limousine Commission

WHAT ARE KEY CONSIDERATIONS FOR FLEET ELECTRIFICATION?

Environmental Impacts



© Laura Sandt, Pedestrian and Bicycle Information Center (PBIC).

Source: Micromobility: A Travel Mode Innovation

The transport sector is one of the largest contributors to greenhouse gases in the U.S. and worldwide. Alternative transportation systems, including EVs and powered micromobility options, support a more resilient transportation network and can reduce emissions by improving access to more sustainable vehicle options. Internal combustion engine vehicles produce tailpipe emissions that lead to air pollution and negative health outcomes. EVs can save 47.5 billion tons of CO^2 emissions from 2020-2050 according to the International Council on Clean Transportation. EVs produce zero to limited emissions; battery-electric vehicles run with zero tailpipe emissions, while plug-in hybrid electric vehicles produce some emissions when they operate on gasoline, but less than comparable conventional vehicles. Similarly, battery-powered micromobility devices (e.g., electric scooters, electric bikes) do not require much energy for travel and produce no tailpipe emissions.

The lifecycle of EVs involves the manufacturing, use, and disposal of devices. Research shows that while adoption of EVs can reduce GHGs, the manufacturing phase including battery production can lead to environmental impacts and negative health outcomes due to larger use of metals, chemicals, and energy. In order to mitigate environment impacts at the end of a battery's life, proper disposal and recycling of EV batteries is key to support carbon reduction. The implications on the natural environment and air quality for micromobility options remains unclear, as the full sum of emissions throughout the device lifecycle is unknown. For shared micromobility systems, the environmental impacts are key concerns, both with respect to mode shift (i.e. whether micromobility trips replace zero emission bicycle and pedestrian trips versus transit or motor vehicle trips) as well as the redistribution of micromobility devices (i.e. ensuring that the emissions the shared systems displace are not exceeded by the emissions produced through rebalancing devices via motor vehicles).

Organizational Impacts

EV adoption can lead to positive impacts on the workplace, including cost savings and organizational culture. With strategic planning and coordination, new investments in EV charging infrastructure and vehicle purchase can decrease operational costs due to lower fuel and maintenance expenses. There are also opportunities for employers to leverage incentives and tax credits to support conversion to EV fleets. Policymakers at the Zero Emissions Urban Fleets

Network indicate that while investing in the implementation and expansion of low-emission areas and no-vehicle areas is key, it is also necessary to educate and train employees throughout the supply chain to build capacity and advance EV workforce development. Employees are drawn to companies demonstrating sustainability as a priority, and there are opportunities for companies to provide EV information sessions influence new user behavior. There are opportunities for companies to provide comprehensive training programs on EV technology, maintenance procedures, and safe charging practices in order to support employee understanding and comfort with operating and maintaining EVs. Additionally, EV fleet adoption supports an organization's brand image and awareness as it reflects positively on organizational commitments towards environmental responsibility and reducing its carbon footprint.

Case Study: NYC Department of Citywide Administrative Services Accelerates Transition of Electric Municipal Fleet Vehicles

The New York City Department of Citywide Administrative Services (NYC DCAS) aims to lead the City's efforts to reduce carbon emissions from government operations. Building on New York City's Mayoral Executive Order (EO) of 2020, in August 2023 NYC passed Local Law 140 of 2023 mandating a 100 percent all-electric, carbon neutral fleet by 2038. The Mayoral EO called for development of a bi-annual Clean Fleet Transition Plan outlining emission-reducing strategies and establishing a Fleet of the Future Network to enhance coordination between public, private, and non-profit fleet operators. The EO also charges NYC DCAS with increasing education and working with public and private fleets as they transition to safe and electric Fleets of the Future. To support the citywide vehicle electrification goals, NYC DCAS is coordinating the transition of all light duty and medium duty on-road fleet vehicles, including law enforcement and emergency response models, and all non-emergency trucks to an all-electric on road fleet by 2035.

Source: New York City Department of City Administration Services Clean Fleet Transition Plan *(2022)*

New York City operates over 28,500 owned and leased vehicles, including 120 types of on-road equipment and 71 off-road unit types, the largest municipal fleet in the U.S. Managed by NYC DCAS, this municipal fleet includes non-emergency light, medium, and heavy-duty vehicles, as well as specialized heavy-duty trucks. There are approximately 5,000 vehicles and off-road equipment pieces that are EVs or plug-in hybrids. Local agencies work together to establish and maintain a reliable EV charging network. In 2021, the NYC Department of Transportation partnered with

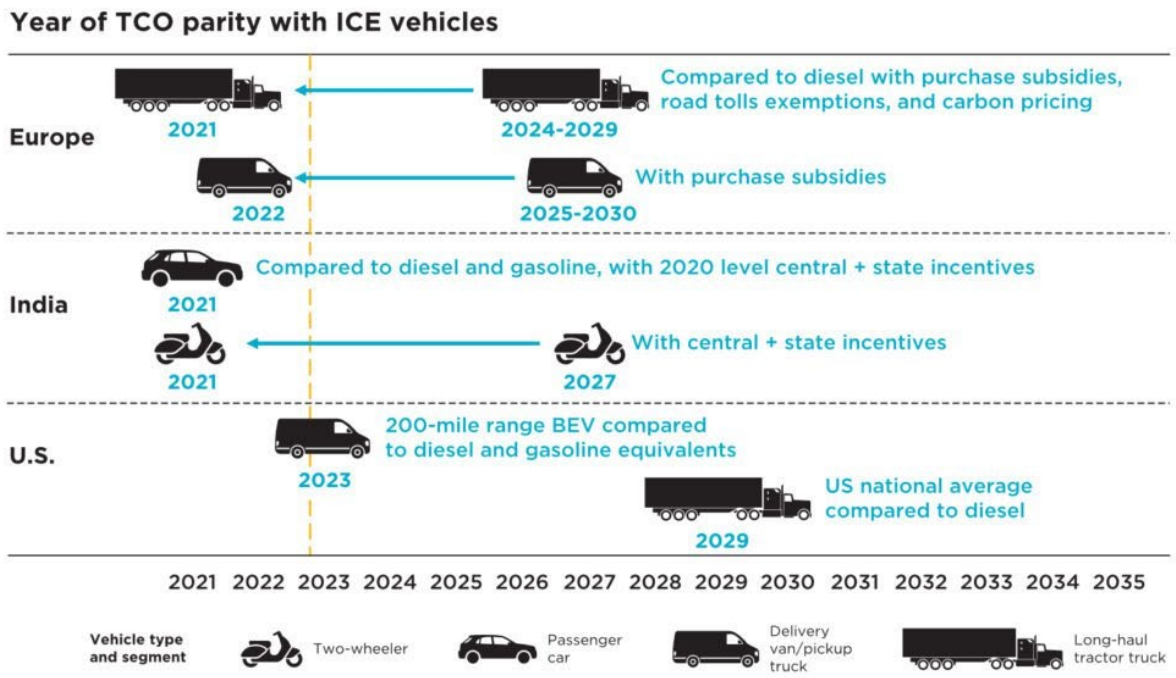
clean energy providers to launch a citywide curbside EV charging station pilot program. The pilot aimed to install 100 Level 2[11] charging ports to over 20 neighborhoods across the five boroughs, with 20 additional charging ports serving city fleet vehicles. Today, NYC DCAS operates 1,700 charging ports (mostly Level 2) and is leading a project to increase DC fast charging infrastructure. There are currently 250 fast chargers in operation, as well as 150 off-grid solar carports.

To support a peer network of EV fleet operators, NYC DCAS coordinates with other municipalities across the U.S. to share best practices and resources. NYC DCAS is working on releasing EV specifications and facilitating connections between manufacturers and other municipalities that are interested in purchasing medium and heavy-duty EVs. NYC DCAS is also committed to supporting EV workforce development by providing skills training for mechanics and developing informational resources for operators. NYC DCAS indicates at least 84 percent of the municipal fleet will transition to electric by 2035. The City's fleet is also on track to achieve the Clean Fleet Plan's goal of a 50 percent reduction in GHG emissions by 2025 and 80 percent by 2035, from a 2005 baseline. This achievement will combine investment in electrification with further hybrid implementation and widescale use of biofuels including renewable diesel.

Economic Considerations

Carbon pollution carries significant social costs, according to an analysis led by the U.S. EPA which found that it costs $190 to curb each ton of CO2 emissions, as compared to a prior estimate of $50 per ton. Research indicates that it is generally less expensive to drive EVs than internal combustion engine vehicles as users can generate cost savings across the lifecycle of an EV. There are key cost differences to note related to vehicle price, fuel price, charging and maintenance costs. According to Natural Resources Defense Council, the average price margin of EVs is expected to decrease in the coming years. As the EV market continues to grow, manufacturers are looking for ways to produce more affordable models and improve battery technology, which tends to be the most expensive element of EVs. EVs generate significant fuel cost savings, as the average cost to fuel an EV is approximately $485 a year, compared to $1,117 for a gas-powered vehicle according to a 2018 study led by the University of Michigan's Transportation Research Institute. One of the primary considerations with EVs are charging costs; charging an EV at home may increase the electricity bill, but costs can vary by location and time of day charged. Public charging stations often provide faster, higher-voltage charging, though they tend to be more expensive compared to charging at home. As far as maintenance, EVs require some basic maintenance but cost nearly half as much to maintain and repair as compared to gas-powered vehicles.[12]

[11] Charger Types and Speeds, U.S. Department of Transportation
[12] Comprehensive Total Cost of Ownership Quantification for Vehicles with Different Size Classes and Powertrains, U.S. Department of Energy, Office of Scientific and Technical Information



Source: *Accelerating ZEV Adoption In Fleets To Decarbonize Road Transportation*

Planning Considerations

Coordination and Partnership Opportunities

Successful implementation and deployment of EV fleets requires strategic planning and coordination with a variety of stakeholders to establish and maintain a charging network. Planning for EV infrastructure involves several guiding principles to support effective implementation.

- **There is no one-size-fits-all approach.**
    - Charging demand and infrastructure readiness can vary by geographical context as space availability and overall landscape differs between urban and rural areas. This may result in different types of charging installations.
- **Many planning processes may be executed in parallel rather than strictly sequential order.**
    - As EV is a rapidly evolving field, planning processes may be conducted concurrently as opposed to sequentially. For example, facilities likely need to obtain permits from local building authorities and complete fire, environmental, and electrical inspections prior to installing charging infrastructure. Project costs may continually need to be revised as site locations change or different priorities are factored. Similarly, facilities likely need to obtain permits from local building authorities and complete fire, environmental, and electrical inspections prior to installing charging infrastructure. This parallel execution process can also help streamline or expedite EV infrastructure projects since various steps are addressed simultaneously.
- **Coordinate early and often with key stakeholders.**
    - Stakeholder engagement is another key guiding principle and is crucial to the success of transportation infrastructure projects. It is critical to engage with stakeholders

early and often as these stakeholders can provide valuable information and technical assistance beginning with site-selection to final installation.

- **Stakeholders may have different needs and perspectives.**
    - Stakeholders may enter projects with different needs and perspectives, and it is important to address all needs and concerns throughout the process, particularly with project siting and design if there are key concerns from community members directly impacted by the infrastructure. There are also opportunities for agencies to engage with stakeholders that are new and/or unfamiliar with EV fleets by identifying shared priorities and goals and building in flexible approaches that factor new user perspectives.
- **Fleet operators should invest in planning and build for flexibility.**
    - Building for flexibility in EV charging installation projects means factoring both current needs and future charging needs. Charging installations that are larger and more complex may need future upgrades to the site's electrical service or nearby power grid. Agencies can avoid the need for expensive upgrades in the future by designing infrastructure that accommodates future growth (e.g., modular charging stations), which will require more installation costs upfront. This long-term planning approach also helps reduce site preparation costs since it would cost less to excavate once to lay electrical conduit for the charging infrastructure versus multiple times during future projects.

Capacity Assessment and Preparing Fleet Facilities

Transitioning fleets to EVs will rely on operators working early and often with relevant stakeholders to ensure the facilities are equipped before the arrival of the new vehicles and how to incorporate, install, or access opportunities, or on-route, charging if supplemental charging is required. Pilot tests can be designed to assess the capacity of the existing fleet and determine the scalability of using EVs. Operators will then need to set an action and implementation plan for rollout and phased implementation. Fleets should make plans to invest in facility upgrades, energy storage equipment, facility energy management systems that incorporate smart-charging capability, data collection tools, skill development/workforce development, and charging and refueling equipment and infrastructure in both the short and long term to support the transition to an EV fleet.

Fleet Operating Profiles and Route Analysis

Fleet operating profiles and route modeling includes information about the distance driven per day per vehicle, the number of stops, average and top speeds, climate conditions for routes, route topology, hours of operation per vehicle, and non-operating hours that are available to charge batteries. This information is needed to better predict the actual performance of the fleet and optimize charging at the depot. Once an operating profile and models have been created, fleets can choose to further optimize charging efficiency by installing high-powered, fast chargers to charge vehicles or revising service routes as needed to allow for staggered charging times.

To determine how vehicle charging will align with route lengths and schedules, agencies should perform a route analysis. A route analysis considers service schedules, traffic patterns, topography, and in- and out-of-service times each day of the week. Operators can use this analysis to better

understand the charging needs for each route scenario by vehicle size, battery capacity, and charging time required. Operators may discover they need to increase their space ratio, change the percentage of unused vehicles, or redesign routes and service schedules to accommodate charging and refueling needs.

Equitable Planning

Electric vehicle accessibility has often been a barrier for low-income, rural, less populated, and otherwise disadvantaged, underserved, or underrepresented communities. The establishment of the EV market was due in part to consumers willing to pay a premium for the vehicles. The market is now looking to allow for all businesses and households to purchase or access EVs without incurring higher transportation costs.

Charging infrastructure is not equitably dispersed, and the charging itself can be a barrier for lower-income areas. Chargers are often found concentrated in densely populated city areas or along major highways. Charging locations often coincide with areas and businesses that can afford to pay for the infrastructure installation, which can be costly even with public sector incentives. Additionally, many EV incentives are available post-purchase, requiring the consumer or business to have adequate capital to make the initial investment to purchase EVs for their fleets.

Operational and Labor Impacts

Private fleet operators should conduct a thorough analysis, including financial, operational, and logistical considerations when transitioning to EVs. Each fleet is unique, so a tailored approach is encouraged to ensure a successful and cost-effective switch. EVs and their associated charging and fueling equipment will include elements and functions that may be unfamiliar to traditional operations, maintenance, and facilities staff. Ensuring adequate training for all staff who interact with the vehicles will help ensure efficient, effective, and safe operations. Upskilling and training will be necessary to accommodate the complexities that come with managing and maintaining an electric vehicle fleet. Continuous educational opportunities should be provided to ensure personnel stay informed as zero-emission technologies emerge and evolve.

Source: Spangdahlem conducts first ever Air Force-wide electric vehicle training

Facilities staff and fleet managers will have new or redefined roles to play with the deployment of EVs:

- **Safety and Emergency Management**
  - Deploying EVs at onsite facilities will require the installation of high-voltage power cables and associated equipment to deliver power to the vehicles. Some fleets may opt to forgo or supplement plug-in charging with overhead pantograph chargers to avoid high-voltage cables on the ground.
  - Staff regularly maintaining the vehicles should be trained on the proper procedures for working around high voltage cables and have access to insulated gloves and tools.
  - Facilities managers should work with local emergency services to develop or update hazard event response plans that consider the additional power supply to the facility, the EVs, and all charging equipment. Proactive strategies include installing monitoring technology in the depots and establishing response procedures should a vehicle exhibit unexpected characteristics.
- **Maintenance**
  - EVs require less maintenance over their lifetime, but the accompanying charging infrastructure will likely require regular maintenance and involve regular communication with OEMs. Managers should reevaluate their baseline maintenance schedules and needs and develop new maintenance forecasts and plans, with a regular cadence for updating.
  - EVs will parts that need regular maintenance, like brakes, power steering systems, and air conditioning.
  - Instead of engines, EVs have electric motors and therefore do not require things like oil changes, transmission service, or spark plug replacement. Most of the vehicle maintenance will be communicated through the vehicle and equipment's diagnostic software and be managed digitally and remotely. EV parts that will still need regular hands-on maintenance, like brakes, power steering systems, tires, and air conditioning.
- **Information Technology**
  - Most EVs will include telematics hardware and software installed by the OEMs. This data will be essential in helping fleet operators maintain efficient operability and know how to deploy, charge, and service electric vehicles and charging equipment. Maintenance staff and technicians will need to become familiar with the computerized features and accompanying software.

Government agencies have a role to play in ensuring technicians can receive the right training and adequately transition from servicing combustion engines to zero-emission motors. Agencies can help connect fleet operators with training programs for maintenance staff and technicians to get the needed skills to work on EVs. For example, the U.S. Department of Energy (DOE), in partnership with the National Renewable Energy Laboratory, has developed a four-part video series to deliver expert insights and resources on fleet electrification.[13]

Source: Electric Vehicle Manufacturers Mobilize Behind Charging Cybersecurity at NREL

For more information:

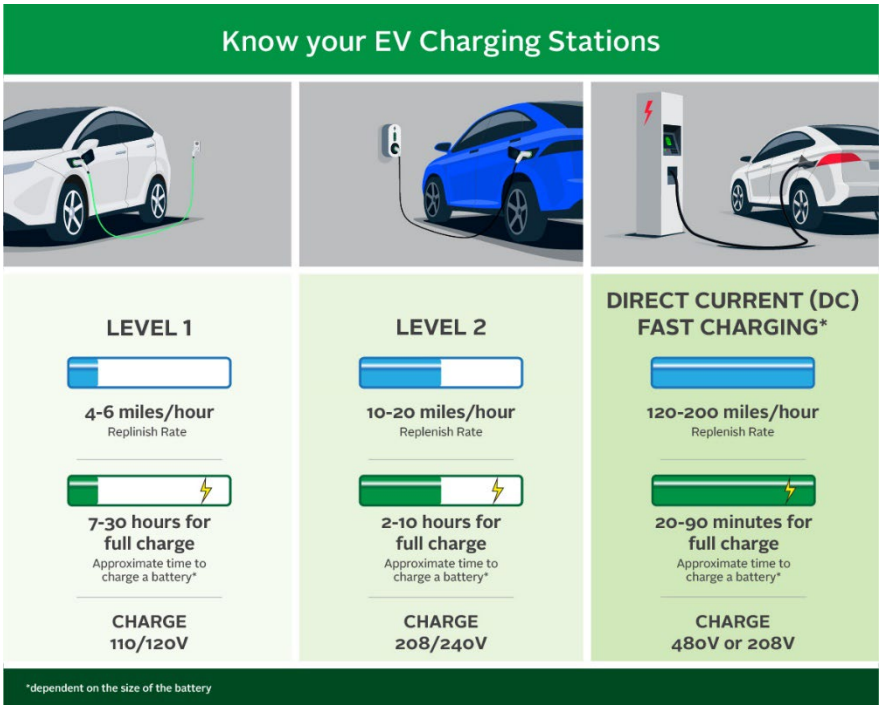
- Interview with Keith Kerman, Brent Taylor, Eric Richardson, and Julia Machetti, New York City Department of Citywide Administrative Services
- Demand-Side Resources, U.S. Department of Energy
- EVs in Fleet Applications, U.S. Department of Energy
- Charging Infrastructure Procurement and Installation, U.S. Department of Energy
- Transitioning to Zero-Emission Bus Operations: Considerations for Greening Transit, U.S. Department of Transportation
- Charging Forward: A Toolkit for Planning and Funding Urban Electric Mobility Infrastructure, U.S. Department of Transportation
- Charging Forward: A Toolkit for Planning and Funding Rural Electric Mobility Infrastructure, U.S. Department of Transportation
- Accelerating ZEV Adoption in Fleets to Decarbonize Road Transportation, International Council on Clean Transportation
- Life cycle assessment of electric vehicles in comparison to combustion engine vehicles: A review

[13] Electric Vehicle Training, Federal Energy Management Program, U.S. Department of Transportation

WHAT ARE THE INFRASTRUCTURE NEEDS OF PRIVATE FLEET ELECTRIFICATION?

Establishing and optimizing EV charging infrastructure involves several key considerations including determining site locations (e.g., convenient, accessible areas), site specific features (e.g., range and interoperability of charging options, security measures), scalability (e.g., designing for future demand), integration with the existing energy grid, regulatory compliance, public engagement and awareness, and monitoring and maintenance needs. As the market penetration of EVs increases, public charging becomes increasingly critical for providing supplementary charging opportunities for drivers who charge at home, work, or fleet facilities. For long-haul drivers, publicly accessible fast chargers along highways support longer trips and can alleviate range anxiety. Fleet operators are facing the complexities of installing charging equipment to serve the unique charging needs of their diverse fleets.

Government agencies can provide electrification resources and education for fleets looking to transition, including making connections with charging equipment manufacturers, land use and planning authorities, and power providers to aid in the installation of charging infrastructure at fleet facilities. Fleet managers will need to create or update their operating profile and model service routes to determine how to optimize the charging process, select the appropriate battery capacities, optimize the number of chargers/charging time needed, and address any other potential



Source: [The future of transportation is electric, and charging stations are powering the transition]

requirements. This section will further explore how to optimize charging at on-site facilities, manage energy load, and introduce some additional considerations for charging infrastructure planning.

One concern shared by many EV drivers is the stress and fear of being stranded while driving and not having reliable, convenient access to a charging station. Although publicly available charging stations are generally available in urban areas, researchers note that there is still a large gap between the driving distance required for long intercity trips and the one that current EV technologies and the distribution of charging stations can support. Providing sufficient on-route charging infrastructure involves two key considerations: (1) does the driver have an energy-feasible path from their origin to destination? and (2) does the driver have a cost-efficient path from their origin to destination? To help address this need, the U.S. DOE maintains a map of public EV charging stations in the U.S. and Canada, which can be filtered by location, energy source, charger types, and connectors; users can also draw specific travel routes to help with their trip planning. It is important that agencies identifying optimal locations along highways and/or commercial corridors (e.g., business centers, lodging, airports). to support EV trip planning needs, help minimize travel detour costs, and provide a more reliable EV charging network.

MANAGING ENERGY LOAD

Load management refers to the balancing of energy needed (supply) and used (demand) throughout each day to power the EV fleet. Electricity production and distribution are closely matched with demand at any point in time. At fleet facilities, there will be times when more power is needed, not just for charging but for all of the other facility functions. Historically, electricity demand is at its peak (and therefore rates can be more expensive) in the late afternoon and early evenings. When adding charging infrastructure to a property, facility managers will need to assess how to manage the load to ensure the supply of power fed to the site meets the alterations in demand that charging will create to ultimately maximize charging efficiency. Additionally, creating an energy load management strategy can help reduce energy use during peak demand periods when electricity prices are often higher.

Operators can establish charging schedules that avoid peak demand times, such as charging overnight or in early morning hours. On-site stationary battery storage can also play a role in reducing peak energy demand. Operators should work with their local power utilities to establish a backup power plan in the event of power disruptions. Supplementary power supplies options include an on-site generator or secondary batteries. Operators will also want to coordinate with their emergency management services to determine a fire safety plan for the vehicles, depot, and at any opportunity charging sites. Facilities can also consider supplementing the utility by self-generating power through solar panels or wind turbines.

Operators will also need to consider a systems approach to EV deployment that includes planning with local utilities and public works departments to make decisions about the charging or fueling infrastructure needed for zero-emission buses. The capacity to meet the needs of a new fleet of battery electric vehicles depends on the existing electricity grid capacity in the area. Operators must determine whether the grid can accommodate the amount of electricity that a battery-electric fleet

requires. Additionally, operators should develop relationships with utilities early on in order to ensure electricity supply is sufficient and infrastructure upgrades are timed before the arrival of the EVs.

It is important to note that accessing reliable, sufficient, and affordable electricity can be challenging in many parts of the world. Particularly in the Global South, electricity grids, including energy generation and transmission and distribution infrastructure, may struggle to accommodate basic energy demand, let alone accommodate increased demand that might come with electromobility. In situations where grid reliability is slightly irregular but mostly sufficient, advancing electromobility could help spur movement toward improving energy reliability and access for populations that currently have limited electricity access by encouraging investments in the grid and more renewable energy sources of power generation.

Case Study: DHL Takes a Global Approach to Electrifying Its Fleet

DHL, a Germany-based company specializing in delivery and express mail services, is looking to incorporate electric vehicles throughout their fleets to lower companywide GHG emissions. In 2021, DHL released a comprehensive plan to take the company to net-zero emissions by 2050. DHL has 120,000 vehicles globally, about 20 percent of which are medium- and heavy-duty vehicles. As of 2023, 29,200 of its fleet vehicles across its international network are electric. The company aims to convert at least 60 percent of its last-mile fleet vehicles to electric by 2030.

Source: Electric Motorcycles Powered Up for Deliveries in Thailand

In some countries, EV models are limited in terms of size and range or might not have undergone the amount of testing needed for DHL to commit to purchase. The constraints around EV model availability have created challenges for fleet transition. Additionally, different parts of the world have different public charging accessibility. Fleet managers must consider the cost-benefit analysis when pursuing EV transitions in parts of the world that may have the resources to meet DHL's service needs.

Some regional success stories for DHL have been their fleet transitions in Malaysia, Thailand, and Singapore.

- Malaysia: As of 2023, DHL Express has 61 electric vehicles operating in Malaysia, having added 44 electric vans and seven electric two-wheel scooters in November 2023. DHL was the first company to utilize electric vehicles for logistics services in Malaysia. DHL Express ultimately plans to transition 23 percent of all last-mile delivery vehicles in Malaysia to electric by the end 2024.
- Thailand: DHL Express currently has 50 electric motorbikes and 16 electric vans to service last-mile deliveries.
- Singapore: DHL Express is the first logistics provider in Singapore to roll out a large-scale electric fleet with a total of 100 EVs as of 2023 and has installed 105 charging points across the service centers. The fleet is expected to electrify 30 percent of daily routes.

CHARGING NEEDS AND OPERATIONAL CONSIDERATIONS FOR MEDIUM- AND HEAVY-DUTY VEHICLES

While medium- and heavy-duty vehicles will have their own unique set of electrification considerations, in areas where electric trucks are available, these vehicles have proven to be competitive on a life-cycle cost basis with conventional diesel trucks, including for long-haul service segments.[14]

Large trucks and buses, like most EVs, will rely on off-shift charging for the majority of their charging needs, likely at public chargers along highways or at private charging depots, often overnight. Mid-shift fast charging, needed to extend range and make long-haul electric operations viable, still requires significant public, fast-charging infrastructure build-out. Additionally, multiple charging standards and technical specifications are currently in use for electric vehicles, which can create interoperability issues, and will be critical to avoid when building out public charging. Mid-shift charging can be coupled with mandatory labor breaks to optimize time.

Source: Electric Vehicles for Fleets

There are also questions about how the weight of the batteries required to power heavy-duty electric trucks might affect the vehicle's payload. There is currently limited data exploring how long-haul routes run by electric truck might lose significant payload capacity, if any. The maximum allowable gross vehicle weight in the U.S. is 80,000 lbs. on interstates (states can set their own limits on non-interstates) and in Europe is 40 tonne. Europe currently provides an additional 4 tonne allowance for electric trucks and the U.S. provides an allowance up to 2,000 lbs. for natural gas or battery electric vehicles.

According to the International Energy Agency, several high-power charging projects are planned or underway in the U.S. and Europe, including the launch of the Megawatt Charging System, a fast-charging design set to significantly reduce charging times for commercial trucks and other heavy-duty vehicles.[15]

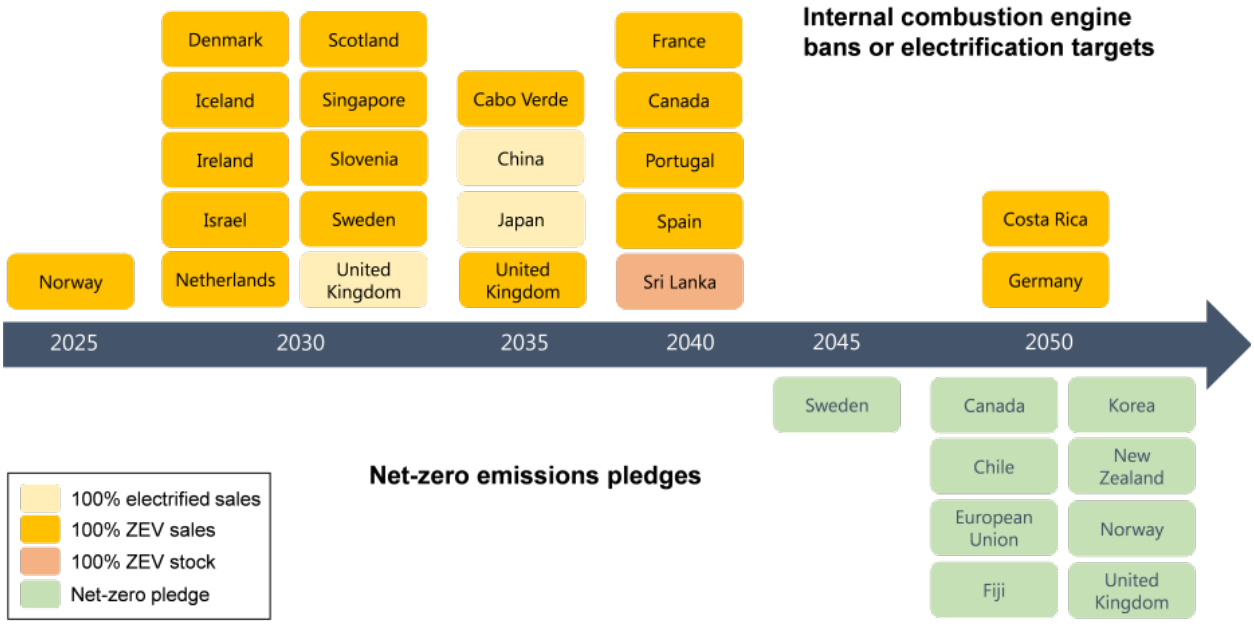
[14] Trends in Charging Infrastructure, International Energy Agency
[15] Industry Experts, Researchers Put Charging Systems for Electric Trucks to the Test, National Renewable Energy Laboratory

For more information:

- Battery Swapping for Electric Two-Wheelers in India, Strategy Hinterlands, The International Council on Clean Transportation
- Trends in Charging Infrastructure, International Energy Agency
- The Future of EVs Goes Beyond Vehicles, DHL
- How DHL is Embracing Electric Vehicles (EVs) for a Greener, Sustainable Future, DHL
- DHL Express Expands Fleet in Malaysia with Electric Bikes and Vans, DHL
- Electromobility in the Global South: An Equitable Transition toward Road Passenger Transport Decarbonization, Sustainable Mobility for All
- How Does EV Charging Load Management Work?, EV Charging Summit
- Safety Risks to Emergency Responders from Lithium-Ion Battery Fires in Electric Vehicles, National Transportation Safety Board
- Medium- and Heavy-Duty Zero-Emissions Vehicles in California, California Energy Commission
- Questions and Answers on Weights and Dimensions: new proposal to accelerate the uptake of zero-emission heavy-duty vehicles and promote intermodal transport, European Commission
- Interview with Bruce Marsh, Daniel Vaz, and Timothy Rivera, DHL
- Optimal en-route charging station locations for electric vehicles: A new modeling perspective and a comparative evaluation of network-based and meta network-based approaches, Transportation Research Part C: Emerging Technologies

PUTTING STRATEGIES INTO ACTION

The upcoming years will be critical for the mass uptake of electrified transportation. As of 2023, approximately 120 countries, constituting around 85 percent of the global road vehicle fleet, have announced net-zero emissions pledges to be reached in the next few decades. Additionally, more than 20 countries have declared their intention to phase out internal combustion engine car sales over the next 10-30 years.[16]



Source: Policies to promote electric vehicle deployment, EIA

New battery technologies are being introduced, the variety and availability of makes and models are increasing, and innovative EV applications are being explored. Government agencies have played an instrumental role in easing the pathways for commercial, public, and private vehicle electrification. Historically, these activities have included the strategically deploying charging infrastructure, providing incentives for EV owners to install charging equipment at home, and establishing construction or redevelopment standards that incorporate charging equipment inclusions, among other initiatives. To ensure a sustained and elevated level of electrification, efforts will be required by every level of government.

Ensuring there are ample grant opportunities and financial incentives is crucial, but funding alone will not be enough to bring about the EV transition without the efforts of the private sector. Government agencies can collaborate with and empower private sector partners to transition their fleets to zero-emission operations.

[16] https://www.iea.org/reports/global-ev-outlook-2021/policies-to-promote-electric-vehicle-deployment

Case Study: Uber

Uber has positioned itself as a global ambassador in advancing EV uptake by exploring innovative pathways and partnerships to get more EVs on the road. The company aims to have all rides be zero-emission in the United States, Canada, and Europe by 2030, and by 2040, all Uber rides, deliveries, and company-wide emissions will be net-zero. As of mid-2023, Uber has 60,100 active battery EV drivers.

Source: Uber rolls out electric bike fleet in Kenya, its first in Africa

Uber works with local and state/provincial partners to align electric vehicles with regional model availability and local transportation preferences and patterns. In 2023, the company introduced Electric Boda, an electric motorbike option for Uber rides in Nairobi, Kenya, and Uber's first standalone green mobility product in Sub-Saharan Africa. Currently, there are a few hundred electric motorbikes operating the Electric Boda program in Kenya with a plan for a fifth of the Uber motorbike fleet in the country to be electric by mid-2024. The Electric Boda option can provide riders with up to a 15-20 percent cheaper ride than a regular Uber Boda trip.

Electric motorbikes can be an advantage for drivers as well as riders. Electric bikes have up to 35 percent lower operating and maintenance costs than conventional motorbikes. Drivers providing rides through the Electric Boda program lease the bikes from Greenwheels Africa, an electric motorbike company that also oversees the maintenance and charging. When the batteries get low, drivers head to one of Greenwheels Africa's swap stations, receive a fully charged battery, and hand off their depleted one.

Electric Boda and Uber Boda are currently available in parts of Nairobi with the program set to extend to other Kenyan cities in the future. Uber is piloting other electric mobility programs with a variety of vehicle models in Chile, Mexico, and India.

Uber worked with Kenya's Energy and Petroleum Regulatory Authority (EPRA) to introduce incentivized charging tariffs for electric vehicles. These came into effect in April 2023 and provide a reduction in costs compared to the standard electricity tariffs. At off-peak hours, this reduced tariff is halved in an effort to incentivize charging when there is a surplus of power on the country's national grid, which is drawn from greater than 85 percent renewable energy sources.

Electric vehicles are increasingly a priority for Kenya. They reduce the country's dependence on imported oil, help combat foreign exchange challenges, and utilize abundant domestic renewable energy. Uber launched the product in the lead-up to the country hosting the inaugural Africa Climate Summit and is currently engaging with the recently established National E-Mobility Taskforce, whose chair spoke at the product launch.

Sources: Amid high fuel costs, Uber launches electric motorbikes in Kenya, Uber rolls out electric bike fleet in Kenya, its first in Africa, Interview with Adam Gromis and Nicole Rudnick, Uber

GLOSSARY

Electric vehicles (EVs): A type of electric vehicle that is powered entirely by a battery. include both motor vehicles and battery-powered micromobility devices like scooters and bikes.

Charging infrastructure: The various physical infrastructure needed to charge EVs. Charging infrastructure includes both plug-in charging and overhead pantograph chargers. Fast chargers provide higher power output to charge vehicles more quickly, often using higher voltage and direct current.

Climate change: Climate change refers to a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or in land use. Note that the Framework Convention on Climate Change (UNFCCC), in its Article 1, defines climate change as: 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. The UNFCCC thus makes a distinction between climate change attributable to human activities altering the atmospheric composition and climate variability attributable to natural causes.

Electricity grid: A network of energy generation, transmission, and distribution infrastructure.

Electromobility: Electromobility is the use of electrical energy to support transportation.

Energy load: The amount of energy (electricity) that is demanded and therefore required at a given time. Peak loads are those when demand is highest, typically in the late afternoon and early evening.

Fleet electrification: The process of introducing EVs into existing vehicles fleets.

Ground transportation fleet: A fleet refers to a group of vehicles owned by a single entity, often for commercial or government purposes. Ground transportation fleets operate exclusively on land. These include local delivery vehicles, car rental, long-haul trucking, taxi, limousine, and for-hire vehicles, and public utility vehicles.

Greenhouse gases (GHG): Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of terrestrial radiation emitted by the Earth's surface, the atmosphere itself and by clouds. This property causes the greenhouse effect. Water vapor (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4) and ozone (O_3) are the primary GHGs in the Earth's atmosphere. Moreover, there are a number of entirely human-made GHGs in the atmosphere, such as the halocarbons and other chlorine- and bromine-containing substances, dealt with under the Montreal Protocol. Beside CO_2, N_2O and CH_4, the Kyoto Protocol deals with the GHGs sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).

Internal combustion engine: Internal combustion engines harness the energy released by burning fossil fuels to generate power.

Interoperability: Interoperability refers to the ability for various technologies to be used reciprocally, or in conjunction with each other. This requires coordination across jurisdictions and producers to ensure compatibility between devices.

Lifecycle emissions: The entire emissions profile of a device from cradle to grave. This means not only emissions generated during operation but also during the manufacturing, material transport, maintenance, and disposal processes. Non-operational emissions are also called embodied carbon.

Mitigation: Processes that can reduce the amount and speed of future climate change by reducing emissions of heat-trapping gases or removing them from the atmosphere.

Mode shift: Mode shift refers to the replacement of one transportation type by another. Street design and transportation demand management (TDM) strategies often aim to encourage mode shift away from motor vehicles and towards active or public transportation.

Net-zero emissions: Net-zero emissions suggests that, on the whole, considering offsets, carbon recapture, and other neutralizing strategies, there is no increase in emissions. This differs from "real" zero emissions, which refers to the complete elimination of emissions.

Original Equipment Manufacturer (OEM): A company which, with its own facilities, that builds a commodity product of component and incorporates it into a new product with its own brand name. including the assembly of parts and components, into the end item being acquire

Plug-in hybrid electric vehicle: A type of electric vehicle that is powered both by a battery and an internal combustion engine.

Resilience: The capacity of a community, business, or natural environment to prevent, withstand, respond to, and recover from a disruption.

Transportation sector: A sector that consists of all vehicles whose primary purpose is transporting people and/or goods from one physical location to another.

Vehicle redistribution: Refers to physically repositioning vehicle fleets to meet demand. This is often used in the context of micromobility, where scooters or bikes need to be transported from popular drop-off areas to popular pick-up areas.

Zero-emission vehicle: A vehicle that produces no tailpipe criteria pollutants, toxic air contaminants, or GHG emissions.

SELF-ASSESSMENT QUESTIONS

Take some time to think through transportation and infrastructure in your region, state/province, or country, and how it could best support a private, all-electric ground transportation fleet. Consider the following questions:

- **What percentage of fleet operators in your jurisdiction have begun transitioning or have completed the transition to an all-electric fleet?**
- **What are your country's or region's existing EV mandates, policies, or guidance?**
  - For national agencies, is there a national-level charging standard in place?
  - For state/provincial agencies, is there a state plan in place for implementing or guiding installation and investment in EVs?
  - For municipal-level agencies, are there policies to promote easier parking and travel access for EV drivers?
- **What public sources of funding or incentive schemes are available for the purchase and deployment of an electric fleet?**
- **What is the current state of your area's public charging network and electricity supply?**
  - What supplemental infrastructure would be needed to accommodate for future commercial EV fleets?
  - What grid upgrades might be necessary?
- **What permitting or land use barriers might hinder installing chargers at private fleet facilities?**
- **What conditions are prevalent in your country that might influence the placement of charging infrastructure and supplementary equipment in safe and reliable locations (e.g., weather hazards, high traffic areas, wildlife populations, etc.)**
- **How do major electric utilities price electricity, and how would that impact vehicle charging schedules?**
- **How does your agency support workforce development to ensure fleet manager and staff have training and skills development associated with EVs?**

For more information about reducing transportation-related GHG emissions, or to learn more about partnering with Momentum, please contact us at momentum@dot.gov.