Helping Fleets Charge

Barriers and solutions to charging electric medium- and heavy-duty vehicles in Ontario

November 2024

Chandan Bhardwaj

PEMBINA Institute

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The Pembina Institute
#802, 322 – 11 Avenue SW
Calgary, AB T2R 0C5
403-269-3344

www.pembina.org

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The Pembina Institute recognizes that the work we steward and those we serve span the lands of many Indigenous Peoples. We respectfully acknowledge that our organization is headquartered in the traditional territories of Treaty 7, comprising the Blackfoot Confederacy (Siksika, Piikani and Kainai Nations); the Stoney Nakoda Nations (Goodstoney, Chiniki and Bearspaw First Nations); and the Tsuut'ina Nation. These lands are also home to the Otipemisiwak Métis Government (Districts 5 and 6).

These acknowledgements are part of the start of a journey of several generations. We share them in the spirit of truth, justice and reconciliation, and to contribute to a more equitable and inclusive future for all.

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Canada's medium- and heavy-duty vehicle (MHDV) sector is critical to the nation's growing economy. However, the sector's heavy reliance on fossil fuel-powered vans and trucks is costing billions of dollars to Canada annually in health care expenses due to pollution-related illnesses. Moreover, this reliance has not been economically beneficial, as Canada's MHDV manufacturing sector has shrunk in recent years, losing global market share and shedding jobs.

Transitioning to electric MHDVs presents a significant opportunity for improvement. Beyond health and environmental benefits, a transition to electric MHDVs offers higher energy efficiency benefits, fuel and maintenance cost savings, a windfall opportunity for Canada's mining industry and the potential to revitalize thousands of jobs in Canada's declining MHDV manufacturing sector.

Despite these benefits, the transition to electric MHDVs is not without challenges. A critical requirement to their widespread adoption is the timely deployment of charging infrastructure.

This report identifies the following key barriers to the deployment of electric MHDV charging infrastructure, with Ontario serving as a case study:

1. The cost of purchasing and installing charging equipment is prohibitive, particularly for small fleet operators with limited budgets.
2. The lack of familiarity with electric MHDVs leads to hesitancy in both purchasing these vehicles and investing in necessary infrastructure.
3. High electricity delivery rates weaken the business case for public charging infrastructure, as low uptake of electric road freight results in idle stations that cannot offset costs.
4. Many local electricity distribution systems require upgrades to handle increased electric MHDV-induced energy demands, but utilities are often restricted to justifying investments based on past usage rather than future needs.
5. Cumbersome approval processes, involving multiple agencies and duplicated efforts, delay the integration of electric vehicles into the grid.
6. The absence of uniformity across charging stations, leading to multiple, often incompatible charger connectors creates uncertainty among users about technology choice, and in turn delays investments in public charging stations.

To address these barriers, we recommend the following actions:

1. The Government of Ontario revive the Electric Vehicle ChargeON program (Community Stream) by at least two more years to fund the installation of public chargers in communities outside of major cities.
2. The Ontario Energy Board (OEB) require utilities to provide publicly accessible information about electric vehicles and grid connection processes to fleet and charging station operators.
3. The OEB allow utilities to use forward-looking data to make investments in electricity system upgrades. This may include updating the Distribution System Code and facilitating the use of localized, forward-looking MHDV traffic data by utilities to allow future investments.
4. The OEB allow utilities to offer reduced billing rates to public charging station operators, such as by reducing demand charges on delivery rates.
5. The OEB continue to streamline the regulatory process for public chargers and include municipalities in the Distributed Energy Resources working group, while developing a single-window approval system for installing electric MHDV charging stations.
6. The Government of Ontario, in collaboration with the Ontario Electrical Safety Authority and the Canadian Standards Association, establish uniform standards for all new charging stations.
7. Fleet owners planning to install private depot chargers and network operators intending to install public charging stations connect with their local utilities early in the planning stage to allow adequate time for electrical upgrades and demand-side management.

Addressing the barriers to charger deployment is essential to unlocking the full potential of electric MHDVs in Ontario and across Canada. By implementing the above recommendations, we believe Ontario and other jurisdictions can take important first steps in in creating a robust, efficient and accessible charging infrastructure and set the stage for a cleaner, more resilient future for the MHDV sector.

1. Introduction

Road-freight transport, dominated by medium- and heavy-duty vehicles (MHDVs), is critical for economic growth and trade in Ontario and across the broader national economy. For example, 90% of all consumer products and food items are transported by MHDVs in Ontario.[1] Medium- and heavy-duty trucks handle about two-thirds of Canada-U.S. trade by value and 75% of Ontario's exports to the U.S.[2] As an illustrative example, the municipal region of Peel, which is a key industrial hub in Ontario, is home to more than 87,000 businesses of all kinds and sees about 68,000 vehicles daily transporting goods, contributing over $125 million in taxes from goods movement in the region.[3]

The heavy reliance on fossil fuel-powered MHDVs in road freight has health and environmental costs. Despite comprising only 10% of the total number of on-road vehicles, freight vehicles are responsible for 50% of on-road emissions in Canada.[4] In the largest Canadian municipalities, transport is one of the highest-emitting economic sectors, contributing up to 40% of total emissions in some jurisdictions.[5] In Canada, air pollution contributes to more than 15,000 premature deaths a year, and pollution-induced, health-related economic costs amount to CAD$120 billion annually (or about 6% of the country's GDP).[6] Even in terms of economic output, Ontario's heavy-duty vehicle manufacturing, dominated by fossil fuel-powered vehicles, is struggling. Over the last 10 years, the industry has shrunk to one-tenth of its size in 2012.[7]

Electrification of the MHDV sector is one effective way of reducing the health and environmental costs associated with fossil-fuel-based transport. Besides health and environmental benefits, transitioning to electric MHDVs offers fuel and maintenance cost savings for fleet operators,[8] presents a windfall opportunity for Canada's mining industry (due

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[1] Ontario Trucking Association, "Freight Economy." https://ontruck.org/freight-economy/

[2] "Freight Economy."

[3] Region of Peel, "Goods movement in Peel." https://www.peelregion.ca/transportation/goods-movement/

[4] Government of Canada, "Greenhouse gas emissions from the transport sector." https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/greenhouse-gas-emissions.html#transport

[5] Municipal Energy and Emissions Database, "Toronto." https://meed.info/en/ca

[6] Health Canada, *Health Impacts of Air Pollution in Canada: Estimates of morbidity and premature mortality outcomes* (2021). https://www.canada.ca/en/health-canada/services/publications/healthy-living/health-impacts-air-pollution-2021.html

[7] Statistics Canada, "Principal statistics for manufacturing industries, by North American Industry Classification System (NAICS) (x 1,000)," November 8, 2024. https://doi.org/10.25318/1610011701-eng

[8] In the case of electric MHDVs, "fuel" costs refer to the costs of charging the vehicle. Electric MHDVs are more energy efficient compared to diesel vehicles. As a result, the overall spend on refuelling or charging the vehicle is up to

to increased lithium and critical mineral demand for electric vehicle [EV] batteries), and offers potential to restore and create thousands of jobs in Canada's declining MHDV manufacturing sector. We discuss these benefits in greater detail and strategies for increasing the adoption of electric (and other zero-emission) MHDVs in our report, *Canada's Pathway to Net-Zero for Medium- and Heavy-Duty Trucks and Buses*.[9] Recognizing the benefits of zero-emission MHDVs, the federal government has set targets to have 35% of total MHDV sales be zero-emission vehicles by 2030, and to achieve 100% zero-emission MHDV sales by 2040 based on feasibility.[10]

The transition to electric MHDVs, while desirable, comes with some challenges. Previous work by the Pembina Institute have identified key challenges to widespread deployment of medium- and heavy-duty, zero-emission vehicles in Canada.[11] One of the primary challenges, and a critical requirement, is the timely deployment of charging infrastructure. According to a survey by Natural Resources Canada, many commercial MHDV fleet operators cite the slow deployment of charging infrastructure as a primary reason for the low uptake of electric MHDVs in Ontario and other regions in Canada. [12]

In this report, using Ontario as a case study, we identify the regulatory barriers to the rapid deployment of electric MHDV charging infrastructure. Drawing lessons from other jurisdictions, we also recommend policies and initiatives that Ontario can implement to accelerate the deployment of charging infrastructure for MHDV fleet operators.

Our analysis included a literature review of best practices from across jurisdictions and engagement of experts through focus groups with stakeholders, including electric utilities, MHDV fleet operators, charging service providers, municipalities and environmental non-government organizations. Ontario was selected as a case study due to its size and strategic relevance. It represents nearly 40% of Canada's population and vehicle numbers, nearly 100% of light-duty vehicle production, and 10% of MHDV production. Moreover, Ontario's low-carbon

50% lower compared to diesel vehicles. Also, electric MHDVs have fewer moving parts, hence typically require less frequent maintenance checks compared to diesel vehicles.

[9] Carolyn Kim, Adam Thorn, Chandan Bhardwaj and Sarah McBain, Canada's Pathway to Net-Zero for Medium- and Heavy-Duty Trucks and Buses (Pembina Institute, 2023). https://www.pembina.org/pub/ZeroX2040-pathway-net-zero-mhd-trucks-buses

[10] Government of Canada, "2030 Emissions Reduction Plan." https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/climate-plan-overview/emissions-reduction-2030/sector-overview.html#sector6

[11] Colton Kasteel, Sarah McBain and Chandan Bhardwaj, *Laying the Groundwork: Exploring the challenges and opportunities to transition to zero-emission medium- and heavy-duty vehicles* (Pembina Institute, 2022). https://www.pembina.org/reports/laying-the-groundwork-mhdvs.pdf

[12] Abacus Data, *Medium and Heavy-Duty Vehicles (MHDV) Fleet Awareness, Knowledge and Attitudes Related to Zero-Emission Vehicles (ZEVs) Survey*, prepared for Natural Resources Canada (2023). https://publications.gc.ca/collections/collection_2023/rncan-nrcan/M4-234-2023-eng.pdf

electricity grid makes it an ideal jurisdiction for the rapid uptake of electric MHDVs. The province's complex electricity regulatory structure, with multiple players, also offers valuable insights on the challenges of deploying electric MHDV infrastructure.

2. Current situation

2.1 Ontario MHDVs in numbers

Statistics Canada defines medium-duty vehicles (MDVs) as vehicles with a gross vehicle weight rating (GVWR) between 4,536 kg and 11,793 kg and includes GVWR classes 3, 4, 5 and 6.[13] Heavy-duty vehicles (HDVs) are vehicles with a GVWR greater than 11,794 kg and includes GVWR classes 7 and 8.

As per this definition, there are about 150,000 MDVs in Ontario (Table 1). Over the last several years, the number of MDVs has typically grown at an annual rate of 5%, increasing from 120,000 in 2017 to around 150,000 in 2022. Among the latter, 58,000 operate on gasoline and 92,000 on diesel. Ontario also has over 170,000 HDVs, most of which are also diesel-fuelled.[14]

Table 1. Ontario vehicle registration data

Vehicle type	All fuels	Gasoline	Diesel	BEV	Hybrid	PHEV	Other
Total road motor vehicle registrations	9,429,566	8,710,523	485,465	57,835	144,910	29,464	1,369
Buses	22,680	x	x	x	x	x	x
Motorcycles and mopeds	242,349	x	x	x	x	x	x
Vehicles weighing less than 4,535 kg							
Total	8,833,401	8,397,728	203,340	57,782	144,909	29,464	178
Passenger cars	3,444,160	3,279,485	43,069	34,994	69,566	17,033	13
Multi-purpose vehicles	3,491,477	3,350,849	43,115	22,468	64,570	10,472	3
Pickup trucks	1,219,595	1,118,871	95,972	251	4,488	0	13
Vans	677,249	647,727	21,078	69	6,285	1,959	131

[13] Statistics Canada, "Vehicle registrations, by type of vehicle and fuel type," November 2, 2023. https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2310030801&pickMembers%5B0%5D=1.7&cubeTimeFrame.startYear=2020&cubeTimeFrame.endYear=2021&referencePeriods=20200101%2C20210101

[14] "Vehicle registrations, by type of vehicle and fuel type."

Vehicle type	All fuels	Gasoline	Diesel	BEV	Hybrid	PHEV	Other
Other vehicles[15]	920	796	106	0	0	0	18
Vehicles weighing 4,536 to 11,793 kg							
Total	158,254	62,079	96,152	0	0	0	23
Vehicles weighing more than 11,794 kg							
Total	172,882	x	x	x	x	x	x

Data source: Statistics Canada[16]

Our analysis of real-world MHDV travel behaviour using telematics data reveals that 95% of MDVs in Ontario have an average daily driving distance of less than 160 km, which is within the typical range of electric MHDVs available on the market today. Additionally, about half of all MDVs return to base at the end of the day. With declining battery costs and lower fuel costs, electric MDVs are approaching cost parity with diesel MDVs in several use cases.[17] Combining these factors suggests that up to 40% of existing MDVs in Ontario could be electrifiable by 2027.

Despite this potential, the uptake of electric MHDVs remains low. For example, averaged across all Canadian provinces, only 5% of fleet operators currently have EVs in their fleet,[18] and in Ontario, this figure is even lower at only 1%.[19] As a result, by 2021, Canada had only about 200 electric (and other zero-emission) MHDV sales a year.[20] As of 2022, the uptake of electric MHDVs in Canada was less than 2%.[21] Ontario-specific data reveal that as of December 2023, there were 121,948 electric vehicles in the province, including 87,655 battery electric vehicles and 34,283 plug-in hybrid electric

[15] This excludes mopeds and bikes, which are broken out separately above.

[16] "Vehicle registrations, by type of vehicle and fuel type."

[17] Clean Energy Canada and CALSTART, *Zero-Emission Medium- and Heavy-Duty Vehicle (ZEMHDV): Canadian Model Availability Catalogue* (2024). https://cleanenergycanada.org/wp-content/uploads/2024/05/ZEMHDV-AvailabilityCatalogue-V7-Online-1.pdf

[18] *Medium and Heavy-Duty Vehicles (MHDV) Fleet Awareness, Knowledge and Attitudes Related to Zero-Emission Vehicles (ZEVs) Survey*.

[19] *Medium and Heavy-Duty Vehicles (MHDV) Fleet Awareness, Knowledge and Attitudes Related to Zero-Emission Vehicles (ZEVs) Survey*.

[20] Claire Buysse, *Zero-emission bus and truck market in the United States and Canada: A 2021 update* (International Council for Clean Transportation, 2022), 3. https://theicct.org/wp-content/uploads/2022/09/update-ze-truck-bus-market-us-can-sept22.pdf

[21] Yidan Chu and Hongyang Cui, *Annual update on the global transition to electric vehicles: 2022* (International Council for Clean Transportation, 2023). https://theicct.org/wp-content/uploads/2023/06/Global-EV-sales-2022_FINAL.pdf

vehicles.[22] However, these were mostly cars and other light-duty electric vehicles rather than electric MHDVs.

Currently, there are approximately 3,550 public EV charging stations in Ontario, with roughly 9,650 Level 2 and Level 3 (high-powered) charging ports.[23] Most public charging stations in Ontario are funded by either the federal or provincial government. They are also predominately owned and operated by private charging station network operators, such as Tesla (~10%), FLO (~3%), Aura (<1%), ChargePoint (<1%), EcoCharge (<1%), Electrify Canada (<1%), Parkland (<1%), Petro Canada (<1%), Shell Recharge (<1%) and SWTCH Energy (<1%), among others.[24] Some public charging stations are operated by provincial agencies. For example, the Ivy Charging Network is a joint venture between utilities Ontario Power Generation and Hydro One that operates about 180 chargers. The Toronto Parking Authority, the largest municipally owned commercial parking operator in North America, similarly operates about 300 chargers.

Among the public charging stations, the high-powered Level 3 fast chargers are the most relevant for electric MHDVs due to their higher electricity demands. Yet, Level 3 chargers currently represent only a small portion of the total charging infrastructure (1,500 out of a total 9,650 ports).[25] Our calculations show that to comply with the federal government's target to have 35% of new MHDV sales be zero-emission vehicles by 2030, the number of Level 3 public chargers in Ontario will need to increase at least fivefold to around 8,000 to 10,000 ports by 2030. The Auditor General of Canada has also highlighted a substantial gap between the current number of charging ports and the projected needs by 2030 and beyond across Canada.[26]

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[22] Government of Ontario, "Electric Vehicles in Ontario – By Forward Sortation Area." https://data.ontario.ca/dataset/electric-vehicles-in-ontario-by-forward-sortation-area

[23] Government of Ontario, "Ontario Making Electric Vehicle Chargers More Accessible," media release, July 3, 2024. https://news.ontario.ca/en/release/1004789/ontario-making-electric-vehicle-chargers-more-accessible

[24] Emma Jarratt and Mehanaz Yakub, "2024 EV charging networks report: Canada's public charger installations up 33 per cent in 12 months," *Electric Autonomy Canada*, March 7, 2024. https://electricautonomy.ca/news/2024-03-07/2024-canada-ev-charging-networks-report/

[25] Government of Canada, "Zero-emission vehicle charging stations." https://tc.canada.ca/en/road-transportation/innovative-technologies/zero-emission-vehicles/zero-emission-vehicle-charging-stations#/analyze?country=CA&region=CA-ON&tab=fuel&fuel=ELEC&ev_levels=2

[26] Office of the Auditor General of Canada, *Reports of the Commissioner of the Environment and Sustainable Development to the Parliament of Canada: The Zero Emission Vehicle Infrastructure Program—Natural Resources Canada* (2023), 10. https://www.oag-bvg.gc.ca/internet/docs/parl_cesd_202311_08_e.pdf

2.2 Key players in the Ontario electricity system

As noted in the Introduction, the absence of charging infrastructure is a major barrier to the uptake of electric MHDVs. Deploying EV charging infrastructure requires the direct and active involvement of the key players in the electricity system, identified below.

2.2.1 Government of Ontario

The Government of Ontario, through the Ministry of Energy and Electrification, sets the overall policy for the energy sector.[27]

2.2.2 Ontario Energy Board

The Ontario Energy Board (OEB) is an independent government agency that regulates Ontario's energy sector and ensures that electricity companies follow the rules. The OEB (i) sets the delivery rates energy utilities can charge consumers, (ii) approves new electricity transmission lines and upgrades, (iii) establishes and enforces the procedures for electricity companies operating in Ontario, and (iv) provides information and tools to help increase consumer awareness. [28]

2.2.3 Independent Electricity System Operator

The Independent Electricity System Operator (IESO) is the Crown corporation responsible for operating the electricity market in Ontario. Its activities involve

- ensuring that there is enough power to meet the province's energy needs in real time by balancing the supply of and demand for electricity in Ontario and directing its flow across the province's transmission lines,
- planning for the province's medium- and long-term energy needs and securing clean sources of supply to meet those needs,
- overseeing the electricity wholesale market, and
- coordinating province-wide conservation efforts.[29]

[27] Ontario Energy Board, "Overview of energy sector." https://www.oeb.ca/ontarios-energy-sector/overview-energy-sector

[28] Ontario Energy Board, "What we do." https://www.oeb.ca/about-oeb/what-we-do

[29] Government of Ontario, "Independent Electricity System Operator (IESO)." https://www.pas.gov.on.ca/Home/Agency/218

2.2.4 Local distribution companies

Local distribution companies (also known as distributors or local utilities) own and operate the last-mile, low-voltage lines and electrical grid system and are responsible for billing the electricity to homeowners and commercial enterprises based on electricity rates set by the OEB. The vast majority (about 95%) of Ontarians choose to buy electricity from their local utility. Sixty local distribution companies currently operate across Ontario, and they are responsible for installing and maintaining power lines and poles.[30] The five largest utilities in Ontario are Hydro One, Alectra Utilities, Elexicon Energy, Hydro Ottawa and Toronto Hydro.[31]

2.2.5 Ontario Electrical Safety Authority

The Electrical Safety Authority (ESA) regulates and promotes electrical safety in Ontario. Before an electrical product or piece of electrical equipment is used, sold, displayed or advertised for sale in Ontario, it must be approved by an accredited certification or evaluation agency. The ESA (and other organizations listed on the ESA website[32]) approve and certify all electrical equipment in Ontario. The ESA also contributes to the review and revision of the Canadian Electrical Code, a process that is led by the Canadian Standards Association. After reviewing the Canadian Electrical Code, the provincial government adopts it with Ontario-specific amendments, calling it the Ontario Electrical Safety Code. The Ontario code describes in detail the standards for electrical installations, products and equipment in Ontario, including those for EV charging stations.[33]

2.2.6 Role of key players in installing charging infrastructure

Each of the above organizations has a role to play in installing an EV charging station. The Government of Ontario's ministries of Energy and Transportation implement policies such as subsidies for charging stations to accelerate their deployment. Guided by

[30] Electricity Distributor's Association, "Facts About Ontario's Local Hydro Utilities." https://www.eda-on.ca/FOR-CONSUMERS/Ontarios-Local-Hydro-Utilities

[31] Energy Rates.ca, "Ontario's Local Hydro Utilities or Local Distribution Companies (LDC)." https://energyrates.ca/ontario/ontarios-local-hydro-utilities-ldc/

[32] Electrical Safety Authority, "Recognized Approval Marks." https://esasafe.com/electrical-products/recognized-certification-marks/

[33] Electrical Safety Authority, *Bulletin 86-1-5 Electric vehicle charging systems* (2023), https://esasafe.com/assets/files/esasafe/pdf/Electrical_Safety_Products/Bulletins/86-01-5.pdf

the government, the ESA establishes rules and safety standards for installing EV chargers. The OEB sets the electricity delivery rates that will be charged to users and owners of the EV charging stations. Local distribution companies are responsible for approving the connection of charging stations to the grid, charging consumers and station operators for the electricity rates (using the rates set by the OEB), and ensuring regular upgrades to the local distribution grid to accommodate the additional electricity demand.

3. Steps to deploying charging infrastructure

To better understand the regulatory barriers to deploying charging infrastructure, it is helpful to review the steps involved in the deployment process for electric MHDVs, as individual barriers (discussed later in section 4) are associated with each step. The steps listed below have significant overlap and follow no particular order. The intention here is to highlight the key ideas station owners should keep in mind when deploying the charging station. But before we delve into the steps, it is important to understand the different types of charging stations available, explained in Box 1.

Box 1: Types of charging stations — private depot and public charging

MHDV fleets can charge at either private depot chargers or public charging stations.

Fleet operators may install private chargers at their home depot. Private chargers typically have lower charging power and slowly charge vehicles overnight. Overnight charging at the fleet's own depot is usually considered the most economical and least constraining option for return-to-base MHDV segments. Lower charging power is usually associated with lower costs, and the flexibility of depot charging allows for managed charging techniques such as smart charging. Natural Resources Canada estimates that one private charger will be needed for every two electric MHDVs over the long term. This means that more than 60,000 private depot chargers will be needed in Ontario by 2030 and 175,000 chargers by 2035.[34]

Other MHDV segments, like long-haul trucks, do not return to a depot daily and need to rely on public charging stations. Even fleets that mostly charge at a private depot may occasionally need access to public charging. Public charging stations are installed and operated by charging station operators (e.g., FLO, SWITCH). Public charging stations typically offer multiple higher-power Level 3+ chargers (100kW or higher) designed for larger vehicles, allowing MHDVs to recharge within minutes. Natural Resources Canada estimates that Ontario will need 18,000 public chargers for electric MHDVs by 2030, rising to 56,000 chargers by 2035.[35]

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[34] Natural Resources Canada, "Electric Vehicle Charging infrastructure for Canada: Updated forecasts of vehicle charging needs, grid impacts and costs for all vehicle segments," Table 37: MHDV BEV to port ratios under each scenario, February 2024. https://natural-resources.canada.ca/energy-efficiency/transportation-alternative-fuels/resource-library/electric-vehicle-charging-infrastructure-for-canada/25756

[35] "Electric Vehicle Charging infrastructure for Canada," Table 44: MHDV public port count by region and charger type (Policy Reference Scenario).

The following steps apply to both private depot chargers and public charging stations. The key difference is that fleet operators must make investment decisions for private depot chargers, whereas the charging network provider handles the investment decisions for public charging stations. Since fleet operators also own and operate vehicles, they have an additional step of considering the total cost of ownership of an electric MHDV (Box 2).

Step 1: Understand how an EV operates and connect with the local utility

Electric MHDVs can lower maintenance and fuel costs by up to 50% compared to diesel-fuelled vehicles.[36] To fully maximize the benefits of owning an EV, it is important to become familiar with how an electric MHDV operates. An electric MHDV runs on electricity instead of diesel or gasoline. It has an electric motor in place of an internal combustion engine and a battery instead of a diesel or gasoline tank. The rest of the vehicle is largely similar to an internal combustion engine vehicle. The battery stores the energy needed to run the vehicle and can be charged using electric chargers, which can be installed at publicly accessible charging stations or privately at the fleet operator's home depot. Transitioning to electric MHDVs will require charging station owners (either fleet operators for private chargers or network operators for public chargers) to consider factors beyond truck fuelling such as electricity delivery rates, infrastructure upgrades and charging time. It is important that charging station owners (both fleet operators and network operators) reach out to their local utility to better understand the dynamics of charging an electric MHDV.

Step 2: Estimate and communicate charging needs to the local utility

Electric MHDVs require a significant amount of electricity to charge. For example, over a year a large heavy-duty long-haul electric truck can consume on average to the same amount of energy as about 20 homes. To accommodate such high electricity demand, upgrades to local distribution networks may be necessary. The extent of these upgrades will depend on a variety of factors, including (i) the number of electric MHDVs charged simultaneously, (ii) the time required for charging, and (iii) the power level desired by the fleet operator. Each of these factors is in turn influenced by the vehicles' daily use case, such as daily distance travelled and the duration of stops between travels, which affect the charging profile (i.e., time of day when

[36] Andrew Burnham et al., *Comprehensive Total Cost of Ownership Quantification for Vehicles with Different Size Classes and Powertrains* (Argonne National Laboratory, 2021), 150, 151. https://publications.anl.gov/anlpubs/2021/05/167399.pdf

vehicle is charged). For instance, a school bus fleet operator with vehicles travelling a few kilometres per day and remaining idle for extended periods will have low charging needs and typically won't require extensive infrastructure upgrades to satisfy the fleet's charging needs. In contrast, a long-haul truck fleet operator with vehicles running most of the day and taking short intermittent stops will require fast, high-power charging during these brief stops, necessitating more significant upgrades. Given the time required for upgrades, it is important for fleet operators (deploying private depot chargers) and charging network operators (deploying public charging stations) to collaborate with local distribution companies early to evaluate the station's charging needs.

Step 3: Assess the total cost of installing a charger

An important consideration is the cost of installing, owning and operating a charger.[37] Table 2 presents the costs for common charger types based on power output required.[38] One charging station usually has multiple charging ports (or chargers), allowing several vehicles to be charged simultaneously. As such, the cost of installing a charging station is spread over many vehicles. Currently, the federal government offers a subsidy of up to 50% on charger costs, which can further enhance the economic feasibility of installing a charging station.[39] The remaining 50% of the installation cost is covered either by the fleet operator (private depot) or the network operator (public station).

Table 2. Common charger types and costs

Charger type	Charger cost
Overnight, Level 2 (5–20 kW)	$5,000 to $20,000
Overnight, Level 3 (50–100 kW)	$50,000 to $75,000
Level 3+ (150–350 kW)	$100,000 to $250,000
Ultra-fast, (750 kW to 3 MW)	$1,000,000

Source: Government of Canada[40]

[37] Cost of charging equipment is typically included in vehicle purchase costs.

[38] For fleet operators installing a private depot charger, the charger costs should be seen within the broader context of the total cost of owning the vehicle. We discuss the idea of total cost of ownership in Box 2.

[39] Government of Canada, "Zero Emission Vehicle Infrastructure Program." https://natural-resources.canada.ca/energy-efficiency/transportation-alternative-fuels/zero-emission-vehicle-infrastructure-program/21876

[40] "Electric Vehicle Charging Infrastructure for Canada."

Box 2: Total cost of ownership of an electric MHDV

For fleet operators, one of the criteria for going electric is the total cost of owning an electric MHDV. Currently, electric MHDVs have higher upfront costs compared to diesel-fuelled conventional internal combustion engine vehicles. However, significantly lower fuel (or charging) costs, lower maintenance costs and government incentives make the total cost of ownership (TCO) of an electric MHDV comparable to that of a diesel vehicle.

Many electric MHDVs are market-ready based on their low TCO. Evidence from six major European cities demonstrates that electric cargo vans can start to reach TCO parity with diesel vehicles by 2025.[41] Similarly, a study by the Argonne National Laboratory estimates that an electric class 4 delivery truck, with a range of 150 miles (240 km), will have a lower TCO (US$671,000) compared to a diesel truck (US$690,000) by 2025 in the U.S.[42] A recent National Renewable Energy Laboratory study corroborates this finding, suggesting that electric MHDVs in the U.S. will reach cost parity with diesel vehicles in both the light-medium-duty (~class 4), and medium-duty (~class 6) segments by mid-decade.[43] Another U.S. study by the Environmental Defense Fund finds that the TCO per mile of a class 5 electric delivery truck will be US$0.68/mile (US$0.42/km), which is 30% lower than a class 5 diesel delivery truck costing US$1.08/mile (US$0.67/km), by 2027.[44]

Figure 1 illustrates the lower TCO for an electric class 4 delivery truck for the model year 2025 versus an internal combustion engine (diesel) truck.

It is important for fleet and truck owners to consider the TCO of electric MHDVs, including charger costs, rather than just the upfront vehicle purchase price, when making a vehicle purchase.

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[41] Hussein Basma, Felipe Rodríguez, Julia Hildermeier, and Andreas Jahn, *Electrifying Last-Mile Delivery: A total cost of ownership comparison of battery-electric and diesel trucks in Europe* (ICCT, 2022), i. https://theicct.org/publication/tco-battery-diesel-delivery-trucks-jun2022/

[42] *Comprehensive Total Cost of Ownership Quantification for Vehicles with Different Size Classes and Powertrains*, 150, 151.

[43] Catherine Ledna, Matteo Muratori, Arthur Yip, Paige Jadun and Chris Hoehne, *Decarbonizing Medium- & Heavy-Duty On-Road Vehicles* (National Renewable Energy Laboratory, 2022), 20. https://www.nrel.gov/docs/fy22osti/82081.pdf

[44] Vishnu Nair, Sawyer Stone, Gary Rogers and Sajit Pillai, *Medium and Heavy-Duty Electrification Costs for MY 2027–2030* (Environmental Defense Fund, 2022), 104. https://blogs.edf.org/climate411/wp-content/blogs.dir/7/files/2022/02/EDF-MDHD-Electrification-v1.6_20220209.pdf

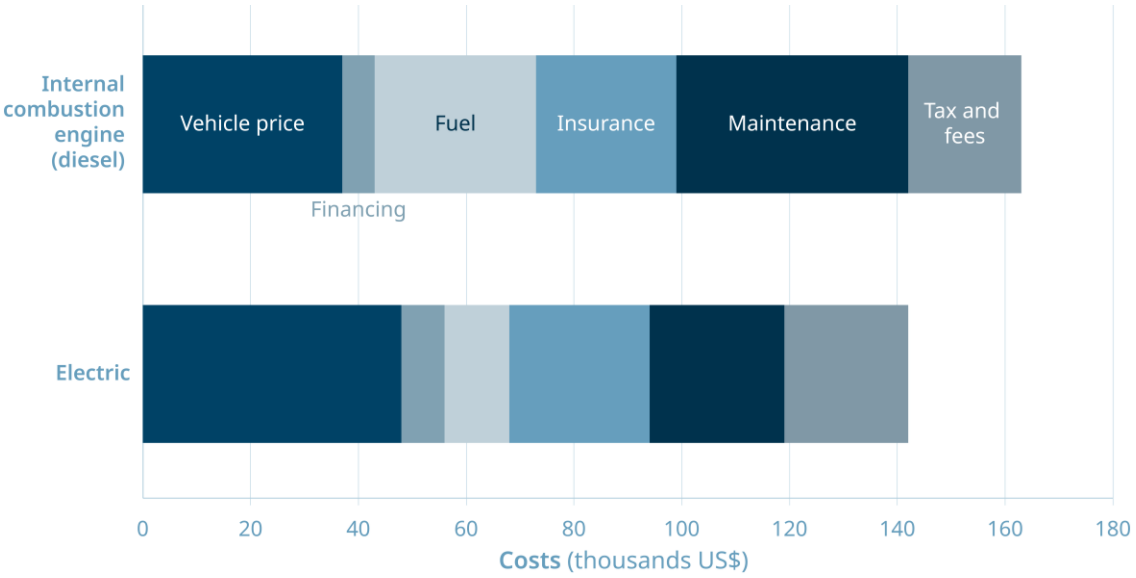

Figure 1. Total lifetime cost of ownership of a class 4 delivery truck, model year 2025.

Note: Vehicle price includes the cost of charger.

Data source: Argonne National Laboratory[45]

Step 4: Learn about electricity delivery rates to minimize costs

Electricity is needed to charge the batteries that power electric MHDVs. Hence, electricity delivery rates (the per-unit cost of drawing electricity from the utility) are an important consideration in operating an electric MHDV charger.

Unlike gasoline and diesel prices, which are determined by the market and influenced by global factors, electricity delivery rates are set by local electric utilities under the direction of the OEB (and similar regulators in other provinces). Local distribution companies vary delivery rates based on the time of use — rates are higher during peak hours (evenings and mornings), when electricity demand is at its highest, and lower during off-peak hours (midnight to early morning). By working with local utilities to identify the best offers on electricity rates and managing their charging times, fleet operators and public charging station operators can achieve significant savings on their input costs.

[45] Andrew Burnham et al., *Comprehensive Total Cost of Ownership Quantification for Vehicles with Different Size Classes and Powertrains* (Argonne National Laboratory, 2021), 146. https://publications.anl.gov/anlpubs/2021/05/167399.pdf

Step 5: Choose type of charging equipment

Fleet operators and charging station providers need to select chargers with the technical specifications to meet the fleet's operating requirements.

The first consideration when procuring charging equipment is the power output of the charger. If vehicles are stationed overnight for long hours, slow, low-power overnight chargers can be suitable. In contrast, frequent and fast intermittent charging requires high power-output chargers, which are typically more expensive. Table 3 lists some common charger types and their power output.

Another consideration is charger interoperability, ensuring that chargers are compatible with multiple vehicle models and future vehicle upgrades. Currently, multiple charging standards, connector types, payment methods and protocols for communication between vehicles and charging stations exist because there are no regulations requiring uniform standards across all charging stations. Fleet operators must choose their charger types wisely to ensure operability if they switch EV vendors or charging station service providers.

Table 3. Common charger types and standards

Charger type	Power output	Charging standard	Typical charging time for a Class 6 truck (battery capacity: 25 kWh)
Overnight, Level 2	5–20 kW	J1772	8 hours
Overnight, Level 3	50–100 kW	Combined Charging System or CHAdeMO	3 hours
Fast, Level 3+	150–350 kW	Combined Charging System or CHAdeMO	0.5–1 hour
Ultra-fast	750 kW to 3 MW	Megawatt Charging System	0.5 hour

Step 6: Get regulatory approvals

Installing charging infrastructure requires regulatory approvals from multiple agencies.

Municipalities need to be consulted and approval obtained for the siting of the infrastructure project. The ESA needs to approve the technical specifications of the charging equipment to ensure that the equipment is safe and does not pose a fire or electrical hazard. Local distribution companies need to be consulted, and approvals obtained for connecting the charging station to the electricity grid.

Engaging with all the relevant agencies early will help operators to avoid unnecessary delays due to regulatory pitfalls and to make the transition to electric MHDVs cost effective. Many large fleet operators report that approval processes that vary between local distribution companies and municipalities are a significant challenge when electrifying.

4. Barriers to deploying charging infrastructure

To drive rapid adoption of MHDVs, a robust network of charging stations is essential. However, several common barriers need to be addressed, including those presented below.

4.1 Lack of awareness

Lack of information and knowledge is a key barrier to the uptake of electric MHDVs and associated charging infrastructure. As noted in the previous section, electric MHDVs are fast approaching TCO parity with diesel vehicles. However, despite improving market readiness and the gradual increase in the availability of multiple electric MHDV models — particularly in the medium-duty vehicle and bus segments — many fleet operators in Canada are unaware of how electric MHDVs operate. A recent survey by Natural Resources Canada revealed that 40% of Canadian fleets are not familiar with how an electric vehicle is "fuelled."[46] This knowledge gap (or unfamiliarity with the technology) has also emerged in our interactions with Canadian fleets and is corroborated by other surveys. For example, in a North American survey by the International Council for Clean Transportation 44% of small fleet operators and 60% of large fleet operators (those with more than 25 vehicles) indicated "unfamiliarity with technology" as a key impediment to switching to electric MHDVs.[47] This hesitancy extends to infrastructure installation, effectively creating a barrier to charger deployment.

The knowledge gap is compounded by the absence of publicly available information on the basics of electric MHDVs, including market availability, operating requirements, and how to connect electric fleets to the grid. In a survey commissioned by the OEB in November 2022, 29 out of 35 local distribution companies, representing 80% of consumers in Ontario, reported that they did not have a public guide providing information on the steps for connecting EV chargers to the electricity grid.[48] Limited fleet awareness about electric MHDVs and chargers combined with a lack of available information creates a significant barrier to the uptake of EVs and the necessary charging infrastructure.

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[46] *Medium and Heavy-Duty Vehicles (MHDV) Fleet Awareness, Knowledge and Attitudes Related to Zero-Emission Vehicles (ZEVs) Survey*.

[47] Jerold Brito, *No fleet left behind: Barriers and opportunities for small fleet zero-emission trucking*, Working Paper 2022-31 (International Council for Clean Transportation, 2022). https://theicct.org/wp-content/uploads/2022/10/small-fleet-ze-trucking-oct22.pdf

[48] Guidehouse Canada, Ltd., *Facilitating the Integration of Electric Vehicles in Ontario: Survey of Local Distribution Companies and EV Charging Service Providers*, prepared for the Ontario Energy Board (2023). https://www.rds.oeb.ca/CMWebDrawer/Record/776475/File/document

4.2 Expenses related to electric chargers

Installation costs for on-site chargers vary widely, ranging from $65,000 for an overnight charger (with a power output of 50 kW, sufficient to charge one truck overnight) to $1 million for fast chargers (1 MW power output, capable of charging multiple vehicles).[49] Nearly half (40%) of Canada-based trucking fleets operate a single truck, and 90% operate fewer than 10 trucks.[50] In our interactions with stakeholders, including at the organized by the Pembina Institute in May 2024, Ontario-based fleet owners and operators identified the high cost of purchasing and installing chargers as the single largest roadblock to the robust uptake of electric commercial vehicles. Private charging stations are too expensive to construct for smaller operators — those with as few as one or two MHDVs — who often run on lean budgets and narrow profit margins.

Due to the high cost of chargers and the fact that many fleets rely primarily on street parking, small fleets will likely depend on public charging infrastructure to operate electric trucks. This is backed by a 2022 survey conducted by Natural Resources Canada, in which 79% of fleets across Canada cited the lack of public charging infrastructure as a key reason for not considering EVs.[51] However, as noted earlier, the number of public charging stations for electric MHDVs remains low, which in turn slows uptake of electric MHDVs. One contributing factor to the slow deployment of public charging stations is unfavourable electricity rates, which is discussed next.

4.3 Unfavourable electricity rates

According to the 2022 Natural Resources Canada survey, 94% of fleet operators identified fuel costs — or charging costs for EVs — as an important factor in vehicle purchase decisions.[52] High electricity rates, like high gasoline or diesel prices, influence purchase decisions, potentially slowing, or even preventing, rapid adoption of electric MHDVs and the deployment of chargers.

For many small fleet operators who own one or two trucks and often park on the street, installing private chargers at home is difficult. These operators rely entirely on public charging

[49] Bernard Marie Rajon, Alexander Tankou, Hongyang Cui, and Pierre-Louis Ragon, "Charging solutions for battery electric trucks," *International Council for Clean Transportation*, December 2022. https://theicct.org/publication/charging-infrastructure-trucks-zeva-dec22/

[50] Brito, Jerold. *No fleet left behind: Barriers and opportunities for small fleet zero-emission trucking*. Working Paper 2022-31 (2022). International Council for Clean Transportation. https://theicct.org/wp-content/uploads/2022/10/small-fleet-ze-trucking-oct22.pdf

[51] *Medium and Heavy-Duty Vehicles (MHDV) Fleet Awareness, Knowledge and Attitudes Related to Zero-Emission Vehicles (ZEVs) Survey*.

[52] *Medium and Heavy-Duty Vehicles (MHDV) Fleet Awareness, Knowledge and Attitudes Related to Zero-Emission Vehicles (ZEVs) Survey*.

stations. However, public charging station operators argue that the business case for installing more public infrastructure is weak.[53] The low adoption of electric road freight means charging stations sit idle much of the time and fail to generate enough revenue to offset electricity costs. Consequently, charging station operators are hesitant to invest in additional chargers.

Unfavourable electricity delivery rates are a key reason for the weak business case for public charging stations, especially given the low utilization rates. With charging stations remaining underused for most of the day due to low demand, the revenue earned does not fully cover the electricity input costs. Electricity rates are based on customer energy consumption at peak demand — i.e., the maximum power used for a brief period over 24 hours. Presently, because of the formula used to determine electricity rates, public charging station owners are charged high peak demand rates (also known as demand charges), even if their total electrical power consumption is low. This makes it uneconomical to operate public charging stations in cases of low utilization.

During our stakeholder meetings, fleet operators and EV charging service providers consistently cited electricity rates as a key factor undermining the business case for EVs and private charging infrastructure. A report commissioned by the OEB echoed this, with respondents in a 2022 survey "unanimously agree[ing] they were concerned with the impact of demand charges on future EV supply equipment deployment."[54]

4.4 Complex regulatory process

With procedures varying across utilities and lengthy timelines for utility and other agency approvals, the complexity of the regulatory process is a common concern among stakeholders, including service providers.[55] A recent Electricity Canada study highlighted that the approvals processes are overly cumbersome, often involving duplicated efforts and numerous rounds of review by various agencies.[56]

Selecting a location for siting an EV charger involves addressing potential real estate issues, particularly when the land is owned by a third party. The latter requires negotiating lease

[53] Chandan Bhardwaj, "Charging Solutions for Electric Fleets," *Pembina Institute*, July 18, 2024. https://www.pembina.org/blog/charging-solutions-electric-fleets

[54] Ontario Energy Board, "Report on EV Survey," February 1, 2023. https://engagewithus.oeb.ca/ev-integration/news_feed/report-on-ev-survey

[55] Chris Nelder and Emily Rogers. *Reducing EV charging infrastructure costs* (RMI, 2019). https://rmi.org/insight/reducing-ev-charging-infrastructure-costs/

[56] Electricity Canada, "Build Things Faster," May 2023. https://www.electricity.ca/news/time-to-get-building-a-cleaner-reliable-and-affordable-electricity-grid/

agreements, along with navigating the complex licensing and permitting processes, which vary significantly by province and city.

Additionally, EV charging stations must comply with both the Accessible Canada Act and the Electricity and Gas Inspection Act.

Negotiating an electrical utility access agreement with the provincial utility commission or corresponding authority is also necessary to connect to the power grid.[57] In a recent interview with Electric Autonomy, the CEO of the OEB noted that "in Ontario alone, there are about 60 local distribution companies. This translates into 60 different engineering standards, work methods, costs and timelines for providing power to electric MHDVs. It creates a complex energy sector."[58] Acknowledging this complexity, the Ontario Minister of Energy has directed the OEB to take steps to reduce the number and cost of regulatory burdens by March 30, 2026.[59]

4.5 Lack of charging equipment standardization

Currently, a variety of electric MHDV charger types and charging standards are in use across North America.[60] Interoperability is challenging because standardization across charging connectors, payment methods and communication protocols at charging stations is still evolving. For example, different charging network providers in Canada continue to use different charging connectors.[61] According to the Canadian Standards Association, the lack of uniform standards for charging equipment raises concerns about future-proofing for fleet operators, who want the flexibility to change EVs, charging stations and network providers.[62] In an August 2023 webinar organized by the Pembina Institute, Canadian utilities identified the lack of uniform charger standard as a significant barrier. This concern is echoed in other studies. A 2017 study commissioned by Natural Resources Canada highlighted the lack of standards for EV hardware

[57] Frank Robinson, Jeremy Barretto, A. Chandimal Nicholas and Dakota Bundy, "Plugged In: An Overview of Legal Issues with Respect to Canada's Transition to Electric Vehicles," *Cassels*, February 14, 2024, https://cassels.com/insights/plugged-in-an-overview-of-legal-issues-with-respect-to-canadas-transition-to-electric-vehicles/

[58] Mehanaz Yakub, "Utilities need to move in the direction of proactive grid management; EVs can help," *Electric Autonomy Canada*, June 8, 2023. https://electricautonomy.ca/2023/06/08/utilities-grid-management-mdhdv/

[59] Ontario Minister of Energy, letter of direction to the chair of the Ontario Energy Board, October 21, 2022. Available at https://www.oeb.ca/sites/default/files/letter-of-direction-from-the-Minister-of-Energy-20221021.pdf

[60] Marie Rajon Bernard, Alexander Tankou, Hongyang Cui and Pierre-Louis Ragon, *Charging solutions for battery electric trucks* (International Council for Clean Transportation, 2022). https://theicct.org/wp-content/uploads/2022/12/charging-infrastructure-trucks-zeva-dec22.pdf

[61] Mehanaz Yakub, "A complete guide to NACS adoption by EV charging networks in Canada," *Electric Autonomy Canada*, December 5, 2023. https://electricautonomy.ca/charging/2023-12-05/guide-nacs-adoption-charging-networks-canada/

[62] CSA Group, "CSA Group Standards help accelerate the deployment of DC fast chargers," *Electric Autonomy Canada*, September 25, 2023. https://electricautonomy.ca/charging/2023-09-25/csa-group-chargers-ev-adoption/

as a critical gap in preparing electricity grids to accommodate EV charging — an issue that remains largely unresolved.[63]

4.6 Gaps in electricity grid readiness

Should policies encouraging the rapid adoption of electric vehicles (both passenger and MHDVs) succeed, electricity demand in Canada is predicted to increase by 47% between 2021 and 2050.[64] The IESO in Ontario estimates that grid capacity in the province will need to more than double to meet the increased electricity demand driven by decarbonization efforts,[65] assuming all load increase is grid connected and served through new supply.

Upgrading local distribution grid capacity at pace with EV uptake presents a significant challenge in the absence of adequate planning. Local distribution investments are both costly and time consuming, often leading to bottlenecks in infrastructure development. Modest upgrades, such as installing a transformer, can take up to three to four months, while more extensive upgrades, like laying a new distribution line, can take much longer.

Utilities responsible for these upgrades face additional challenges due to the lack of timely access to data on projected EV uptake, which is crucial for planning and making grid investments. During our Getting Connected workshop, utility representatives highlighted that many electricity regulators have not updated their planning codes and guidelines, which govern how utilities operate and plan investments. This is problematic because utilities are often restricted to making system upgrades based on historical rates of growth in grid capacity, without considering the rapid system changes needed to accommodate the future surge in EV deployment.

[63] Pollution Probe, *Gap Analysis Research Paper: Interaction of Electric Vehicles and the Grid within Canada*, prepared on behalf of Natural Resources Canada (2017), 3. https://www.pollutionprobe.org/wp-content/uploads/2021/04/Pollution-Probe-EV-Grid-Gap-Analysis-Study-Final-Report.pdf

[64] KPMG, "The road to adoption: building EV infrastructure and smart grids," 2022. https://kpmg.com/ca/en/home/insights/2022/06/the-road-to-adoption-building-ev-infrastructure.html

[65] Independent Electricity System Operator (IESO), *Pathways to decarbonization* (2022). https://www.ieso.ca/en/Learn/The-Evolving-Grid/Pathways-to-Decarbonization

5. Policies across jurisdictions

Ontario has recognized the need for further action to integrate EVs (both light-duty vehicles and MHDVs) into the electricity grid, including improving charging infrastructure, to meet climate targets. The Ontario Minister of Energy expressed this intent in a letter to the OEB, calling for accelerated efforts to support EV adoption, including (i) enabling system readiness for EV adoption, (ii) designing favourable electricity distribution rates for EV charging, and (iii) removing regulatory and administrative barriers to connecting EV charging stations to the electricity grid.[66] The OEB launched the Electric Vehicle Integration initiative in September 2022 to guide actions that ensure the efficient integration of EVs into the electricity system.[67] As part of this initiative, the OEB is reviewing matters related to system readiness, electricity delivery costs and EV connections. As Ontario looks for ways to improve its charging infrastructure, it can draw valuable lessons from other jurisdictions (see Table 4).

Table 4. Policies for addressing barriers to deploying electric MHDV charging infrastructure across jurisdictions

Barriers	Remedial policies	Ontario	California	B.C.	Quebec	Others
Lack of awareness about EV grid integration	Fleet advisory services and information support		✓	✓	✓	✓ (multiple U.S. states)
Expenses related to electric chargers	Financial incentives for electric MHDV charging stations		✓	✓	✓	✓ (multiple U.S. states)
Complex regulatory process	Multi-agency working group for improved coordination and streamlining of processes	✓	✓	✓	✓	

[66] Ontario Minister of Energy, letter of direction to the chair of the OEB, October 21, 2022, 3. Available at https://www.oeb.ca/sites/default/files/letter-of-direction-from-the-Minister-of-Energy-20221021.pdf

[67] Ontario Energy Board, "Electric Vehicle Integration." https://www.oeb.ca/consultations-and-projects/policy-initiatives-and-consultations/electric-vehicle-integration

Barriers	Remedial policies	Ontario	California	B.C.	Quebec	Others
Unfavourable electricity rates	Discount on demand charges for EV charging stations		✓	✓	✓	✓ (multiple U.S. states)
Gaps in grid readiness	Long-term strategy for infrastructure deployment		✓	✓	✓	✓ (multiple U.S. states)
Lack of charging equipment standardization	Regulation to impose uniform standards		✓			✓ (Chile)

5.1 Policies to address lack of awareness

Utilities in leading EV jurisdictions typically offer two types of policy support to address the lack of awareness among fleet operators about EVs and the grid integrations process.

The first type of support is advisory services, where utilities or government agencies guide fleet operators through the process of connecting their electric MHDV to the grid. For example, BC Hydro's EV ready fleet incentive program provides funding to fleet operators to hire consultants to perform assessments and identify charging requirements and electrical infrastructure needs.[68] The program offers up to a 50% rebate on planning costs. Hydro-Québec subsidiary Cleo provides turnkey solutions and specialized support, including charging infrastructure design, installation, connection and maintenance for light-, medium-, or heavy-duty commercial vehicles fleets.[69] Several California utilities also offer fleet advisory services. San Diego Gas & Electric company's Power Your Drive for Fleets program helps fleet owners and operators transition to EVs by connecting them with resources, fleet-friendly charging rates and financial incentives to design and install charging infrastructure. [70] Similarly, Pacific Gas and Electric Company's EV Fleet program offers guidance on government incentives and rebates, site design

[68] BC Hydro, "EV Ready fleet plan rebate," https://www.bchydro.com/powersmart/electric-vehicles/industry/fleets/incentives.html

[69] Hydro Quebec, "Transportation Electrification – Cleo." https://www.hydroquebec.com/transportation-electrification/commercial-electric-fleets.html

[70] SDG&E, "Power Your Drive for Fleets," https://www.sdge.com/business/electric-vehicles/power-your-drive-for-fleets

and permitting, and construction and activation of charging stations.[71] Similar advisory services are available or being planned in several other U.S. states, including Massachusetts, Washington, New York and New Jersey.[72,73,74,75]

The second type of support involves providing a publicly available repository of informative tools and resources. BC Hydro, for instance, offers a design and operational guide for EV charging.[76] Similarly, Hydro-Québec has published a guide for fleet operators that includes information on types of chargers, EVs, electricity rates and how to assess charging needs.[77]
In California, the California Energy Commission, in consultation with the Public Utilities Commission, maintains a website with links to electricity companies, publicly owned electric utilities and other EV-specific resources.[78] In addition, various EV infrastructure planning tools and resources from the California and U.S. governments are available for fleets.[79,80,81]
In Ontario, barring one or two exceptions like Ontario Power Generation,[82] most utilities lack a publicly available guidebook or other informative resource for fleet operators.[83]

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[71] Pacific Gas and Electric Company, "EV Fleet Program." https://www.pge.com/en/clean-energy/electric-vehicles/ev-fleet-program.html

[72] Mass Fleet Advisor, "Home." https://www.massfleetadvisor.org/

[73] Joint Utilities of New York, "EV Make-Ready Fleet Assessment Services." https://jointutilitiesofny.org/ev/make-ready/fleet-assessment

[74] Government of Seattle, "Fleet Electrification Program." https://www.seattle.gov/city-light/business-solutions/renewable-energy-services/fleet-electrification-program

[75] Government of New Jersey, "Request for Proposals: Zero-Emission Fleet Advisory Services." https://dep.nj.gov/stopthesoot/zero-emission-fleet-advisory-services/

[76] BC Hydro, *EV Fast Charging Design & Operational Guidelines* (2021). https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/power-smart/electric-vehicles/BCHydro-EV-Fast-Charging-Guidelines.pdf

[77] Hydro Québec, *Guide de recharge pour parcs de véhicules électriques* (2022). https://www.hydroquebec.com/themes/electrification-transport/documents/2022G118f_guide_recharge_gestionnaire_flotte_v12.pdf

[78] U.S. Department of Energy, "Electricity Laws and Incentives in California." https://afdc.energy.gov/fuels/laws/ELEC?state=ca

[79] Government of California, "Resources for Transitioning to a Zero-Emission Fleet." https://business.ca.gov/industries/zero-emission-vehicles/zev-resources-and-readiness/fleet-transition-services/

[80] U.S. Department of Transportation, "Resources for EV Infrastructure Planning." https://www.transportation.gov/rural/ev/toolkit/planning-resources

[81] U.S. Department of Transportation, "EV Infrastructure Planning for Rural Areas." https://www.transportation.gov/rural/ev/toolkit/ev-infrastructure-planning

[82] Ontario Power Generation, "OPG subsidiary to PowerON electric vehicle fleets." https://www.opg.com/media_releases/opg-subsidiary-to-poweron-electric-vehicle-fleets/

[83] *Facilitating the Integration of Electric Vehicles in Ontario: Survey of Local Distribution Companies and EV Charging Service Providers*.

5.2 Policies to address infrastructure expenses

Offering subsidies and financial incentives to offset the high upfront costs of charging infrastructure are common strategies in leading EV jurisdictions. British Columbia's Go Electric Fleet Charging Program offers up to $100,000 in rebates per charger for the purchase and installation of fast chargers (over 200 kW) for zero-emission MHDV fleets.[84] Similarly, California's EnergIIZE (Energy Infrastructure Incentives for Zero-Emission) commercial vehicles program provides incentives of up to US$750,000 for public charging stations for battery electric and hydrogen fuel cell MHDVs.[85] In Michigan, fleet operators can receive up to US$5,000 per Level 2 EV charger and up to US $70,000 per fast charger installed.[86] Quebec also offers commercial incentives for charging stations, although the maximum incentive of $5,000 per charger is more suitable for light-duty vehicle chargers rather than the costlier electric MHDV chargers.[87]

The Ontario government had in place the EV ChargeON program (Community Stream), that offered financial support to local businesses in the deployment of public electric vehicle charging infrastructure in rural and Indigenous communities with populations under 170,000. However, has been discontinued since early 2024.[88,89]

5.3 Policies to rectify unfavourable electricity rates

Due to the structure of electricity rates, demand charges — fees based on a customer's peak energy usage — significantly increase the cost of electricity of EV charging stations. Consider a charging station with a power output of up to 350 kW that experiences a few short, intermittent charging sessions with multiple electric trucks charging simultaneously. The station could see its electricity bill rise by 40% due to demand charges (compared to a scenario where the demand charges were zero), even if the total electrical energy drawn from the grid remains the same.

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[84] Government of British Columbia, "Go Electric Fleet Charging Program." https://www2.gov.bc.ca/gov/content/industry/electricity-alternative-energy/transportation-energies/clean-transportation-policies-programs/clean-energy-vehicle-program/go-electric-fleet-support-program

[85] California Energy Commission, "EnergIIZE Commercial Vehicles (MD/HD ZEV Infrastructure Incentive Block Grant project) – EV Public Charging Station Funding Lane." https://www.energy.ca.gov/solicitations/2023-10/energiize-commercial-vehicles-mdhd-zev-infrastructure-incentive-block-grant

[86] Government of Michigan, "Charge Up Michigan Program." https://www.michigan.gov/egle/about/organization/materials-management/energy/rfps-loans/charge-up-michigan-program

[87] EV Quebec, "Commercial Incentives." https://www.evquebec.ca/commercial-incentives/

[88] Government of Ontario, "Electric vehicle (EV) ChargeON Program." https://www.ontario.ca/page/ev-chargeon-program

[89] Government of Ontario, "Ontario Making Electric Vehicle Chargers More Accessible." https://news.ontario.ca/en/release/1004789/ontario-making-electric-vehicle-chargers-more-accessible

To address this issue, multiple jurisdictions in North America have introduced electricity rates designed to promote EV fleet charging by offering temporary discounts on demand charges. BC Hydro offers special fleet electrification rates to customers who own or lease and operate electric fleet vehicles.[90] BC Hydro also offers a six-year holiday window on demand charges to fleet operators.[91] The California Public Utilities Commission has approved commercial EV-specific rates for the state's three largest utilities: Pacific Gas and Electric, San Diego Gas and Electric Southern California Edison.[92,93] The latter offers a five-year period without demand charges for commercial EV rates. The State of Massachusetts mandates that utilities offer alternative discounted demand-based rate structures to facilitate the uptake of electric MHDVs.[94] In Alberta, ATCO offers special rates for EV fast-charging stations based on energy consumption rather than demand charges.[95] Hydro-Québec has introduced a similar rate structure for all fast chargers with loads above 50 kW.[96]

In Ontario, the OEB introduced a new optional ultra-low overnight price plan in April 2023, featuring lower electricity delivery rates between 11 p.m. and 7 a.m.,[97] which could benefit commercial fleet operators who typically charge their electric MHDVs overnight. However, unlike the jurisdictions discussed above, Ontario does not offer discounts on demand charges for EV charging stations.

5.4 Policies to help improve grid readiness

Given the time lag in building a charging infrastructure network for electric MHDVs, it is critical to plan and invest in electrical grid upgrades in a timely manner. Utilities need information such as the location and the number of charging stations required (which depends on EV uptake) and

[90] BC Hydro, "Fleet Electrification Rates." https://app.bchydro.com/accounts-billing/rates-energy-use/electricity-rates/fleet-electrification-rates.html

[91] "Fleet Electrification Rates."

[92] California Public Utilities Commission, "Electricity Vehicles Rates and Cost of Fueling." https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/transportation-electrification/electricity-rates-and-cost-of-fueling

[93] Environmental Defense Fund, "New electricity rate will make truck and bus charging cheaper, cleaner in California." https://blogs.edf.org/energyexchange/2021/11/18/new-electricity-rate-will-make-truck-and-bus-charging-cheaper-cleaner-in-california/

[94] Anna Vanderspek, "Demand charge alternatives for EV charging in Massachusetts." https://blog.greenenergyconsumers.org/blog/demand-charge-alternatives-for-ev-charging-in-massachusetts

[95] ATCO, *Price Schedule Index*. https://electric.atco.com/content/dam/web/atco-electric/rates/2024-01-01-atco-electric-price-schedules.pdf

[96] Electric Autonomy, "Understanding Demand Charges Part 2: What you need to know and why?" May 2022. https://electricautonomy.ca/sponsored/2022-03-23/chargepoint-about-demand-charges-part-2/

[97] Government of Ontario, "Ontario Launches New Ultra-Low Overnight Electricity Price Plan." April 2023. https://news.ontario.ca/en/release/1002916/ontario-launches-new-ultra-low-overnight-electricity-price-plan

fleet charging needs (e.g., time and duration of charging) to make informed investment decisions.

To provide utilities with better guidance, many jurisdictions develop long-term strategies for deploying charging infrastructure. The U.S. Joint Office of Energy and Transportation recently released the National Zero-Emission Freight Corridor Strategy, which details a phased plan for building public charging infrastructure along key hubs and corridors nationwide.[98] The European Commission's Alternative Fuels Infrastructure Directive sets targets to establish publicly accessible recharging infrastructure for electric MHDVs every 60 km along key highways by 2030.[99] In Canada, BC Hydro has published a map showing current and planned EV fast-charging stations,[100] with additional stations expected to be installed by 2025 as part of its EV networking plan.[101] Quebec's Electric Vehicle Charging Strategy emphasizes the need to accelerate the introduction of public charging stations for heavy trucks along major roadways.[102] These strategies and plans, which identify corridors or locations for charger deployment, help utilities prioritize grid upgrade investments. More-detailed, region-specific forecasts of EV adoption and expected charging behaviour, however, may be necessary to accurately quantify the scale of investments required.

Ontario has yet to develop a long-term strategy for province-wide deployment of charging infrastructure. The province also lacks provisions in the Distribution System Code (which sets out the operating procedures and rules for local distribution companies) to allow utilities to forecast EV uptake and make associated investments independently.

5.5 Policies to reduce regulatory complexity and improve interagency coordination

Regulatory complexity is inherently lower in regions with fewer electricity sector stakeholders, such as British Columbia and Quebec, where only one to two utilities operate. In contrast,

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[98] U.S. Joint Office of Energy and Transportation, *National Zero-Emission Freight Corridor Strategy* (2024). https://driveelectric.gov/files/zef-corridor-strategy.pdf

[99] Jaan Soone, *Deployment of alternative fuels infrastructure: Fit for 55 package* (European Parliamentary Research Service, 2023). https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698795/EPRS_BRI(2021)698795_EN.pdf

[100] BC Hydro, *Map of current and upcoming EV fast charging stations* (2022). https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/power-smart/electric-vehicles/ev-current-upcoming-stations-map.pdf

[101] BC Hydro, *BC Hydro EV network* (2022). https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/power-smart/electric-vehicles/ev-current-stations-by-regions-map.pdf

[102] Government of Québec, "Québec's Electric Vehicle Charging Strategy." https://www.quebec.ca/en/government/policies-orientations/quebec-electric-vehicle-charging-strategy#c228739

regulatory complexity is higher in regions like Ontario, which has about 60 distribution utilities, each with its own timelines, protocols and application procedures. Regions with more stakeholders, therefore, need to focus on streamlining regulatory procedures and improving interagency coordination.

According to the International Energy Agency's Clean Energy Ministerial Initiative,[103] one way to reduce regulatory complexity and improve coordination among agencies is to establish working groups that bring together different stakeholders to agree on common objectives, such as implementing a single-window ticketing system for EV charging stations.

A notable example is California's Vehicle Grid Integration Working Group, which includes the California Public Utilities Commission, California Energy Commission, California Air Resources Board and California Independent System Operator. This group collaborates to reduce regulatory burden related to vehicle-grid integration[104] by eliminating regulatory duplication across state agencies and streamlining permitting for charging infrastructure.[105] Similarly, Australia's EV Grid Integration Working Group is working on identifying gaps in standards and procedures for integrating EVs to the grid.[106]

In Ontario, the OEB created the Distributed Energy Resources (DER) Connections Working Group,[107] which includes key electricity sector stakeholders such as utilities, the ESA, Ministry of Energy, Ministry of Transportation and the IESO. The working group meets quarterly to provide advice to the OEB on issues related to connecting DERs, including electric vehicle charging stations, to the grid. Arising from this process, in February 2024, the OEB published the Electric Vehicle Charging Connection Procedures, which standardizes the procedures all utilities in Ontario need to follow when connecting charging stations to the grid.[108] This is a notable step. Though, since the new procedures have only been in effect since May 2024, their effectiveness in reducing regulatory complexity remains to be seen.

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[103] IEA, *Grid Integration of Electric Vehicles A manual for policy makers* (2022), 16. https://iea.blob.core.windows.net/assets/21fe1dcb-c7ca-4e32-91d4-928715c9d14b/GridIntegrationofElectricVehicles.pdf

[104] California Energy Commission, "Vehicle Grid Integration." https://www.energy.ca.gov/programs-and-topics/programs/vehicle-grid-integration-program

[105] California Public Utilities Commission, *Final Report of the California Joint Agencies Vehicle-Grid Integration Working Group* (2020), 10. https://gridworks.org/wp-content/uploads/2020/07/VGI-Working-Group-Final-Report-6.30.20.pdf

[106] Australian Energy Market Operator, *Distributed Energy Integration Program – Electric Vehicles Grid Integration* (2021), 4. https://aemo.com.au/-/media/files/stakeholder_consultation/working_groups/der-program/deip-ev/2021/deip-vgi-standards-report.pdf?la=en

[107] Ontario Energy Board, "Distributed Energy Resources (DER) Connections Review." https://engagewithus.oeb.ca/derandevchargingconnections

[108] Ontario Energy Board, *Electric Vehicle Charging Connection Procedures* (2023). https://www.rds.oeb.ca/CMWebDrawer/Record/827142/File/document

5.6 Policies to improve charger standardization

To address the lack of standardization, a number of jurisdictions worldwide are in the process of developing or implementing regulations for uniform standards across all chargers and charging station equipment. In July 2023, California passed the Electric Vehicle Supply Equipment Standards Regulation, mandating uniform standards for all charging stations across the state.[109] The Government of Chile is developing technical standards for charging infrastructure and a regulatory framework to enforce interoperability, facilitating access and connection to the charging network as part of its National Electromobility Strategy 2022.[110]

Currently, Ontario (and other provinces in Canada) do not have any regulations in place to ensure uniform standards for EV charging equipment in the province. Though, some provinces are further along the process of standardizing charging stations. For example, BC Hydro's EV infrastructure plan lays out a standardizing framework for charging stations in the province.[111]

[109] California Air Resources Board, "Electric Vehicle Supply Equipment (EVSE) Standards." https://ww2.arb.ca.gov/our-work/programs/electric-vehicle-supply-equipment-evse-standards

[110] International Energy Agency, *Grid Integration of Electric Vehicles* (2022), 24. https://iea.blob.core.windows.net/assets/21fe1dcb-c7ca-4e32-91d4-928715c9d14b/GridIntegrationofElectricVehicles.pdf

[111] BC Hydro, *BC Hydro's electric vehicle infrastructure: Five-Year Plan – 2025* (2022), 16. https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/power-smart/electric-vehicles/ev-5-year-ev-fast-charging-network-deployment-plan.pdf

6. Recommendations

Table 5 summarizes our recommendations for removing barriers to deploying charging stations in Ontario, with more detailed recommendations on the pages that follow.

Table 5. Steps to removing barriers to deploying charging stations

Barrier	Recommendation	Regulator
Lack of awareness	Require utilities to provide information on EVs and the grid integration process.	Ontario Energy Board
Charging infrastructure expenses	Revive the EV ChargeON program (Community Stream), which offers subsidies for MHDV charging stations, for at least two years.	Government of Ontario
Unfavourable electricity rates	Reduce demand charges on electricity delivery rates for public electric MHDV charging stations, while accounting for regional variation in station utilization rates.	Ontario Energy Board
Lack of charger standardization	Require ALL new charging stations to have uniform standards for chargers, connector types, payment methods and vehicle-charger network communication protocols.	Ontario Electrical Safety Authority (under guidance from the Government of Ontario), in collaboration with the Canadian Standards Association
Complex regulatory procedures	Include municipalities in the DER working group and work toward a single-window approval system for installing electric MHDV charging stations.	Ontario Energy Board
Lack of grid readiness	Allow utilities to use forward-looking data to make investments in electricity system upgrades.	Ontario Energy Board

6.1 Recommendations for regulators

Support Ontario fleet operators in understanding EVs and the grid integration process

Essential information about EVs and the grid connection process should be made publicly available to fleet operators and charging network operators. This includes key contacts at local utilities, information on charger types and necessary approvals. Providing accessible information was the most highly recommended next step to facilitate charger deployment by industry stakeholders — including fleet operators, infrastructure service providers and utilities — who attended our Getting Connected workshop.

We **recommend** that the OEB require each Ontario utility to publish a guidebook that clearly outlines the steps for installing a charging station. The guidebook should provide, among other items, basic information on how EVs are charged, a simple explanation of how the electricity grid works, the key components connecting an EV charging station to the grid, a list of approved charger types, contact information for key utility personnel and estimated charger costs.

In drafting their guidebook, Ontario utilities can draw from what has been done in other jurisdictions, such as the *Electric Vehicle Charging Guidebook for Medium- and Heavy- Duty Commercial Fleets* by Southern California Edison.[112] Other valuable resources include the Rocky Mountain Institute's report for guiding fleet managers on electrification,[113] the North American Council for Freight Efficiency's primer on utility basics for fleet operators[114] and the Edison Electric Institute's guide to working with your electric company.[115]

Extend financial support to Ontario fleet operators for charger costs

As noted earlier, the high upfront costs of EV charging infrastructure present a significant barrier, particularly for small MHDV fleet operators.

The Ontario government's EV ChargeON program (Community Stream) targeting small and Indigenous communities was one concrete approach to tackling the costs of deploying public EV

[112] Southern California Edison, *Electric Vehicle Charging Guidebook For Medium- and Heavy- Duty Commercial Fleets* (2019). https://img03.en25.com/Web/GNA/%7B3c9022f3-cabd-4025-81ad-2a958ed58e68%7D_EV_Charging_Guidebook_CLIENT_FINAL.pdf

[113] Lynn Daniels and Chris Nelder, "Steep Climb Ahead: How Fleet Managers Can Prepare for the Coming Wave of Electrified Vehicles," *Rocky Mountain Institute*, 2021. https://rmi.org/insight/steep-climb-ahead/

[114] North American Council for Freight Efficiency, *Fleets Primer for Commercial Truck Electrification*. https://nacfe.org/wp-content/uploads/2020/07/Fleet-Primer-090522.pdf

[115] Edison Electric Institute, "Preparing to Plug In Your Fleet: 10 Things to Consider", 2019, https://www.publicpower.org/system/files/documents/PreparingToPlugInYourFleet_FINAL_2019.pdf

charging infrastructure in rural regions of the province.[116] The $91 million program, which offered up to 50-75% of capital funding, was first announced in March 2022 but was discontinued in early 2024.[117]

The program, however, was well short of achieving a robust charging infrastructure network in Ontario when it was discontinued. As of September 2023, Ontario has more than 2,900 public charging stations, including 6,600 Level 2 ports and 1,300 Level 3 fast-charging ports.[118] Most of these stations are concentrated in urban areas or along major transit corridors, leaving rural Ontario under-serviced. Moreover, to meet the federal Emissions Reduction Plan 2030 targets, the total number of chargers in Ontario will need to increase at least fivefold by 2030. The costs for MHDV charging infrastructure are projected to be between $1 to 1.6 billion by 2030 across Ontario, with about $800 million required in rural areas — the focus of the EV ChargeON program. Assuming 50% of the funding comes from other sources (e.g., the federal Zero Emission Vehicle Infrastructure Program, municipalities, or private investment), the Ontario government will need to provide approximately $400 million in financial support to rural areas by 2030.

Therefore, we **recommend** that the Ontario government revive the EV ChargeON (Community Stream) program beyond 2024 for at least two more years, with the potential to continue through 2030.

Reduce costs for Ontario's public charging infrastructure providers

As discussed earlier, public charging stations will need to be deployed either by the government or private charging system providers who see a business opportunity in making such investments. The business case for owning, operating and installing public charging stations is hindered by the high electricity rates that charging providers must pay to draw power from the grid. One significant factor contributing to these high rates are the demand charges, which are applied based on peak demand of a charging station during short charging periods (e.g., 15 minutes), even if the charger remains unused for most of the day. A 2023 study commissioned by the OEB found that demand charges can account for as much as 70% of electricity bills for

[116] "Electric vehicle (EV) ChargeON Program."

[117] Alexandra Lopez-Pacheco, "Ontario opens application process for EV ChargeON funding," October 2023, *Electric Autonomy Canada*. https://electricautonomy.ca/charging/2023-10-27/ev-chargeon-funding-ontario-ev-chargers/

[118] Government of Ontario, "Ontario Building More Electric Vehicle Charging Stations," news release, October 20, 2023. https://news.ontario.ca/en/release/1003677/ontario-building-more-electric-vehicle-charging-stations

public charging stations in Ontario.[119] Similar findings have been observed in the U.S. in studies conducted by the National Renewable Energy Laboratory.[120,121]

To help lower operating costs for charging station providers, we **recommend** that the OEB reduce demand charges for public charging stations, particularly where utilization rates are lower than 5%.[122] Jurisdictions across North America, including Massachusetts, Wisconsin, New York and California in the U.S., and Quebec and British Columbia in Canada, have already reduced demand charges for EV charging stations. The reduction could take the form of a 50% rebate, like in New York,[123] or a six-year holiday on demand charges, as done in British Columbia.[124] In our frequent engagement with stakeholders, EV charging service providers have expressed strong support for considering alternative rate designs to address demand charges for infrastructure with low utilization, which is also reflected in other surveys.[125]

We also **recommend** that the OEB's reduction in demand charges be informed by a granular, region-specific assessment of charging station utilization rates and an examination of vehicle travel behaviour (e.g., the percentage of vehicles returning to base and daily travel distance). Our internal analysis has shown significant variation in the travel behaviour of MHDVs across Ontario. For example, 80% of vehicles starting their journey in the Greater Toronto and Hamilton Area return to the region at the end of the day, whereas only about 40% of vehicles from other regions in Ontario return to base. Similarly, the frequency and duration of stops made by commercial vehicles vary across different municipalities. Thus, rather than applying uniform province-wide rates, demand charges could be location-specific to better align with existing grid capacity and travel patterns in each area.

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[119] Ontario Energy Board, "Delivery Rates Report," April 2023. https://engagewithus.oeb.ca/ev-integration/news_feed/delivery-costs-report

[120] Brennan Borlaug and Jesse Bennett, *EV Charging & the Impacts of Electricity Demand Charges* (National Renewable Energy Laboratory, 2022). https://www.nrel.gov/docs/fy22osti/82738.pdf

[121] Muratori, Matteo, Eleftheria Kontou and Joshua Eichman. "Electricity rates for electric vehicle direct current fast charging in the United States," *Renewable and Sustainable Energy Reviews* 113 (2019), 109235. https://www.sciencedirect.com/science/article/abs/pii/S1364032119304356?via%3Dihub

[122] Utilization rate refers to the average power demand relative to the peak power demand during the day. In Canada, utilization rates have on average been around 5%, with utilization rates even lower in rural areas.

[123] New York State Senate, "SECTION 66-S Electric vehicle charging; commercial tariff." https://www.nysenate.gov/legislation/laws/PBS/66-S

[124] "Fleet Electrification Rates."

[125] *Facilitating the Integration of Electric Vehicles in Ontario*.

Continue to streamline regulatory processes for charging infrastructure deployment

Having numerous multiple local electricity utilities in Ontario, each with its own procedures for connecting new public EV charging stations — varying timelines, information requirements and customer responsibilities — has added significant regulatory complexity to deploying charging infrastructure. This complexity is further compounded by the need for approvals from multiple stakeholders, including landlords, local utilities, municipalities, contractors and design and engineering firms.

To address this issue, the OEB introduced the Electric Vehicle Charging Connection Procedure (EVCCP), which came into effect on May 27, 2024, and, as previously discussed, standardized the process all local utilities must follow to connect EV chargers to the grid, including forms, timelines and information requirements. To reinforce this process, the OEB has incorporated the EVCCP into the Distribution System Code, a document that serves as an operational guide for utilities.

It is still too early to comment on the effectiveness of the EVCCP. However, it is expected to simplify the regulatory process for establishing charging stations and support the broader adoption of EVs in Ontario.

More broadly, to ease the integration of DERs with the grid, the OEB has created the DER Connections Review Working Group. Although the group includes utilities, the IESO, the Ministry of Energy and the ESA, certain key stakeholders are excluded, such as local municipalities whose involvement is critical for granting infrastructure development approvals.

We **recommend** that the OEB continue to implement measures like the EVCCP to reduce regulatory complexity. Further, we **recommend** that the OEB consider including municipalities in the DER Connections Review Working Group. This inclusion would enable the working group to explore the development of a single-window system for operators aiming to electrify their fleets, reducing the need for approvals from multiple agencies.

Ensure Ontario's grid is prepared for electric MHDV adoption

To match the increased electricity demand driven by the rapid adoption of electric MHDVs, local distribution companies will need to make frequent and timely upgrades to the electrical distribution system. Effective planning of these upgrades requires utilities to have accurate data on the number of EVs expected to be charged, where they will be charged and when they will be charged. Therefore, there is a critical need for localized forecasts of likely EV adoption rates, identification of candidate locations for charging infrastructure, and data on vehicle driving and idling patterns to assess optimal charging times.

We **recommend** that the OEB facilitate the gathering of localized data and the sharing of these data with local distribution companies for better grid planning. To do this, the OEB could commission third parties to generate province-wide estimates of projected EV adoption and electricity demand. The Pembina Institute (and others) are already working on projects to demonstrate how real-world truck travel behaviour data, collected from telematics-equipped vehicles, can be used to generate EV adoption forecasts and estimate electricity demand over the long term.

Alternatively, we **recommend** that the OEB allow utilities to incorporate forward-looking data and insights into their processes for distribution system planning and load forecasting. California adopted such an approach with the passing of Senate Bill No. 410 in October 2023. The bill empowers utilities to adopt a more proactive planning process using modelling and demand forecasting tools. It also permits utilities to include "projections of load that exceed forecasts provided by the Energy Commission."[126] This means that California utilities can commission independent inquiries for EV-related demand projections and load forecasting and integrate forward-looking data into their medium- to long-term grid planning process. The OEB could implement similar provisions in its Distribution System Code.[127]

Establish uniform standards for charging infrastructure

Differences in charger levels, connector types, payment methods and other aspects across charging stations create uncertainty and apprehension among fleet and charging station operators considering installing EV chargers.

Some jurisdictions have, therefore, begun implementing uniform standards for charging infrastructure. In March 2023, the U.S. Federal Highway Administration and the Department of Transportation established regulations setting minimum standards and requirements for projects funded under the National Electric Vehicle Infrastructure Formula Program.[128] In July 2023, California passed the Electric Vehicle Supply Equipment Standards Regulation, which mandates uniform standards across all EV charging stations, not just those funded by federal or state governments.[129]

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[126] California State Legislature, *SB-410: Powering Up Californians Act*, 2023-2024. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202320240SB410

[127] Ontario Energy Board, "Distribution System Code (DSC)." https://www.oeb.ca/regulatory-rules-and-documents/rules-codes-and-requirements/distribution-system-code-dsc

[128] Federal Highway Administration, *National Electric Vehicle Infrastructure Standards and Requirements,* 88 FR 12724 (2023). https://www.federalregister.gov/documents/2023/02/28/2023-03500/national-electric-vehicle-infrastructure-standards-and-requirements

[129] California Air Resources Board, "Electric Vehicle Supply Equipment Standards." https://ww2.arb.ca.gov/sites/default/files/2020-06/evse_fro_ac.pdf

In contrast, Canada does not have national standards. Although the Ministry of Natural Resources has expressed the intent to implement uniform standards, following the U. S's lead in developing national standards.[130] Ontario did take some initial steps to standardize charging stations through its Electric Vehicle ChargeON program, which offered financial incentives for installing public charging stations. To be eligible for funding, the program required stations to meet specific standards for connector types, data connectivity protocols and payment methods, as well as a minimum number of Level 2 (slow) and Level 3 (fast) ports.[131] These standards, however, applied only to projects funded under the program, and the program was discontinued in 2024.

We **recommend** that the Government of Ontario work with the Ontario ESA and the Canadian Standards Association to establish uniform standards for all new charging stations in Ontario, regardless of how they are funded. The standards should cover installation, operation and maintenance of EV charging stations; payment methods; display of pricing; charging speed and power; and information on the availability and functioning of each charging station.

Our second, related **recommendation** is that Ontario align its standards with those of the U.S. About 400,000 Canadian vehicles travel from Ontario to the U.S. every month.[132] Given this high volume of cross-border traffic, standardizing charging infrastructure across North America is essential for extending the charging network, ensuring interoperability and reducing deployment costs across regions. With U.S. standards already in place, fleet operators travelling between the two countries would greatly benefit if Ontario harmonized its standards with those of the U.S.

[130] Brian Banks, "Will Canada follow U.S. lead with new federal performance and reliability standards for EV chargers?" *Electric Autonomy Canada*, March 2023. https://electricautonomy.ca/news/2023-03-15/standards-ev-chargers-us-canada-federal/

[131] Ontario Ministry of Transportation, "Ministry of Transportation Electric Vehicle (EV) ChargeON Program Guide (2023), 5. https://forms.mgcs.gov.on.ca/dataset/75c38be7-40ae-4011-b391-2e36561c6fd0/resource/d6c0c9ea-7127-4b64-9591-72443dd4a34b/download/ev-chargeon-program-guide-eng-v.1.1.pdf

[132] Statistics Canada, "Number of vehicles travelling between Canada and the United States." https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2410000201&pickMembers%5B0%5D=1.56&pickMembers%5B1%5D=3.1&pickMembers%5B2%5D=4.1&cubeTimeFrame.startMonth=08&cubeTimeFrame.startYear=2021&cubeTimeFrame.endMonth=08&cubeTimeFrame.endYear=2021&referencePeriods=20210801%2C20210801

6.2 Recommendations for fleet owners and charging station operators

Contact local utilities early to allow time for adequate grid upgrade planning

Efforts by regulators are necessary but not sufficient to accelerate the deployment of charging infrastructure. Complementary actions are also needed by both fleet operators and charging station operators. While it may be challenging to assign specific tasks to either group, one broad recommendation applies to both.

We **recommend** that fleet owners planning to install private depot chargers and network operators intending to install public charging stations connect with their local utilities early in the planning stage. Working with local distribution companies from the outset will give utilities the time needed to invest in upgrading the distribution grid to accommodate the additional electricity demand. Delaying this engagement until after the purchase of the EV charging station equipment may result in unnecessary delays if it is later found that the local grid cannot handle the proposed station's electricity demand.

We also **recommend** that fleet owners and network operators explore demand-management techniques to minimize charger-induced electricity demand, thereby reducing costs. Engaging with utilities early can assist with this.

A common piece of feedback that we receive from utilities is that proposals for installing EV chargers often overestimate electricity demand, leading to the installation of oversized chargers. Implementing demand-side management techniques can help right-size the chargers. One simple demand-management technique is shifting the timing of charging. Utilities vary electricity rates based on the time of use, with higher rates during peak hours (mornings and evenings) and lower rates during off-peak hours (midnight to early morning). By actively managing the timing of EV charging, owners can reduce electricity demand from the charging station — improving the stability of the broader electricity gird — while also lowering electricity costs. Another emerging demand-management option is vehicle-to-grid (V2G) technology. Under this approach, electric MHDVs feed electricity back to the grid from their batteries during idle periods, generating revenue in return. For example, the El Cajon school district in the U.S. has piloted a V2G project where electric school buses supply power to the grid during peak demand or emergencies.[133] This approach provides the school with extra revenue by selling power and contributes to grid stability by helping manage peak demand.

[133] Rob Nikolewski, "Charge by night, discharge by day: Electric school buses in El Cajon will send power to the grid," *San Diego Union-Tribune*, July 27, 2022. https://www.sandiegouniontribune.com/2022/07/27/charge-by-night-discharge-by-day-electric-school-buses-in-el-cajon-will-send-power-to-the-grid/

7. Conclusion

In this report, we used Ontario as a case study to identify the regulatory barriers hindering the rapid deployment of electric MHDV charging infrastructure.

Our analysis revealed several key barriers: limited awareness of EVs and the grid integration process, high infrastructure costs, unfavourable electricity rates for charging stations, lack of charger standardization, complex regulatory procedures and lack of grid readiness.

Drawing on lessons from other jurisdictions, we recommend that Ontario implement the following policies and initiatives to address these challenges:

- Provide comprehensive information on EVs and grid integration to fleet owners and station operators.
- Extend financial incentives for electric MHDV charging stations.
- Reduce electricity delivery rates for public charging stations.
- Establish uniform standards for charging station equipment.
- Establish a single-window system for charging station applications.
- Allow utilities to use forward-looking data to make investments in electricity system upgrades.

We also recommend that fleet owners or network operators that are planning to install chargers contact their utility early in the planning process and explore demand-management techniques.

The case for transitioning to electric (and other zero-emission) MHDVs is clear given the drawbacks to fossil fuel-powered MHDVs, such as air pollution, which poses significant health risks. This transition also has substantial potential to spur economic growth through boosting the vehicle manufacturing and mining sectors and the development of a robust charging infrastructure network. For fleet operators, adopting electric MHDVs can reduce fuel and maintenance costs, among other benefits.

A successful transition requires the timely build-out of charging infrastructure to meet the growing energy demands of an increasing number of electric MHDVs on the road. To achieve this, as well as meet the federal government's transition timelines, Ontario must expand its charging infrastructure network fivefold by 2030 (and tenfold by 2035).

By adopting the recommendations in this report, Ontario can overcome the barriers to infrastructure development and boost the uptake of MHDVs, unlocking the economic and health benefits from accelerating the transition to a cleaner and more prosperous freight sector.

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