Keeping it Current

Guidance for Collaborative Deployment of EV Charging in Metro Vancouver

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SERVICES AND SOLUTIONS FOR A LIVABLE REGION

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BC Hydro
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List of Abbreviations and Terms

BC: British Columbia

BCUC: British Columbia Utilities Commission

CCS: Combined Charging System

CSA: Canadian Standards Association

DCFC: Direct Current Fast Charging

EV: Electric Vehicle

EVEMS: Electric Vehicle Energy Management System

LCFS: Low Carbon Fuel Standard

LDV: Light-duty Vehicles

MHDV: Medium- and Heavy-duty Vehicles

OCPP: Open Charge Point Protocol

1. About this Document

1.1 Purpose of the Guide

The purpose of this guide is to help Metro Vancouver local governments and other key actors plan public and multifamily building EV charging infrastructure for light-duty vehicles (LDVs).

Metro Vancouver has the highest EV adoption rate of any region in Canada: in Q4 2022, 25% of new vehicles registered in Metro Vancouver were EVs.[1] EVs now comprise approximately 5% of all vehicles in Metro Vancouver.[2]

This progress is the result of leadership by many actors. Significant progress on charging infrastructure has been made to date. For example, many Metro Vancouver municipalities have adopted best-in-class rules requiring new construction to be EV ready. Meanwhile, BC Hydro and other actors have invested in a foundational network public EV charging stations. To keep up with continued EV adoption—and ensure equitable access to electric mobility—continued expansion of EV charging infrastructure is necessary.

The recommended principles and actions in this guide are based on the latest information about EV adoption and infrastructure and can be implemented in the near to medium term (two to five years). Implementation practices should continue to be re-evaluated over time as policy, technology and the region itself change.

It takes an ecosystem to deploy and operate a charging network. **This guide was developed with Metro Vancouver municipalities and First Nations anticipated as the primary audience, along with the project sponsors (Metro Vancouver, TransLink and BC Hydro).** Other key actors that can use this guidance include building owners, landowners, charging network companies, and other orders of government.

1.2 Navigating the Guide

This guide covers the following questions:

- **What are the basics EV charging infrastructure?** See Section 1
- **What should be our guiding principles for EV charging infrastructure planning and deployment?** See Section 3
- **Who should do what?** See Section 4
- **What actions should local and regional governments take in the near to medium term?** See Section 5
- **How much infrastructure do we need?** See Section 6
- **How do we make our strategies equitable?** See Section 6.2
- **What are the operational considerations?** See Section 7

[1] https://electricautonomy.ca/2023/02/13/canada-zev-sales-q4-2022/
[2] Derived from the Province of BC's Zero-Emissions Vehicle Update 2022 and Statistics Canada's Table 23-10-0308-01 Vehicle registrations, by type of vehicle and fuel type

2. EV Charging Basics

For light-duty vehicles (LDVs - cars, vans, SUVs and light trucks) there are three main charging levels: Level 1, Level 2, and direct current fast charging (DCFC), sometimes referred to as Level 3 or, simply, fast charging. The main characteristics of these charging types for LDVs are provided in Table 2-1.

Table 2-1. Main characteristics of different charging types for LDVs

Charging Type	Charging Power	Approx. charging time for 300 km of range[3]		Charging Location					Type of light-duty EV that can use
		Typical car	Typical SUV/ light truck	Other resid-ential	Multi-fam. bldg	Pub-lic	Dep-ot	Shared comm-ercial	
Level 1	1.3-2.4 kW	46-25 h	69-37.5 h						BEV and PHEV
Level 2	3 kW	20 h	30 h						BEV and PHEV
	7 kW	8.5 h	13 h						
	9.6 kW	6 h	9.5 h						
	19.2 kW	3.25 h	4.75 h						
DCFC	25 kW[4]	2.5 h	3.5 h						BEV
	50 kW[5]	1.25 h	1.75 h						
	100 kW	36 min	54 min						
	150 kW	24 min	36 min						
	350 kW	10 min	15 min						

[3] Many vehicles do not require a full 300 km charge on a typical day.

[4] While 25 kW chargers use direct current, they are not considered "fast" chargers. As seen in the charging times, they are only appropriate where vehicles are staying for over two hours.

[5] While 50 kW chargers use direct current, they are increasingly not considered sufficiently "fast" to provide on-the-go charging. Deployment organizations are increasingly focusing on charging speeds of 75kW and above.

Charging at home (whether in ground-oriented homes or in multifamily buildings) plays the largest role in the charging ecosystem in terms of the number of ports and the overall amount of energy dispensed at those locations. According to a survey of BC EV drivers conducted by BC Hydro in late 2022 of their public EV charging network members, 86% of EV drivers respondents use home charging. Meanwhile, most of these drivers also use public charging at least some of the time; 88% and 77% of EV drivers respondents use BC Hydro and other public charging stations, respectively.[6]

Despite the importance of home charging, **public charging** plays a critical role in the ecosystem for three principal reasons:

1. It is the only choice for residents who do not have access to home charging, which includes:
   - **"Garage orphans":** a term sometimes used for people without any access to private home parking. This group includes people in all housing types. They will always rely on public charging.
   - **People living in multifamily buildings** who have access to parking, but where that parking space has not had the electrical upgrades required to support the installation of EV charging. This second group can use public charging, or their parking space can be retrofitted to become EV ready. As more multifamily buildings are retrofitted, fewer members of this group will rely exclusively on public charging.
2. The presence and visibility of **public charging** is crucial to helping consumers overcome range anxiety and feel confident purchasing an EV.
3. Providing opportunities for mid-day charging may become increasingly important to the electrical system to **balance loads** as more low-cost solar energy comes onto the grid.

We consider four categories of charging in this Guide:

1. **Ground-oriented home charging.** People living in ground-oriented housing (single family homes, duplexes, triplexes and row houses) are more likely to have access to, and ownership of, a parking space attached to their living space (e.g. a private garage or parking pad). Installation of EV charging in these settings can be relatively simple, although panel and/or service upgrades or other electrical works are sometimes required and implementing appropriate EV energy management systems in these building types can be complicated.
2. **Multifamily building charging.** Multifamily building apartments feature shared parking areas. It is more challenging for multifamily building residents to install EV charging, even when they do have access to a parking spot, due to legal, financial, technical and logistical barriers inherent in both condominiums and rental apartments.
3. **Public charging,** which includes:
   - **Community charging,** which can be on-street (curbside) or off-street (for example, in publicly accessible parking lots or garages).
   - **Highway charging,** which is provided on major corridors, mostly serving people making long trips.

[6] BC Hydro, 2023. Public EV Charging Service Rates Application submitted to BCUC. Exhibit B-1.

- **Workplace charging,** which is mainly used by employees but could be publicly accessible, and can be provided on- or off-street.

4. **Shared commercial charging.** This type of charging is shared among fleets but is exclusively dedicated to commercial vehicles. It is placed in strategic locations for fleets like taxi stands and downtown delivery zones.

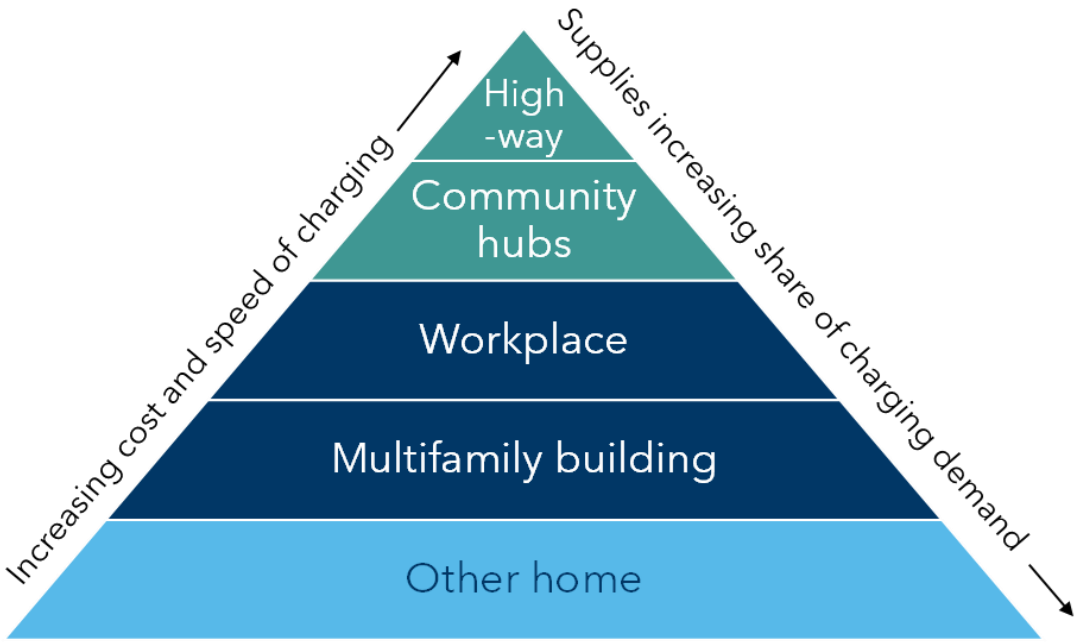

Figure 2-1. Relative importance of different charging categories, by total energy dispensed[7]

[7] Figure adapted from: U.S Department of Energy, *A Guide to the Lessons Learned from the Clean Cities Community Electric Vehicle Readiness Projects*, 2014.

2.1 Potential Revenues from EV Charging

Potential revenues from operating public charging infrastructure include the following:

- **User fees.** User fees can be applied for parking and/or for use of charging infrastructure. Fees for charging are usually structured on a time basis ($/minute); however, regulations introduced by Measurement Canada in February 2023 now allow site hosts to charge on a volumetric basis ($/kWh, $/kW).
- **BC Low Carbon Fuel Standard and Canada Clean Fuel Regulations.** BC's Renewable and Low Carbon Fuel Requirements currently provide a robust market for carbon credits. These credits are generated by providing EV charging; wholesalers of polluting gasoline and diesel must procure these credits in increasing quantities. This provides an exceptional opportunity for revenue that can make offering many forms of EV charging profitable. However, the value of these credits in the future is uncertain; it is possible their value will reduce and providing EV charging will accordingly become less lucrative.
  Utility services, such as demand response. Utilities are increasingly offering voluntary rates and/or programs that provide financial rewards to customers operating equipment (e.g. EV chargers) that can be controlled in such a way to provide benefits to the electricity grid. For example, EV chargers can provide demand response services, reducing power consumption when wholesale electricity prices are high and/or the grid is congested. This provides revenue opportunities for network operators.
- **Advertising.** Charging infrastructure, screens and apps can feature advertising, presenting revenue opportunities for networks.

3. Strategic Principles

Local and regional governments should adopt the following strategic principles in their efforts to support EV charging infrastructure deployment in their communities:

STRATEGIC PRINCIPLES FOR LOCAL GOVERNMENTS

1. Embrace the **critical role of local governments** in providing public EV charging infrastructure
2. Continue to prioritize **active and shared modes**
3. Ensure **equitable access** to EV charging
4. Take a **futureproofing** approach
5. Focus on convenient EV charging located **where vehicles already park**
6. Enable **private-sector and utility investment**
7. Advocate for **senior government and utility policies** that support EV charging

Below, we briefly describe the rationale for each of these principles. The principles inform the recommended Deployment Actions that follow in Section 5.

Principle 1. Embrace the critical role of local governments in providing public EV charging infrastructure

Local and regional governments have a critical role to play in the supply of EV charging to residents.

Local governments directly control land use, use of the right-of-way, business licencing, and parking in their communities, while also owning and operating public lands. Local governments therefore **control many of the opportunities to provide public charging**. By deploying, allowing, and/or requiring EV charging to be deployed, local governments can speed the transition to EVs.

Specifically, the key tools at local governments' disposal include:

- **Policy/regulation:** adopting bylaws, business licencing requirements, and land development approaches that require EV charging deployment on private lands.
- **Providing lands:** cities own rights of way, parking facilities, and other public lands that are strategic public charging sites.
- **Engagement, partnerships and education:** bringing together charging service providers, other orders of government, landowners, developers, financial institutions and others to collaborate on EV charging deployment. Likewise, local governments can inform their residents about opportunities to implement EV charging.
- **Planning and target setting:** local governments have intimate knowledge of their residents needs, travel patterns, use of public space, and future infrastructure and land development plans. As such, municipalities should be involved in setting deployment strategies to ensure alignment with other policy objectives.

- **Investment:** procuring or otherwise funding the deployment of public, multifamily, and shared commercial charging. Further discussion of deployment and operation models is provided in the next paragraph.

There can be significant benefits to municipally-led charging networks, including a greater ability to match location, charging type and pricing in line with local public interests. Municipalities should only seek to establish or expand their own independently managed EV charging networks if they have dedicated sufficient capital, operating and staff resources, and plan to achieve significant economies of scale. Alternately, local governments could partner with BC Hydro with the municipality providing sites to host public charging; BC Hydro has indicated their interest in such partnerships.

Principle 2. Continue to prioritize active and shared modes

The transition to EVs must not come at the expense of more sustainable modes of transportation, including walking, biking, and transit. When planned and designed appropriately, EV charging infrastructure can complement and even **enhance the experience of people using other transportation modes.** For example:

- Public charging stations located on mid-road islands can double as protected bike lanes or curb bulges.
- EV charging can supply power for food trucks or other on-street amenities, reducing air and noise pollution and enhancing the pedestrian experience.
- Supporting the electrification of carsharing and passenger directed fleets (ridehailing and taxis) can help improve the business case for these modes, reduce emissions from high mileage fleets, and support drivers who are less likely to have home charging access.

Local governments must **coordinate internally to avoid conflicts with active and shared modes**; for example, planning the cycling network and on-street chargers on different corridors. Further, while there is a strong rationale for subsidizing EV charging, local governments should ensure that policies do not inadvertently oversupply or underprice parking in ways that incentivise vehicle use.

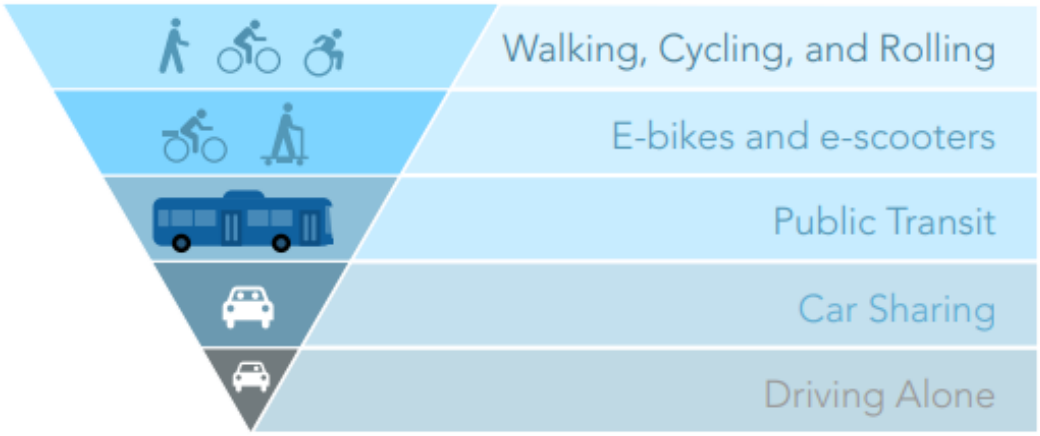

Figure 3-1. Transportation hierarchy[8]

Principle 3. Ensure equitable access to EV charging

It is critical that historically disenfranchised and equity-deserving groups (including low-income households, recent immigrants, disabled people, and renters) **face no additional barriers** to accessing EV charging compared to more privileged members of Metro Vancouver's communities.

Likewise, it critical that EV charging infrastructure is designed to be **safe** (including for women in public spaces) and **designed for accessibility**. Section 6.2 includes further guidance on how to plan and deploy EV charging infrastructure with a focus on social equity.

Principle 4. Take a futureproofing approach

EV adoption is already growing rapidly in Metro Vancouver and it will accelerate over the next decade, driven by increasing consumer interest, decreasing costs, and especially the BC Zero-Emission Vehicle (ZEV) sales mandate. According to forecasting conducted for this project, the number of light-duty EVs on the road in the region will surpass **0.5 million by 2033** and **1 million by 2038**, up from about 90,000 today. While the rate of adoption is somewhat uncertain, the end state is known—by 2035, 100% of sales will be EVs, resulting in near complete fleet turnover by 2050 or earlier.

Accordingly, in the next five to 10 years, **there is little risk of building too much public charging infrastructure**; demand will soon catch up with any temporary oversupply. Rather, there is a risk of under-building, which could slow the transition to EVs if people do not feel confident adopting EVs. An undersupply could even threaten the viability of policies like BC's ZEV sales requirements, which are predicated on all residents being empowered to adopt an EV if they are going to drive a personal vehicle. Accordingly, **local governments must facilitate rapid and widespread deployment of EV charging infrastructure**.

[8] Source: Metro Vancouver Climate 2050 Transportation Roadmap

Principle 5. Focus on convenient EV charging located where vehicles already park

The best place to charge is a place where the vehicle is already parked, whether at home overnight, at work during the day, or at retail establishments or other amenities. Key locations include transit hubs and park and rides (where taxi and ridehailing fleets, as well as individuals) often conduct pickup and drop-offs. Local governments have the best knowledge and data on travel behaviour and use of public space.

Where possible, Metro Vancouver and its members should maximize the potential of EV charging at drivers' **homes, workplaces and regular destinations**, as opposed to new dedicated public charging locations where drivers must make special trips. This approach will be **more convenient for drivers**, while **reducing the space devoted to cars**. Accordingly, public EV charging hubs should be **close to amenities** (such as food and washrooms), with charging speeds aligned with typical vehicle parking dwell times and frequency of visits (**faster charging for shorter stays and slower charging for longer parking times**).

Principle 6. Enable private-sector and utility investment

EV charging infrastructure will be deployed by several organizations in Metro Vancouver, including BC Hydro, the private sector, and local governments. Successful deployments rely upon the timely and low-cost approval of projects by local governments, but in some cases, legacy regulations or inappropriate processes pose barriers. For example, some municipalities unnecessarily apply building permitting to public charging stations or do not count dedicated EV charging parking towards parking minimums. Local governments should **strive to be "open for business" for private sector and utility EV charging networks.** See Action 2.1 for further information.

Principle 7. Advocate for senior government and utility policies that support EV charging

Local governments can also call for and support federal, provincial and utility policies that help improve the business case for charging investment. For example, **Local governments should continue to serve as a strong voice for effective climate and energy policy** that serves their interests as operators of charging infrastructure and more importantly the interests of their communities.

4. Roles for Key Actors

Deploying EV charging infrastructure at the scale necessary requires **big, coordinated actions** across the ecosystem from governments, utilities and third parties. **There are significant benefits to publicly owned charging infrastructure,** including setting locations and charging fees in the public interest. This is particularly important to ensure service to historically and currently underserved communities. **Overall, some level of public sector intervention is required to ensure equitable access to EVs and charging.**

There are some responsibilities that only certain actors can address. For example, municipalities and provinces have **unique regulatory powers** (land use approvals, zoning, right of way permissions) that must be leveraged. Likewise, successful deployment is not possible without timely **electrical service extensions** provided by the utility.

On many other fronts, multiple actors have the opportunity and responsibility to act, including **establishing targets, investing in infrastructure, and educating the public**. This means that setting clear roles and mechanisms for coordination among actors in the Metro Vancouver region will be critical to avoid duplication and align efforts. Table 4-1illustrates the most important roles to be played by these different actors.

Table 4-1. Roles for key actors

Action	Fed. Govt.	Prov. Govt.	MVRD, Trans-Link	Local govts.	BC Hydro	First Nat-ions	Prop-erty owners	Charging service providers
Establish deployment **targets**; monitor and evaluate	■	■	■	■	■	■	■	■
Invest in charging infrastructure	■	■	■	■	■	■	■	■
Ensure **equitable access** for underserved communities	■	■	■	■	■	■	■	■
Provide **public data** that support planning	■	■	■	■	■	■		■
Provide **lands** for infrastructure deployment	■	■	■	■	■	■	■	
Invest in **workforce** training and development	■	■	■	■	■	■		■
Establish a supportive **regulatory framework**	■	■	■	■		■		
Use **regulatory tools** to require private sector deployment		■	■	■		■		
Provide timely **approvals**		■		■	■	■		
Develop **demand response programs** & utility-integrated EV Energy Management Systems (EVEMS)		■			■			■
Develop **electricity supply** to meet future demand	■	■			■			
Provide timely **electrical services**					■			

4.1 Role for Local and Regional Governments

When local and regional governments deploy charging infrastructure, they must choose from **several possible deployment models**, including:

- **Partnering with BC Hydro to deploy infrastructure**. BC Hydro encourages this approach (see Section 4.2);
- **Investing directly,** by:
  - Funding the deployment of infrastructure by third parties through grants or procurement;
  - Owning their own infrastructure but outsourcing operations; or
  - Owning and operating their own infrastructure.

Despite the potential revenues outlined in Section 2.1, the ability to recover the investment costs of public charging infrastructure is uncertain, due especially to uncertainties around the price and future availability of Low Carbon Fuel Standard credits, charging demand, capital costs, maintenance costs, electricity rates and demand charges.

Accordingly, there is a crucial role for the public sector to support deployment of charging infrastructure, to ensure that a lack of charging in not-profitable areas does not present a barrier to EV adoption. In this context, local and regional governments should expect that providing EV charging in the public interest may mean operating these services at a loss in some cases.[9] Further discussion of considerations for municipal-led deployment are explored further in Section 6 Deployment Planning.

[9] While there is a strong rationale for subsidizing EV charging, there is no justification for subsidizing *parking* in general. It is recommended that local governments ensure that policies do not oversupply or underprice parking in ways that incentivise excessive private vehicle use or incur unnecessary construction costs.

MUNICIPAL PRIORITY AREAS FOR EV CHARGING

There are specific strategic charging sites on lands that local and regional governments and authorities control, influence, or understand, including:

- Employment and commercial hubs
- Tourism sites
- Park and rides at transit stations
- Taxi and ridehailing stands
- Concentrations of people without home charging
- Equity-deserving areas

Whether local and regional governments are deploying their own infrastructure or partnering with BC Hydro or third parties for deployment, they can make sure these sites of municipal interest are incorporated into plans. See Section 6 Deployment Planning for further guidance on area prioritization and site selection.

4.2 Role for BC Hydro

At the end of the 2023 fiscal year, BC Hydro had deployed 141 DCFC ports across 83 sites in British Columbia. Of those sites, 31 serve urban populations (greater than 30,000 residents) and the remainder serve non-urban and corridor charging. BC Hydro's network currently represents about 14% of the public DCFC market share and less than 1% of the public Level 2 market share.[10]

BC Hydro's Electrification Plan (2021) established its current plan to have 325 fast chargers (around 450 DC ports) at 145 sites by the end of 2025.

On July 28, 2023 BC Hydro filed an application to the BCUC for a 10-year levelized public charging rate, along with a 10-year reference deployment plan to expand BC Hydro owned and operated public charging stations to 2000+ DC ports and 1200+ Level 2 charging ports by 2033. The plan includes a wide spectrum of public charging power levels from Level 2 through 350kW DCFC.[11]

While the outcome of this regulatory process will not be known until after the completion of this report, this proposed plan by BC Hydro is substantial and indicates to local governments that BC Hydro is ready to provide significantly more public EV charging infrastructure. BC Hydro encourages local governments to start or continue working with BC Hydro to ensure sites in their communities are ready and secured for investment by BC Hydro.

[10] BC Hydro (2023). BC Hydro Public Electric Vehicle Charging Rates Workshop presentation.

[11] Details of the BCUC proceeding (as of August 2023) can be viewed here: https://www.bcuc.com/OurWork/ViewProceeding?applicationid=1139

4.3 Role for First Nations

As shown in Table 4-1, First Nations will generally have a similar role to municipalities when it comes EV charging. Like municipalities, First Nations may set targets for EV charging deployment in their communities and pursue deployment independently or through partnerships. In this regard, the recommended actions for local governments in this guide may also support First Nations in their planning.

Furthermore, local and regional governments must consult First Nations in developing their EV charging infrastructure strategies. The action plan (Section 5) includes recommendations to this effect.

5. EV Charging Deployment Actions

This section presents **policies, procedures, investments and partnerships** that municipal governments, Metro Vancouver and Translink should take to support deployment of EV charging infrastructure, along with actions by other actors that local and regional governments can advocate for. Actions in Table 5-1 are grouped into the following categories:

1.0 Formalize EV charging strategies

2.0 Require and support public charging on private property

3.0 Invest in municipal/regional charging networks

4.0 Adopt design practices that support access and integration

5.0 Require and support EV ready multifamily residential buildings

6.0 Call upon the Province of BC, the BC Utilities Commission, and BC Hydro to continue to adopt a supportive regulatory environment

Table 5-1 also provides information to support implementation, including:

- **The appropriate lead organization**:
  - Local government (LG)
  - Regional entity which includes Metro Vancouver and Translink (Reg.)
  - BC Hydro (BCH)
  - BC Utilities Commission (BCUC)
  - Province of BC (Prov.)
- **The type of action** (policy, procedure, investment, engagement or partnership)
- **Time frame** (indicates a combination of urgency and ease of implementation)
- **Cost to government** ($, $$, or $$$). Regulatory and policy actions are considered low cost while investments and programs entail greater costs.

Table 5-1. Action plan

Action		Lead	Action Type	Time Frame	Cost to Govt.
1.0	**Formalize EV charging strategies** (multifamily, public and shared commercial charging)				
1.1	**Adopt charging infrastructure targets, plans and strategies**	LG & Reg.	Policy	0-2 yrs	$
2.0	**Require and support public charging on private property** (public and shared commercial charging)				
2.1	**Streamline municipal regulatory regimes and provide timely project approvals**	LG	Procedure	0-3 yrs	$
2.2	**Adopt EV ready requirements for parking in new non-residential developments**	LG	Policy	0-2 yrs	$
2.3	**Develop regulatory incentives for installation of EV charging infrastructure on appropriate commercial land uses**	LG	Policy	0-4 yrs	$
2.4	**Secure additions to public fast charging networks in appropriate new development approvals**	LG	Procedure	0-4 yrs	$
3.0	**Invest in municipal/regional charging networks** (multifamily, public and shared commercial charging)				
3.1	**Establish an agreement with BC Hydro to support deployment of public, workplace and residential EV charging; and/or establish or formalize local government EV charging services**	LG & BCH	Investment	0-2 yrs	$ - $$$
3.2	**Explore a regional government EV charging service**	Reg.	Investment, Partnership	0-2 yrs	$$$
3.3	**Engage with First Nations to support the deployment of infrastructure**	Reg.	Engagement, Partnership	0+ yrs	$
3.4	**Support access to parking and charging for carshare**	LG &/or Reg.	Policy, Investment	0-4 yrs	$$
3.5	**Support access to charging for taxis and ridehailing**	LG &/or Reg.	Policy, Investment	0-4 yrs	$$
3.6	**Establish a coordination body to oversee the deployment of public EV charging services**	Reg.	Engagement, Partnership	0-5 yrs	$

Action		Lead	Action Type	Time Frame	Cost to Govt.
4.0	**Adopt design practices that support access and integration** (multifamily, public and shared commercial charging)				
4.1	**Enable curbside EV charging with electricity sourced from an adjacent building or utility connection point**	LG	Procedure	0-4 yrs	$
4.2	**Integrate public EV charging into street design in a way that is compatible with other land uses**	LG	Procedure	0-2 yrs	$
4.3	**Develop procedures and practices for ensuring deployment is universally accessible and safe**	LG	Procedure	0-2 yrs	$
5.0	**Require and support EV ready multifamily residential buildings** (multifamily charging)				
5.1	**Adopt EV ready requirements for new residential developments**	LG	Policy	0-1 yrs	$
5.2	**Provide top-up incentives complementary to the EV ready Incentive Program**	LG	Investment	0-2 yrs	$$$
5.3	**Explore financing mechanisms, "make ready" programs, and other initiatives to support EV ready retrofits of multifamily buildings and workplaces**	LG &/or Reg.	Partnership	0-2 yrs	$-$$$
5.4	**Educate residents, rental building owners and strata corporations on options for providing EV charging infrastructure in multifamily buildings**	LG &/or Reg.	Policy	0-2 yrs	$
6.0	**Call upon the Province of BC, the BC Utilities Commission, and BC Hydro to continue to adopt a supportive regulatory environment** (multifamily, public and shared commercial charging)				
6.1	**Ensure BC Hydro has a comprehensive regulatory mandate to deploy and to facilitate private sector deployment of EV charging infrastructure**	Prov., BCUC, BCH	Policy	0-2 yrs	$
6.2	**Adopt Province-wide EV ready new construction requirements**	Prov.	Policy	0-3 yrs	$
6.3	**Set Province-wide targets and plans for comprehensive EV ready retrofits of existing multifamily buildings**	Prov.	Policy	0-3 yrs	$
6.4	**Ensure the regulations developed under the Strata Property Amendment Act, 2023 appropriately define Electrical Planning Reports and improve standards of practice for EV ready Plans**	Prov.	Policy	0-3 yrs	$

1.0 Formalize EV charging strategies

1.1 Adopt charging infrastructure targets, plans and strategies

Local governments should adopt charging infrastructure targets and actions into municipal/regional policy, plans and strategies, either in a standalone EV charging strategy or within other planning documents (e.g. Official Community Plans; climate, transportation, and neighbourhood plans. These strategies should:

- Establish EV charging deployment targets, particularly for local government charging networks. Include targets for equity-deserving communities.
- Engage the public in policy development, including equity-deserving communities.
- Formally acknowledge the importance of transportation electrification to achieve GHG reduction goals, improved air quality, reduce noise pollution.
- Acknowledge EVs' position in transportation hierarchies (e.g. continue to prioritize active modes, transit, etc.).
- Providing the mandate for all departments and services to facilitate deployment of EV charging.
- Commit to actions. Consider those noted in this document.

2.0 Require and support public charging on private property

2.1 Streamline municipal regulatory regimes and provide timely project approvals

Local regulatory regimes can impose unintended barriers to expanding public, workplace and residential charging. Local governments should review and update regulations, permitting and licensing requirements to remove barriers to investment in EV charging. Priorities include:

- Ensure zoning and parking requirements do not create unnecessary barriers (e.g. excessive minimum drive aisles and parking space dimensions). Dedicated EV charging parking spaces should count toward parking minimums to avoid requiring additional parking in new or retrofitted buildings. Consider clarifying that EV charging in visitor parking may be accessed by residents of a property.
- Do not apply building permits to EV charging infrastructure deployments.
- Clarify that premises collecting EV user fees for EV charging do not require a separate business license for that activity.
- Frontline municipal staff should be educated on relevant regulations and policies.

2.2 Adopt EV ready requirements for parking in new non-residential developments

Local governments should ensure they have EV ready requirements for new non-residential construction requiring that 20 to 40% of parking spaces be EV ready. Alternate compliance mechanisms may also be offered.

Requirements should provide for both workplace (longer-term) and visitor (shorter-term) EV charging applications; consider published best practice resources and local precedents for how to best achieve these policy objectives.[12]

[12] McEwen. 2021. *"EV ready" Requirements for New Buildings: A Best Practice Guide for BC Local Governments.*

Many Metro Vancouver municipalities have been world leaders in establishing these requirements; several have been adopted and more are underway.

See also Action 5.1 for residential EV ready requirements.

2.3 Develop regulatory incentives for installation of EV charging infrastructure on appropriate commercial land uses

Land uses such as service stations, public parking facilities, retail and assembly destinations are excellent opportunities for public EV charging; local governments can compel owners of these types of properties to provide EV charging. Local governments should consider:

- Replicating the City of Vancouver's business licence regime for EV charging. Effective January 2025, gas stations must provide at least 50kW of charging capacity, and public parking lots 26 kW (equivalent to four dedicated Level 2 chargers). Businesses that do not meet these requirements will pay an extra $10,000 on their business license annually.
- Flexible compliance mechanisms as part of the regimes, including allowing businesses to comply by building infrastructure offsite when onsite conditions are overly challenging. A few years' lead time should be provided.

Metro Vancouver should also consider developing requirements for charging as part of its authority to regulate air quality.

2.4 Secure additions to public fast charging networks in appropriate new development approvals

Local governments should develop policies to secure additions to publicly-accessible EV charging networks as a consideration of rezoning and/or development approvals for appropriate new developments. Consider the opportunity for a private property site to convey ownership and operations of the EV charging infrastructure to local government, BC Hydro, or other public charging networks.

3.0 Invest in municipal/regional charging networks

3.1 Establish an agreement with BC Hydro to support deployment of public, workplace and residential EV charging; and/or establish or formalize local government EV charging services

As part of its July 2023 application to the BCUC, BC Hydro filed a 10-year reference deployment plan for EV charging. This plan signals BC Hydro's interest in collaborating with BC local governments to deploy EV charging.

Metro Vancouver municipalities are recommended to engage with BC Hydro to develop agreements (for example, memorandums of understanding) on how to collaborate in deploying public charging infrastructure. Likewise, the agreements can identify respective roles to support home and workplace charging.

Likewise, as discussed in Principle 1, in appropriate circumstances, there are benefits to local governments investing in their own public EV charging assets to supply public, workplace, and potentially multifamily building charging. Local governments that choose to invest and operate EV charging services should establish sufficiently resourced and budgeted local government public EV charging services. Local governments deploying their own EV charging networks should:

- Define the objectives of the public charging service which should include some cost recovery, but not necessarily seek full cost recovery or profitability.
- Formally recognize the environmental and social benefits of charging

infrastructure investments, and explicitly plan for equitable deployment. This may entail operating at a loss, particularly in early years.

- Establish a preliminary target market share. For local governments, it is reasonable to aim to deploy 10% to 30% of the total charging infrastructure demand forecast.[13]
- Include targets for investments in equity-deserving communities.
- Include a commitment to meet all demand for workplace charging at city facilities; workplace charging can support talent retention and demonstrate leading by example.
- Formalize an operational unit to provide EV charging services, with sufficient resources to meet targets.
- Engage consultants and EV charging service providers to support network deployments.
- Plan medium-term (e.g. next 5 years) EV charging deployments, including cost estimates. Incorporate plans into municipal capital and operating budgets.
- Charge user fees to achieve some degree of cost recovery and encourage efficient use of infrastructure by community members.
- Pursue revenue streams from Low Carbon Fuel Standard credits, utility demand response programs, and potentially other sources.
- Periodically evaluate targets and performance.

3.2 Explore a regional EV charging service

As noted in Action 3.1, responsible stewardship of public resources when building EV charging networks requires dedicated professional management of EV charging networks and a sufficient scale of investment to achieve economies of scale. To ensure sufficient resources and scale, there may be a case for regional coordination of certain EV charging services – including building public charging infrastructure, as well as efforts to support workplace and residential charging.

It is recommended that Metro Vancouver and its member municipalities consider the business case for a regional public charging network in partnership with BC Hydro, to achieve appropriate scale and professional network management, particularly amongst smaller Metro Vancouver member municipalities.

3.3 Engage with First Nations to support the deployment of infrastructure in First Nations communities according to First Nations' identified needs

One model that may be of interest is increasing funding available for EV charging in First Nations communities and ensuring community ownership of the infrastructure.

3.4 Support access to charging for carshare, taxis and ridehailing

Carshare services are a critical service to enable households to forgo owning a car. Potentially, viability of carsharing can be bolstered through the transition to EVs.

One of the biggest barriers to the expansion of carsharing services is a lack of access to parking. As a result, local and regional

[13] The recommended 10 to 30% market share is based on estimates of how much BC Hydro and private actors will build, as well as a high-level estimation of the amount of parking controlled by local governments.

governments should use all available tools to expand carshare access to parking, including:

- Providing preferential charging at designated on-street carshare parking spaces.
- Leveraging developments review, business license incentives, grants and other mechanisms to support spaces and charging for carshare in residential and non-residential developments.
- Enabling carshare access in existing private parkades, which will reduce the demand for more parking and improve the business case for charging in existing buildings.

The two main types of carshare service include **round-trip carsharing** (members begin and end their trip at the same location) and **one-way carsharing** (members begin and end their trip at different locations). Each service type requires a different approach to charging: round-trip carsharing requires a permanent parking space with Level 2 charging. One-way carsharing can make use of publicly available charging, both Level 2 and fast charging. Across Canada, some providers are basing their model for EV carsharing on the premise that users will charge the EV (necessitating affordable overnight Level 2 charging) while others have staff that take care of charging the vehicles (necessitating access to fast charging). Local governments should engage further with carsharing providers in their jurisdictions to determine specific needs.

Given the regional nature of carsharing use, charging for carsharing is a strong candidate for regional coordination.

3.5 Support access to charging for taxis and ridehailing

Supporting the electrification of taxi and ridehailing services offers an excellent opportunity to reduce emissions, expand EV adoption, and support equity. Drivers can cover upwards of 300 kilometres per day, meaning that the business case for taxi and ridehailing electrification is strong, but drivers need support to overcome (a) the high capital cost of the vehicle and (b) access to charging.

To support charging for taxi and ridehailing drivers, local governments should:

- **Ensure there is a network of very fast charging (e.g. 350kW) at key pickup/dropoff points and taxi stands.** Consider providing this network exclusively to commercial vehicles (at least during peak demand hours) to ensure low wait times. (This model has been pursued in London, UK).
- **Explore opportunities to provide access to home charging for drivers.** (This model is being pursued by the Atmospheric Fund in Toronto).

Given the regional nature of taxi/ridehailing use, charging for carsharing is a strong candidate for regional coordination.

3.6 Establish a coordination body and develop tools for the scaling of public EV charging services

There are a variety of EV charging infrastructure deployment models involving local governments that would benefit from the adoption of replicable design approaches, bulk procurement/deployment, and central administration.

Deployment at scale will benefit from collaboration between BC Hydro, local governments, and EV charging service providers. Such coordination could be facilitated via the Local Government EV Peer Network, the Regional Engineering Advisory Committee, or other fora.

As part of this coordination, regional actors like Metro Vancouver and TransLink could develop the following tools to support rapid and cost-effective local government procurement and deployment:

- **Model Request for Proposal** documents that accelerate the process of establishing performance criteria for the design and operation of charging infrastructure.
- **Joint procurement** processes to help local governments procure infrastructure quickly and cost-effectively.
- **Model bylaws** to expedite the development and adoption of municipal rules including EV ready requirements (Actions 2.2 and 5.1), EV charging requirements within business licencing regimes, and processes to secure public EV charging in new developments.
- **Regular collection and dissemination to local governments of market intelligence about planned charging investments by other actors**. At a minimum, the coordination body would liaise between BC Hydro and EV charging service providers deploying public charging (e.g. Tesla, Electrify Canada, ChargePoint, etc.) to understand their deployment plans.

4.0 Adopt design practices that support access and integration

4.1 Enable curbside EV charging

On-street EV charging can be most cost-effective when it uses power supplied from an adjacent building (as opposed to a new electrical service), and/or when timely electrical and civil works create the opportunity for a utility grid connection to the parking space. Local governments should consider how best to enable curbside EV charging using power supplied from private property, while ensuring other policy goals for the street are realized. As part of this effort, local governments should:

- Formalize processes to designate "EV Only" or "EV Preferred" parking where charging is provided;
- Incorporate accessibility standards;
- Avoid conflicts with current or future municipal infrastructure, including proactively designating acceptable and unacceptable locations for charging;
- Adopt policies to allow for cost-recovery of electricity and charging infrastructure by those providing these amenities (e.g. the adjacent building), while ensuring municipalities retain control over curbside charging pricing;
- Require new developments implementing changes to the right of way to provide power to on-street EV charging. Alternately, require developers to install "make ready" conduits along the curbside when replacing the curb and sidewalk as part of the new development, connection between the parking space and the developments electrical room or a suitable utility connection point. Collaborate with BC Hydro and development stakeholders to establish consistent specifications;
- Enable use of extension cords to provide curbside charging in residential neighbourhoods, with appropriate rules for covers over sidewalks for safety and accessibility. Consider the City of Vancouver's EV Cord Cover License as a model.

4.2 Integrate public EV charging into street design in a way that is compatible with other land uses

EV charging can integrate well into the public realm but when not properly designed, can result in conflicts with other modes, stranded assets or excessive costs (if chargers need to be moved or modified).

Local governments should coordinate EV charging with other relevant plans, including active transportation networks, parking and curb access, food trucks, street engineering, facilities planning and design, and green infrastructure. When major street or facility works are planned, always consider opportunities to integrate EV charging. See Section 6.3 below for further guidance on siting EV charging infrastructure.

4.3 Develop practices and procedures for ensuring EV charging is universally accessible and safe by design

Incorporating accessible and safe design considerations as mandatory criteria at the inception of the project will ensure all EV users have access to barrier-free charging while ensuring regulatory compliance and avoiding costly renovations in the future.

Key accessibility considerations include the **physical accessibility** of the parking stall and the connector, as well as the **accessibility of all related communications interfaces** (apps, payment system, etc.)

While there are currently no regulations or consistent standards for accessibility of EV charging stations in Canada, there are several resources available (see Section 7.1.1).

Incorporating safety by design principles means ensuring groups that experience more harassment and violence in the public realm (women and gender diverse people, racialized people) **feel safe** using the infrastructure. Considerations include **visibility to the site, good maintenance, good lighting, and availability of cell phone reception**.[14]

In all cases, involving and consulting people with lived experience in setting design standards is critical. To ensure consistency across the region, a regional entity may be best suited to support the development and dissemination of best practices.

5.0 Require and support EV ready multifamily residential buildings

5.1 Adopt EV ready requirements for new residential developments

The most cost-effective way to provide charging access in new multifamily buildings is to require the EV ready components to be installed at the time of construction. Without this future-proofing approach, it becomes more costly and complicated to retrofit multifamily buildings to have EV charging.

Local governments should adopt requirements stipulating that 100% of parking in new residential developments be EV ready. Many Metro Vancouver municipalities have already taken this step, which represents the best practice internationally.

5.2 Provide top-up incentives complementary to the EV ready Incentive Program

BC's EV Ready Rebate Program for multifamily buildings provides a funding for building owners to future-proof multifamily buildings with EV charging infrastructure at scale. Local governments should consider providing top-up funding to the program.

Local governments should also explore other opportunities to support EV ready retrofits in collaboration with other regional stakeholders (see Action 5.3).

5.3 Explore financing mechanisms, "make ready" programs, and other

[14] See for example SNC Lavalin and Atkins, 2021. Draft Report: Getting Home Safely.

initiatives to support EV ready retrofits of multifamily buildings and workplaces

Local governments should work with other actors (including private sector finance, federal and provincial governments, and utilities) to assess options for EV ready retrofit project financing. Project financing for EV Ready Retrofits can help condominiums, rental buildings and other multifamily developments pursue comprehensive EV Ready futureproofing strategies that tend to be much more cost-effective on a life cycle basis, without needing to make a one-time major cash outlay. Currently, there are limited private sector financing offerings for this type of retrofit, particularly for the condominium sector. Development of appropriate financing mechanisms could be pursued by the Metro Vancouver Zero Emissions Innovation Centre. Consideration should be given for how best to integrate consideration for other building electrification actions into project delivery of EV ready retrofits.

Likewise, comprehensive EV charging futureproofing of multifamily buildings and workplaces could enabled by directing electrical utilities to pay for and rate-base the cost of EV Ready retrofit projects. Similar "Make Ready" programs have been established by New York and California utilities. Metro Vancouver should engage with the Province, BC Hydro and BCUC to explore opportunities for BC Hydro to rate-base the cost of EV Ready retrofits.

Finally, consider collaborating with BC Hydro and the EV charging industry on a standard specification for EV chargers, EV charging management systems, and EVEMS. Such standards would help ensure multifamily residents receive the best value from the EV charging services that are associated with 100% EV ready buildings.

5.4 Educate residents, rental building owners and strata corporations on options for providing EV charging infrastructure in multifamily buildings

Many multifamily residents and owners do not yet have a good understanding of their options for EV charging infrastructure in their properties. Local governments are often regarded as trusted impartial sources of information. Local governments can facilitate information about different opportunities to implement EV charging infrastructure, including comprehensive future-proofing with EV ready retrofits. This could be coordinated regionally, to achieve economies of scale and consistency. There are many resources already available to support education; see Appendix A for a list.

6.0 Call upon the Province of BC, the BCUC, and BC Hydro to continue to adopt a supportive regulatory environment

6.1 Ensure BC Hydro has a comprehensive regulatory mandate to deploy and to facilitate private sector deployment of EV charging infrastructure

BC Hydro currently operates one of BC's largest public charging networks and is actively planning further expansion. Likewise, BC Hydro tariffs and interconnection processes have a significant influence on the costs of deploying charging infrastructure. Metro Vancouver and its member municipalities should engage with the Province, BCUC and BC Hydro to ensure:

a) **BC Hydro has a strong mandate to invest** in its public charging network, especially in urban locations. This should include announcing targets for public EV charging deployment.
b) **Tariffs are designed to support EV charging**. Metro Vancouver and its municipalities could advocate for (1) predictable service extension fees; (2) EV-friendly rate design and the development of demand response programs. This latter category includes

actions like managing the impacts of demand charges, dynamic pricing and/or demand response programs that reflect the real-time cost of power.

c) **Improved transparency of the capacity of different locations on the distribution grid** (capacity on feeders) to accommodate charging infrastructure. Consider requiring BC Hydro to publish a regularly updated "hosting capacity analysis" map.[15]

6.2 Adopt Province-wide EV ready new construction requirements

Province-wide EV ready requirements for new construction should be adopted via legislation or the BC Building Code. Such rules are necessary to support the Province's adoption targets under the *Zero-Emissions Vehicle Act,* which mandates 90% of car sales to be zero-emissions by 2030 and 100% by 2035.

Such EV ready requirements will increase consistency for the development industry across BC while significantly reducing the time and effort required by local governments to adopt their own requirements. It will also support effective future-proofing and associated cost savings, for residents in municipalities that have not yet adopted requirements.

This action should not be implemented unless the Province matches the best practice EV ready requirements adopted by leading Metro Vancouver municipalities that require 100% EV ready residential parking in new developments, and 20% to 45% EV ready non-residential parking. Local governments should continue to expediently implement EV ready requirements in the absence of provincial action.

6.3 Set Province-wide targets and plans for comprehensive EV ready retrofits of existing multifamily buildings

Based on analysis as part of this project, comprehensive EV ready retrofits of existing multifamily buildings (as well as other buildings, such as workplaces and fleet parking) typically represents a more cost-effective and convenient method of providing EV charging at scale, compared to serving multifamily residents with public charging.

Accordingly, it is recommended that Metro Vancouver advocate for Provincial targets for EV ready retrofits be established. Target that all suitable multifamily buildings be 100% EV Ready by 2030. These targets should be supported by plans, including actions to drive adoption of these retrofits (actions for exploration are noted below).

6.4 Ensure the regulations developed under the *Strata Property Amendment Act, 2023* appropriately define Electrical Planning Reports and improve standards of practice for EV Ready Plans

BC *Bill 22 – 2023 The Strata Property Amendment Act, 2023* received Royal Assent on May 11, 2023. Among other actions, it will require that strata corporations obtain an "Electrical Planning Report". The detailed scope of this report will be determined in subsequent regulations, which will likely be drafted in 2023.

These Reports will help stratas understand their electrical systems' capacity in their buildings to support EV charging and electrify other end uses like space heating, hot water, and cooking. Likewise, the CleanBC EV Ready Rebate Program supports EV Ready Plans (i.e. feasibility

[15] See the Interstate Renewable Energy Council. 2020. "Validation Is Critical to Making Hosting Capacity Analysis a Clean Energy Game-Changer".

studies) with incentives, and defines the standards of practice of eligible Plans.

Metro Vancouver should engage with the Province and BC Hydro to ensure that the Electrical Planning Reports and the EV Ready Plans:

a) Help stratas understand their options to make all parking EV Ready, while also electrifying other building loads like space heat, hot water, cooking, etc. This includes understanding how much spare electrical capacity is available in the building to serve these loads, and the electrical design strategies that can provide power to these loads.

b) Are supported by automated, accurate provision of data from electric utilities wherever possible, to help minimize the costs of these reports.

c) Are performed by suitably qualified people.

d) Cannot be easily deferred, given the importance of stratas having this information to achieve regional transportation and buildings decarbonization goals.

6. Deployment Planning

6.1 Assessing Charging Needs

EV adoption is already growing rapidly in Metro Vancouver and it will accelerate over the next decade, driven by increasing consumer interest, decreasing costs, and especially the BC ZEV sales mandate. The Province's proposed update to this regulation will bring the mandate to 26% of sales by 2026, 90% by 2030, and 100% by 2035.

According to forecasting conducted by Dunsky for Metro Vancouver, TransLink and BC Hydro, the number of light-duty EVs on the road in the region will surpass **0.5 million by 2033** and **1 million by 2038**. While the rate of adoption is somewhat uncertain, the end state is known—by 2035, 100% of sales will be EVs, resulting in near complete fleet turnover by 2050 or earlier.

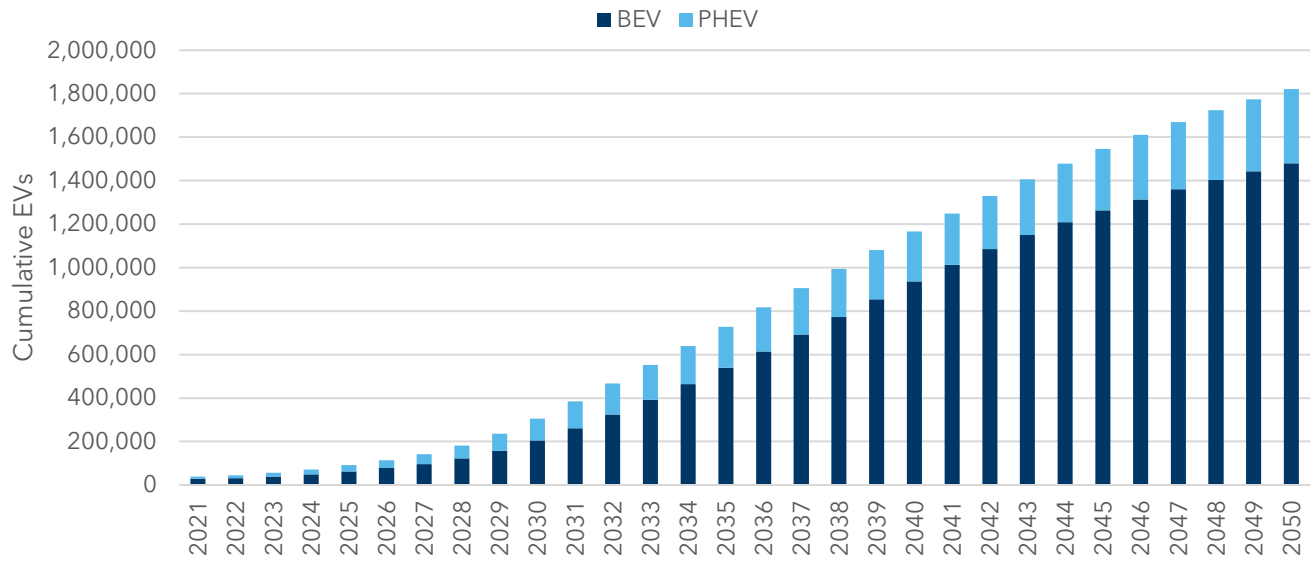

Figure 6-1. Results: Forecasted cumulative EVs on the road, by BEV and PHEV

This growth in adoption must be met with an increase in charging infrastructure.[16] The number and type of public ports required depends especially on the degree of access to home charging among adopters or potential adopters. Many Metro Vancouver residents do not have access to parking at home. These users will always rely on public charging.

Other residents have access to parking but due to the additional challenges related to installation in multifamily buildings, they do not currently have access to charging. Thirteen of 24 Metro Vancouver members, covering most of Metro Vancouver's population, have adopted parking design requirements in parking or zoning bylaws requiring EV ready

[16] Dunsky's charging needs assessment is based on nominal ratios of EVs on the road to EV charging infrastructure required, developed by the National Renewable Energy Laboratory (NREL) and adapted for Canadian communities. This method takes into account key factors such as the relative share of battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs); local urban density, climate and driving distances; and assumptions about average charging power.

parking for 100% or near-100% of residential parking in new developments. These rules ensure that charging equipment can be easily installed in any parking provided in new developments.

For existing buildings, parking space retrofits allow for installation of charging equipment. The charging needs assessment that follows is provided under two distinct scenarios to demonstrate the impact that multifamily retrofits can have on (a) the overall demand for public charging and (b) the total infrastructure costs. They are:

1. **High multifamily building retrofit scenario**: 90% (about 350,000) of existing multifamily building units' parking spaces are made EV ready by 2035.
2. **Low multifamily building retrofit scenario:** no additional EV ready retrofits of existing multifamily buildings are carried out; these users rely exclusively on public charging.

Cumulatively, **by 2035,** Metro Vancouver will need:

- **2,200 to 2,900 public DCFC ports** (on corridors, community hubs and for taxi and ridehailing vehicles), and
- **32,000 to 47,000 public L2 ports** (of which about two-thirds would be workplace charging).

Table 6-1 shows the total number of ports and installed power that needs to be added across the region, cumulatively, along with other key outputs include EV to charger ratios. Table 6-2 shows the total number of ports and installed power that needs to be added in five-year increments. Each five-year number should be added to the previous one.

These scenarios represent bookends: the highest and lowest possible approaches to multifamily retrofits. The best solution for Metro Vancouver jurisdictions will likely lie somewhere in between, and local governments can play a role in striking the right balance.

In Appendix B, we provide the disaggregated forecasts for each Metro Vancouver member (municipalities and First Nations). Please refer to the **Modelling Results Report** for further details, assumptions and sensitivities behind the modelling.

Table 6-1. Results: Summary of charging needs (cumulative)

Metric	Scenario	Current	2025	2030	2035	2040	2045	2050
Vehicles on the road								
Total number of LDV on the road (millions)	**All**	**1.5**	**1.6**	**1.7**	**1.8**	**1.9**	**1.9**	**2.0**
Light-duty EVs (thousands)	All	44	91	304	728	1,166	1,547	1,821
Charging needs (cumulative)								
Total public DCFC	**High retro.**	**270**	**931**	**1,196**	**2,152**	**3,362**	**4,203**	**4,627**
	Low retro.	**270**	**937**	**1,417**	**2,926**	**4,911**	**6,574**	**7,707**
Corridor DCFC	All		51	91	211	347	410	410
Community DCFC	High retrofit		840	1,030	1,801	2,859	3,622	4,029

Metric	Scenario	Current	2025	2030	2035	2040	2045	2050
	Low retrofit	270[17] in total	846	1,253	2,575	4,408	5,993	7,109
Shared commercial DCFC	All	0	40	75	140	156	171	188
Total public L2 (including workplace)	**High retro.**	**1,660**	**6,857**	**19,401**	**32,460**	**40,027**	**47,857**	**54,781**
	Low retro.	**1,660**	**6,907**	**23,696**	**46,729**	**62,228**	**79,906**	**97,622**
Workplace L2	High retrofit	1,660 in total	4,526	12,804	21,424	26,418	31,586	36,156
	Low retrofit		4,559	15,639	30,841	41,071	52,738	64,431
Other public L2	High retrofit		2,332	6,596	11,036	13,609	16,272	18,626
	Low retrofit		2,349	8,057	15,888	21,158	27,168	33,191
Total multifamily parking spaces retrofit (cumulative)	**High retro.**	**22,396[18]**	**34,769**	**278,350**	**353,754**	**353,754**	**353,754**	**353,754**
	Low retro.	**22,396**	**0**	**0**	**0**	**0**	**0**	**0**
Other outputs								
BEV/DCFC port ratio	High retrofit	106	68	171	250	278	301	320
	Low retrofit	106	67	144	184	191	192	192
EV/L2 port ratio	High retrofit	27	13	16	22	29	32	33
	Low retrofit	27	13	13	16	19	19	19
EV/total public port ratio	High retrofit	23	12	15	21	27	30	31
	Low retrofit	23	12	12	15	17	18	17
DCFC MW installed[19]	High retrofit	14	78	145	549	1,008	1,261	1,388
	Low retrofit	14	79	167	742	1,473	1,972	2,312
L2 MW installed	High retrofit	10	43	120	201	248	297	340
	Low retrofit	10	43	147	290	386	495	605

[17] We did not assign current ports to any of the sub-categories

[18] The current number of electrified stalls is estimated at 5% of the multifamily building stock. There is no available data to confirm.

[19] The total kW installed is calculated as the number of ports multiplied by the assumed average charging power level of those ports. For higher-power DCFC, the average charging power is lower than the nominal power of the charger most of the time. The ability of vehicles to take a high-power charge will increase over time. If the average power level in the future is different than the forecasts, the revised number of ports can be obtained by dividing the total installed power by the average charging power. The total installed power is **not** equivalent to the load impact; the load impact is much smaller because not all ports will be used at any given time. See the load impacts section for more information.

Table 6-2. Results: Summary of charging needs (in five-year increments)

Metric	Scenario	Current	2025	2030	2035	2040	2045	2050
Charging needs (five-year)								
Annual public DCFC	**High retro.**	**270**	**661**	**265**	**956**	**1,210**	**841**	**424**
	Low retro.	**270**	**667**	**480**	**1,509**	**1,985**	**1,663**	**1,133**
Corridor DCFC	All	270[20] in total	51	40	120	136	63	0
Community DCFC	High retrofit		840	190	771	1,058	763	407
	Low retrofit		846	407	1,322	1,833	1,585	1,116
Shared commercial DCFC	All	0	40	35	65	16	15	17
Total public L2 (including workplace)	**High retro.**	**1,660**	**5,197**	**12,544**	**13,059**	**7,567**	**7,830**	**6,924**
	Low retro.	**1,660**	**5,247**	**16,789**	**23,033**	**15,499**	**17,678**	**17,716**
Workplace L2	High retrofit	1,660 in total	4,526	8,278	8,620	4,994	5,168	4,570
	Low retrofit		4,559	11,080	15,202	10,230	11,667	11,693
Other public L2	High retrofit		2,332	4,264	4,440	2,573	2,663	2,354
	Low retrofit		2,349	5,708	7,831	5,270	6,010	6,023
Total multifamily parking spaces retrofit	**High retro.**	**22,396[21]**	**12,373**	**243,581**	**75,404**	**0**	**0**	**0**
	Low retro.	**22,396**	**0**	**0**	**0**	**0**	**0**	**0**
Installed power (five-year)								
DCFC MW installed[22]	High retrofit	14	65	81	469	540	722	667
	Low retrofit	14	66	102	641	833	1140	1173
L2 MW installed	High retrofit	10	33	87	114	134	163	177
	Low retrofit	10	33	114	176	210	285	320

[20] We did not assign current ports to any of the sub-categories

[21] The current number of electrified stalls is estimated at 5% of the multifamily building stock. There is no available data to confirm.

[22] The total kW installed is calculated as the number of ports multiplied by the assumed average charging power level of those ports. For higher-power DCFC, the average charging power is lower than the nominal power of the charger most of the time. The ability of vehicles to take a high-power charge will increase over time. This value is provided to support planning; if the average power level changes, the revised necessary number of ports can be obtained by dividing the total MW installed by the average charging power. However, it is important to note that the total installed power is **not** equivalent to the load impact; the load impact is much smaller because not all ports will be used at any given time. See the load impacts section for more information.

6.1.1 Futureproofing

Local governments should consider future-proofing charging investment plans; that is, deploying (or supporting the deployment of) infrastructure at a rate that stays ahead of demand to not artificially constrain EV adoption. There is little risk of overbuilding when considering the long-term outlook. While charging equipment technologies may change, the basic electrical and civil infrastructure needed to facilitate the installation of charging equipment will not.

6.1.2 Choosing charging types

The recommended share of community DCFC and L2 charging in the needs assessment is determined using the methodology laid out by the National Renewable Energy Laboratories which has been calibrated for North American communities. However, the right mix of fast-charging hubs and community L2 charging (at workplaces, along residential streets, etc.) will ultimately be a strategic choice that can be made by municipalities and other EV charging deployers according to community input and urban form. In choosing between charging types for specific sites, local governments should consider the following:

- **Past financial performance/utilization** of similar infrastructure in the area and pro forma analysis.
- **Use profile of the candidate sites.** Sites with relatively high turnover (30- to 90-minute typical parking times) make good candidates for DC fast charging. Longer parking times (four or more hours) are best suited to Level 2. See Table 2-1 for further information on charging times.

For planning the EV charging network, a broader set of considerations includes:

- **Needs of the potential users.** Level 2 is most appropriate for charging in most employment and residential areas due to the longer parking times. Much of what may be considered "workplace charging" will be in publicly accessible parking spaces where workers tend to park. Meanwhile, very fast charging is most appropriate for high pickup and drop-off areas, including those used by taxi and ridehailing drivers, who need to top up on the go.
- **Public input.** Public engagement on EV strategies and deployment plans may reveal charging type preferences or insights from specific neighbourhoods or charging sites. See the results of a recent BC Hydro customer survey for an example.[23]
- **Presence of BEV versus PHEV.** PHEVs cannot generally use DCFC charging.

In the results above, the relative importance of L2 charging peaks in the 2030-2035 period when a maximum of PHEVs is expected to be on the road and declines beyond that point as BEV become the dominant technology. As a high-level rule of thumb, **the ratio of L2 to DCFC ports ranges from approximately eight to 12** over our 30-year planning horizon. If a municipality or other user of this guidance chooses to further prioritize DCFC charging hubs over L2 deployment, this rule of thumb could be used to shift some of the anticipated public L2 demand to DCFC ports. It would be most appropriate to make this shift from the pool of "other public L2," since workplace charging is a good use case for L2.

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[23] BC Hydro (2023). BC Hydro Public Electric Vehicle Charging Rates Workshop presentation.

6.2 Equitable Deployment

6.2.1 Equity in EV Charging

Incorporating **equity** into government decision-making requires going beyond the notion of "equality" to recognize the root causes (historic and current) of oppression,[24] and being alert to the circumstances of specific groups. Moreover, equity includes both *outcomes* ("who gets what resources?") and *process* ("who is involved in making the decisions?"), as shown in Figure 6-2.

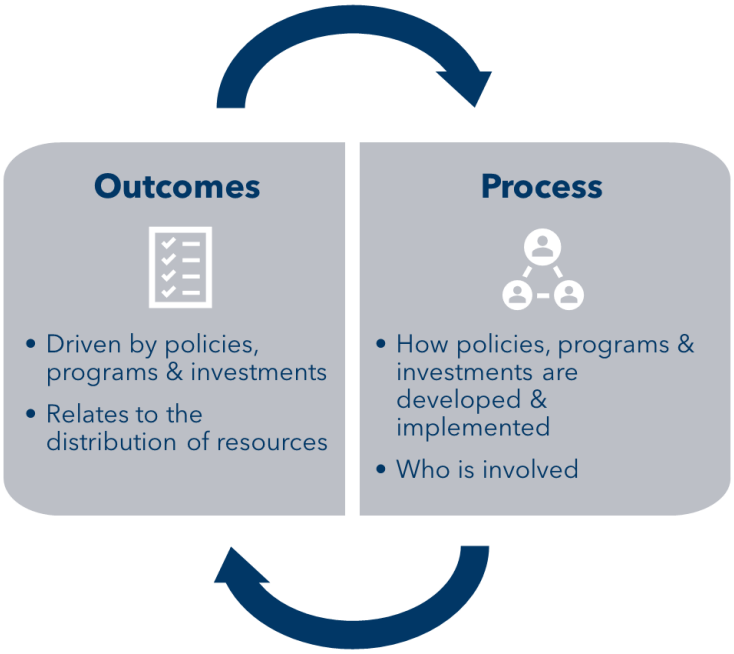

Figure 6-2. The key elements of an equity approach

Equity considerations can and should be applied to the transportation system, including transportation electrification infrastructure. Communities, organizations and advocates are increasingly recognizing the following elements as being a fundamental part of **transportation equity**:

- **Accessibility:** how many opportunities (jobs, services, amenities) can an individual access in a reasonable time and at an accessible cost, by the transportation means they have available?[25]
- **Safe and dignified mobility as a human right:** moving away from the focus on "choice" to a focus on dignity.[26]

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[24] City of Vancouver (2021). Equity Framework. Report to Council. RTS No.: 14507. VanRIMS No.: 08-2000-20. Also informative are the four lenses that the City of Vancouver incorporated within its Equity Framework. They are: Indigenous Rights, racial justice, intersectionality, and systems orientation.
[25] Grisé, Boisjoly, Maguire and El-Geneidy (article in press). Elevating access: Comparing accessibility to jobs by public transport for individuals with and without a physical disability. *Transportation Research Part A*.
[26] Sarah Brown (2021). Study: How We Talk About Racism in Transportation – And Why it Matters. Blog published on StreetsBlog USA. Also informed by a presentation from Charles T. Brown.

- Ensuring that the **benefits and burdens** of a program are **fairly distributed.**[27]
- **Engaging the communities** that a program is designed to serve, **meeting their needs, and building their capacity** to participate in decisions about transportation programs.[28]

Notable commitments to transportation (and land use) equity by governments and agencies in Metro Vancouver include:

- **2015:** Metro Vancouver Board adopts resolution endorsing the Truth and Reconciliation Commission of Canada Report.
- **2019:** Metro Vancouver released *A Review of Social Equity in Regional Growth Management*. Identifies equity-deserving groups in the region and where they live spatially.
- **2021:** Metro Vancouver Board recommitted to reconciliation and adopted a Strategic Plan identifying "strengthening relationships with First Nations" as a primary objective.
- **2022:** TransLink adopts *Transport 2050*, which includes equity and reconciliation as key strategic lenses through which all the actions of the Strategy are considered.
- **2022:** TransLink applied an Equity Evaluation Framework as part of its 10-year priorities, which identifies disadvantaged groups of interest and key metrics/barriers facing these groups.[29]
- **2023:** Metro Vancouver commissioned an annotated bibliography of social equity tools and resources in support of its Clean Air Plan.

6.2.2 Criteria for equitable access to EV charging infrastructure

Cost and access to charging are two of the predominant barriers to EV adoption facing people in poverty and recent immigrants (who are all more likely to be renters and live in multifamily buildings[30],[31]). When examining access to charging specifically, there are several additional barriers facing these and other groups, as shown in Table 6-3. This analysis of barriers faced by specific groups supports the identification of **priority communities** that Metro Vancouver, local governments and their partners should focus on when evaluating equity in charging deployment plans.

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[27] Smart Electric Power Alliance (SEPA) (2022). Benchmarking Equitable Transportation Electrification. Toolkit and Modules referenced throughout this report. This citation is from the Insight Brief, p. 8.
[28] Ibid.
[29] In this document, Translink puts forward the following definition of social equity: *The promotion of justice and fairness and the removal of systemic barriers that may cause or aggravate disparities experienced by different groups of people. This can include the many dimensions of identity, such as socioeconomic status, ethnicity, sex, age, disability, gender, sexuality, religion, indigeneity, class, and other equity-related issues.*
[30] Low-income people are about twice as likely as other people to be renters (Source: Statistics Canada, Housing Experiences in Canada: People in poverty, 2016).
[31] In Vancouver, 77% of renters lived in apartments in multiunit structures compared to 44% of owner households (Source: City of Vancouver, 2022, Housing Needs Report.(

Table 6-3. Barriers to EV charging[32]

Barrier	Description	Groups disadvantaged
Ability to install home charging	• More difficult in multifamily buildings • Split incentives between renters/landlords (including small businesses that rent their storefront)	• Multifamily building residents • Renters • Low-income people • Racialized people
Ability to use charging	• Many chargers cannot be used by people without banking, credit cards, smart phone applications, English or tech proficiency, etc. • Lack of accessible design standards for stations and application interfaces	• Unbanked people • People with disabilities • Non-English speakers
Greater cost & time burden	• At-home charging is cheaper, but multifamily building residents and renters more often have to rely on more expensive public charging • Private sector is less interested in investing in areas where current EV adoption is low • The price of public charging will likely increase over time • There is a greater time burden associated with public charging (home charging is more convenient) • Charging costs represent a greater share of household spending • Without careful futureproofing, the limited electrical capacity in existing buildings for EV charging can be exhausted by early adopters, making subsequent additions of EV charging for later adopters (who will be lower income on average) much more expensive	• Multifamily building residents • Renters • Low-income people • Racialized people
Lower access to programs	• Managed load programs may be limited to homeowners • Multifamily building residents or people that rely on on-street parking can be barred from accessing managed load programs	• Multifamily building residents • People without parking at their home • Renters

[32] Key sources for this table are: ACEEE (2021). Siting Electric Vehicle Supply Equipment (EVSE) With Equity In Mind; SEPA (2022). Benchmarking Equitable Transportation Toolkit - Report and Modules.

Spatial analysis can be used to evaluate the extent to which current infrastructure and future plans serve priority communities, in cases where those communities tend to be concentrated spatially (Table 6-4).

In many cases, **spatial equity** priority areas also align with areas of high **anticipated public EV charging demand** (e.g. dense urban areas with a high proportion of the population living in apartments). However, governments should apply caution when conducting data-driven equity analysis because:

- Frameworks and decisions must be informed by direct engagement with members of the priority communities.
- Aggregated data can mask nuances at the local level or among members of a given community (e.g. certain newcomer communities may face more barriers than others).
- Spatial analysis only reveals the presence of certain priority communities. Disabled people, for example, face barriers to accessing EV charging that must be eliminated through other actions.

Table 6-4. Priority communities who potentially face greater barriers to EV charging in Metro Vancouver

Priority Community	For spatial equity analysis	For outreach and involvement
First Nations		
Racialized people		
Recent immigrants		
Low-income people		
Multifamily building residents		
Renters		
Taxi and ridehailing drivers		
People with disabilities		
Unbanked people		
Non-English speakers		
Women and gender non-conforming people		

6.3 Planning and Site Selection

Local and regional governments should establish their priority areas for public and workplace deployment so they are prepared to prioritize sites, whether as part of funding or deploying their own networks, when partnering with or advising BC Hydro or other third parties on site selection, or when seeking to secure charging as part of private development (for example, as a consideration of rezoning).

Local and regional governments should:

- **Consider demand for charging and equity when prioritizing areas for EV charging**. Locating EV charging can often be opportunistic, depending on circumstances such as the occurrence of other street civil works; construction or renovation of municipal

buildings; enthusiastic neighbours or partners at a particular site; and other factors. There will be rapidly growing demand, and EV charging will be required widely across our communities. Accordingly, local governments need not necessarily engage in extensive mapping exercises to identify candidate locations.

- Nevertheless, some local governments will benefit from using spatial analysis to identify priority sites. Key factors to consider include the immediate demand for EV charging; equity between neighbourhoods; and the extent of EV charging infrastructure already serving particular communities, and whether it is at capacity. Table 6-5 below summarizes the types of areas to prioritize to meet EV charging demand as well as equity, and spatial indicators that can be used in analysis. Note that equity indicators and demand are often correlated. These areas represent "no regrets" opportunities for investment in public EV charging.

Table 6-5. Priority areas for public EV charging investment

Areas to prioritize	Rationale		Spatial indicators
	Demand	Equity	
High multifamily residential buildings			• Dwelling type (StatsCan)
High renters			• Housing tenure (StatsCan)
High vehicle use			• High vehicle trip origin/destination & mode (Trip Diary Survey)
High population density			• Population density (StatsCan)
High car-based employment density			• Employment density and trip mode (Trip Diary Survey)
Low public charging access			• NRCan Station locator • PlugShare
High taxi/ridehailing activity			• Major origins & destinations (transportation network service data)
Low income/wealth			• Low Income Measure (StatsCan) • Index of Multiple Deprivation (StatsCan) • Household spending data (e.g. Environics)
High recent immigrants			• Recent immigrants (Census)
First Nations communities			• Community/reserve locations
Indigenous identity			• Indigenous identity (Census)

- **Seek alignment, synergies and integration with other municipal infrastructure**. Inventory the parking at local government facilities, parks, and on-street locations. Engage with other local government departments to determine the key opportunities for synergies with EV charging infrastructure, as well as to identify challenges and risks of stranded assets. Explore options for maximizing the utility of EV charging infrastructure. For example, consider whether the same parking can provide workplace charging during the day and public or fleet parking during the evenings.
  - Consider plans for active transportation networks; parking and curb access; food trucks; street engineering; facilities planning and design; green infrastructure; and

other potential synergies and conflicts with EV charging infrastructure. Determine at what existing streets or facilities could EV charging be implemented with low risk of stranded assets or conflicts. When street or facility works are planned, always consider of opportunities to integrate EV charging.

- **Minimize costs by taking advantage of pre-existing electrical services with available capacity.** A new electrical service can significantly increase the costs of providing EV charging infrastructure, particularly public Level 2 charging. Local governments and other stakeholders should optimize opportunities to take advantage of existing electrical services when deploying EV charging infrastructure. This includes:
  - Prioritize deployment of EV charging at municipal facilities where it is possible to take advantage of existing electrical services.
  - Consider opportunities for street-light and power-pole EV charging. The City of New Westminster, in partnership with BCIT, have piloted such opportunities. While street-light circuits generally cannot provide fast charging, in some circumstances they can be useful for longer duration day-time or overnight charging. Seek to comprehensively inventory the potential for streetlight charging in any locations with on-street parking and streetlights. Consider especially such opportunities during LED retrofits.
  - Consider sites adjacent to utility infrastructure (e.g. low profile transformers - LPTs) that *may* (not always) result in lower utility extension fees. Inventory neighbourhood LPTs.
- **Engage with utilities early regarding candidate sites.** Seek guidance on locations where extension fees will be lower. As BC Hydro processes may evolve, continue to actively coordinate with BC Hydro and note the importance of timely guidance on where service extensions are likely to be more cost effective in advance of detailed electrical design.
- **Minimize costs through economies of scale and futureproofing infrastructure.** Seek opportunities to deploy multiple chargers at sites to achieve economies of scale by reducing the per-unit capital cost of "bulky" infrastructure (e.g. electrical services and equipment). When deploying EV charging infrastructure, always include consideration of subsequent expansion in the design process.

7. Managing Local Government Owned Public Charging Infrastructure

If local governments elect to manage their own charging infrastructure, they should ensure that it provides great customer service and is well managed. This section summarises recommended practices for administering, siting, designing and operating local government owned public EV charging infrastructure. Local governments should also follow guidance included in BC Hydro's *EV Fast Charging Design and Operational Guidelines for Public DCFC Stations in BC* and the *Level 2 Public Sector Charging Stations Best Practices Guideline*.

7.1 Designing systems

Local and regional government EV charging network operators should:

- **Follow best practice design and operations guidance.** Detailed design and operational guidelines are beyond the scope of this project. BC Hydro has published two key guides[33]. These resources (which are also linked in Appendix A) provide extensive design guidance (station placement on sites, lighting, surveillance, signage, landscaping, and civil works), as well as operating guidance (best practices for selecting vendors and contractors, maintenance, repairs, customer service, emergency response plan, and monitoring and dashboards). It is recommended that all public charging operators carefully consider these guidelines and adhere to all relevant guidance. Note that these guidelines are undergoing an update in consultation with the Local Government EV Peer Network.
- **Consider appropriate connector standards.** All installations going forward should include CCS, with a planned path to NACS (formerly the Tesla connector). It is currently recommended to have one CHAdeMO connector for the next two or three years to accommodate older EVs that require this connector type. Level 2 charging should always feature the J1772 connector in the short term, but should also consider the possibility of migrating to NACS in the future.
- **Seek scale and futureproofing for expansion.** Always consider opportunities to include multiple chargers and connectors at a site. This will often reduce costs, as some infrastructure costs are relatively fixed and not completely proportional to the number of chargers at a site. Likewise, explore opportunities to futureproof the infrastructure to accommodate later expansion. While the number of parking spaces that can be devoted exclusively to EV charging may be limited currently, futureproofing infrastructure can provide options for when more vehicles are EVs and devoting more parking to be exclusively for EVs becomes more acceptable.

[33] BC Hydro: EV Fast Charging Design and Operational Guidelines for Public DCFC Stations in BC and Level 2 Public Sector Charging Stations Best Practices Guideline.

7.1.1 Ensuring accessible charging station design

Organizations deploying or procuring EV charging must ensure that all drivers can use the infrastructure. Unfortunately, as the Canadian Standards Association (CSA) has noted, there are currently no regulations or consistent standards for accessibility of EV charging infrastructure at federal nor provincial levels.[34] Unfortunately, many stations to date are not barrier-free.

Incorporating accessible design considerations as mandatory criteria at the inception of the project will ensure all EV users have access to barrier-free charging while ensuring regulatory compliance and avoiding costly renovations in the future.

High-level accessibility considerations are listed here, but users of this guide should consult the key resources listed below and in Appendix A and seek input from users with lived experience with disabilities. Considerations include:

- **Ensuring physical accessibility of the infrastructure**:
  - Ensuring a person using a wheelchair or mobility device can physically access the charging interface, connector, and connect it to her/his vehicle. This means removing curbs, slopes and bollards, choosing a level parking stall, and ensuring sufficient parking stall width. Cable management systems should be designed such that all users are able to easily access and lift the cables (which are sometimes heavy) to and from their vehicles.
  - Assigning an appropriate number of chargers to designated accessible parking stalls.
  - Ensuring proper location relative to pedestrian entrances to the parking area.
- **Ensuring accessibility of communication features** such as display screens, apps, and card readers:
  - These components must be compatible with the needs of all EV users including those who are deaf or hard of hearing, visually impaired, have dexterity limitations or other disabilities.
  - Some features that increase accessibility include user interfaces or display screens (including apps) that are compatible with screen readers, the use of tactile and braille controls, and audio descriptions or speech output.

As a starting place, system and site designers should adhere to all accessibility requirements for parking in the BC Building Code[35] and to all relevant requirements and standards under the Accessible British Columbia Act, either currently enacted or forthcoming.

These resources provide guidance on **accessible parking**, which is an important component of **accessible EV charging**. The only design guidance in North America specifically related to EV charging to date has been released by the U.S. Access Board, in its resource called Design Recommendations for Accessible EV Charging Stations.[36] This document is an important resource. In Canada, the CSA Group is moving to consider appropriate standards.

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[34] Thirgood, J. (2022) *Charging Ahead: Ensuring Equity and Reliability in Canada's Electric Vehicle Network*. Canadian Standards Association.

[35] See the BC Building Accessibility Handbook 2020.

[36]

7.2 Administering EV charging services

7.2.1 Appropriate resourcing and priority-setting

Local and regional government EV charging network operators should **establish stable, well-resourced administration of EV charging services**. Local governments should ensure that their public charging networks are positioned for success. As noted in Section 3.1, local governments should consider formally establishing EV charging services to provide public charging as well as workplace charging for their employees. It is recommended to:

- Ensure sufficient human resources, capital and operating funds, and full-time staff to plan, design and deploy EV charging services and to sustain an excellent quality of service. This will require dedicated staff time and could well require new staff position(s). Staff roles should be formalized in work plans and job descriptions, and made less *ad hoc*. Likewise, it may require funding consultants to assist with planning, design and operations.
- Explicitly define the triple bottom line objectives of public charging services. Staff and network operators should have a mandate and structural incentives to optimize financial performance; however, local governments should formally recognize that EV charging services may not achieve full cost-recovery nor profitability.
    - There is much uncertainty influencing the operations of EV charging networks, notably regarding the price of credits that can be made through provincial and federal low carbon fuel requirements; depending on these credit prices (which are difficult to predict) EV charging may be quite profitable or conversely operate at a loss.
    - Municipalities should formally recognize the environmental and social benefits of investments in charging infrastructure, and that these benefits justify the risk of losses.
    - However, local governments are also encouraged to consider the opportunity to generate revenues to reinvest in other public services, and pursue all opportunities to profitably operate EV charging, provided these strategies do not impede other EV charging network from operating in their communities or otherwise slow EV adoption.
- Set targets for deployment. It recommended this be on the order of 10% to 30% of the total charging infrastructure demand forecast for communities.
- Commit to meeting demand for workplace charging at City facilities where parking is provided.
- Administer competitively procured relationships with EV charging service providers that will typically operate charging infrastructure on behalf of site hosts (i.e. municipalities).
- Plan to achieve sufficient economies of scale in the next 3-5 years to make investment worthwhile (e.g. a minimum total CAPEX of ~$500k+ over 3-5 years).
- Make a strong commitment to excellent customer service. This includes ensuring stations have very high uptime (e.g. 99%) and that maintenance and emergency repairs will be implemented expediently.

7.2.2 Establishing user fees

Local and regional government EV charging network operators should **establish user fees and capitalize on other revenue streams.** User fees support cost recovery and encourage drivers to use the limited resource of EV charging efficiently. User fees should be set high enough to encourage drivers to charge at home or at work where feasible, thereby reducing how much space must be devoted to public charging, but low enough to offer significant savings compared to fossil fuels. Monitor and consider prices from peer networks in the region (e.g. BC Hydro).

Seek carbon credit revenues under provincial and federal low carbon fuel requirements to the greatest extent possible. Likewise, explore utility demand response and other credit opportunities.

7.2.3 Procuring operators

Even when local and regional governments choose to manage their own infrastructure, they will likely outsource operation. In this case, they should **carefully procure EV charging service network providers to manage EV charging networks**. T

The choice of an EV charging network partner to deploy and manage locally-owned charging infrastructure is probably the most important decision facing local governments when deploying locally-owned charging infrastructure. Local governments should administer competitive procurement processes to select EV charging service provider partners. Key considerations include:

- Customer service. Select charging service providers with evidence of strong local maintenance and servicing capacity, 24/7 troubleshooting services, and other evidence of good customer service.
- Stable market position.
- Open protocols. Drive demand for entities to pursue full certification by the Open Charge Alliance for Open Charge Point Protocol (OCPP, a *de facto* industry protocol) 1.6 or higher for both charging stations and charging management systems. OCPP is intended to ensure compatibility between EV chargers and the charging management systems that charging network operators use to control them. It can help avoid stranded assets should a local government choose to change charging service provider partners. Note, however, that use of OCPP does not necessarily guarantee full interoperability; engage with service providers to seek demonstration of functionality. Likewise, in the future, demand IEC 63110, a forthcoming international standard for interoperable charging station and management system communications. Notwithstanding the value of moving towards open systems, recognize that in the current market there may be trade-offs between use of open systems and other key considerations (e.g. local capacity and customer service) when selecting charging service providers.
- Compatibility with multiple charging connector interfaces, including NACS, CCS, and CHAdeMO.
- Privacy and cybersecurity. The service provider must take appropriate steps to protect user data. They should consider whether data stored in Canada and secure the process for remote firmware updates.
- Capacity to valorize low carbon fuel requirement credits, if not separately being pursued by local governments.

Consider the opportunity for model or joint RFP administered by Metro Vancouver or other entities operating at the regional level.

7.2.4 Rewarding performance

Local and regional governments that choose to manage their own infrastructure should aim to **reward desirable performance** by key players. They should seek to structure compensation and/or contractual reward schemes for charging service providers, and potentially for municipal staff, for achieving key performance indicators, including equipment uptime and customer satisfaction.

8. Conclusions

Metro Vancouver has Canada's highest rate of EV adoption and, in accordance with BC's *Zero Emission Vehicle Act,* the number of EVs on the road will increase exponentially over the next decade. By the 2040s, nearly all passenger vehicles in Metro Vancouver will be EVs. This transition will largely eliminate GHG emissions and tailpipe criteria air contaminants from this sector, and result in significant economic benefits for Metro Vancouver by reducing the spending on gasoline and diesel that leaves the region.

Rapid deployment of EV charging infrastructure is critical to enabling the transition to EVs. Metro Vancouver and its municipalities are crucial to deploying EV charging. Through land use, business licensing, air quality regulation and other powers, local governments can support EV charging infrastructure deployment on private property. Additionally, local governments can partner with BC Hydro to deploy charging infrastructure, as well as invest directly in their own EV charging networks. Further, they can advocate for action by the Federal and Provincial governments, utilities, and BCUC. Local governments must focus on speed, scale and social equity in EV charging infrastructure deployment.

This document provides guidance on the key **principles** that should inform efforts to deploy charging infrastructure; **roles** for different stakeholders; **actions** for Metro Vancouver and its municipalities; deployment **planning**; and **management strategies** for municipal EV charging networks. By supporting rapid, well-considered deployment of charging infrastructure, Metro Vancouver local governments can realize the considerable benefits of EV adoption for the region.

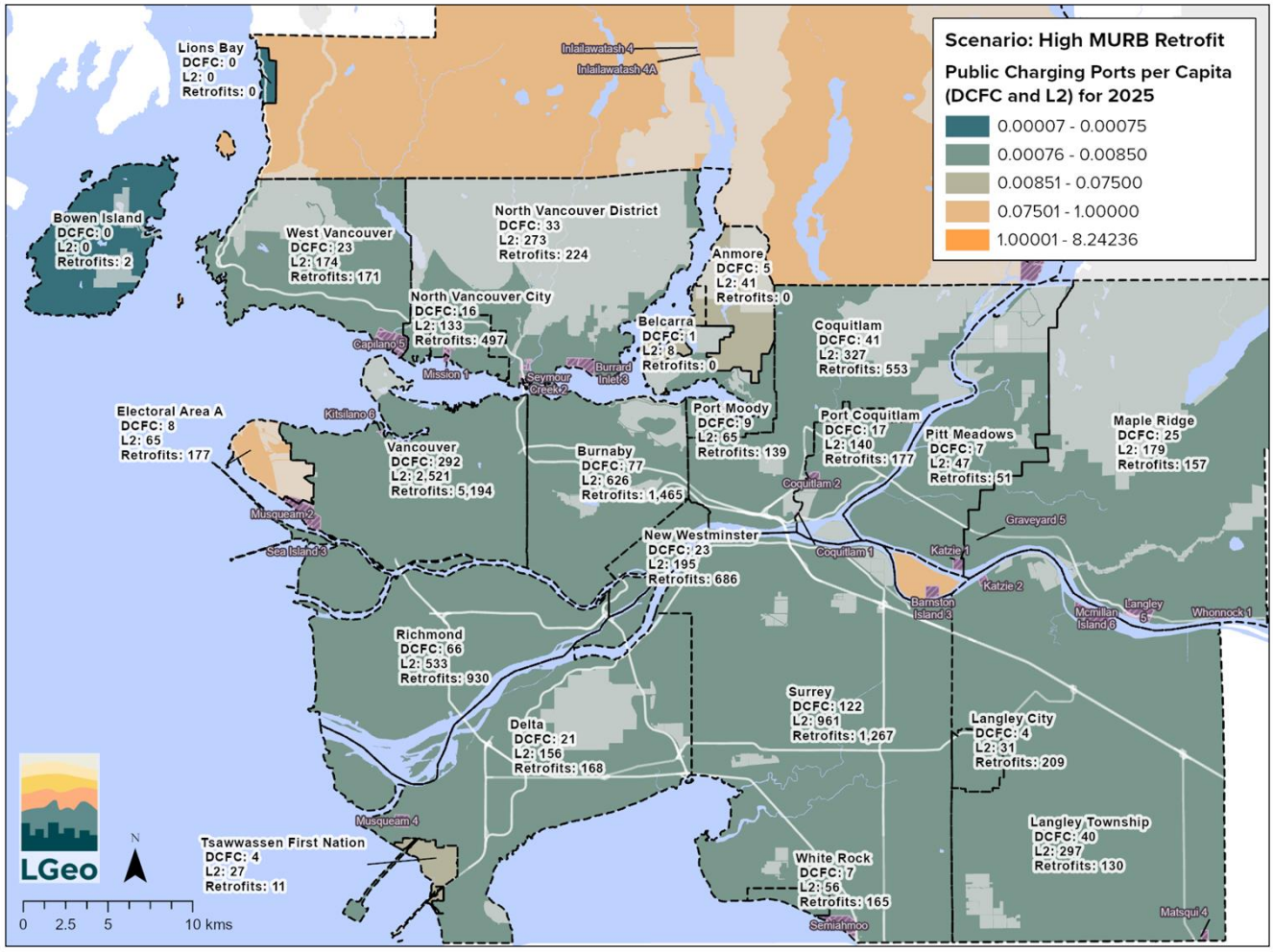
Appendix A: Complementary Resources

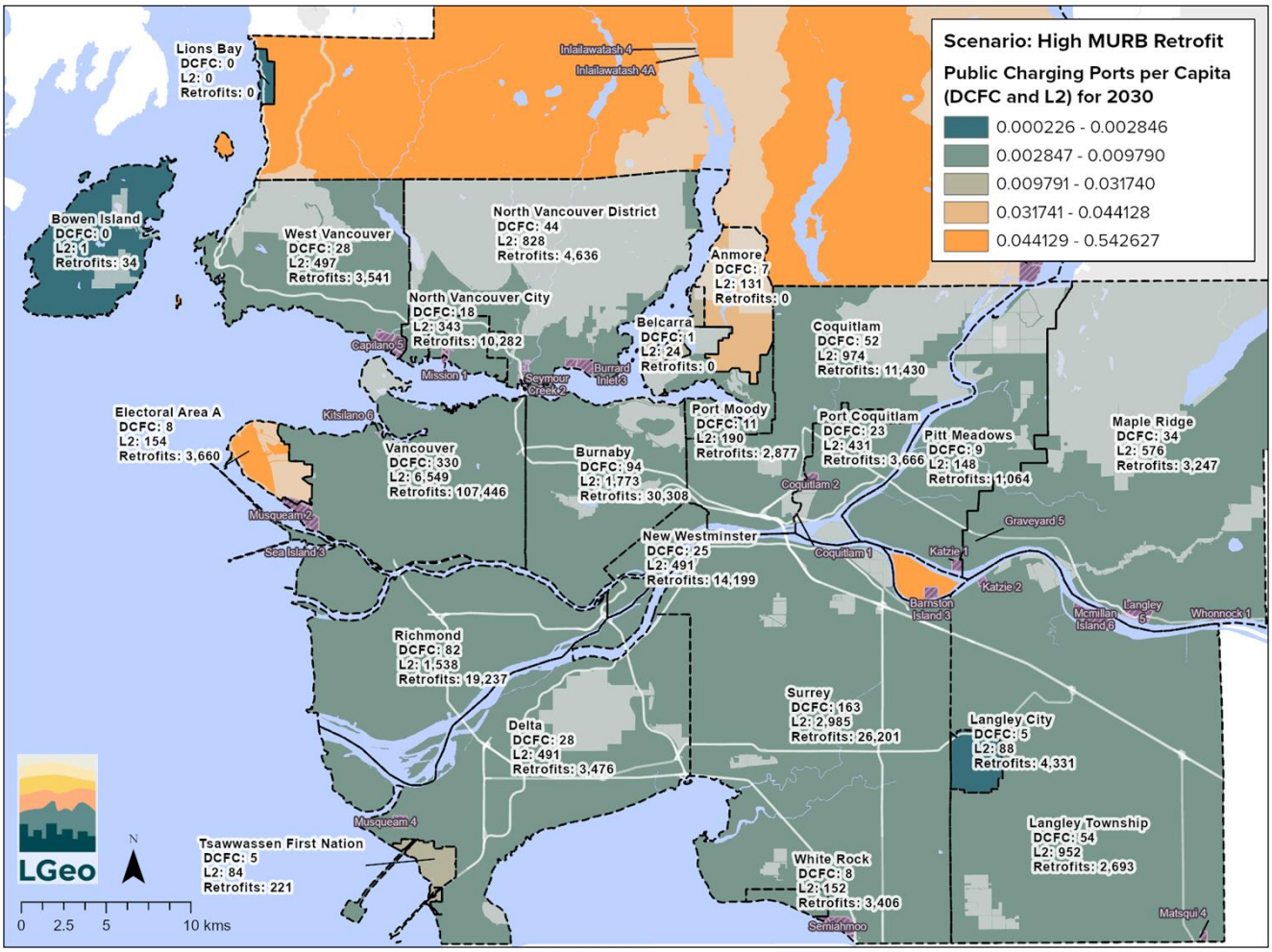
Topic	Author	Title & Link
Public Charging	BC Hydro	EV Fast Charging Design and Operational Guidelines for Public DCFC Stations in BC
	BC Hydro	Level 2 Public Sector Charging Stations Best Practices Guideline
Accessible & Equitable Design	Government of BC	BC Building Accessibility Handbook 2020
	Canadian Standards Association	Charging Ahead: Ensuring Equity and Reliability in Canada's Electric Vehicle Network
	US Department of Transportation	Design Recommendations for Accessible Electric Vehicle Charging Stations
Multifamily Charging	Plug In BC; Government of BC	A Guide to Installing EV Charging in MURBs
		A template survey to explore level of support for EV infrastructure from fellow residents in your building
	District of Saanich for the BC Sustainable Communities Network	A template Request for Proposals (RFP) that can be used by strata corporations to solicit quotes for EV Ready Plans
	Plug In BC	EV ready Plan Vetting Questions – to help strata corporations choose the right contractor for their EV ready Plan

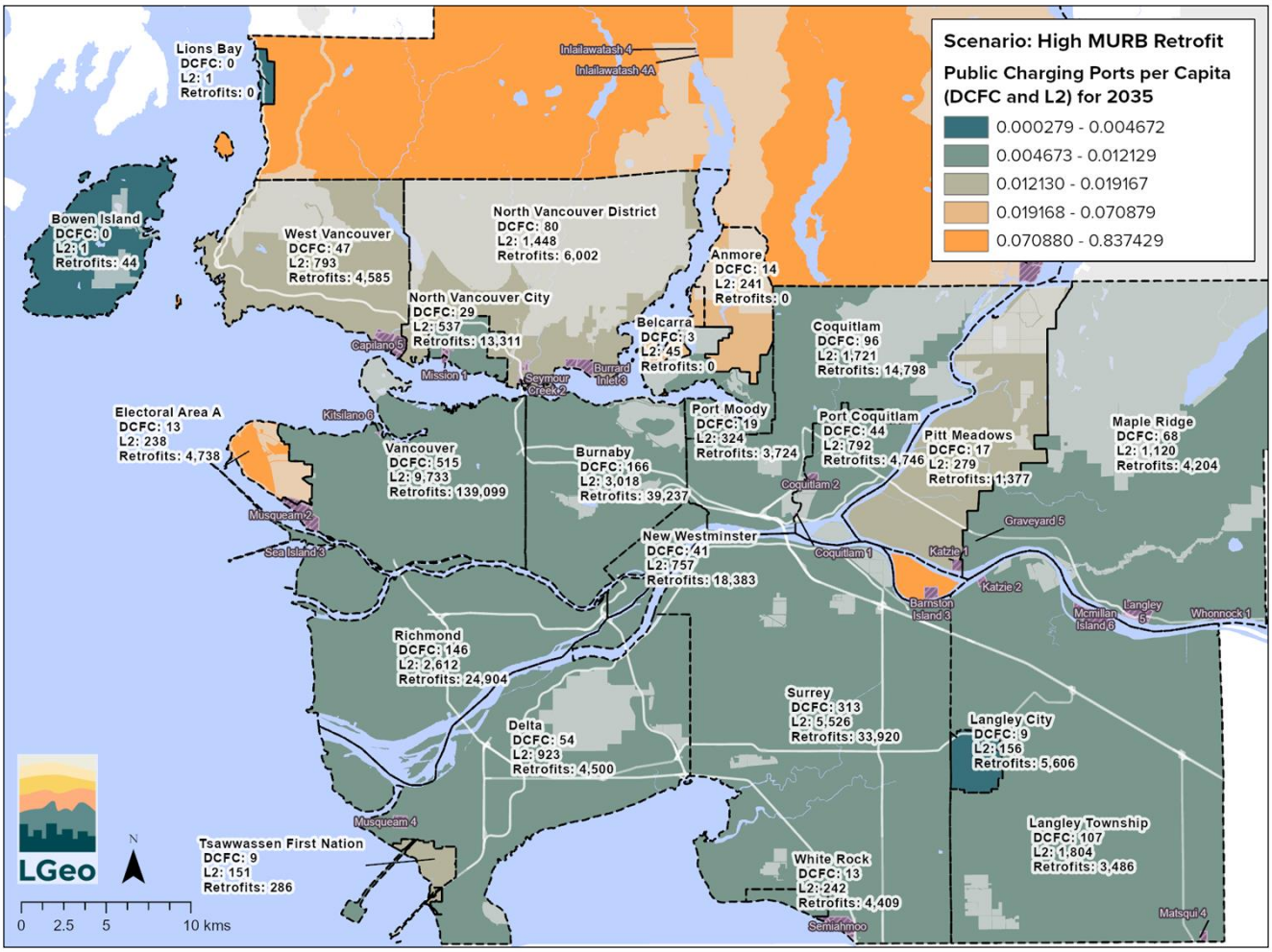
Appendix B: Charging Needs Forecasts by Metro Vancouver Member

See also the Results Dashboard (Excel).

Cumulative EV Charging Needs (Scenario 1: High Multifamily Building Retrofit)




Scenario: High MURB Retrofit
Public Charging Ports per Capita (DCFC and L2) for 2030
0.000226 - 0.002846
0.002847 - 0.009790
0.009791 - 0.031740
0.031741 - 0.044128
0.044129 - 0.542627
Lions Bay DCFC: 0 L2: 0 Retrofits: 0
Inlailawatash 4
Inlailawatash 4A
Bowen Island DCFC: 0 L2: 1 Retrofits: 34
West Vancouver DCFC: 28 L2: 497 Retrofits: 3,541
North Vancouver District DCFC: 44 L2: 828 Retrofits: 4,636
Anmore DCFC: 7 L2: 131 Retrofits: 0
North Vancouver City DCFC: 18 L2: 343 Retrofits: 10,282
Capilano 5
Mission 1
Seymour Creek 2
Burrard Inlet 3
Belcarra DCFC: 1 L2: 24 Retrofits: 0
Coquitlam DCFC: 52 L2: 974 Retrofits: 11,430
Electoral Area A DCFC: 8 L2: 154 Retrofits: 3,660
Kitsilano 6
Vancouver DCFC: 330 L2: 6,549 Retrofits: 107,446
Port Moody DCFC: 11 L2: 190 Retrofits: 2,877
Port Coquitlam DCFC: 23 L2: 431 Retrofits: 3,666
Pitt Meadows DCFC: 9 L2: 148 Retrofits: 1,064
Maple Ridge DCFC: 34 L2: 576 Retrofits: 3,247
Burnaby DCFC: 94 L2: 1,773 Retrofits: 30,308
Coquitlam 2
Musqueam 2
Sea Island 3
New Westminster DCFC: 25 L2: 491 Retrofits: 14,199
Graveyard 5
Coquitlam 1
Katzie 1
Katzie 2
Barnston Island 3
Mcmillan Island 6
Langley 5
Whonnock 1
Richmond DCFC: 82 L2: 1,538 Retrofits: 19,237
Surrey DCFC: 163 L2: 2,985 Retrofits: 26,201
Delta DCFC: 28 L2: 491 Retrofits: 3,476
Langley City DCFC: 5 L2: 88 Retrofits: 4,331
Musqueam 4
Tsawwassen First Nation DCFC: 5 L2: 84 Retrofits: 221
Langley Township DCFC: 54 L2: 952 Retrofits: 2,693
White Rock DCFC: 8 L2: 152 Retrofits: 3,406
Semiahmoo
Matsqui 4
LGeo
N
0 2.5 5 10 kms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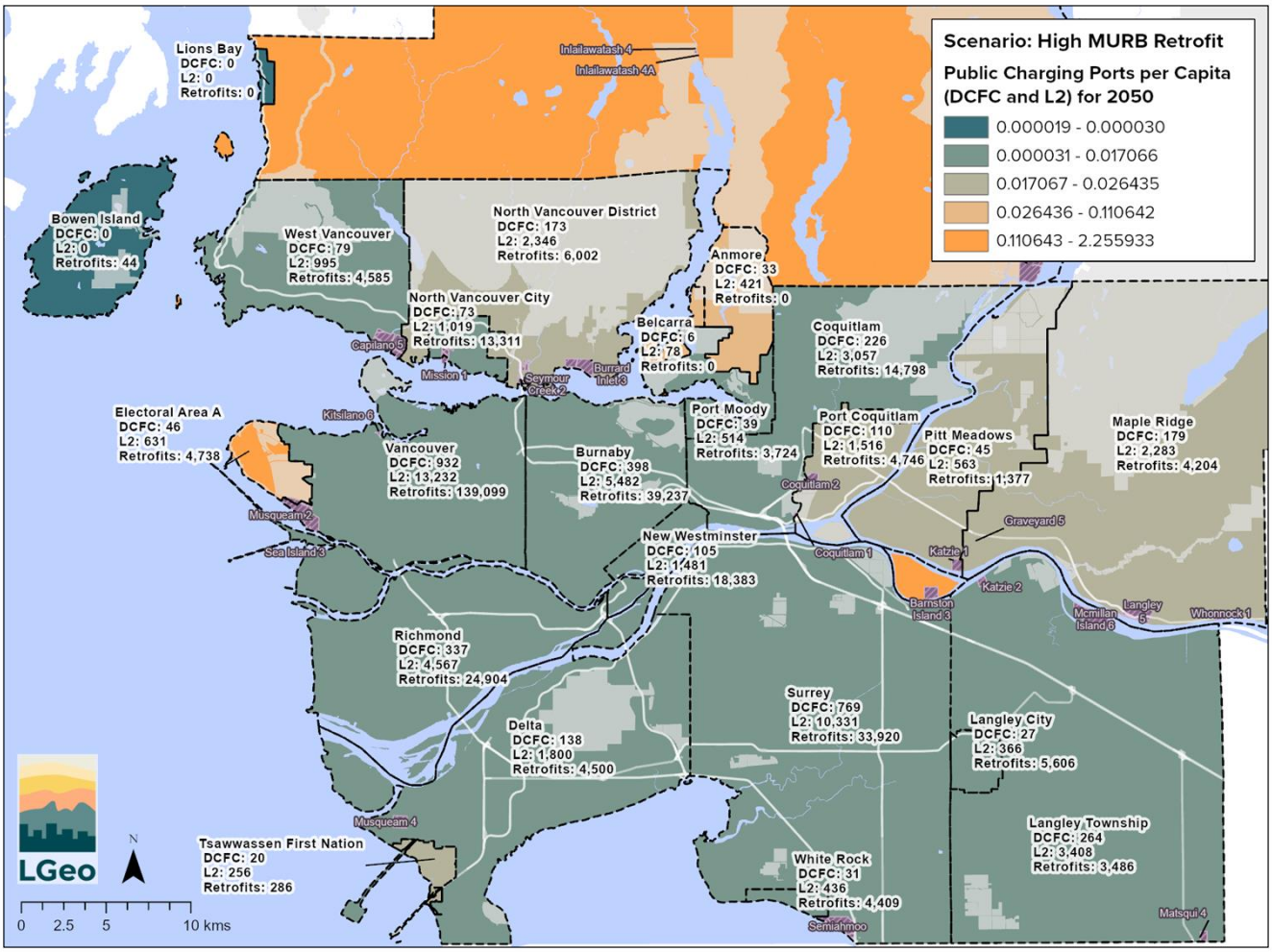
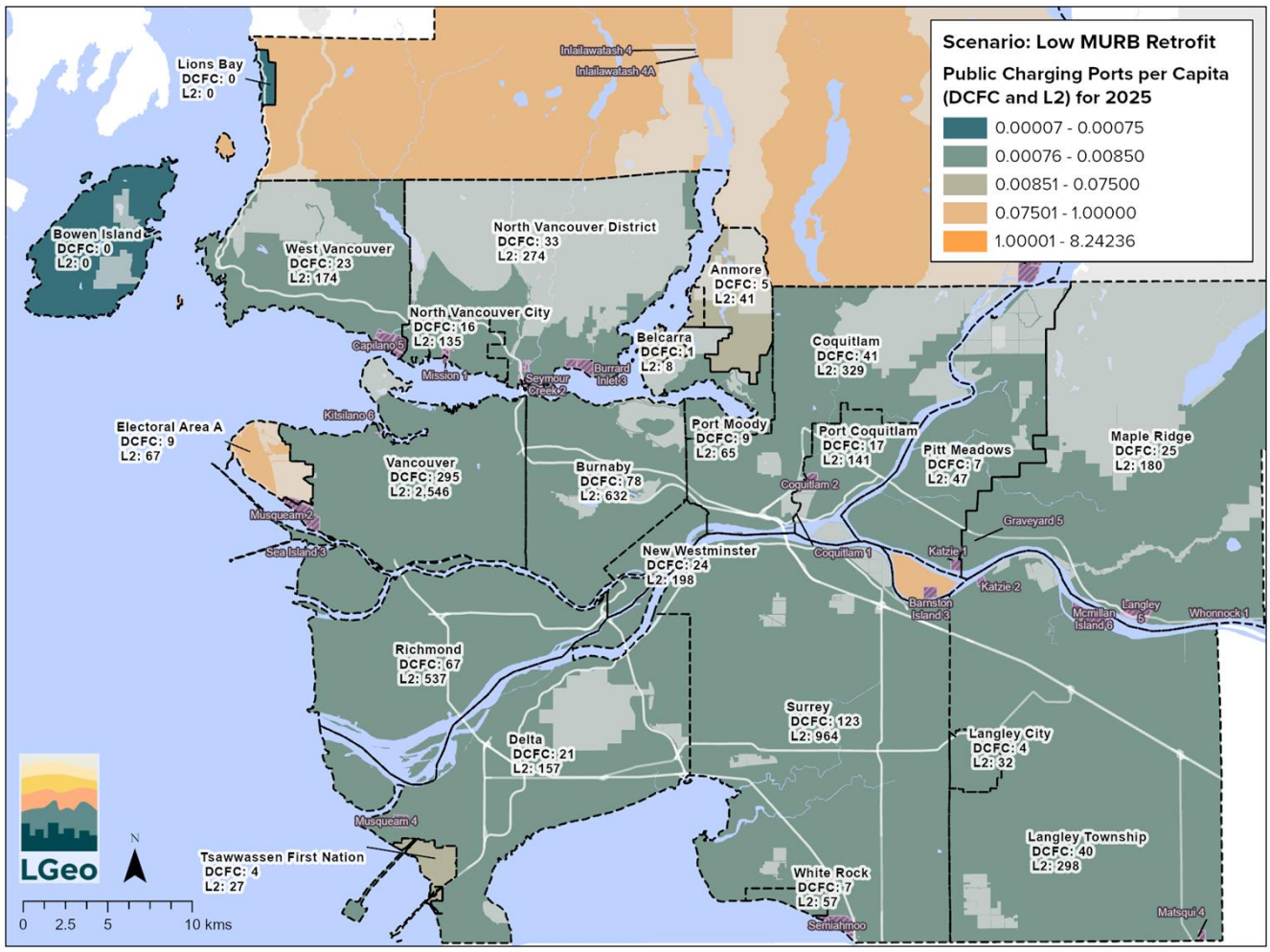
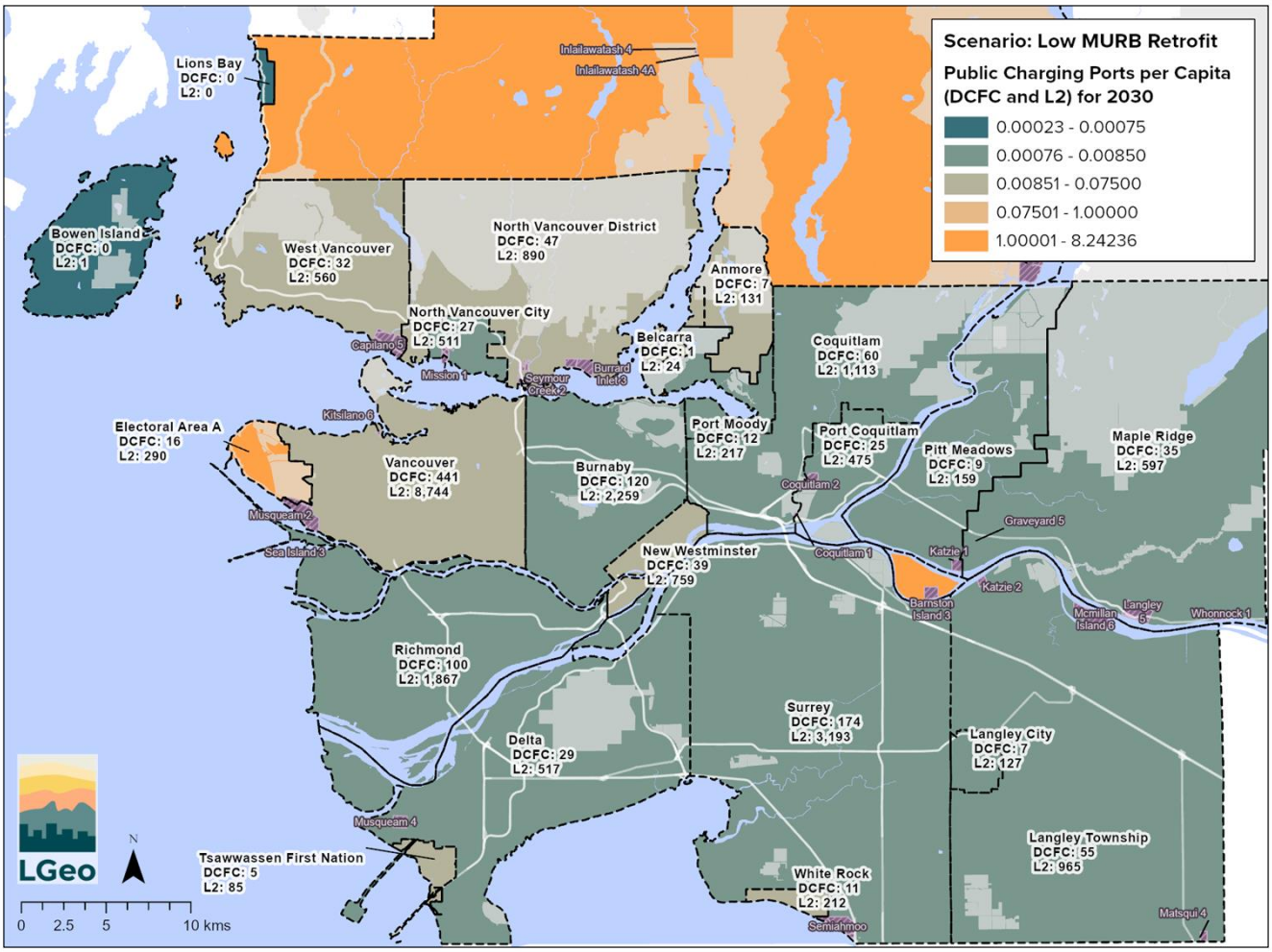
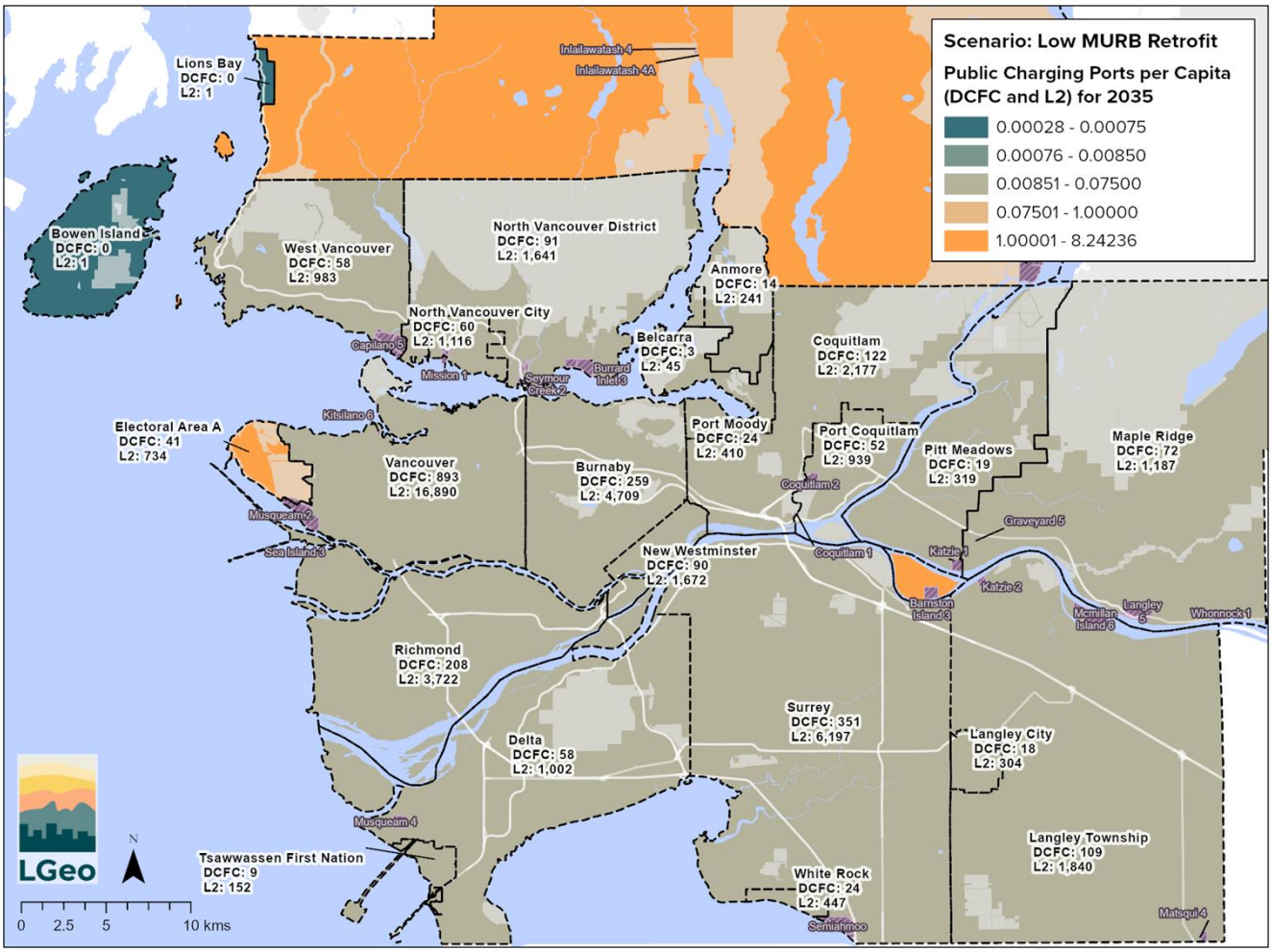
0.000279 - 0.004672
0.004673 - 0.012129
0.012130 - 0.019167
0.019168 - 0.070879
0.070880 - 0.837429
Lions Bay DCFC: 0 L2: 1 Retrofits: 0
Inlailawatash 4
Inlailawatash 4A
Bowen Island DCFC: 0 L2: 1 Retrofits: 44
West Vancouver DCFC: 47 L2: 793 Retrofits: 4,585
North Vancouver District DCFC: 80 L2: 1,448 Retrofits: 6,002
Anmore DCFC: 14 L2: 241 Retrofits: 0
North Vancouver City DCFC: 29 L2: 537 Retrofits: 13,311
Capilano 5
Mission 1
Seymour Creek 2
Burrard Inlet 3
Belcarra DCFC: 3 L2: 45 Retrofits: 0
Coquitlam DCFC: 96 L2: 1,721 Retrofits: 14,798
Electoral Area A DCFC: 13 L2: 238 Retrofits: 4,738
Kitsilano 6
Vancouver DCFC: 515 L2: 9,733 Retrofits: 139,099
Burnaby DCFC: 166 L2: 3,018 Retrofits: 39,237
Port Moody DCFC: 19 L2: 324 Retrofits: 3,724
Port Coquitlam DCFC: 44 L2: 792 Retrofits: 4,746
Pitt Meadows DCFC: 17 L2: 279 Retrofits: 1,377
Maple Ridge DCFC: 68 L2: 1,120 Retrofits: 4,204
Coquitlam 2
Musqueam 2
Sea Island 3
New Westminster DCFC: 41 L2: 757 Retrofits: 18,383
Graveyard 5
Coquitlam 1
Katzie 1
Katzie 2
Barnston Island 3
Mcmillan Island 6
Langley 5
Whonnock 1
Richmond DCFC: 146 L2: 2,612 Retrofits: 24,904
Surrey DCFC: 313 L2: 5,526 Retrofits: 33,920
Delta DCFC: 54 L2: 923 Retrofits: 4,500
Langley City DCFC: 9 L2: 156 Retrofits: 5,606
Musqueam 4
Tsawwassen First Nation DCFC: 9 L2: 151 Retrofits: 286
Langley Township DCFC: 107 L2: 1,804 Retrofits: 3,486
White Rock DCFC: 13 L2: 242 Retrofits: 4,409
Semiahmoo
Matsqui 4
LGeo
N
0 2.5 5 10 kms

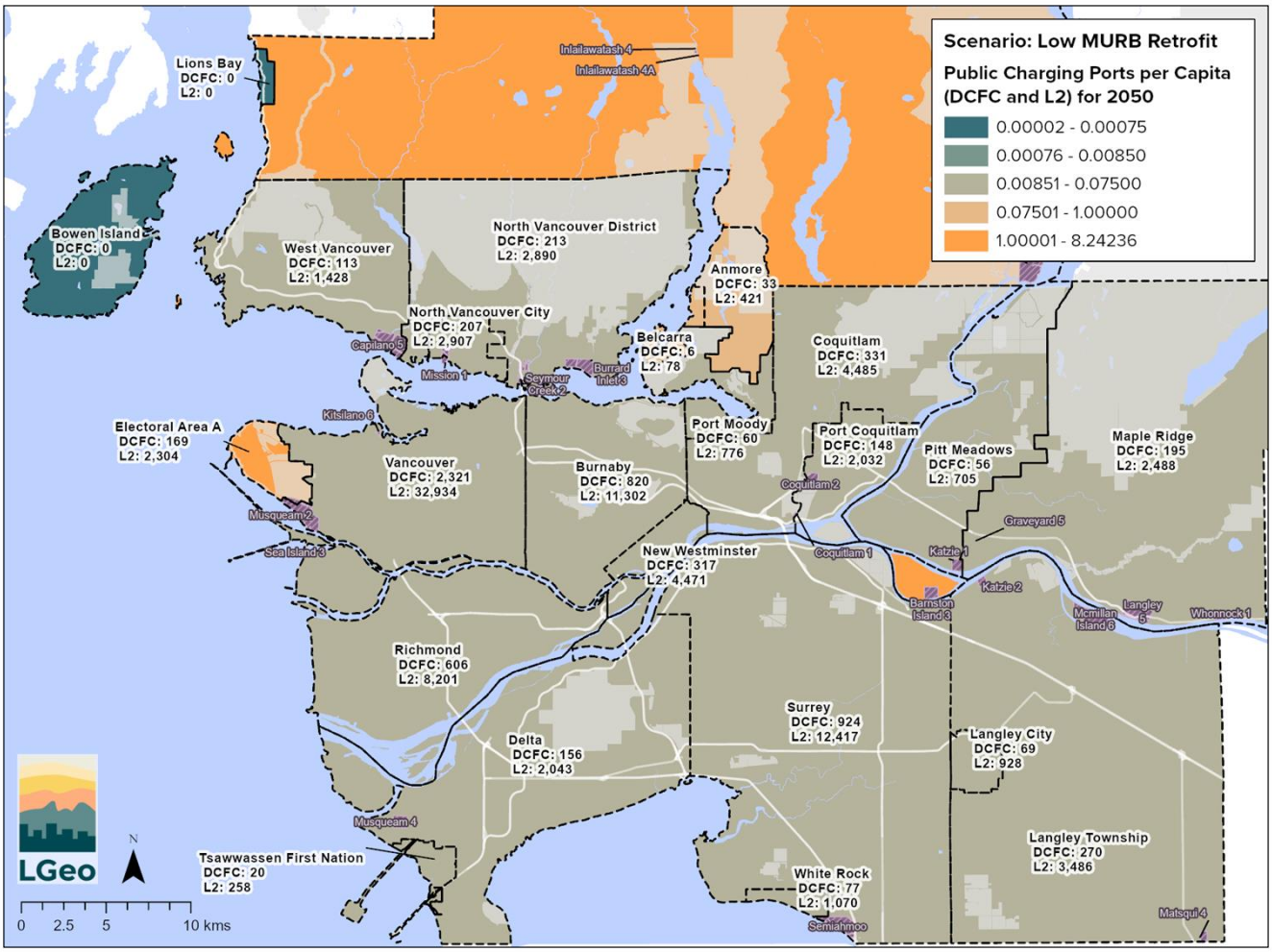

Scenario: High MURB Retrofit
Public Charging Ports per Capita (DCFC and L2) for 2050
0.000019 - 0.000030
0.000031 - 0.017066
0.017067 - 0.026435
0.026436 - 0.110642
0.110643 - 2.255933
Lions Bay DCFC: 0 L2: 0 Retrofits: 0
Inlailawatash 4
Inlailawatash 4A
Bowen Island DCFC: 0 L2: 0 Retrofits: 44
West Vancouver DCFC: 79 L2: 995 Retrofits: 4,585
North Vancouver District DCFC: 173 L2: 2,346 Retrofits: 6,002
Anmore DCFC: 33 L2: 421 Retrofits: 0
North Vancouver City DCFC: 73 L2: 1,019 Retrofits: 13,311
Capilano 5
Mission 1
Seymour Creek 2
Burrard Inlet 3
Belcarra DCFC: 6 L2: 78 Retrofits: 0
Coquitlam DCFC: 226 L2: 3,057 Retrofits: 14,798
Electoral Area A DCFC: 46 L2: 631 Retrofits: 4,738
Kitsilano 6
Vancouver DCFC: 932 L2: 13,232 Retrofits: 139,099
Burnaby DCFC: 398 L2: 5,482 Retrofits: 39,237
Port Moody DCFC: 39 L2: 514 Retrofits: 3,724
Port Coquitlam DCFC: 110 L2: 1,516 Retrofits: 4,746
Pitt Meadows DCFC: 45 L2: 563 Retrofits: 1,377
Maple Ridge DCFC: 179 L2: 2,283 Retrofits: 4,204
Coquitlam 2
Musqueam 2
Sea Island 3
New Westminster DCFC: 105 L2: 1,481 Retrofits: 18,383
Graveyard 5
Coquitlam 1
Katzie 1
Katzie 2
Barnston Island 3
Langley 5
Whonnock 1
Mcmillan Island 6
Richmond DCFC: 337 L2: 4,567 Retrofits: 24,904
Surrey DCFC: 769 L2: 10,331 Retrofits: 33,920
Delta DCFC: 138 L2: 1,800 Retrofits: 4,500
Langley City DCFC: 27 L2: 366 Retrofits: 5,606
Musqueam 4
Tsawwassen First Nation DCFC: 20 L2: 256 Retrofits: 286
Langley Township DCFC: 264 L2: 3,408 Retrofits: 3,486
White Rock DCFC: 31 L2: 436 Retrofits: 4,409
Semiahmoo
Matsqui 4
LGeo
N
0 2.5 5 10 kms

Cumulative EV Charging Needs (Scenario 2: Low Multifamily Building Retrofit)




Scenario: Low MURB Retrofit
Public Charging Ports per Capita (DCFC and L2) for 2030
0.00023 - 0.00075
0.00076 - 0.00850
0.00851 - 0.07500
0.07501 - 1.00000
1.00001 - 8.24236
Lions Bay DCFC: 0 L2: 0
Inlailawatash 4
Inlailawatash 4A
Bowen Island DCFC: 0 L2: 1
West Vancouver DCFC: 32 L2: 560
North Vancouver District DCFC: 47 L2: 890
Anmore DCFC: 7 L2: 131
North Vancouver City DCFC: 27 L2: 511
Capilano 5
Mission 1
Belcarra DCFC: 1 L2: 24
Burrard Inlet 3
Seymour Creek 2
Coquitlam DCFC: 60 L2: 1,113
Kitsilano 6
Electoral Area A DCFC: 16 L2: 290
Vancouver DCFC: 441 L2: 8,744
Port Moody DCFC: 12 L2: 217
Port Coquitlam DCFC: 25 L2: 475
Pitt Meadows DCFC: 9 L2: 159
Maple Ridge DCFC: 35 L2: 597
Burnaby DCFC: 120 L2: 2,259
Coquitlam 2
Musqueam 2
Sea Island 3
Graveyard 5
Coquitlam 1
Katzie 1
New Westminster DCFC: 39 L2: 759
Katzie 2
Barnston Island 3
Langley 5
Whonnock 1
Mcmillan Island 6
Richmond DCFC: 100 L2: 1,867
Surrey DCFC: 174 L2: 3,193
Delta DCFC: 29 L2: 517
Langley City DCFC: 7 L2: 127
Musqueam 4
Tsawwassen First Nation DCFC: 5 L2: 85
Langley Township DCFC: 55 L2: 965
White Rock DCFC: 11 L2: 212
Semiahmoo
Matsqui 4
LGeo
N
0 2.5 5 10 kms


Scenario: Low MURB Retrofit
Public Charging Ports per Capita (DCFC and L2) for 2035
0.00028 - 0.00075
0.00076 - 0.00850
0.00851 - 0.07500
0.07501 - 1.00000
1.00001 - 8.24236
Lions Bay DCFC: 0 L2: 1
Inlailawatash 4
Inlailawatash 4A
Bowen Island DCFC: 0 L2: 1
West Vancouver DCFC: 58 L2: 983
North Vancouver District DCFC: 91 L2: 1,641
Anmore DCFC: 14 L2: 241
North Vancouver City DCFC: 60 L2: 1,116
Capilano 5
Mission 1
Belcarra DCFC: 3 L2: 45
Burrard Inlet 3
Seymour Creek 2
Coquitlam DCFC: 122 L2: 2,177
Kitsilano 6
Electoral Area A DCFC: 41 L2: 734
Port Moody DCFC: 24 L2: 410
Port Coquitlam DCFC: 52 L2: 939
Pitt Meadows DCFC: 19 L2: 319
Maple Ridge DCFC: 72 L2: 1,187
Vancouver DCFC: 893 L2: 16,890
Burnaby DCFC: 259 L2: 4,709
Coquitlam 2
Musqueam 2
Sea Island 3
Graveyard 5
Coquitlam 1
Katzie 1
New Westminster DCFC: 90 L2: 1,672
Katzie 2
Barnston Island 3
Langley 5
Whonnock 1
Merritt Island 6
Richmond DCFC: 208 L2: 3,722
Surrey DCFC: 351 L2: 6,197
Delta DCFC: 58 L2: 1,002
Langley City DCFC: 18 L2: 304
Musqueam 4
Tsawwassen First Nation DCFC: 9 L2: 152
Langley Township DCFC: 109 L2: 1,840
White Rock DCFC: 24 L2: 447
Semiahmoo
Matsqui 4
LGeo
N
0 2.5 5 10 kms


Scenario: Low MURB Retrofit
Public Charging Ports per Capita (DCFC and L2) for 2050
0.00002 - 0.00075
0.00076 - 0.00850
0.00851 - 0.07500
0.07501 - 1.00000
1.00001 - 8.24236
Lions Bay DCFC: 0 L2: 0
Inlailawatash 4
Inlailawatash 4A
Bowen Island DCFC: 0 L2: 0
West Vancouver DCFC: 113 L2: 1,428
North Vancouver District DCFC: 213 L2: 2,890
Anmore DCFC: 33 L2: 421
North Vancouver City DCFC: 207 L2: 2,907
Capilano 5
Mission 1
Belcarra DCFC: 6 L2: 78
Burrard Inlet 3
Seymour Creek 2
Coquitlam DCFC: 331 L2: 4,485
Kitsilano 6
Electoral Area A DCFC: 169 L2: 2,304
Port Moody DCFC: 60 L2: 776
Port Coquitlam DCFC: 148 L2: 2,032
Pitt Meadows DCFC: 56 L2: 705
Maple Ridge DCFC: 195 L2: 2,488
Vancouver DCFC: 2,321 L2: 32,934
Burnaby DCFC: 820 L2: 11,302
Coquitlam 2
Musqueam 2
Sea Island 3
Graveyard 5
Coquitlam 1
Katzie 1
New Westminster DCFC: 317 L2: 4,471
Katzie 2
Barnston Island 3
Langley 5
Whonnock 1
Mcmillan Island 6
Richmond DCFC: 606 L2: 8,201
Surrey DCFC: 924 L2: 12,417
Delta DCFC: 156 L2: 2,043
Langley City DCFC: 69 L2: 928
Musqueam 4
Tsawwassen First Nation DCFC: 20 L2: 258
Langley Township DCFC: 270 L2: 3,486
White Rock DCFC: 77 L2: 1,070
Semiahmoo
Matsqui 4
LGeo
N
0 2.5 5 10 kms

"NO DISCLAIMERS" POLICY

This report was prepared by Dunsky Energy + Climate Advisors, an independent firm focused on the clean energy transition and committed to quality, integrity and unbiased analysis and counsel. Our findings and recommendations are based on the best information available at the time the work was conducted as well as our experts' professional judgment.
Dunsky is proud to stand by our work.