Fleet electrification

A practical guide to developing your fleet electrification plan in British Columbia

September 2020

BC Hydro
Power smart

INTRODUCTION

Now is the time for organizations to develop their fleet electrification strategies. Electric vehicle (EV) options are becoming more available in the market, with many manufacturers now planning significant increases in EV production volumes in the near future. Many EV options in the medium and heavy duty vehicle classes are being developed or are already available. Charging equipment suppliers now offer a vast range of reliable and cost-effective charging solutions for fleet charging needs.

Fleet electrification in British Columbia provides many advantages over other markets. There are many incentive programs available for vehicle purchases, charging stations and other elements of fleet electrification planning. Our electricity in B.C. is reliable, affordable and clean, offering significant greenhouse gas reduction opportunities over traditional fuels. Our electricity rates are low, while our diesel costs are relatively high, providing compelling total-cost of ownership numbers to support business cases and attractive return on investment.

This fleet electrification guidance document will provide you with suggestions and resources on how best to prepare your fleet electrification plan, as well as things to consider when deploying EVs into your fleet. Our Key Account Managers and EV fleet experts are here to help; you're always welcome to contact us directly to discuss your plans and seek advice. To learn more, contact your Key Account Manager or our EV Fleet experts at **evfleet@bchydro.com**.

BC HYDRO OVERVIEW AND CLEAN ELECTRICITY GENERATION

BC Hydro is a provincial Crown Corporation, owned by the people of British Columbia. We operate an integrated system of generation, transmission and distribution infrastructure to safely provide reliable, affordable and clean electricity to our customers throughout British Columbia. We are the third largest utility in Canada and we serve 95 per cent of the province's population. We have approximately 2 million customer accounts and provide services to over 4 million people and businesses. BC Hydro's electricity is an incredible 98% clean.

Gordon M. Shrum Generating Station & W.A.C. Bennett Dam

Electrical utilities across the world find themselves at the centre of climate action plans, leaning more and more on clean energy to reduce fossil fuel use and the pace of climate change. And most look with considerable envy at B.C.'s investment in clean, renewable electricity generated by the power of falling water.

B.C.'s hydroelectric advantage has powered our economy and our homes for decades, at electricity rates among the lowest in North America. Now it has opened the door to reduced reliance on gas-powered cars and trucks, which are part of a transportation sector that runs mostly on fossil fuels and produces approximately 40% of B.C.'s greenhouse gases.

CLEANBC PLAN

In December 2018, the Government of B.C. released its CleanBC plan, an economic development, energy and climate strategy that will position B.C. to meet the legislated reduction of greenhouse gas (GHG) emissions by 40% by the year 2030. The CleanBC plan identifies 28.9 Mt of GHG reductions in the transportation, buildings, waste management and industrial sectors, of which 6 Mt are planned for the transportation sector.

BC Hydro's clean electricity plays a key role in the shift from fossil fuels to electrification to reduce GHG emissions. With 98% of its generation from renewable sources, BC Hydro is well positioned to help deliver on GHG emissions reduction targets. An electric passenger car operating in British Columbia emits approximately 0.2% of the GHG emissions per kilometer compared to its gasoline equivalent.

Emissions comparison			
Vehicle	**Fuel**	**Average fuel efficiency**	**CO2e kg/km**
Car	Gasoline	9.2 L/100 km	0.22
Electric vehicle	Electricity	20 kWh/100 km	0.0005

**2018 B.C. methodological guidance for quantifying greenhouse gas emissions*

Cleaner transportation is a key element of government's CleanBC plan. The Government of B.C. has announced a "Zero Emissions Vehicle" mandate that states light-duty ZEV sales must meet the following sales thresholds:

- 10% by 2025
- 30% by 2030
- 100% by 2050

BENEFITS OF EV ADOPTION IN BC

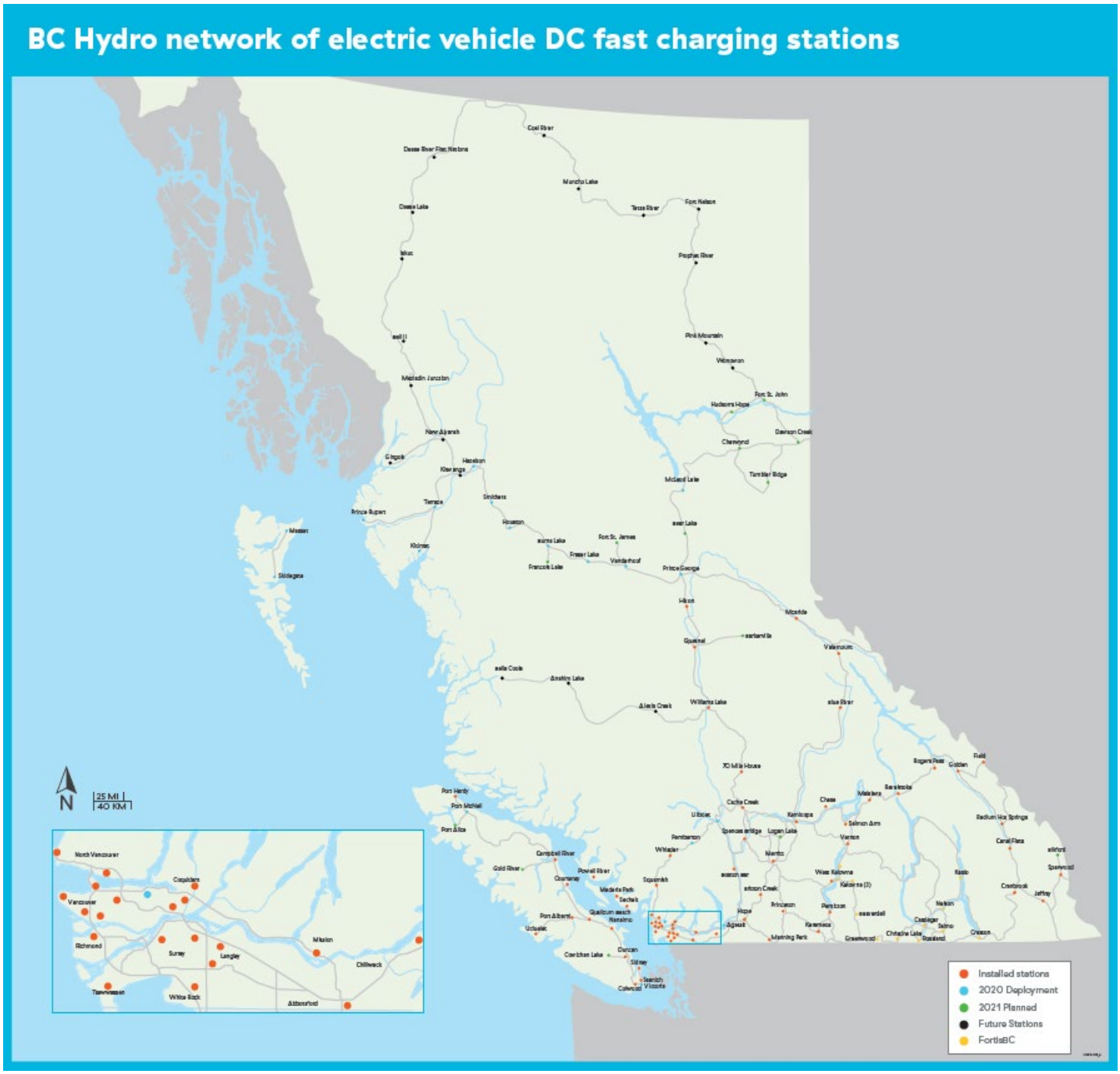
In B.C., electricity is not only cleaner; it's also a lot cheaper. Based on BC Hydro rates, this means that a Nissan Leaf can travel 100 kilometres (km) for just $2 in electricity costs – a tiny fraction of what it would cost to drive an equivalent gas-powered car the same distance. EVs perform better in B.C. as well, thanks to moderate weather conditions and less severe temperatures that contribute to performance degradation with EVs.

EVs have far fewer moving mechanical parts than gas-powered vehicles, so there's a lot less to go wrong. Braking is different in an EV, with the vast majority of slowing and stopping performed by regenerative braking. So an EV's traditional friction brakes are used much less. Anecdotal evidence from drivers suggests those friction brakes can last up to 300,000 km or more before being replaced.

You can also say goodbye to oil changes. In fact, a Canadian EV cost study published in September 2018 concluded that on average, there was a 47% maintenance cost saving for electric vehicles over gas-powered vehicles.

BC HYDRO FAST CHARGING INFRASTRUCTURE

British Columbia has one of the largest public charging networks in Canada and electric vehicle sales are the highest per capita in North America. BC Hydro has been installing charging stations throughout the province since 2012 with support from the provincial and federal governments, and in partnership with municipalities, regional districts and businesses. There are now more than 1,000 public charging stations in B.C. BC Hydro currently operates 70 fast chargers located along B.C.'s major highways, and will be increasing that to more than 120 fast charging stations in 2020.



DEVELOPING A FLEET ELECTRIFICATION PLAN

Fleet electrification requires careful planning to realize the benefits of electric vehicle adoption while ensuring the performance and functionality of your fleet is maintained. For this guidance document on developing a fleet electrification plan, we have put together a simple EV fleet base case of 10 delivery trucks that operate for local distribution and drive 100 km per day on their route. Based on this example, we can illustrate the economic and environmental benefits of adopting EVs into this fleet. In the following pages, we will use this EV fleet base case of 10 delivery trucks to exemplify the key factors you need to consider when developing your fleet electrification plan.

EV fleet base case – 10 delivery trucks

EV fleet base case, Class 5 delivery trucks*			
	Diesel delivery truck	EV delivery truck	Annual savings / loss
Maintenance	$4,600	$1,067	$3,533
Fuel	$10,265	$3,510	$6,755
Cost of capital	$3,600	$4,800	-$1,200
Depreciation	$8,100	$10,800	-$2,700
Total annual costs	$26,565	$20,177	$6,388
Total annual GHG tailpipe emissions	19 tCO2e	0 tCO2e	-19 tCO2e

**These examples are for illustrative purposes only*

**Calculations based on V0.7 ICE EV Cost Tool, Richmond Sustainability Initiatives*

Based on this guidance document, you will understand the right EV options for your fleet vehicle applications and how to develop a charging plan. A thorough understanding of your fleet is the foundation of developing a robust business case to support vehicle and charging equipment procurement activities. This document will also provide an overview of the electricity rates that are available to support fleet electrification. But before any decisions are made to advance electrification, we encourage you to reach out to BC Hydro to support your fleet electrification planning.

1. ENGAGE WITH BC HYDRO

Advanced and early stage infrastructure planning is critical to the success of your fleet electrification planning. Electricity as a fuel requires careful consideration on where and when to charge the EVs in your fleet. It's important to reach out to BC Hydro early and often as your consider your fleet electrification plan. Our Key Account Managers and our EV Fleet Team can assist you with planning and early phase assessments. We can help you complete a free pre-assessment of your infrastructure capacity and make recommendations on how best to connect to our grid. If you have a Key Account Manager assigned to your company, you can reach out to them directly, or contact our EV Fleet team at **evfleet@bchydro.com**.

BC Hydro Key Account Managers and our EV Fleet Team can help with early planning assessments:

- We can help you understand what is required for fleet electrification planning
- We can provide you with resources and tools to support your planning
- We can help evaluate your site options and advise on which locations offer easier access to connect to our clean electricity grid
- We can suggest appropriate connection points to save costs and time
- We can advise if any electrical upgrades might be required
- We can help you get prepared for a formal application for connection to BC Hydro
- We can help you evaluate your electricity billing options: we have new Fleet Electrification Rates that will help reduce your costs

Contact us

evfleet@bchydro.com

bchydro.com/EVfleet

Engage early and often

It's important not to underestimate what might be involved. Civil and electrical work can be complex, require permitting and have an impact to your site. Site upgrades, especially to support medium and heavy duty electric vehicle deployment, can be significant and require proper planning and costing.

Consider your charging layout and the functionality of your site, as well as future planning. By engaging with us early in your process, we can help save you time and money by advising on optimum site locations before you begin a formal design process, which can be lengthy.

2. ALIGNMENT WITH ORGANIZATIONAL GOALS

Understanding your organizational goals and how EVs can contribute to those goals will provide support for fleet electrification strategies and policies. In British Columbia, EVs offer significant environmental benefits over conventionally fueled vehicles thanks to our clean electricity generation. Replacing conventional fleet vehicles with EVs can significantly contribute to reducing carbon emissions, helping organizations meet their GHG reduction and sustainability targets. If your organization has carbon reduction or zero-emission strategies, evaluating the potential reductions available through fleet electrification can help support the incremental costs of EV adoption.

3. CONSIDER YOUR STAKEHOLDERS

Coordination and implementation of a fleet electrification plan requires collaboration between departments that may not have worked together in the past. Energy managers and facility managers can help fleet managers with facility infrastructure and electric vehicle supply equipment (EVSE) equipment decisions, as well as supporting benefits assessments. Procurement and finance departments can assist with the plan by drafting specific policies and guidelines to help influence adoption of EVs into fleet purchases.

4. UNDERSTAND THE RIGHT EV OPTIONS FOR YOUR FLEET VEHICLE APPLICATIONS

EVs require greater investment than conventional fleet vehicles, but offer significant maintenance and fuel savings. It's critical to understand key performance data for your existing fleet in order to ensure the EV equivalent vehicle can perform the same function reliably while providing the appropriate economic and environmental benefits. Selecting the right EV for your vehicle application includes understanding the vehicles duty cycle, dwell time, use case and charging locations.

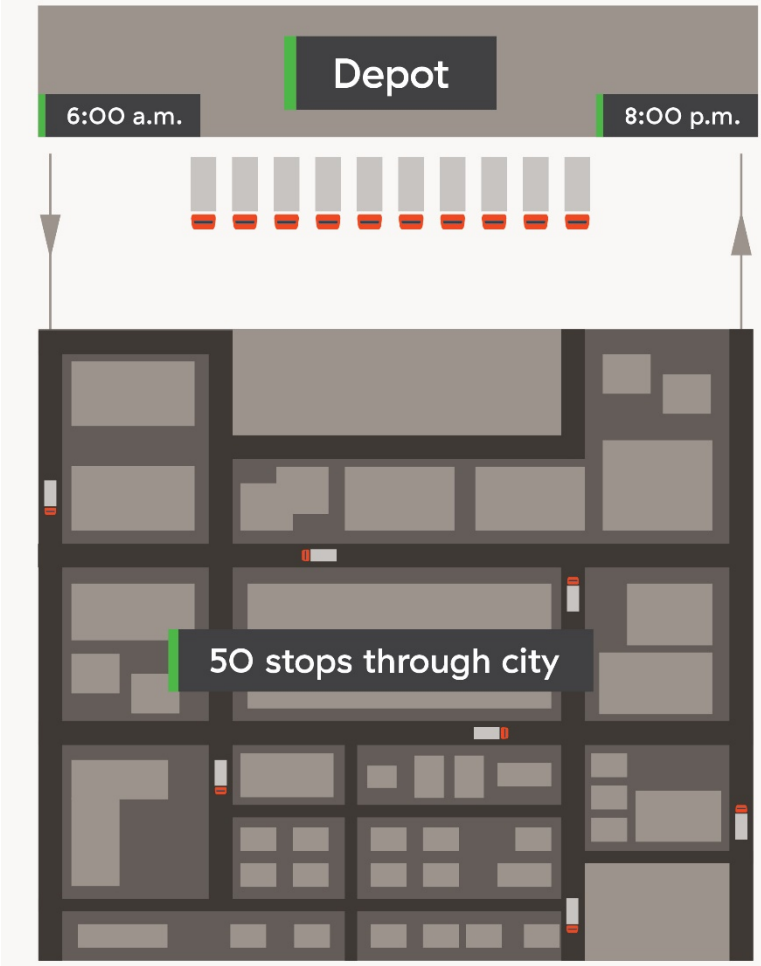
	Key criteria to assess EV fleet suitability
Fleet inventory	Listing of vehicle types, classification and service application
Current costs	Evaluation of annual mileage and fuel consumption, as well as maintenance costs, to provide an estimate on annual costs of the existing vehicles and fleet
Duty cycle	An assessment on a per vehicle basis of the average daily mileage and the maximum daily mileage of the existing fleet vehicle in order to assess the compatibility with the EV alternatives
Dwell time	An assessment on a per vehicle basis of where, when and how long a vehicle is dormant to determine charging opportunities

You will need to work with vehicle manufacturers to ensure you understand critical performance data when considering EV replacements for your fleet vehicles. In addition to the specifications and requirements you may have for the particular vehicle applications—such as towing capacity, cargo capacity, gross vehicle weight rating—there are specifications for EVs that require consideration.

	EV specifications
Vehicle range	EV driving ranges are rated by the Environmental Protection Agency (EPA) based on efficiency in the same way conventionally fueled vehicles are. While the EPA rated range considers highway and city driving, it's important to note that vehicle range can vary significantly depending on other factors, such as cargo and passenger loads, seasonal variations and terrain.
Fuel/energy efficiency	Measured as kWh/km, this represents the average energy efficiency of the EV. Unlike conventionally fueled vehicles, where the higher the litres/100 km the better, with electricity as the fuel the lower the kWh/km the better.
Charging capacity	This defines the amount of instantaneous power (kW) the vehicle can accept when charging. This will help you understand your charging time necessary to refuel your EV.

Let’s consider a simple example on how to capture critical data for fleet application, based on your existing diesel fleet performance indicators. In our EV fleet base case there are 10 delivery trucks that leave the depot each morning at 6 a.m. These trucks travel an estimated 100 km while making 50 stops throughout the city and return back to the depot around 8 p.m. where each truck resides overnight. The trucks are in service five days a week. We will use this example throughout this guidance document to help you understand the process of fleet electrification planning.

EV fleet base case – 10 delivery trucks



	Current diesel fleet performance indicators
Vehicle use case	• 10 delivery box trucks for local city distribution daily • 10 year planned lifecycle • Vehicle cost MSRP = $90,000
Duty cycle	• Each truck drives an estimated 100 km per day on their route, with approximately 50 stops • Each truck is in service five days a week
Dwell time	• Each truck leaves the depot at 6 a.m. and returns at 8 p.m. The truck resides in the depot overnight. • Each truck therefore has the ability to charge overnight for 10 hours, between 8 p.m. and 6 a.m.
Current costs	• Maintenance: $4,600 • Fuel: $10,265 • Cost of capital: $3,600 • Depreciation: $8,100 • Total annual costs: $26,565

Based on the current diesel performance indicators outlined above, we have found an EV equivalent Class 5 delivery box truck that meets your fleet requirements with the following specifications:

- EV truck MSRP: $120,000
- Battery capacity: 225 kWh
- Estimated range: 150 km
- Efficiency: 150 kWh/100 km

We will use these specifications and this EV fleet base case to develop our charging plan on the next page.

5. DEVELOP A CHARGING PLAN

Electricity as a fuel creates new opportunities and challenges for fleet managers. When developing your fleet electrification plan, it is critical to evaluate where and when you need your vehicles to be charged. Are you able to charge your vehicles in a facility your organization owns? Do you require in route charging? Are you able to charge at known destination points? It's important to assess each charging location individually, including how much charging capacity you need for the vehicles located at the site, as well as planning for future fleet growth, if necessary. Facility ownership can pose challenges as well; if your fleet needs to be charged in a leased location, do you have the right approvals to install charging infrastructure? Additionally, your electricity bill depends on how and when you charge, and BC Hydro can assist you with evaluating your electricity rates.

Developing a charging plan is the first important step to understanding your infrastructure and charging equipment needs. Doing this analysis will help you ensure you are appropriately right-sizing your charging equipment for the actual needs of your fleet. It's important to remember, the higher the charging power, the more expensive the equipment. Understanding your charging plan will help you manage costs and not over design infrastructure.

A few things to consider for your charging plan:

- The smaller the charging opportunity, the higher the charging power you will need to make sure the vehicle is charged sufficiently for its duty cycle.
- The higher the power, the faster the charging, and the higher the cost. Using the maximum amount of available charging time can help reduce these costs.

	Key criteria of a charging plan
Daily energy required	The total amount of electricity energy your fleet will require to operate the duty cycles on a daily basis.
Charging opportunity	The window of time on a daily basis that your fleet vehicle is available to charge (dormant periods while in-service, or off-service time).
Average power requirement	The amount of electrical power, instantaneously, that your fleet needs to be able to charge fully within the charging opportunity time.
Charging needed per vehicle	The amount of electrical power, instantaneously, that each individual vehicle needs to be able to charge fully within the charging opportunity time.

Using our 10 delivery trucks example, we can now calculate the charging needs for this fleet and establish the fundamentals of a charging plan.

Fleet charging plan			
Daily energy required	**Charging opportunity**	**Average power requirement**	**Charging needed per truck**
10 delivery box trucks for local city distribution daily **X** 100 km/day **X** 150 kWh/100 km **=** 1,500 kWh day	8 p.m. to 6 a.m. **=** 10 hours/day	1500 kWh/day **÷** 10 hours **=** 150 kW (peak demand)	150 kW **÷** 10 trucks **=** 15 kW/truck (charging capacity required per truck)

Based on this analysis, we now know some key pieces of information for our fleet electrification plan:

- Peak demand: we know that we will need 150 kW of power instantaneously to support charging these trucks.
- Charging requirement: we know that each truck needs 15 kW of charging to refuel 10 hours overnight. This means our charging equipment must be rated for a minimum of 15 kW.

In our example, we assumed each truck would require the full 10 hours of charging each night, requiring 15 kW of power during those 10 hours. It's important to remember a general rule of thumb: the higher the power requirement, the higher the cost of the charging equipment. Accordingly, as you develop your charging plan, consider ways to manage your charging loads:

- Do all the trucks really need to be charging for the full 10 hours per night?
- Is there an opportunity to reduce the number of chargers you need by managing when your vehicles charge?
- Is there an opportunity to load share and reduce charging power?
- Now is the time to consider right sizing your fleet—and right sizing your charging equipment to minimize infrastructure and vehicle costs.

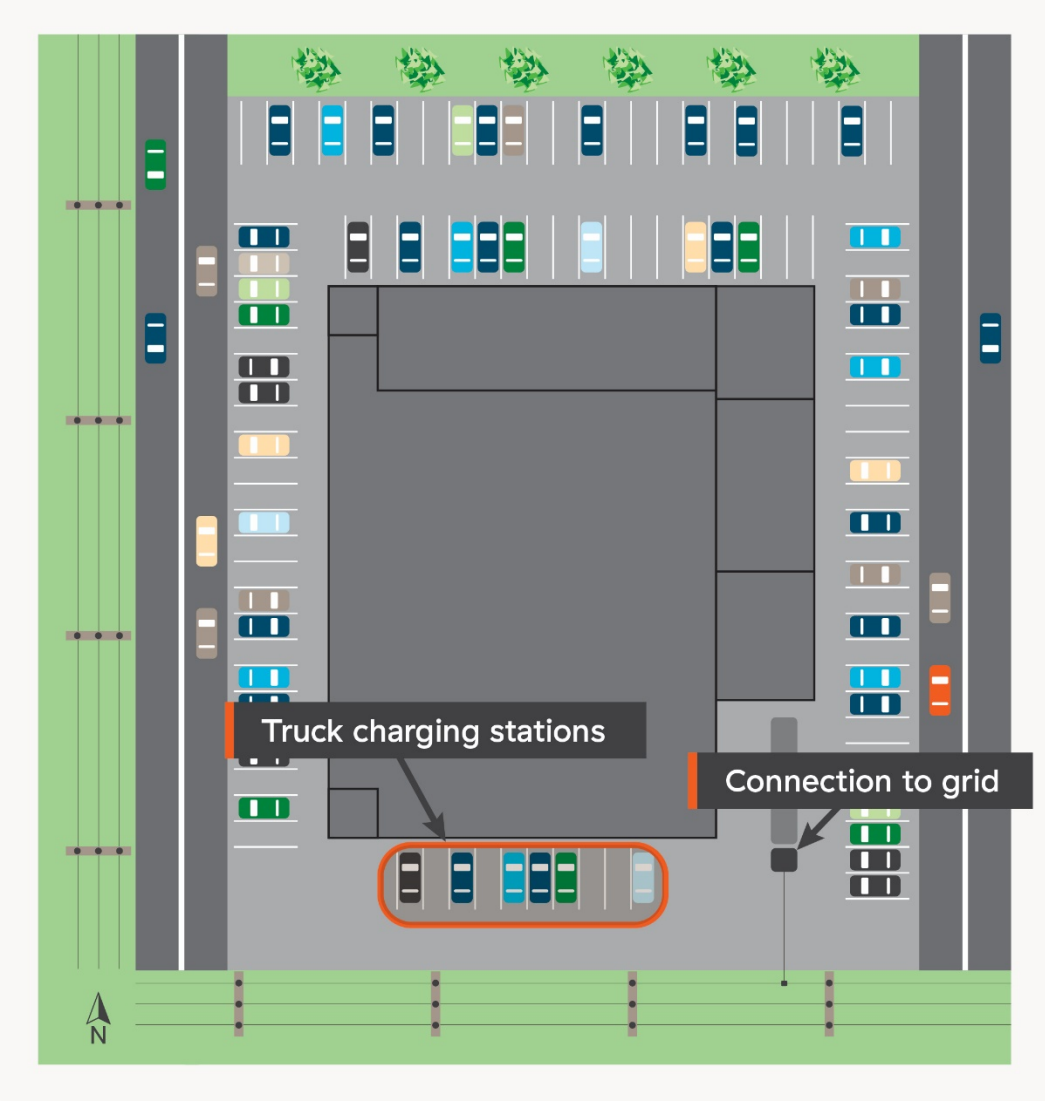
6. INFRASTRUCTURE PLANNING: BC HYDRO FACILITY PRE-ASSESSMENT SERVICE

Now is the time to ask your experts at BC Hydro to help you evaluate site infrastructure options. You know what your power requirement will be and where your vehicles will charge. Let's use this example to illustrate how we can help you with early phase assessment of your facility readiness.

In the illustration to the right, we would recommend locating the truck charging stations on the south side of the building as opposed to the west side of the building. This would allow the charging stations to be connected to primary service, to achieve the 15 kW of charging required while minimizing site infrastructure costs—such as civil and electrical work—that would be required to facilitate a connection from the west.

We can help you assess your electrical infrastructure needs and make recommendations on how best to connect to our grid. If you have a Key Account Manager assigned to your company, you can reach out to them directly, or contact our EV Fleet team at **evfleet@bchydro.com**.

We have a simple intake process to support your facility assessment. Please complete the intake form in preparation for your discussion with us: **bchydro.com/EVfleet**.



7. BUSINESS CASE DEVELOPMENT

Now that your basic analysis is complete, you have the fundamental data to proceed with a formal plan and business case to support vehicle and EVSE procurement activities.

Let's review the basic cost model and total cost of ownership using our example of 10 delivery trucks.

Key inputs to cost model		
	Diesel delivery truck	EV delivery truck
Vehicle cost	$90,000	$120,000
Fuel	$1.41/litre	$0.09/kWh
Planned lifecycle	10 years	10 years
Annual maintenance costs	$4,600	$1,067
Fuel efficiency	28 l/100 km	150kWh/100 km
Annual mileage	26,000 km	26,000 km
Annual cost of capital	4.0%	4.0%
End of life salvage value	10.0%	10.0%

EV fleet base case – 10 delivery trucks

Comparison of annual costs			
	Diesel delivery truck	EV delivery truck	Annual savings / loss
Maintenance	$4,600	$1,067	$3,533
Fuel	$10,265	$3,510	$6,755
Cost of capital	$3,600	$4,800	-$1,200
Depreciation	$8,100	$10,800	-$2,700
Total annual costs	**$26,565**	**$20,177**	**$6,388**

Based on this example, the EV delivery truck will result in annual savings of $6,388 as compared to the diesel delivery truck. While this example is for illustrative purposes, there are some important things to note:

- The higher the vehicle utilization, the better the savings with an EV due to significantly lower fuel and maintenance costs.
- Diesel fuel costs are highly variable, while electricity rates are relatively stable and allow for higher reliability in budgets.

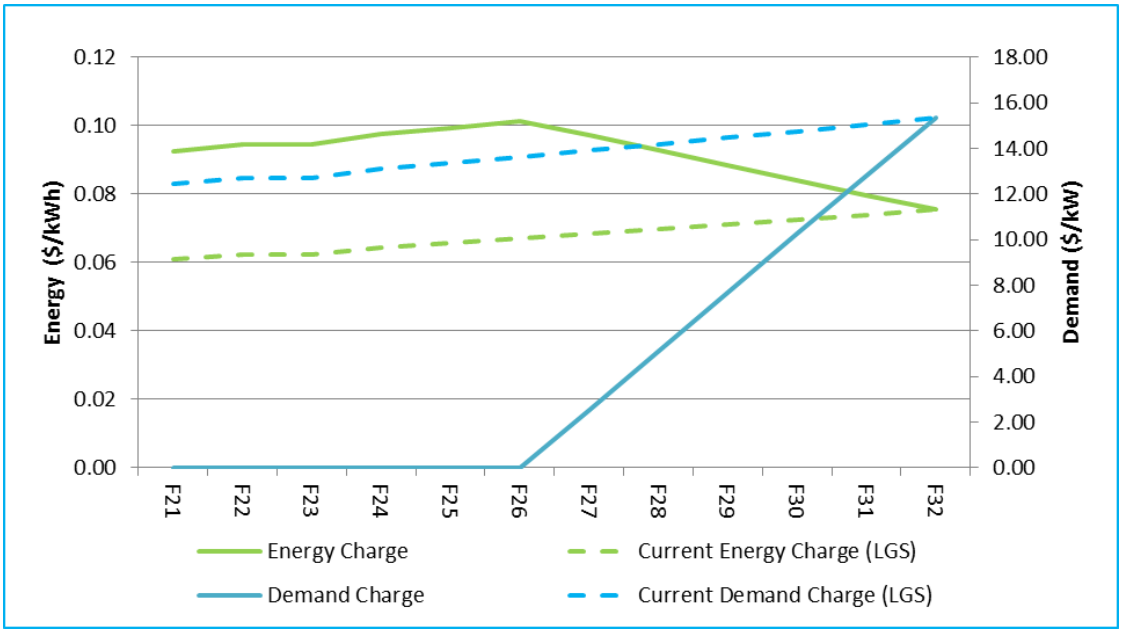
- The costs of electric vehicle supply equipment (EVSE) impact the total cost of ownership, and right sizing / leveraging EVSE assets for other fleet applications is an important consideration in planning.
- Consider other elements that should be included in your total cost of ownership model, such as third party licence fees, software management, residual vehicle value, insurance, and other metrics used in fleet costing analysis.

8. UNDERSTANDING YOUR FUEL COSTS

BC Hydro electricity rates are regulated by the BC Utilities Commission. Your actual energy rate largely depends on the size of your organization and billing structure. It's important to understand your electricity rate structure, and whether or not your organization is billed under a Small General Service (SGS), Medium General Service (MGS) or Large General Service (LGS) rate. For more information on our Business Rates, visit **bchydro.com/accounts-billing/rates-energy-use/electricity-rates/business-rates.html**.

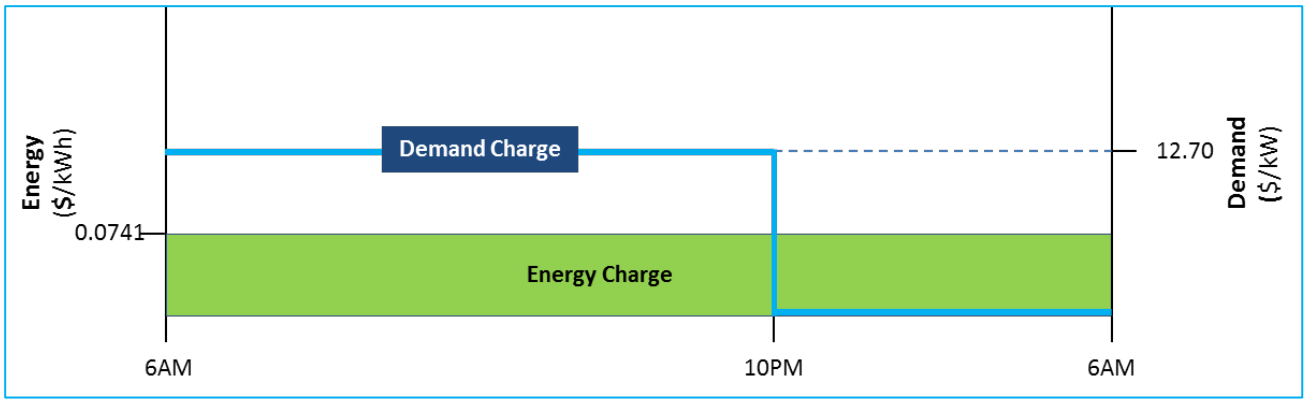
If your organization falls under the Large General Service rate your bill will include demand charges. These charges are for your peak use of electricity in a given month; the highest rate of electricity use during a period of time. In the EV delivery truck example, we found that the peak power for that fleet was 150 kW, when all 10 trucks are charging at the same time. This peak energy use would add demand charges to your bill, and the higher the demand the larger the charge. We have been engaging with transportation providers to understand how we can support the reduction of GHGs in the province through the conversion of fleets from fossil fuels to clean electricity; stakeholders have told us that the demand charge associated with the Large General Service rate is a barrier to converting fleets to electric operation. As such, we have introduced a Fleet Transportation Rate to help organizations avoid these demand charges for their fleet vehicles. For customers who have fleet charging with 150 kW of peak demand or more, there are two optional rates available to relieve these charges: Demand Transition Rate and Overnight Rate.

Demand Transition Rate		
Effective Dates	**Start date: April 1, 2020**	**End date: March 31, 2023**
Eligibility	Businesses, government agencies or other organizations that own, or lease, and operate electric fleet vehicles or vessels, for separately metered charging with maximum demand equal to or greater than 150 kW. Medium General Service customers are not eligible.	
Description	Demand Transition Rate supports electrification by providing demand relief for daytime and in route fleet charging over the early years of fleet conversion from fossil fuels to electricity.	



**Graph is for illustrative purpose only*

Overnight Rate		
Effective Dates	**Start date: April 1, 2021**	**Ongoing**
Eligibility	Businesses, government agencies or other organizations that own, or lease, and operate electric fleet vehicles or vessels, for separately metered charging with maximum demand equal to or greater than 150 kW. Medium General Service customers are not eligible.	
Description	Overnight Rate supports electrification by providing ongoing demand relief for nighttime and in depot fleet charging.	



**Graph is for illustrative purpose only*

Utilizing these optional rates will help you reduce your fleet electrification fuel costs, supporting a stronger total cost of ownership and business case model.

9. CHARGING EQUIPMENT

Understanding your charging plan and vehicle selection will help you focus on the right charging station technology. There are various charging interfaces for vehicles, including plug-in, conductive overhead and wireless. The majority of EVs use plug-in charging equipment, with overhead systems being used primarily for large vehicles, such as buses. Wireless charging is not widely adopted at this point.

- Plug-in charging equipment: the vast majority of EVs use plug-in charging, which can be either DC or AC voltage, depending on the capability of the vehicle itself. Plug-in chargers use a charging cord with a plug interface for the vehicle's charging receptacle. This interface can have a number of different plug types, such as J1772, CHAdeMO, SAE CCS, or proprietary plugs such as Tesla. Plug-in charging is categorized by the level of charging, or charging capacity:
  - Level 1: the lowest level of charging, using a standard 120V plug and wall outlet. Depending on the amperage, this offers only 1-2 kW of charging power.
  - Level 2: uses 208-240V circuits and higher amperage, typically offering 7 kW of charging power.
  - Level 3: also known as DC Fast Charging (DCFC), offer high power charging capacity (50 kW+) and are generally commercial grade installations.
- Overhead charging: typically automated, high power chargers that use a pantograph interface to fast charge large vehicles, usually transit buses.

General rule of thumb

The higher the power requirement, the higher the cost of the charging equipment.

Be sure to right size your fleet

As noted earlier, the higher the charging capacity, the higher the cost. Level 1 and Level 2 charging are generally much lower cost installations than Level 3 DCFC, which are typically used for in route charging or in high utilization fleets at a specific site.

Accordingly, it is critical to consult with vehicle manufacturers and consider your charging plan to ensure you're selecting the right charging equipment.

Deployment of your charging equipment requires careful planning. Key considerations for charging equipment include:

- Site accessibility, vehicle logistics and parking, sight lines, lighting
- Permitting, approvals, filings
- Coordination with BC Hydro, engineering and design functions
- Construction management and commissioning
- Expandability and upgradability
- Network and interoperability – considerations of how to manage your system online
- Ongoing maintenance and management of charging assets

10. ENVIRONMENTAL BENEFITS

In addition to cost savings, the environmental benefits are an important consideration when developing your business case. In our delivery truck example above, each diesel truck would emit an estimated 19 tonnes of carbon dioxide emissions on an annual basis whereas there are zero emissions associated with the EV delivery truck. The fleet of 10 trucks would then have 190 tonnes of carbon dioxide emissions annually. If your organization has a price on carbon to support sustainability goals and directives, this price should be included in your annual cost model as well. As an example, public sector organizations in British Columbia pay carbon offsets of $25/tonne.

19 tCO2e x $25 = an additional annual cost of $475 or $4,750 for the fleet

Some municipalities and city governments are choosing to price carbon much higher than $25/tCO2e, in some cases as high as $150/tCO2e.

Diesel trucks significantly contribute to air pollutants, including CO, NOx, VOCs, SOx and particulate matter. Tailpipe air pollutants have been shown to be harmful to human health, resulting in increased cases of lung disease, heart disease and cancer. EVs do not have any tailpipe emissions, eliminating these pollutants completely. Further, EVs have very little noise associated with them, helping to reduce noise pollution in urban centres. These benefits result in new opportunities for EV fleets. Many municipalities and cities are now declaring climate emergencies or developing zero-emission zones, resulting in directives to promote the use of ZEVs in their jurisdictions. Aside from the obvious benefits of noise reduction, certain vehicle applications may be able to reschedule their service hours given noise bylaws, refuse trucks as an example.

11. CHANGE MANAGEMENT, POLICIES & SUSTAINMENT

When developing a fleet electrification plan, the temptation is to focus on vehicle selection, charging equipment, infrastructure and benefit analysis. It's important to consider other elements critical to implementation that can help support EV adoption in your organization as well.

- Procurement policies: many organizations are revising procurement policies to introduce sustainability goals and emissions reductions as evaluative criteria in their procurements. With respect to fleet vehicle purchases, there are examples where organizations are mandating or prioritizing the purchase of ZEVs first, or allowing for a premium price variance for EV purchase, and users must provide justification if they wish to purchase a non-ZEV vehicle. Fleet procurement models are also shifting to adopting pilot / demo EV vehicles to test in service prior to initiating fleet wide purchases. It's worth considering collaboration with

other organizations as well. Can your fleet purchases be consolidated through strategic partnerships or fleet management companies to help reduce costs?

- Fleet management policies: now is the time to consider refining and introducing new policies to help manage fleet costs. Including criteria to help your organization rationalize and right-size your fleet while developing your electrification plan can support stronger cost benefits. Other fleet policies can help reduce costs and emissions as well, such as anti-idling, promoting telecommuting and user policies to reduce mileage.
- Infrastructure / facility management policies: facility management and development policies can be revised to include the appropriate consideration and evaluation of installing charging infrastructure when major renovation or construction projects are initiated. Facility plans that include charging infrastructure should also evaluate the need for backup generation and contingencies for critical emergency service vehicles.

APPENDIX A: RESOURCES

Organization	Website links
Advocacy / Education	pluginbc.ca/ emotivebc.ca/ fraserbasin.bc.ca/ richmondsustainability.org/
Councils / Associations / Memberships	nacfe.org/ veva.ca/ globaldrivetozero.org/ westcoastelectricfleets.com/
Government	cleanbc.gov.bc.ca/ gov.bc.ca/gov/content/home nrcan.gc.ca/home
Media	greencarreports.com/ cleantechnica.com/ act-news.com/ truckinginfo.com/ electrek.co/
Tools / Funding	pluginbc.ca/suvi/ plugshare.com/ globaldrivetozero.org/tools/zero-emission-technology-inventory/ toolkit.globaldrivetozero.org/ globaldrivetozero.org/tools/calculator/

APPENDIX B: VEHICLE CLASSES

Vehicle class	Vehicle type	Example
Class 1 **0 lbs – 6,000 lbs**	Passenger Car/SUV/Minivan	Chevrolet Colorado, Nissan Frontier
Class 2 **6,001 lbs – 10,000 lbs**	Light Duty Truck/ Full-size PickupTruck	Ford F150, Toyota Tundra
Class 3 **10,001 lbs – 14,000 lbs**	Box/Delivery Truck, Heavy Duty Pickup	Ford Super Duty F350, Isuzu NPR
Class 4 **14,001 lbs – 16,000 lbs**	Large Walk In Van, Box Truck	Ford F450 Chassis Cab, GMC Sierra 4500
Class 5 **16,001 lbs – 19,500 lbs**	Bucket Truck, Large Walk In Van	Peterbilt 325, Ford F550
Class 6 **19,501 lbs – 26,000 lbs**	Single Axle Truck, School Bus	International Durastar, Ford F650
Class 7 **26,001 lbs – 33,000 lbs**	Transit Bus, Refuse Truck	Peterbilt 220, Autocar ACMD
Class 8 **33,001+ lbs**	Truck Tractor, Sleeper Cab	Freightliner Cascadia, Kenworth T600

GLOSSARY

Word	Definition
Distribution	The infrastructure to deliver power from transmission lines to users
EV	Electric vehicle
EVSE	Electric vehicle supply equipment necessary to supply electric charging to electric vehicles
Generation	The process of producing electricity from an energy source, such as fuel or water
GHGs	Greenhouse Gases, such as carbon dioxide, methane, nitrous oxide, and ozone that create the greenhouse effect on planets. GHG emissions from fossil fuel sources contribute to global warming and climate change.
Hydroelectric	Electricity generated from water in motion
kW	A unit of electric power, equivalent to 1,000 watts
kWh	A unit of electric energy, one kilowatt (kW) of power sustained for one hour
Level 1,2,3 charging	• Level 1 charging uses 120 V AC and can use a standard wall outlet. • Level 2 charging uses 240 V AC (residential) or 208 V AC (commercial) and require installation by an electrician. • Level 3 charging are also known as DCFC (direct current fast charging) and offer significantly higher power charging (50kW and greater) for fast charging
Peak demand	The highest electrical power that has occurred over a specified time interval
Regenerative braking	An energy recovery process used when a vehicle slows down or brakes to generate electricity to charge the vehicle battery
Transmission	The infrastructure to deliver power from generating stations across long distances