

There are over 110 000 public charging stations in North America. Each month, this number increases. All signs point to the electrification of passenger vehicles. So, how can utilities and governments ensure that their investments in public EV charging echo this shift in mobility?

This presentation will provide real-life insights into developing a sound EV strategy. Using from data ChargeHub, the speaker will share best practices to keep in mind as public charging infrastructure is developed. These suggestions are inspired by the actions of forward-thinking utilities and governments, which ChargeHub has had the privilege of assisting with data and strategic advice over the last few years. Done right, EVs prove to be good for utilities, their ratepayers, and all citizens. Here's how.

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In his career, Ben has led over 120 projects in strategic planning, business transformation, marketing, and technology, including the management of the largest smart meter installation program in Canada.

Along the way, he has sold, financed, designed, and managed systems, programs, services, and organizations. His passion is to help utilities, vendors, and investors to thrive through the energy transition and the electrification of transportation.

Ben graduated as a professional engineer and went on to complete a master's degree in Applied Sciences and an MBA.

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This is a current snapshot of the public charging infrastructure in US and Canada. Overall, there are over 110,000 charging ports, up from 85,000 in January 2020, a 30% increase.

Most stations are Level 2, operating at 240 Vac. On average, statistics show that drivers plug in about 3 hours at a public level 2 station, typically getting around 60 miles of range.

Level 3 stations are faster, operating usually at 400 Vdc. On average, drivers stay plugged about 30 minutes, getting between 100 to 200 miles of range during that time.

Most charging occurs at home. However, many studies have shown that a robust public charging infrastructure is a prerequisite to accelerate the adoption of EVs, although only perhaps 15% of charging energy is delivered through public ports.

It is worth noting that the US has only 6 times as many charging ports as Canada, but 9 times its population. In other words, per capita, Canada is 50% ahead of the US when it comes to deploying the public EV charging infrastructure.

(Please contact me if you need something more specific for a city or a state, or more information on those stations.)

Overall, EV charging is a rapidly growing market, perhaps the fastest growing electrical load segment in North America. However, it is marred by the complexity of the public charging ecosystem. So, let's look at it.



The public charging ecosystem is very complex, with many players and an array of EV charging ecosystem stakeholders.

- Almost 2 million EVs (or EV drivers).
- 3500 electric utilities, including 300 with about 100,000 ratepayers or more.
- 50 states and 10 provinces; thousands of municipalities.
- >25 public charging network operators with 110,000+ charging ports.
- 25 automakers with 39 brands; hundreds of global OEM parts suppliers.

However, the cost of installing and operating public charging stations, especially DC fast chargers, far exceeds the charging revenue that are generated. Owners of charging stations then need someone or something to help justify their business case.

- Automakers support public charging because they have to it is a competitive necessity to sell EVs, or, in the case of VW, a fallout from a court settlement.
- Charging operators provide and operate charging stations. Overall, there are about over 25 charging operators in North America.
 - In the USA, the largest operators, measured by port count, are ChargePoint, Tesla, SemaConnect and Blink.
 - In Canada, the largest operators are Tesla, the Electric Circuit (in Québec), Flo and ChargePoint.
 - Business models vary, but most independent charging operators get businesses to buy or subsidize chargers to attract customers to their locations, perhaps improving for their image in the process, while some utilities directly own and operate chargers.
 - Some independent operators actually operate the back-end systems for other operators, including utilities.
 - Some operators focus on level 2, others on level 3, with multiple connector types.
 - Some are operating across North America, other just in a limited area.
 - Some stations are free to use, while drivers pay for others, with payment schemes varying greatly between operators and between states and provinces.
 - Some operators manufacture their own stations, while others buy them form electrical vendors like ABB.

Today, I'll be talking mostly about the right-hand side of this chart, utilities and governments. They're the ones mostly enabling the public charging infrastructure.

- For utilities, higher EV adoption brings a corresponding increase in profitable home and workplace charging, creating permanent value for utilities and ratepayers.
- For governments, the public charging infrastructure has been demonstrated to be a precursor to wider light duty EV adoption, with societal benefits related to clean air and GHG emissions. They are also gatekeepers: states, provinces and cities have their own rules and regulations that affect the placement and the costs of public charging stations.



The public EV charging infrastructure serves a small set of use cases. The taxonomy of public EV charging use cases includes:

- 1. At a destination, where one can expect the vehicle to be parked for at least a few hours, such as for street parking, at hotels, at shopping centers, and a ski resort. These should be level 2 chargers. They may or may not be in cities, and they may or may not be along highways, but they must be at a location with points of interest requiring parking for at least a couple of hours.
- 2. On-the-go charging, where drivers may expect to stay a few minutes, such as at a highway service area. These are much like legacy gas stations, often collocated with a convenience store or a café, with access to restrooms. They should be level 3 fast chargers. From the driver perspective, it is also useful to distinguish 2 use sub-cases for on-the-go charging:
 - a. Community charging, in metro areas, for drivers not having access to home or workplace charging.
 - b. Charging along highways, for intercity travelers and long-haul trucks.

From our database and driver feedback, we know that many charging locations do not properly fit in the above use cases. For example, some level 2 locations are not near relevant points of interest, leading to poor usage. Similarly, some level 3 locations are not near amenities, such as access to restrooms, leading to a poor customer experience. These incongruities result in significant inefficiencies in the EV charging infrastructure. A more optimal deployment would have resulted in fewer geographic and performance gaps.

In addition to today's focus, utilities also need to account for home and workplace charging of light duty vehicles, and for fleet charging. Charging of light duty vehicles and fleet charging are very different use cases, with vastly different impact on utilities. While utilities usually see a downward pressure on rates from adoption of light duty vehicles, fleet charging often lead to additional loads measured in megawatts, requiring local distribution upgrades. Whether these upgrades should be paid by the fleet owner or by the base of ratepayer is not clear.



Working with utilities and governments, we identified 3 categories of gaps in the public EV charging infrastructure. In the coming years, we will have to fill these gaps.

- City gaps. This refers to the charging challenges that city dwellers face, and especially EV drivers
 that are garage or driveway "orphans" or living in a multi-unit residential building (MURB). In
 addition to non-public home and workplace charging, the charging needs of city dwellers are filled
 by a combination of level 2 destination locations in the city (use case 1 above), such as curbside
 chargers, and level 3 locations in the city (use case 2.a above).
- *Highway gaps.* This refers to the challenges that EV drivers may face when driving on highways over long distances, often in rural areas. Their needs are filled by a combination of level 2 chargers at their destination (use case 1 above), such as a cottage or a resort area, and level 3 locations along the way (use case 2.b above).
- *Customer experience gaps.* From the number of comments that we get on the ChargeHub platform, it is clear that we need to address the many concerns that EV drivers have with the existing EV charging infrastructure, such as poorly located sites without amenities, blocked access to charging stations, broken stations, complex payment schemes, and variability of the charging experience across the various operators. For EV drivers, charging anxiety has replaced range anxiety.

Given that charging stations are not profitable, utilities and governments will fund the expansion of the public charging infrastructure. So, let's turn to what's in it for them and some of the bast practices that they should follow.



Downward Pressure on Electricity Rates

Real-world experience by utilities in markets with relatively high penetration of EVs shows that EV charging brings additional utility revenues that vastly exceed the costs to generate and deliver the additional energy. And demand management, like direct load control and time-of-use electricity rates, further improves the economics of EV charging. If anything, it will get utilities to grow again, as they were a couple of decades ago. Obviously, some utilities will benefit more than others – vertically integrated utilities gain along the entire value chain, while distribution-only utilities see a smaller piece of the pie. Ratepayers gain anyway: these economic benefits exert a downward pressure on rates for all ratepayers – not just to those driving EVs.

Stronger Customer Engagement

<u>Before</u>: Listening to customers complaining about outages, billing and new connection. <u>After</u>: Empowering customers to see friends & family.

Leading utilities leverage the new EV touch points with robust education, outreach and assistance programs, starting with dealer engagement and partnerships with contractors and charging station site hosts, with a focus on providing value for the customer.

• Did you know that EV drivers are also the most digitally engaged customers and prime customers for other utility program?

Unlocking Business Opportunities for Electric Utilities

While local regulations shape what business models are allowed, leading utilities are developing new business opportunities through home, public and workplace charging in collaboration with site hosts. Some utilities are now selling chargers and installation services to homeowners and businesses, while others are operating charging networks.

With EV drivers voicing dissatisfaction with public charging, utility participation removes a barrier to adoption, accelerating EV adoption and benefiting ratepayers and communities.

You can download the complete business case at <u>https://chargehub.com/en/utilities/index.html</u>.



Smart and Healthy Communities

Cities consume somewhere between 2/3 (67%) and 3/4 (76%) of total global energy and generate about 3/4 (75%) of global carbon emissions, largely because of transportation. By contributing so much to climate change and air pollution, cities are major contributors to climate change and unhealthy environments.

Mayors are "the great pragmatists of the world's stage" (Michael Bloomberg). Mayors view the challenges they face on a daily basis – it is about their constituents getting sick, having clean air and water, getting around, holding productive jobs, and surviving disasters. That's why so many cities around the world have ambitious transportation electrification objectives.

Sustained Citizen Engagement

Mobility has always been a key mission of local governments. But electrification of transportation is more than adopting a new type of fuel, and it shows in the high level of citizen engagement, pushing on local governments and municipalities to become enablers of electric mobility.

Sensitive to citizen concerns, cities then change zoning and building codes to have parking ready for electrification in multi unit residential buildings and offices. They change parking regulations to account for charging overnight. They adapt street cleaning and snow removal to account for curb side charging.

Leading cities leverage the new EV touch points to support communities with robust education, outreach and assistance programs.

New Services

Leading cities are developing and managing new services opportunities through home, public and workplace charging in collaboration with site hosts. They build, or help build, charging stations along streets for driveway or garage "orphan" citizens. They bring communities together by getting stations installed in gathering places, such as libraries and places of worship.

With EV drivers already voicing dissatisfaction with public charging, cities need to pay attention to uptime and citizen satisfaction, or a service problem may quickly become a political one.



The efforts to expand the public charging infrastructure is getting snagged on technological and regulatory issues. To progress towards electrification, the public EV charging infrastructure needs reorganization; starting with a data-driven and customer-focused approach to public charging.

Here are 3 best practices that we have seen working.



Utilities, like governments, are, foremost, in the people's business. When getting into electromobility, the "product" that people buy isn't a luxury, but rather an essential tool to complete daily activities: getting to work, going grocery shopping, visiting friends and traveling to go see family. All of these are potential touch points for utilities and governments to connect with EV drivers and engage with them in new ways that have yet to be leveraged.

Due to the low level of satisfaction regarding the current public charging infrastructure, we recommend putting EV drivers first by simplifying their lives and bringing value, such as:

- Allowing them to easily discover where they can charge.
- Streamlining the EV charging payment process to help them save time and money.
- Helping them engage with local EV communities and creating feedback loops on their EV charging experience.
- Promoting what utility or city programs are available to them.



Cities should leverage access to city-owned properties and streets. This is one of the industry's best kept secrets and incredibly valuable to charging operators. Finding a location to put charging stations in a city core is challenging, especially for DCFCs. Therefore, having access to city-owned properties and rights-of-way brings new opportunities that help diversity local economies. Don't forget that a service issue with a public infrastructure may quickly become a public perception and political issue.

Another key insight to consider: EV charging puts a downward pressure on electricity rates—that's good for utilities and their ratepayers. However, public charging operators don't make money unless the utility (or other stakeholders) support them, and regulators often approve of this. But planning grid upgrades is difficult unless the utilities understand where EV drivers go to charge outside their home.

Utilities and cities should get something in return for their contributions.

Session-level charging data is valuable to utilities and cities for planning the infrastructure and for managing services to drivers. Therefore, as a best practice, prioritize getting access to session-level charging data from charging operators in return for access to city-owned properties or support from the utility. Cities and utilities may also require operators to meet certain performance metrics in order to continue benefiting from access or support, such as uptime and driver satisfaction.

Shield Yourself From Complexity and Changes



Utilities and cities can shield from the technology and business complexities of the public charging infrastructure, with its many network operators.

- This is especially true as the technology continues to mature, with evolving communication protocols and increasing charging rates.
- Furthermore, independent charging operators are new businesses. There will be many acquisitions, mergers and, unfortunately, bankruptcies.
- There a significant risk of stranded investments.

What cities and utilities really need is to stay above the fray, but

- Get informed on key EV charging trends and forecasts within their territory.
- Ensure that EV drivers get good service and are satisfied.
- Streamline the EV charging buying and paying process.
- Promote their EV (and non-EV) programs.

But they can accomplish this without necessarily becoming owners-operators themselves.

Charge Hub

Thank you!

Mogile Technologies Inc. maintains the ChargeHub database, the only independent, curated, user-enriched and commercially available database of public EV charging stations in North America.

This unique perspective on public EV charging serves our commercial and institutional customers—public utilities, governments and automakers with the necessary EV charging and driver insights and analytics solutions to apply a data-driven approach to public charging development, including the ChargeHub Central EV Charging Management System.

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