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ELECTRIFYING PUBLIC AND PRIVATE FLEETS

WORKSHOP REPORT



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INTRODUCTION

The global transition to zero-emission vehicles continues, with cumulative light-duty electric vehicle sales surpassing 7 million in 2019. Figure 1 shows the total global electric vehicle sales from 2010 through 2019.¹ Annual global electric vehicle sales surpassed 2 million units in 2018 and 2019, an increase of approximately 65% and 75%, respectively, compared to 2017. As shown, electric vehicle sales are primarily concentrated in the major markets of China, Europe, and the United States. These markets have a broad suite of policies in place to overcome the prevailing key consumer barriers of model availability, higher upfront cost, infrastructure, and consumer awareness.

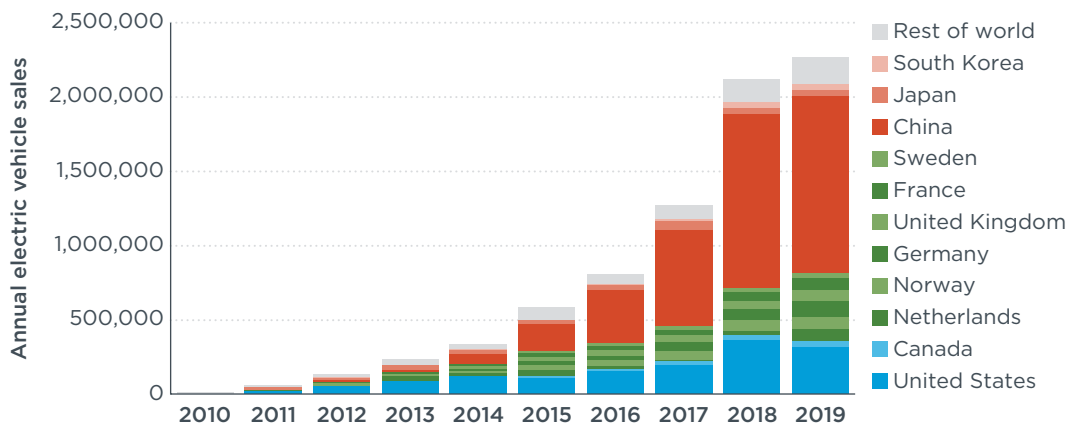


Figure 1. Global electric vehicle sales 2010 through 2019.

Despite early success and rapid electric vehicle market development across the major markets, more work is needed to increase and broaden uptake. Numerous governments are committed to transitioning entirely to zero-emission vehicles (ZEVs) within the next three decades. Achieving this vision means that all vehicles—including personal vehicles that are privately owned or leased by individual consumers as well as fleets of vehicles that are used by businesses, organizations, or government agencies—will need to be ZEVs. Furthermore, deploying electric vehicles across diverse public and private fleets is commonly identified as a major priority to accelerate the global ZEV transition.²

Governments, businesses, and nonprofit groups have identified opportunities and barriers to accelerating fleet electrification. There are many benefits to incorporating electric vehicles within public and private fleets, and there are several reasons why fleets present a strong case for electric vehicle adoption. Deploying electric vehicles in fleets contributes directly to uptake and promotes awareness by increasing electric vehicles' visibility and exposure. In addition, placing electric vehicles in fleets demonstrates leadership and helps develop best practices for others to follow. At the same time, there can also be unique procedural, infrastructure, cost, or educational

1 Based on EV-Volumes, (EV Data Center, 2020), <http://www.ev-volumes.com/datacenter/>.

2 National Research Council (NRC), (2015). "Overcoming Barriers to the Deployment of Plug-in Electric Vehicles," National Academies Press, (2015), <https://www.nap.edu/catalog/21725/overcoming-barriers-to-deployment-of-plug-in-electric-vehicles>

challenges, and many government support policies to date have been tailored to private customers.

This report summarizes the learnings from four interactive webinar discussions on electrifying public and private fleets, commissioned and convened by the International Zero Emission Vehicle Alliance (IZEVA) in July and August 2020. Table 1 lists the more than 20 participants in the four webinar discussions, who represent fleet management and implementation experts; non-profit and community organizations; city, regional, state, provincial, and national governments; electric utilities; businesses; and other fleet thought leaders across North America and Europe. The interactive webinar discussion series fostered discussions on work to electrify different high-impact fleet categories: government, corporate, commercial truck, and shared.

Table 1. Summary of electrifying fleets interactive webinar discussion series

Topic	Participants
Electrifying government fleets	Nick Nigro, <i>Atlas Public Policy</i> ; Sue Gander, <i>Electrification Coalition</i> ; Evan Speer, <i>California Department of General Services</i> ; Yves Madore, <i>Natural Resources Canada</i> ; Marchelle Cain, <i>City of Houston</i> ; Martin Boudreault, <i>Québec Centre de gestion de l'équipement roulant (CGER)</i>
Electrifying corporate fleets	Charlotte Argue, <i>Geotab</i> ; Charles Trudel, <i>Institut du véhicule innovant</i> ; Jonathan Ells, <i>NYC Department of Citywide Administrative Services</i> ; Sandra Roling, <i>The Climate Group</i> ; Carol Lee Rawn, <i>Ceres</i> ; Sarah Olexsak, <i>Duquesne Light Company</i>
Electrifying commercial truck fleets	Julie Johnson, <i>Lightning Systems</i> ; Gary Lalonde, <i>Lion Electrique</i> ; Andrea Schön, <i>DB Schenker</i> ; Natalia Swalnick, <i>Electrification Coalition</i> ; Mike Roeth, <i>North American Council for Freight Efficiency</i>
Electrifying shared fleets	Martien Das, <i>Netherlands Ministry of Infrastructure and Water Management</i> ; Andrei Greenawalt, <i>VIA</i> ; Tegan Molloy, <i>Forth</i> ; Nick Colledge, <i>London EV Company</i> ; Shelley Francis, <i>EVNoire</i>

In each interactive webinar discussion, participants discussed the challenges and opportunities of fleet electrification, how the electric vehicle barriers differ for fleets compared to individual vehicle owners, and how governments could accelerate electric vehicle uptake within fleets. Although the discussions and this summary report primarily emphasize plug-in electric vehicles, the transition to zero-emission vehicle fleets will also include hydrogen fuel cell electric vehicles. The experts engaged with members of the International ZEV Alliance through interactive discussions. Insights from each interactive webinar discussion are summarized below with references to programs and activities to illustrate the associated challenges and successes of electrifying public and private fleets. The voices and perspectives of the expert speakers and their insights are paraphrased below. The summary is intended to represent the major themes and messages from the interactive webinar discussions and do not necessarily reflect the views of the participating speakers and their organizations. A list of additional resources related to webinar discussions and associated activities is provided at the end of the report.

WEBINAR 1

ELECTRIFYING GOVERNMENT FLEETS

Government fleets play an important role by helping public agencies develop best practices, policies, and demonstrate their commitment and leadership in electrification. This leadership cannot be overstated: it sets high expectations, creates demand, and sends a signal to industry to bring more volume and models to market.

Many of the electrification barriers for government fleets are similar to those for privately owned vehicles, including model availability, cost, infrastructure, and awareness. The general lack of available models suitable for government fleet applications in sufficient volume is a key challenge. Many electric vehicle models simply are not available for purchase in many markets, particularly those without ZEV sales requirements. In the United States, the Climate Mayors Electric Vehicle Purchasing Collaborative is an initiative whose aim is to leverage cities' collective buying power and increase vehicle availability, signaling to the automobile industry that there is a guaranteed customer.

Government financial incentives help to overcome electric vehicles' initial upfront cost barrier in the early market, but these programs have typically been tailored to private car buyers and government fleets are not always eligible. For example, the United States' \$7,500 federal income tax credit for ZEV purchase or lease cannot be applied to government non-taxable entities, and many state-level incentive programs limit the number of rebates available per entity. Expanding eligibility and lifting fleet restrictions could accelerate public fleet electric vehicle uptake.

Charging infrastructure is also a key challenge for government fleets, as fleets of electric vehicles require planning to calculate the number of chargers needed, where to site them, and the associated impacts on budget and financing. Electric vehicles' total cost of ownership benefit can be more difficult to quantify when there is less certainty around infrastructure needs. For early government fleet projects, Level 2 (normal) charging has largely fulfilled the energy demand. Many governments seek opportunities to make their fleet charger purchases benefit the public as well; for example, government fleet charging infrastructure could be primarily used for overnight fleet vehicle charging and made available to the public during the day.

Awareness, understanding, and confidence in electric vehicles can be a barrier in internal government fleet procurement decision making. Cultural barriers may persist due to lack of familiarity, education, and trust in electric vehicles' capabilities. Sometimes a few electric vehicle champions within government agencies are not enough, and there is a need for much greater internal understanding and education for fleet managers and the staff using the fleet vehicles.

Electrification of government fleets can also face unique procurement challenges. There are often laws, regulations, and provisions that require government vehicle purchases to be the most cost effective. Although electric vehicles offer a total cost of ownership benefit in many cases, they don't necessarily provide the best value in every case. California's fleet procurement cost guidelines include environmental benefits to more fully quantify the benefits of electric vehicles beyond fuel and maintenance savings.

Electric vehicle uptake within government fleets can be accelerated in several ways. Several organizations have created tools for fleet managers to ease the switch to electric vehicles; some examples are provided in the table of additional resources below. Governments can adopt procurement policies so that ZEVs are the default technology choice when replacing older vehicles. Such “ZEV-first” policies—including those underway in California and Québec—require government agencies to purchase zero-emission vehicles if they are available and fit their needs. As Sue Gander of the Electrification Coalition explained, “The ability for government executives to require electric vehicle adoption with the stroke of a pen is a huge advantage for electrifying government fleets compared to the difficulties of spurring the private electric vehicle market.” Collecting and maintaining good data on fleet vehicles and their routes, usage, parking situations, and other parameters is key to identifying the right electric vehicle models to fit the needed applications. Government budgets are usually very tight, and fleet vehicle data are key to understanding the total cost of ownership value proposition of electric vehicles and supporting government procurement decision-making.

“The ability for government executives to require electric vehicle adoption with the stroke of a pen is a huge advantage for electrifying government fleets compared to the difficulties of spurring the private electric vehicle market.”

—Sue Gander, Electrification Coalition

Many government agencies are finding a clear total cost of ownership advantage for electric vehicles, especially when incentives are available. In these cases, charging infrastructure can be the primary hurdle for fleet managers to transition to electric vehicles. Governments can support fleet managers with infrastructure financing, planning, and permitting to reduce barriers. A coordinated approach to charging across different agencies can lead to lower-cost and more efficient solutions. Electric power utilities can be good partners for fleet infrastructure deployment. Electric utilities have funding available for infrastructure programs in many markets, and expedited contracts, permitting, and interconnection processes can help fleet managers access these programs in a timely manner.

WEBINAR 2

ELECTRIFYING CORPORATE FLEETS

Corporate fleets play an important role in the promotion of electric vehicles by demonstrating private sector commitment and leadership in adopting ZEV technologies. Electrification of corporate fleets both directly increases the deployment and use of electric vehicles and exposes many people who might not otherwise have first-hand experiences with the technology.

The barriers to deploying electric vehicles in corporate fleets are similar to those for personal vehicles, including model availability, higher upfront cost, charging infrastructure, and awareness. Government ZEV regulations and greater automaker production volumes are improving the number and diversity of electric vehicle models available for fleet procurement. The total cost of ownership is critical for corporate fleets, and government incentives are making electric vehicles more attractive from an economic perspective in many markets. Charging infrastructure is a key challenge for corporate fleets, with difficulties including power demand and organization structures.

Corporate fleets also face their own unique challenges and motivations to electrify. There is no one size fits all approach, as all fleets are different and require distinct approaches. For companies to commit to and invest in electric vehicle fleets, it is critical that electric vehicles do not hinder daily operations or the ability to carry out business contracts. Key motivations for corporate fleet electrification include the emphasis on total cost of ownership, environmental goals, branding and reputation, and investor pressure. The 85 companies under The Climate Group's EV100 initiative have collectively committed to purchase more than 2 million electric vehicles by 2030.

Buying electric vehicles for a fleet and installing the associated charging infrastructure is a much larger endeavor than individual vehicle purchases. Developing in-house solutions for fleet refueling is a new challenge compared to what companies and fleet managers are used to, and infrastructure installation and permitting can take additional time and increase overall fleet costs. Many different departments and employees will need to coordinate, as buildings and vehicles are often controlled by different parts of companies.

At the same time, there are opportunities to make fleet-wide efficiency gains or logistics changes simultaneously with vehicle purchases to reduce overall costs. Sometimes a small change in logistics can lead to positive impacts and cost savings. This was the case of a restaurant chain in Québec, which bought used electric vehicles with short battery ranges for its deliveries. Used Chevrolet Spark electric vehicles were selected due to their lower initial purchase costs and availability of Québec's used electric vehicle incentive program. The company installed one DC fast charger instead of many Level 2 chargers in order to lower total costs.

Data and analysis on fleet duty cycles can reveal valuable information on how well electric vehicles would work in companies' current operations. The information available from tools like Geotab's Electric Vehicle Suitability Assessment on duty cycles, cost savings, and emissions reductions can make a compelling case to fleet managers. Some of the barriers to corporate electric vehicle uptake are more perceived than actual, and they can be overcome with flexibility, creativity, and

deeper analysis. “We find that when we do analyses on fleet duty cycles, companies are usually surprised at just how well electric vehicles would work in their current operations,” said Charlotte Argue of Geotab. Access to comprehensive data is key to supporting company commitments and investments in electric fleet vehicles. Electric vehicle trials with data collection can help build familiarity and demonstrate the benefits and suitability of electric fleet vehicles. Installing telematics can provide companies the information needed to manage a fleet. These tools can support smaller and larger companies alike. The data and lessons learned from the early programs can be used to develop best practices and disseminated in a clear way that helps others identify opportunities for fleet electrification.

“We find that when we do analyses on fleet duty cycles, companies are usually surprised at just how well electric vehicles would work in their current operations.”

—Charlotte Argue, Geotab

Governments can support greater corporate fleet electric vehicle uptake in several ways, including by adopting policies and actions like electric vehicle targets, financial incentives, charging infrastructure programs, guidebooks and toolkits, and local access policies. A comprehensive policy package is key to making electric vehicles more affordable, practical, and accessible while increasing awareness and understanding. City access policies and zero-emission zones in Europe have successfully motivated companies to electrify in order to continue business operations in city centers and gain a competitive edge in these markets. Companies have highly sophisticated approaches to fleet operations and logistics, and many take a long-term view and work to stay ahead of clear signals from government. As more cities continue to develop their local access policies and zero-emission zones, greater policy coherence in terms of timelines and technology requirements is ideal. Governments can also financially support NGOs with expertise in providing fleets with technical assistance for electrification to increase their capacity and impact.

Non-government stakeholders also play a key role in supporting corporate fleet electrification. Companies can join initiatives like the Corporate Electric Vehicle Alliance (CEVA) and EV100 to collaborate with others to identify challenges, develop solutions, and share best practices; a link to the list of CEVA and EV100 companies is included in the table of additional resources below. Non-government stakeholders can help by promoting knowledge sharing across different businesses by providing technical assistance and best practice guides, and can increase ambition by aggregating and aligning commitments across different companies and sectors. Electric power utilities can directly deploy charging infrastructure or construct make-ready spaces to support electric vehicle charging, which can provide significant cost and time savings. Automakers and charging infrastructure providers can promote fleet electrification by partnering with corporations, offering lower costs through bulk procurement, and collaborating on electric vehicle and charging solutions.

WEBINAR 3

ELECTRIFYING COMMERCIAL TRUCK FLEETS

Transitioning commercial truck fleets to zero emissions plays a critical role in meeting government air quality, climate change mitigation, and environmental equity goals. Heavy-duty vehicles typically make up a small share of a region's vehicle fleet, but emit a disproportionate share of pollution, especially in or near communities of concern. Switching from combustion to zero-emission trucks provides greater relative benefits.

Although the transition offers substantial benefits, heavy-duty vehicle electrification is in its early stages. Low electric truck production volume and model availability, higher upfront cost, limited refueling infrastructure, and general lack of awareness and understanding hinder consideration and uptake. These barriers apply to electric and hydrogen fuel cell trucks, although some experts view battery-electric as the simplest and most technologically-ready solution. Hydrogen can provide flexibility to commercial truck fleets, can be a solution for space-constrained and public fueling fleets, is promising for longer-haul applications, and could also be added as range extenders for specific applications. At the same time, improvements in battery efficiency, lower cost, and weight are expanding the applications that battery-electric trucks can fulfill. Plug-in hybrid electric trucks could fill some niches, but are generally viewed as more technologically complex and expensive than battery-electric vehicles.

There is significant variation within truck segments, ranging from simple box trucks to those designed for specialized roles. In early markets, when electric vehicle model availability is low, it is critical that fleet managers and suppliers identify applications where electric trucks will be successful, or there is risk of negative perceptions and setbacks to market growth. To ensure that vehicles meet the needs of the user, some manufacturers like Lion Electric Company are using a modular approach and customizing trucks based on range and other technical specifications to supply purpose-built vehicles. Because there is more variety within electric truck architectures than for traditional diesel trucks, more education and understanding about the capabilities and limitations of electric trucks is needed.

Electric trucks typically cost several thousand dollars more than their combustion counterparts, and while electric trucks offer lower per-mile maintenance and fuel costs, the overall economics remain challenging. Financial incentives are important in the early market to help offset the greater upfront cost of electric trucks and may need to extend beyond when incentives for light-duty vehicles will no longer be needed. Near-term incentives also help to build scale by creating more demand, which will drive down costs more quickly. Greater manufacturing volumes along with continued technological advancements are key to achieving cost parity in the absence of government incentives.

Developing charging infrastructure solutions for commercial truck fleets is another challenge. The geographic availability and distribution of chargers is limited in many markets. Depot charging can provide a more cost-effective approach with predictable fueling costs and bypass the need to refuel at diesel truck stops, but charging away from a depot can require long dwell times or more expensive high-powered chargers. Daily return-to-base truck applications are well suited for electrification in 2020. The business case for electrifying commercial trucks is more challenging when fleets pay

the full costs of expanding infrastructure to their existing locations. In some cases, it can be more cost-effective to move facilities or build infrastructure off-site, requiring changes in operational patterns.

Although the technology is still at the early stages, there may also be opportunities for overhead wire charging for electric trucks on specific routes, including near ports and at distribution hubs with high freight truck activity. Pilot projects are underway in Sweden, Germany, and California. Overhead wire charging offers significant energy efficiency and fuel savings benefits and could enable trucks to use smaller batteries, but there may be challenges with maintenance and reliability, and several factors need to be optimized to create a good business case.

Governments can accelerate electrification of commercial truck fleets in several ways. Vehicle regulations that require increasing ZEV sales and establish long-term targets signal to industry to bring more product to market. Examples include California's Advanced Clean Truck regulation and the multi-state medium- and heavy-duty vehicle memorandum of understanding by 15 U.S. states to achieve 100% ZEVs by 2050. "Clear government signals provide industry with greater confidence and motivation to invest in electric truck manufacturing," said Andrea Schön of DB Schenker. Several governments offer financial incentives, which are needed in the near term while technology costs fall and production volume increases. Expanding eligibility could help boost uptake, such as by lifting restrictions on incentives only being available to companies that scrap old vehicles. Sales tax exemptions could also help reduce the cost gap, as sales tax compounds the greater upfront cost of electric trucks.

"Clear government signals provide industry with greater confidence and motivation to invest in electric truck manufacturing."

—Andrea Schön, DB Schenker

Along with vehicle incentives, public funding for charging infrastructure will be key, as this is an important factor in a fleet's decision to switch to electric trucks. In the United States, the federal Alternative Fuel Vehicle Refueling Property Credit provides up to \$30,000 for businesses that install electric vehicle charging. Continued electric utility programs that directly deploy chargers, build make-ready infrastructure, and offer EV-friendly rate structures are needed. In Europe, many programs exist, but it takes time and resources to identify, understand, and make use of the various programs that are available. Additional coordination and transparency can help facilitate and streamline the process. Governments and industry coalitions can also overcome barriers to public charging with standards and open protocols so that heavy-duty trucks can charge at existing stations wherever they go.

City policies such as urban access policies, pollution-index vehicle pricing, and strategic charging infrastructure deployment also play a key role in pushing for greater electrification of commercial truck fleets. Amsterdam has announced an emission-free zone for freight by 2025, which will expand to all vehicle modes by 2030. In Norway, the city of Oslo is working to implement two zero-emission zones by the end of 2020, which include complementary actions like differentiated pricing, strategic and targeted

infrastructure deployment, and planning of a zero-emission truck route along a key corridor. A comprehensive package of local, regional, and national policies is key to accelerating electrification of commercial truck fleets; the suite of policies in Oslo has enabled logistics company DB Schenker to achieve 100% electric logistics vehicles in that city.

WEBINAR 4

ELECTRIFYING SHARED FLEETS

Shared fleets, including taxis, ride-hailing, and carsharing, contribute to the broader ecosystem of mobility options needed to help people affordably, reliably, and conveniently get around without the need to own a car. Electrifying shared fleets plays an important role in the electric vehicle market by directly increasing electric vehicle uptake and usage in what are often highly- utilized, high-mileage applications. For the services' many users, electric taxi, ride-hailing, and carsharing fleets greatly expand access and exposure to electric mobility. Electrifying taxi and ride-hailing vehicles can also improve driver experience and unlock greater earnings potential by enabling lower per-mile operating costs.

Many of the barriers to electrifying shared fleets are similar to those for privately-owned electric vehicles. Although electric vehicles can improve taxi and ride-hail driver earnings, upfront purchase or lease cost for the vehicle is a significant barrier. To overcome these barriers, upfront financial incentives and fair financing programs that ensure that the cost savings directly benefit drivers are needed. The availability of electric vehicle models suitable for shared fleet applications is also a barrier in many markets. Companies such as Via that operate on-demand pre-scheduled transit are challenged by limited availability of electric shuttle, minibus, and van options. Greater availability of more electric vehicle models with longer range and lower cost is needed to expand uptake, especially within taxi, ride-hailing, and micro transit fleets.

Charging infrastructure is one of the greatest challenges for taxi and ride-hailing fleets. Time spent charging an electric vehicle means downtime and lost revenue for drivers. These vehicles typically have high daily mileage and thus require public rapid charging infrastructure that is affordably priced and convenient. Possible locations where such charging is needed include airports and other ride-hailing hotspots. Improving driver access to overnight charging at homes, multi-unit dwellings, and convenient curbside locations can offset the need for public charging. Convenient and affordable overnight charging can increase electric vehicles' economic benefits by offering less expensive electricity and less downtime.

Inclusive and equitable home charging solutions are needed for electric vehicles to be successful in ride-hailing applications. In the United States, many ride-hail drivers are from diverse and frontline communities where there is insufficient charging infrastructure. In the Netherlands, infrastructure deployment follows demand; the city of Amsterdam operates a unique program where electric vehicle drivers can submit requests for the city and partner electric utility to install public chargers near their residences as a method of identifying locations where additional supply is needed to meet demand. Programs like this can continue to be used to help fleet drivers and charging providers to identify charging infrastructure needs.

Governments can accelerate electrification of shared fleets in several ways. Proposed regulations like California's Clean Miles Standard, which is under development, will require shared fleets to increasingly deploy cleaner cars while giving confidence to vehicle manufacturers that there is a market for zero-emission ride-hailing vehicles. With the implementation of regulatory requirements, there is an onus on policymakers to facilitate the transition with complementary incentive and infrastructure policies.

Many incentive and infrastructure policies are designed for privately-owned vehicles and may need to be expanded or modified for shared fleets to be eligible. Shared fleets that provide co-benefits like higher occupancy trips and reduced car dependence are ideal applications for public investments to prioritize. Limited public funding would ideally be directed to shared fleets that contribute to supplemental government goals, such as services that complement rather than compete with public transit.

Alongside funding and infrastructure, complementary outreach, awareness, and communication efforts tailored to the unique needs and concerns of shared fleets and their drivers are needed. Two relevant examples are Forth Mobility's and EVNoire's driver-focused outreach to help active Uber and Lyft drivers understand the benefits and economics of electric vehicles and the support programs that are available. It will be key to work directly with ride-hail and taxi drivers to assess the suitability and benefits of switching to electric vehicles, secure fair financing and access government incentives, and guide deployment of overnight and public charging.

Local-level access policies like zero-emission zones or diesel restrictions send strong signals to shared fleets and individuals alike. Many cities in the Netherlands are phasing in diesel restrictions and consumers are increasingly turning to electric carsharing as an alternative to private vehicle ownership. In London, local regulations and pollution-indexed pricing to access the city center encourages greater electric taxi and private hire vehicle use. It can be a challenge for businesses to understand and comply with local regulations and policies that can vary widely across cities. Greater policy coordination across jurisdictions would increase confidence for shared fleet companies to invest and grow their electric vehicle initiatives.

Efforts to expand access to electric mobility and electrify shared fleets would ideally be community-centered. Viewing government policies and programs through the lens of community development are critical. Understanding communities, their mobility needs, and their unique adoption barriers is a critical first step to designing policy solutions. "The solution that's best for a community often lies closest to the community. Engaging community organizations, drivers, and other stakeholders is an effective way to identify and develop tailored solutions," said Shelley Francis of EVNoire. This is true when designing electric carsharing programs and for helping ride-hail drivers switch to electric vehicles. Building on early successes, new housing developments in the Netherlands are being built with parking for shared electric vehicles and charging infrastructure, with minimal parking available for private cars. In the United States, cities including Portland, Ore. and Sacramento, Calif., have successful community-centered electric carsharing programs underway that are affordable, convenient, and reliable.

"The solution that's best for a community often lies closest to the community. Engaging community organizations, drivers, and other stakeholders is an effective way to identify and develop tailored solutions."

—Dr. Shelley Francis, EVNoire

REFLECTIONS

The full transition to zero-emission transport means electrifying a diverse range public and private fleets in operation across the world. Many of those fleets present a variety of important opportunities to accelerate the transition, while others show unique challenges. The interactive webinar discussions provided insights to help identify and address the issues related to electrifying public and private fleets going forward.

There are many benefits to electrifying public and private fleets. Public and private entities alike can demonstrate their leadership and commitment to electric vehicles and help develop best practices for others to follow suit. Electrifying fleets both directly increases the sales and use of electric vehicles, while significantly increasing public exposure and awareness. In the right applications, electric fleet vehicles offer an attractive total cost of ownership, lower fuel and maintenance costs, and greater environmental benefits in high-mileage applications. The early projects around the world show great progress and there are many success stories. Drivers of electric fleet vehicles appear overwhelmingly pleased with the experience and enjoy the smooth, quiet, and zero-emission ride. Many of these drivers become champions for electric vehicles and encourage others to go electric.

As with privately owned electric vehicles, key barriers including model availability, higher upfront cost, charging infrastructure, and awareness hinder widespread electric vehicle fleet purchases. Fleets have unique needs and characteristics, and there is no one-size-fits-all solution. Because of this challenge and the need for tailored information, there is a growing body of technical assistance, case studies, and analytical tools to help fleet managers make the switch to electric vehicles. These personalized data-driven analyses are key to identifying which fleet vehicles are most suited for electrification and the associated financial and non-financial benefits of doing so. It will be critical to identify the fleet applications where electric vehicles will be successful or there is risk of negative perceptions and market set back. Many fleet applications are already suitable for electric vehicles under the current landscape. In other cases, sometimes a small change in logistics can lead to huge benefits.

A common theme throughout the four interactive webinar discussions is that policy is driving fleet electric vehicle uptake. A comprehensive policy ecosystem of aligned government actions like executive orders, ZEV-first procurement policies, regulations, fleet-friendly financial incentives, charging infrastructure programs, and low- and zero-emission zones in cities are helping to overcome barriers and accelerate fleet electric vehicle uptake. Many opportunities, anecdotes, and recommendations for governments emerged from the four interactive webinar discussion topics summarized above. Several promising and inspiring efforts by non-governmental organizations, community-based organizations, industry groups, and governments are underway, and the early examples provide lessons learned and serve as models for others going forward. The sections above also summarize specific challenges, opportunities, and recommendations for governments to further promote electrification of government, corporate, commercial truck, and shared fleets.

This summary briefing is intended to capture the voices and perspectives of the experts in this space and summarize their insights and recommendations for governments. Coordinated discussions like this interactive webinar series help to disseminate lessons learned and best practices to scale up successful fleet electrification. Adopting the key principles and ideas outlined here is a good first step toward electrifying public and private fleets.

ADDITIONAL RESOURCES

There is a growing body of technical assistance, research, literature, and exemplary examples on topics related to electrification of public and private fleets. A selection of these resources that generally support the insights from the interactive webinar discussions are provided below.

ELECTRIFYING GOVERNMENT FLEETS

Title and link	Resource type	Organization(s) or author(s)	Key elements
Climate Mayors Electric Vehicle Purchasing Collaborative (2020)	Website	U.S. Climate Mayors	<ul style="list-style-type: none"> Online portal provides governments a turnkey, one-stop tool for vehicle and infrastructure procurement
Fleet procurement analysis tool (2020)	Excel-based tool	Atlas Public Policy	<ul style="list-style-type: none"> Customizable tool to assess financial and environmental impacts of vehicle fleet procurements
Municipal fleet electrification: a case study of Winter Park, FL (2020)	Case study report	Electrification Coalition	<ul style="list-style-type: none"> Overview of the EV experience, procurement method and process, and how to build on early success
Municipal fleet electrification: a case study of Ann Arbor, MI (2020)	Case study report	Electrification Coalition	<ul style="list-style-type: none"> Overview of municipal fleet assessment, electric vehicle adoption, and key supporting policies
Greening Government Fleets Best Practices (2018)	Best practice guide	Natural Resources Canada	<ul style="list-style-type: none"> Step-by-step process to help public fleet managers procure EVs in a simple and cost-effective way
AchiEVe: model policies to accelerate electric vehicle adoption (2019)	Report	Sierra Club, Plug in America	<ul style="list-style-type: none"> Identifies actions to support electrification of public vehicle fleets and provides several examples
Canada's Greening Government Strategy (2019)	Government Strategy	Government of Canada	<ul style="list-style-type: none"> Establishes federal electric vehicle fleet procurement targets
California Zero Emission Purchasing Mandate (2012)	Executive Order	Department of General Services	<ul style="list-style-type: none"> Orders state agencies to increase ZEV purchases to 10% by 2015 and 50% by 2025
Progress report for reducing or displacing the consumption of petroleum products by the state fleet (2019)	Report	Department of General Services	<ul style="list-style-type: none"> Quantifies reduction of petroleum use in the state fleet and details the underlying policies and actions
California AB-236 (2007-2008) Public resources: state and local motor vehicle fleets (2007)	Legislation	State of California	<ul style="list-style-type: none"> Directs the Department of General Services to include environmental benefits in vehicle procurement cost analysis
2019 Drive Green California (2019)	EV brochure	Department of General Services	<ul style="list-style-type: none"> Details EV models available to agencies and key info on charging infrastructure, procurement, and financing
Québec Energy Policy (2030)	Policy report	Government of Québec	<ul style="list-style-type: none"> EV-first policy, requiring government to purchase EVs if available and suitable; targets 1,000 EVs by 2020
Reducing maintenance costs with electric vehicles (2019)	NYC Fleet Newsletter	Keith T. Kerman	<ul style="list-style-type: none"> Data show NYC municipal fleet maintenance costs are dramatically less for all-electric models
H2Nodes Milestone 19 (2020)	Report	Rijkswaterstaat	<ul style="list-style-type: none"> Assessment of opportunities for hydrogen fuel cell vehicle procurement in passenger vehicles and buses

ELECTRIFYING CORPORATE FLEETS

Title and link	Resource type	Organization(s) or author(s)	Key elements
EV100 (2020)	Global initiative website	The Climate Group	<ul style="list-style-type: none"> Global initiative amongst companies committed to accelerating EV adoption
Charging ahead on electric vehicles: 2020 EV100 progress and insights report (2020)	Progress and insights report	The Climate Group	<ul style="list-style-type: none"> Corporate and leasing fleet commitments sum up to over 2.6 million ZEVs by 2030; supply is a key barrier
Geotab: electric vehicles (2020)	Website	Geotab	<ul style="list-style-type: none"> Data, analysis, case studies, blogs, and other resources on fleet electrification
Going electric: making the switch to EVs (2020)	White paper	Geotab	<ul style="list-style-type: none"> Informational materials and key considerations for fleet managers to make the switch to electric vehicles
Electric vehicle suitability assessment (2020)	EV fleet assessment tool	Geotab	<ul style="list-style-type: none"> Provides personalized data-driven recommendations for fleet EV adoption based on fleets' unique needs
Plug in fleet project (2019)	Project website	Innovative Vehicle Institute	<ul style="list-style-type: none"> Overview of project to facilitate EV integration in businesses, including key objectives and results
Companies in Québec increase EV uptake through fleet trials (2020)	Briefing	Under2 Coalition and Innovative Vehicle Institute	<ul style="list-style-type: none"> Summary of EV trials for 30 companies across Québec, including key challenges and lessons learned
Choose a plug-in vehicle that meets your needs (2020)	EV brochure, 2020 edition	Équiterre	<ul style="list-style-type: none"> Electric vehicle brochure summarizing benefits, incentives, and models available in Québec
Guide for the electrification of a fleet of vehicles (2020)	Booklet	Innovative Vehicle Institute	<ul style="list-style-type: none"> EV adoption guide including vehicle, infrastructure, cost, emission, user, and operation components
Corporate Electric Vehicle Alliance (2020)	Website	Ceres	<ul style="list-style-type: none"> Homepage to initiative supporting corporate fleet electrification
The road to fleet electrification (2020)	Report	Ceres	<ul style="list-style-type: none"> Summary of utility, regulatory, and policy actions to support electrification of commercial fleets
Business case for fleet electrification (2019)	Webinar	West Coast Electric Fleets	<ul style="list-style-type: none"> Overview of the business case for fleet electrification and data-driven business decisionmaking
Governor Cuomo announces “make-ready” program for electric vehicles (2020)	Website	New York State	<ul style="list-style-type: none"> Initiative to direct utilities to build grid infrastructure to cover 90% of costs to make-ready sites for charging

ELECTRIFYING COMMERCIAL TRUCK FLEETS

Title and link	Resource type	Organization(s) or author(s)	Key elements
Electric trucks: where they make sense (2018)	Guidance report	NACFE	<ul style="list-style-type: none"> • Overview of key challenges and opportunities for electric trucks by class. Illustrative quotes from industry
Medium-duty electric trucks: cost of ownership (2018)	Guidance report	NACFE	<ul style="list-style-type: none"> • Provides key considerations for adoption and TCO decision-making tools
Amping up: charging infrastructure for electric trucks (2019)	Guidance report	NACFE	<ul style="list-style-type: none"> • Charging infrastructure roadmap and guidance for fleets considering electric truck adoption
Viable class 7/8 electric, hybrid, and alternative fuel tractors (2019)	Guidance report	NACFE	<ul style="list-style-type: none"> • Overview of EV technology progress, trade-offs, and key considerations for class 7/8 fleets
California Advanced Clean Trucks regulation (2020)	Website	California Air Resources Board	<ul style="list-style-type: none"> • New standards that require increasing sales shares of zero-emission heavy-duty trucks starting in 2024
Multi-State medium- and heavy-duty zero emission vehicle MOU (2020)	Memorandum of Understanding	15 States and the District of Columbia	<ul style="list-style-type: none"> • Signatories agree to strive to achieve 30% zero emission medium- and heavy-duty vehicle sales by 2030 and 100% by 2050
Policy: Clean air (n.d.)	Website	City of Amsterdam	<ul style="list-style-type: none"> • From 2025, goods and delivery vehicles can only access the A10 ring if they are zero emission
DB Schenker achieves 100% electric city logistics in Oslo with new Volvo FL Electric truck (2020)	Press release	DB Schenker	<ul style="list-style-type: none"> • DB Schenker to use 11 16-ton Volvo FL electric trucks in its distribution center in Oslo

ELECTRIFYING SHARED FLEETS

Title and link	Resource type	Organization(s) or author(s)	Key elements
Electrification + Mobility + Diversity (2020)	Website	EVNoire	<ul style="list-style-type: none"> Homepage of EVNoire, national award-winning organization for best practices in e-mobility
California Clean Miles Standard (2020)	Website	California Air Resources Board	<ul style="list-style-type: none"> Regulation to develop requirements for TNCs to reduce greenhouse gas emissions and adopt cleaner cars
Rideshare drivers (2020)	Website	Forth	<ul style="list-style-type: none"> Overview of key benefits and opportunities to adopt electric vehicles in ride-hailing applications
Emissions standards for taxis (2020)	Website	Transport for London	<ul style="list-style-type: none"> From 2018, newly licensed taxis must be zero-emission capable
Emissions standards for PHVs (2020)	Website	Transport for London	<ul style="list-style-type: none"> From 2020, newly licensed private hire vehicles must be zero emission capable
Running cost calculator (n.d.)	Calculator	London EV Company	<ul style="list-style-type: none"> Cost calculator to assess potential fuel cost savings from switching to electric taxis in London
Electric vehicles reduce stress behind the wheel (2018)	Study	London EV Company	<ul style="list-style-type: none"> Taxi drivers found to be calmer, happier, and more focused when driving electric vehicles
Ride with Via: electric vehicles (2020)	Website	Via	<ul style="list-style-type: none"> Homepage with links to Via's electric vehicle projects in Amsterdam, UK, and Auckland
Electric ride-hail case study (2020)	Living case study	Atlas Public Policy	<ul style="list-style-type: none"> Overview of Forth's work to accelerate electric ride-hailing, including project successes and challenges
Netherlands electric carsharing dashboard (2020)	Website	CROW	<ul style="list-style-type: none"> 8.2% of the nearly 65,000 shared cars are electric in the Netherlands
Breakthrough in sharing electric cars in housing projects (2018)	Website	Government of the Netherlands	<ul style="list-style-type: none"> 3-year program to bring affordable and attractive electric carsharing to seven Dutch cities
Where can I request a charging point for my electric vehicle (2020)	Website	City of Amsterdam	<ul style="list-style-type: none"> Program for electric vehicle drivers without off-street parking to request charging points near their property
Emerging policy approaches to electrify ride-hailing in the United States (2019)	Study	ICCT	<ul style="list-style-type: none"> Identifies emerging state, city, and utility policy approaches to support electric ride-hailing
Plugged in (2020)	Podcast	Forth	<ul style="list-style-type: none"> Discussion series to help ride-hail drivers understand the benefits of electric vehicles and available support programs
Low-income carsharing report (2020)	Report	Forth	<ul style="list-style-type: none"> Overview of unique approaches to low-income carsharing
The future of car sharing: electric, affordable, and community-centered (2018)	Case study report	Forth	<ul style="list-style-type: none"> Summarizes low-income electric carsharing project in Portland, Oregon and provides recommendations