Creating an Effective Workplace Electric Vehicle Charging Policy

Clean Air Partnership

ACKNOWLEDGEMENTS

Authors
Louis Coningsby, Kevin Behan

Cover images
Shutterstock.com

Design
Leena Salem / www.leenasalem.com

For more information, contact

Clean Air Partnership,
75 Elizabeth Street,
Toronto, Ontario, M5G 1P4 Canada.
416.4606320
www.cleanairpartnership.org
kbehan@cleanairpartnership.org

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About Clean Air Partnership

Clean Air Partnership (CAP) is a charitable environmental organization launched in June, 2000. CAP's mission is to help municipalities become sustainable, resilient, vibrant communities where resources are used efficiently, the air is clean to breathe and greenhouse gas emissions are minimized. We achieve this mission through research, knowledge transfer, and by fostering collaboration among all orders of government, academia, NGOs and a range of additional stakeholders.

Clean Air Partnership

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INTRODUCTION

Workplace electric vehicle (EV) charging refers to "…PEV [plug-in EV] charging that is provided at or near the driver's place of employment"[1]. Research increasingly emphasizes the workplace as the second most important charging opportunity after residential options. Workplace EV charging can help eliminate one of the major barriers to EV adoption: a lack of charging infrastructure and the range anxiety it causes. It can also improve equal access to EVs where individuals with limited/no residential charging options can use their workplace as an additional charging location. In turn, this increases the feasibility of driving an EV beyond those who occupy single family homes with off-street parking. Additionally, an estimated 54% of non-residential parking occurs at the workplace where layover is around 4-8 hours daily[2] (Tomic and Bloch-Ruben, 2014); providing sufficient time for current EVs to charge considerably if not fully. Therefore, providing workplace EV charging can be an effective and feasible strategy to support and accelerate the transition to sustainable low carbon transportation options.

Focusing on the municipality as a workplace, EV charging represents both a challenge and an opportunity. Financial assistance through government programs and a range of guidance documents are available to support decisions on the purchase and installation of EV charging infrastructure. However, guidance on the actual management of workplace EV charging is lacking and represents a more nuanced challenge.

PURPOSE OF THIS REPORT

This report explores how municipalities can create workplace EV charging policies by examining existing guidelines and current workplace EV charging best practices. Section 1 highlights the advantages of workplace EV charging, section 2 documents five Canadian workplace EV charging policy case studies, and section 3 analyses existing guidelines and present-day examples to advise stakeholders on how they can develop and enforce effective policies.

The range of workplace stakeholders involved in the development of such a policy is often broad (as this report comes to highlight). Consequently, this report may be of interest to departmental staff from environment and energy, infrastructure, buildings, operations, parking, finance and human resources among others.

This report focuses on the management of workplace EV charging programs through the development and enforcement of an effective workplace EV charging policy. Consequently, it does not include discussion around how to purchase and install EV charging equipment.

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1 PEV Collaborative, 2013. *Amping up California workplaces: 20 case studies on plug-in electric vehicle charging at work*. Sacremento, CA: PEV Collaborative.

2 Tomic, J. and Bloch-Rubin, T., 2014. Employer Policies and Incentives Encouraging EV Adoption. Calstart. Published December, 2014.

1. BENEFITS OF WORKPLACE EV CHARGING

Developing workplace EV charging policies can be a challenge, but can result in multiple benefits directly for the municipality (employer) and employee as well as indirectly for the wider transportation sector. This section provides a small overview of these benefits. These can assist municipal stakeholders in building the business case for a workplace EV charging program to key decision makers (e.g. senior management and elected officials).

RANGE CONFIDENCE AND RANGE EXTENSIONS

Workplace EV charging can potentially double the daily all-electric driving range of EVs. Furthermore, EV layover at the workplace is around 4-8 hours which, depending EV charging equipment available, could extend range by approximately 24-115km; more than satisfying the needs of typical commute distances.[3] This can successfully alleviate range anxiety; the fear of depleting an EV's battery before a destination has been reached.

THERMAL PRECONDITIONING

Very hot or very cold temperatures are known to reduce EV range. With on-site workplace chargers, batteries and the cabin can be preheated or precooled to achieve optimum temperature. In turn, less battery power needs to be used for climate control and driving range can be extended.

GREATER FLEXIBILITY

With EV range extensions, employees have greater driving flexibility. This makes urgent or unexpected trips more feasible. Additionally, workplace EV charging serves as a market enabler, providing a new charging opportunity. This is particularly useful at making EVs a feasible option for drivers whose residential charging options are restricted or inconvenient, such as those living in multi-unit residential buildings and/or those with on-street parking only.

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3 Minnesota Pollution Control Agency, 2012. *Charging while you work: a guide for expanding electric vehicle at the workplace*. Baxter, MN: Minnesota Pollution Control Agency.

ENVIRONMENTAL GOALS

Enabling workplace EV charging directly works towards a municipality's climate change (and broader environmental) goals by mitigating both upstream and tailpipe greenhouse gas emissions from employee commutes. It can also contribute to buildings' LEED certification.[4]

EMPLOYEE RECRUITMENT AND RETENTION

Increasingly, providing workplace EV charging is an attractive employer quality. It expresses an adaptability to contemporary socio-economic and environmental challenges as well as new technological innovation. This can help to recruit and retain employees and mitigate against the costly process of employee turnover.

CORPORATE SOCIAL RESPONSIBILITY

Providing workplace EV charging also works to improve a municipality's public image to the community by expressing environmental leadership. Workplace charging is often highly visible to the community as it often takes place in open parking lots and charging stations are often shared by employees and the wider public.

INCREASED EV ADOPTION

Workplace EV charging can also indirectly increase wider EV adoption by allowing individuals observe how peers purchase, drive and charge their EVs in everyday life. This can give the encouragement and assurance they need to switch from conventional to electric driving. For example, studies have estimated employees with access to workplace EV charging are 20 times more likely to drive an EV compared to employees without this benefit.[5]

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4 Energetics Incorporated, 2015. *Workplace electric vehicle charging policies: best practices guide.* Clinton, NY: Energetics Incorporated.

5 US Department of Energy, 2014. *Survey Says: workplace charging is growing in popularity and impact*. Washington, DC: US Department of Energy.

2. CASE STUDIES

These case studies identify how four municipalities and one institution addressed employee EV charging policies. The case studies reflect the range of charging infrastructure opportunities available. At present, there are 3 different charging levels on the market, each with different characteristics (see table 1).

TABLE 1 | 3 TYPES OF EV CHARGER

	LEVEL 1	LEVEL 2	LEVEL 3 (DC FAST CHARGING)
Voltage	120v	240v	480v
Time required to recharge depleted battery	≈ 8 hours	≈ 4 hours	≈ 0.5 hours
Typical application	Home (and sometimes workplace)	Home, workplace and other public locations	Commercial
Description	Specialised corded plug that connects to a standard household outlet.	Dedicated charging 'pylon' that requires wiring and mounting.	Dedicated charging 'pylon' that requires wiring and mounting.
Cost	$400-1250	$2500-4000	$30,000-50,000

EV chargers are also split into non-networked and networked types. Level 1 chargers are typically non-networked. Non-networked chargers do not feature an internet connection and as such are cheaper to purchase and install. However, they do not use any kind of software-based management.

Networked EV chargers feature an internet connection and, for a premium paid to the service provider, use a software-based management system. This system means charging providers can often stop, start, delay and monitor charging remotely, notify the user when charging is complete and handle payments.

CITY OF OTTAWA | CORPORATE EV CHARGING STATION POLICY

Context and rationale

Until 2017, the City of Ottawa had installed a range of EV chargers on its municipal properties through isolated ad hoc projects without formalized policy guidance. This led to the creation of the Corporate Electric Vehicle Charging Station Policy (led by the Economic Development and Long-Range Planning Department): a framework for the ownership, installation and management of new EV charging stations for use by employees and other users.[6]

Main policy features

Cost minimisation was a key principle for the City, using a user payment system to provide a return on investment and to reimburse increased utility bills as well as maintenance on charging stations and parking bays. The fee structure was representative of the different levels (1-3) of EV charging service offered. City staff also explored advertising and sponsorship opportunities to further minimize costs.
The policy document also designates a range of roles and responsibilities among internal City stakeholders. Infrastructure Services ensure that new City facilities and major expansions therein meet the policy requirements above. Each facility's managing department is responsible for day-to-day operation and maintenance of the EV charging stations. Economic Development and Long-Range Planning are responsible for policy review to assess effectiveness and compliance with legislation and best practices.
The policy review process itself is also useful to highlight. In addition to requiring policy review every 3 years, it lays out wider circumstantial criteria, such as changes to base electricity costs, time-of-use rates and/or provincial legislative requirements, that would initiate a review process should they occur.

The policy is also well integrated with existing facility operations. For example, charging stations must meet the City's Accessibility Design Standards for equal access. Requirements for appropriate signage to communicate usage and etiquette rules and to ensure snow clearing access are also written into the policy.

Lessons learned

Roles and responsibilities

The policy document explicitly identifies three distinct groups of stakeholders with responsibilities. This is advantageous as it provides clear instruction as to the planning, enforcement and review of workplace EV charging across multiple departments. This feature also provides a record of accountability in the event of future confusion or conflict.

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6 City of Ottawa, 2017. *Corporate Electric Vehicle Charging Station Policy* (report number: ACS2017-PIE-EDP-0044). Ottawa, ON: City of Ottawa.

Policy review

This policy uses a combination of time and needs-based policy review processes. Laying out wider circumstantial criteria determining when a policy review should be initiated allows this policy to more quickly adapt to (often short-term) changes. This is more effective than conducting policy reviews at regular time intervals alone.

CITY OF MARKHAM | ALECTRA DRIVE FOR THE WORKPLACE: MARKHAM CIVIC CENTRE

Context and rationale

The City of Markham is currently using an EV charging policy under their 2-year Alectra Drive for the Workplace pilot project in partnership with Alectra Utilities (initiated in January 2018). The pilot involves the installment of 16 level 2 EV charging stations for employees of the Markham Civic Centre while also allowing Alectra Utilities to explore and demonstrate the value of using "smart" EV charging stations to curtail building energy consumption. The City's Sustainability and Asset Management Department are the main municipal stakeholders collaborating with Alectra Utilities.

The City was able to create an effective business case to be Alectra Utilities' pilot project partner. First, the City had already conducted an employee survey and found that many employees already drove EVs or planned to in the near-future. Second, the City used their recognition as an ambitious leader in sustainability initiatives, identifying itself as an ideal pilot location. This pilot project enabled the City to achieve cost neutrality with project funding coming 50% from Alectra Utilities and its partners and 50% from the Independent Electricity System Operator.

Main policy features

Employee engagement was a key focus in this case. As well as the advantages of the employee survey in securing the pilot project, City staff (in partnership with Plug'n Drive) delivered an EV awareness and experience campaign to encourage EV adoption and interest in workplace EV charging. The pilot project also features quarterly feedback sessions allowing employees to share their experiences.
Cost minimisation was another important focus. Alongside no capital costs, the City operates a monthly subscription fee (via a payroll deduction) on each project participant to recoup electricity costs. After the pilot project, costs are intended to be recovered by charger usage revenue and electricity demand savings.

Sustainability and Asset Management and Operations, Culture and Corporate Communications Departments ensured the 16 level 2 EV charging stations were positioned to minimise disruption to events, other services and grounds care. This helped to ensure accessible EV charging without disproportionately privileging EV driving employees; a useful consideration to guide policy development.

Lessons learned

Employee engagement

The City conducted a preliminary employee survey. This helped to better guide decisions around program initiation and charging station type, number and location. The EV awareness and experience campaign as well as ongoing feedback sessions also helped to increase and maintain employee interest. This is particularly useful where workplace EV charging is a disruption to business-as-usual operations and in promoting uptake of workplace charging opportunities.

Cost minimisation

The City entered into a partnership agreement with Alectra Utilities which enabled the "no-cost-to-the-city" provision of workplace charging and the charging station acquisition for a nominal fee. This is one way in which municipalities can minimise upfront costs.

CITY OF VAUGHAN | WORKPLACE EV CHARGING POLICY

Context and rationale

In April 2009 the City of Vaughan released their Community Sustainability and Environmental Master Plan - "Green Directions Vaughan" – which identified sustainable transportation as a key goal. Concurrently, the City had a growing understanding of the benefits of increased EV adoption within the organisation and had a history of participation in the Smart Commute program. Accordingly, the Environmental Sustainability Office established the City's "Workplace EV Charging Policy" (created in 2013 and updated in 2015) which aimed to provide formal guidance to employees driving EVs and to promote a corporate culture that prioritized sustainability.[7]

Main policy features

This policy's registration process is useful to highlight. For employees wishing to benefit, they must register with the Environmental Sustainability Office (who are the policy coordinators). At registration employees are given a short information session on the proper usage and etiquette of the EV charging equipment and are asked to review the policy manual.

The City's policy also focuses on EV charging station access. For example, under a first-come first-served system employees are allowed to charge for up to 4 hours between 8:30am to 4:30pm (i.e. the City's regular business hours). In this case, an employee is allowed to leave their EV parked in a designated EV charging bay without being connected (although in systems where usage may be higher rules are often enforced to prevent this).

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7 City of Vaughan, 2015. Workplace Electric Vehicle Charging Policy – update. Vaughan, ON: City of Vaughan.

The City originally charged a single monthly subscription (charged at $24.27/month). Based on research by the Environmental Sustainability Office, this was aimed at full cost recovery. However, policy monitoring in 2014 revealed that some employees were not paying the subscription fee. Consequently, the City introduced a new part-time payment option for employees in 2015. This requires employees to self-report their hours of usage to the Environmental Sustainability Office until they accumulate 80 hours; after which time employees are invoiced ($24.27/80 hrs of charging).

Lessons learned

Registration process

A formal registration process, like that used here, is good practice. This gave the City the opportunity to directly brief employees on the rules and expectations around EV charger usage and etiquette, which leads to better enforcement, and accurate monitoring of the number of employees using workplace charging to better guide policy redesign decisions. Additionally, the registration process could be easily incorporated into existing employee on-boarding procedures.

Policy review

This example also highlights the advantage of policy review. Through their 2014 policy monitoring, the City identified that their monthly subscription payment system was not being effectively enforced. This exercise prompted a redesign of the payment system to accommodate full-time and part-time users meaning they could now receive the correct revenues whilst also satisfying the range of employee charging needs.

CITY OF KINGSTON | PROPOSED EV STRATEGY

Context and rationale

In 2017, the City of Kingston recognized that its public EV charging opportunities were limited and that existing charging stations had limited hours of operation and/or were unavailable. Kingston had poor EV charging infrastructure compared to other southern Ontario municipalities. These factors were identified as a barrier to EV adoption within the community.

Consequently, in October 2017 the City approved the "Kingston EV Strategy", a 2-year pilot project that aims to:

1. incorporate EVs into the municipal fleet;
2. install EV charging stations on municipal property for public use;
3. promote the benefits of EVs;
4. ready the local electrical distribution network for EV charging demand; and
5. support employees who choose to commute using EVs.[8]

8 City of Kingston Real Estate and Environmental Initiatives, (2017). Kingston EV Strategy.

Main policy features

This policy focuses on assessing employee demand to guide decision making. The City will consult with employees to assess the current and future demand for workplace EV charging opportunities. Additionally, the City plans to consult with Utilities Kingston on the feasibility of purchasing and installing EV charging stations within employee parking areas using their expertise around electrical base loads and capacities on municipal property.

As with the City of Ottawa's policy, the EV Strategy is designed to be integrated into existing facility policies, bylaws and standards. For example, the policy identifies the need to amend the City's Fees and Charges Bylaw to permit the City (as employer) to collect fees for workplace EV charging and to erect appropriate EV charging station and parking bay signage. To ensure equal access, integration with the Accessibility for Ontarians with Disabilities Act and the City's own Facility Accessibility Design Standards is also planned. Other policy provisions include the completion of a policy review process at the end of the 2-year pilot period and, in the pursuit of cost minimisation, the use of a payment structure for charging as well as the exploration of a variety of funding streams for charging equipment purchase and installation.

Lessons learned

Assessing employee demand

This case emphasizes the assessment of employee demand for workplace EV charging as an important preliminary step as it can help to justify investments to senior management as well as guide decisions on, for example, the number, type and location of new EV infrastructure. This ensures that the provision of workplace EV charging remains grounded in satisfying employee needs.

HUMBER COLLEGE | ON-CAMPUS EV CHARGING POLICY

Context and rationale

Humber College (Etobicoke, ON) has had a strong culture of environmental leadership. The college was designated a gold-level Smart Commute workplace, was only the 3rd in Canada to achieve a silver STARS designation for their sustainability initiatives and is implementing a 5-year Sustainability Plan 2014-2019 which outlines sustainable transportation as a priority action area.

Consequently, the College has installed 20 EV charging stations: two non-networked and 18 networked level 2 EV charging stations across its Lakeshore and North campuses respectively.

Main policy features

On-campus charging is open to both employers, students and other campus visitors. Therefore, appropriate EV charger usage and etiquette is a key focus. The Office of Sustainability sets and communicates a series of charger usage rules through their webpage.

At the Lakeshore campus location, a first-come, first-served access system is in operation. Free charging is offered but limited to 4 hours per user (with parking fees applying alongside). Usage rules instruct drivers to move their vehicle after 4 hours to a different parking location. Note that because these 2 EV charging stations are non-networked, no fees apply nor is charging cut off if the 4-hour limit is exceeded.

At the North Campus location, the 18 level 2 charging stations are networked. This means that after 4 hours of free charging an hourly fee applies; incentivising EV drivers to vacate charging stations more efficiently. The Office of Sustainability also operates an email feedback system for employees, students and other users.

Lessons learned

Usage and etiquette

This case emphasizes the usefulness of explicit, well-communicated and enforceable rules around EV charging station usage and etiquette. For example, College employees share charging infrastructure with other users (e.g. students, visitors etc.). Recognizing potentially high demand, the College institutes a 4-hour charging limit, which is enforceable via campus security officers, to help share charging stations. Usage and etiquette rules such as these help to mitigate driver conflicts and promote the safe and fair use of charging infrastructure.

Networked EV charging stations

This case also highlights the advantage of basing workplace EV charging policies on networked chargers. The College's Lakeshore campus chargers are non-networked meaning the 4-hour charging time limit can only be encouraged and where required must be enforced by security officers. This is an administrative burden for the college. In contrast, the North campus uses networked chargers which begin applying a fee after the 4-hour time limit. This incentivises EV drivers to move their vehicles and so reduces the administrative burden of enforcing usage and etiquette rules.

3. AN EFFECTIVE WORKPLACE EV CHARGING POLICY

This section outlines key considerations in the development and implementation of effective workplace EV charging policies and is based on evidence from existing guidance documents, the case studies in section 2 and other North American examples.

EVALUATING EMPLOYEE DEMAND

A useful preparatory step in developing a workplace EV charging policy is to evaluate current and future employee demand. An employee survey, which can be distributed through employee mailing lists, is a common way to do this. Questions may inquire about commute distances, type of vehicle currently driven, willingness to purchase an EV in the future, availability of home charging and willingness to pay for workplace charging among others.[9] For example, employee surveys were successfully used by the City of Markham to identify the number of EV-driving employees at the organisation which, in turn, enabled them to clearly agree that conducting a workplace EV charging pilot project was an attractive venture.[10] A similar process is planned for the implementation for Kingston's EV Strategy. Other methods could include employee focus groups and consultations.

Key decision makers in the organisation can then evaluate the results to help inform a number of other issues such as the number and type of EV charging stations, the stringency of access, prioritization and etiquette rules among others. In terms of charger type, existing US-based research shows that level 2 charging stations are commonly chosen. For example, the US Department of Transportation's nationwide Omnibus household survey revealed that 78% of people drive between 1.5-32km to work one-way.[11] With level 2 chargers able to add approximately 12-32km of EV range per hour of charge, these would generally provide a sufficient post-commute charging top-up for the majority of EV drivers. Additionally, a 2013 California-based survey of 79 workplace EV charging policies shows that 73% had chosen to use level 2 chargers.[12] This provides general guidance on charger selection, however it is best practice to base such decisions on your organisation's specific assessments of employee demand, electrical load and capacity among other factors.

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9 National Renewable Energy Laboratory, 2013. *Plug-in electric vehicle handbook for workplace charging hosts.* Washington, DC: US Department of Energy.

10 City of Markham, 2017. *Electric Vehicle Workplace Charging Pilot.* Markham, ON: City of Markham.

11 Bureau of Transportation Statistics, 2017. Omnibus household survey. Washington, DC: US Department of Transportation.

12 PEV Collaborative, 2013. *Amping up California workplaces: 20 case studies on plug-in electric vehicle charging at work.* Sacremento, CA: PEV Collaborative.

ROLES AND RESPONSIBILITIES

Another preparatory step is to consider the roles and responsibilities that come with developing and implementing a workplace EV charging policy. Firstly, it is important for key stakeholders to maintain effective lines of communication with staff as a means to detect preliminary interest in workplace EV charging. For small municipalities, informal discussion is often sufficient to initiate the process. However, municipal governments will likely need to follow formal decision-making processes and protocols.[13]

Secondly, it is important to recognise the specific roles and responsibilities of different stakeholders in a workplace EV charging program and to explicitly identify them in the policy document. This is beneficial for the employer because it provides a record of responsibility and accountability for the policy's development, enforcement and review. It is also beneficial for employees because it provides clear guidance as to who to consult should any issues arise, as well as communicating their own expected responsibilities.

The City of Ottawa's Corporate EV Charging Station Policy provides a good example of this. They identify 3 different roles: ensuring that new and renovated facilities comply with the policy and provide workplace charging opportunities is the responsibility of Infrastructure Services; day-to-day operation and maintenance lies with whichever City department operates the facility in question; and the Economic Development and Long-range Planning department are responsible for policy review to help ensure its continued effectiveness.

Generally, a management-level designee(s) as well as environment and energy, building and facilities, parking, infrastructure services, human resources, legal and finance staff are involved in workplace EV charging policy development and implementation. Environment and energy staff usually lead policy development, given their environmental priorities, in consultation other departments where necessary. They can also be responsible for employee registration and policy review. Parking services usually tackle day-to-day policy enforcement while human resources and finance departments take on policy administration. Senior management-level designees and/or city councillors are obviously the key decision makers responsible for officially endorsing a workplace EV charging policy. In smaller municipalities where some of these departments may not exist cross-departmental committees can be set up to better assign roles and responsibilities.

Other preliminary considerations are important for the provision workplace EV charging include facilities ownership, electrical load and capacity considerations, equipment and installation costs which will influence the selection of charging station level, number and location. However, these are not covered in detail in this report which concerns the management (e.g. access, security, usage etc.) of EV charging stations through effective policy as opposed to their selection, purchase and installation[14].

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13 National Renewable Energy Laboratory, 2013. *Plug-in electric vehicle handbook for workplace charging hosts.* Washington, DC: US Department of Energy.

14 See Resource Compendium for additional resources on these topics.

REGISTRATION AND LIABILITY

A formal registration process is a beneficial component to an effective workplace EV charging policy. As well as constituting good organisational bookkeeping, using a formal registration process enables the employer to track the number of employees using the workplace charging stations. This is particularly useful at informing subsequent policy reviews. It also allows the employer to directly communicate policy rules to the employee such as charging station access, prioritization and expected etiquette. As discussed later, it is unlikely that an organisation will be able to provide an EV charger for each EV driver meaning it is important that the employer actively encourages and enforces charger sharing. Using a formal registration process helps this goal and, more widely, fosters a culture of charger sharing. While this adds some upstream administrative burdens, it can considerably reduce employee conflict, confusion and the need for repeated policy enforcement later on.

For example, the City of Vaughan successfully used a registration process in their workplace EV charging policy; requiring interested employees to contact their Environmental Sustainability Office (the policy coordinators) for registration who then liaised with Buildings and Facilities, Legal and Finance departments to make necessary arrangements. This is advantageous as it removes the burden of responsibility from the employee and so can foster greater uptake.

It is also good practice to incorporate a liability waiver into this registration process akin to those found in many other workplace policies. Research by the Plug-in EV Collaborative on Californian workplaces found that employer liability over workplace EV chargers was a top concern. Accordingly, a liability waiver helps to mitigate responsibility in the event of personal injury and/or damages due to user negligence and can also set binding time limits under which the employer must do maintenance work[15]. For example, the City of Ottawa uses a liability waiver stating "The City assumes no responsibility or liability for any damage to vehicles using either City or third party owned and operated EV charging stations"[16].

Lastly, a formal registration process for the enrollment of employees into a workplace EV charging program can often be incorporated into normal employee training, on-boarding and handbooks. This can help to mainstream workplace EV charging alongside other workplace policies and benefits (e.g. healthcare programs, transit discounts etc.) and increase uptake.

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15 Energetics Incorporated, 2015. *Workplace electric vehicle charging policies: best practices guide.* Clinton, NY: Energetics Incorporated.

16 City of Ottawa, 2017. *Corporate Electric Vehicle Charging Station Policy* (report number: ACS2017-PIE-EDP-0044). Ottawa, ON: City of Ottawa.

PAYMENT STRUCTURE

Deciding whether to provide free workplace EV charging or charge a fee for the benefit is an important consideration.

Free charging

Free charging is attractive because it actively incentivises employees to use workplace chargers, purchase an EV and has reduced administrative burdens compared to the handling of payments in-house by policy coordinators.

Well-resourced organisations, those particularly interested in championing environmental initiatives and/or those that have secured adequate funding are more at liberty to provide free employee EV charging. In this case, maintenance, electricity and other associated costs are covered out of existing operating budgets.

In 2016, the US Department of Energy examined their nationwide Workplace Charging Challenge program[17] and discovered 80% of participating workplaces were offering free workplace EV charging, suggesting that at present free charging is the preferred choice by many organisations[18].

Paid charging

Nevertheless, free charging comes with disadvantages. It does not incentivise employees to vacate EV charging station parking bays and can therefore lead to the inefficient use of charging infrastructure as well as employee conflicts and confusion[19]. Free charging can cause resentment from employees that drive conventional vehicles, and can also can over-incentivise workplace versus home or public charging, causing a lack of charging station availability. Moreover, these issues risk becoming exacerbated as the EV market becomes better established.

To address these issues, and to acquire a return on investment, many municipalities opt to charge employees a fee. This is of particular advantage to resource-limited municipalities where revenues are commonly used to offset building electricity bills, finance regular maintenance and so achieve cost neutrality. The City of Ottawa and City of Vaughan case studies use this approach to minimize costs (as do many other North American organisations).

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17 The Workplace Charging Challenge program, an initiative of the US Department of Energy, aims to have 500 US employers offering workplace EV charging by the end of 2018 (US Department of Energy, 2017).

18 US Department of Energy, 2015. *Workplace Charging Challenge mid-program review: employees plug in*. Washington, DC: US Department of Energy.

19 Wynne R., 2015. Electric vehicle charging at work: understanding workplace PEV charging behaviour to inform pricing policy and investment decisions. San Francisco, CA: University of California.

Organisations appear to employ a wide range of different payment systems. The table below provides a summary of options available.[20]

TABLE 2

CHARGE FOR ELECTRICITY USED	CHARGE FOR TIME PARKED	VARIABLE PRICING	FLAT/SUBSCRIPTION FEE
Access fee per kWh used	Access fee per time parked	Increasing fees with time parked	Flat fee for use of a parking space
Reimbursed electricity costs	Incentivises drivers to move when finished charging	Maximizes availability of charging stations	Allows driver to park in a designated space

Charging for electricity used, time parked or using variable pricing generally requires networked EV charging stations to handle payments and management or otherwise will likely introduce very high administrative burdens if done in-house. Using these networked stations is costly but effective where charging station usage is expected to be high and/or where charging is available to employees alongside other users (e.g. workplace visitors and the public).

Charging a flat fee (or subscription fee) involves employees paying a fixed fee to permit them to charge in a designated EV station parking bay (or any available bay). This approach usually involves charging employees on a monthly or annual basis often via a payroll deduction. The City of Vaughan uses this system and charges $24.27/month (which reflects local electricity prices) in order to recoup electricity and maintenance costs[21]. This approach is much easier to administer in-house and could constitute a best practice for resource-limited organisations.

Free or paid charging entails a mix of advantages and disadvantages suggesting that it could be most effective for organisations to use a 2-stage system. Stage one involves offering free charging initially, in order to better incentivise EV adoption and employee enrollment. Stage two involves switching to paid charging at a later date when charging station usage has increased and there is more of a need to recoup costs. Such an approach is also advantageous because equity of employment benefits has been identified as major concern of workplaces that offer employee EV charging[22]. This approach offers an effective workaround. Indeed, the City of Markham plans to use a

20 Dominion Energy, 2018. Electric vehicle workplace charging policies. Richmond, VA: Dominion Energy.

21 City of Vaughan Environmental Sustainability Office, (2015). Workplace EV Charging Policy.

22 PEV Collaborative, 2013. *Amping up California workplaces: 20 case studies on plug-in electric vehicle charging at work.* Sacremento, CA: PEV Collaborative.

2-stage system by offering free charging for an initial 2-year pilot period and then plans to switch to a monthly subscription fee of $10-50/month (depending user demand as measured during the pilot period).

ACCESS AND PRIORITIZATION

It is unlikely that organisations are able to provide an excess of EV charging stations compared to EV-driving employees. For example, in 2016 the US Department of Energy's Workplace Charging Challenge survey indicated that only 17% of participating workplaces were providing at least 1 charging station per EV-driving employee[23]. This means access and prioritization rules need to be developed and enforced to ensure the fair usage of workplace EV charging stations especially as the number of EV-driving employees will likely increase.

Proper signage is an obvious yet effective mechanism as it demarcates which parking bays are for EV-only access to chargers and can communicate other access and prioritization rules as discussed below. Signage is also important because many organisations do not employ parking attendants or security officers which leaves parking lot signage as the main strategy through which access and prioritization rules are actually enforced. To aide recognition, it is good practice to design these with similar appearance to other official government signage[24].

Other useful access and prioritization rules include:

- allowing workplace charging at certain times (e.g. normal business hours only);
- setting daily charging time limits (typically 4-hours per day per employee when using level 2 chargers);
- giving priority to battery EVs over plug-in hybrid EVs;
- requiring that EVs be actively charging when parked at a charging station (and moved thereafter); and imposing increased fees for longer charging times.

When devising access and prioritization rules decision makers should consider commuting distances, the types of EVs driven, their ranges and typical states of charge after commuting as well as whether workplace charging stations have other users (e.g. fleet vehicles, visitors, the public)[25]. Again, this reinforces the value of preliminary employee surveying as a useful tool to help guide decisions, in this case around access and prioritization. It is also good practice to include these rules, and the consequences of breach, in a workplace EV charging policy document and on parking lot signage to ensure employees are aware. Again, this reinforces the value of using a formal registration process as a tool to brief employees on these rules.

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23 Energetics Incorporated, 2015. Workplace electric vehicle charging policies: best practices guide Clinton, NY: Energetics Incorporated.

24 Minnesota Pollution Control Agency, 2012. *Charging while you work: a guide for expanding electric vehicle at the workplace.* Baxter, MN: Minnesota Pollution Control Agency.

25 Alternative Fuels Data Center, 2018. Managing workplace charging. Retrieved from: https://www.afdc.energy.gov/fuels/electricity_charging_workplace_managing.html. Last accessed: 1st November 2018.

There are a number of strategies to enforce access and prioritization rules such as using a parking attendant, assigning an employee to a charging station parking bay or using a reservation system among others. However, workplaces can most commonly operate an employee self-managed system, whereby employees communicate with each other via intranet forum or email listserv, because demand is low and it avoids additional costs through 3rd parties (or otherwise there are heavy administrative burdens if done in-house).

Therefore, etiquette relating to charger sharing is an important consideration. One of the major concerns of workplace EV charging is disruption during the workday as employees need to move their vehicles around. However, this can be reduced if charging etiquette rules are established that allow employees to independently unplug another's EV to begin charging their own. Establishing a protocol over if and how this is done is important. A possible low-cost best practice solution is to distribute rear-view mirror hangtags or window stickers which can communicate whether the driver consents to their EV being unplugged and at what state of charge it can be unplugged.

CONCLUSION

This report has explored how municipalities and other organisations can develop and implement effective workplace EV charging policies and better facilitate employee EV adoption. This report finds that effective workplace EV charging policies are those that assess and evaluate employee demand, define clear roles and responsibilities to involved stakeholders, use a formal registration process and liability waiver, decide upon free or paid workplace charging (and explore an appropriate payment system where necessary) and define, communicate and enforce clear rules and expectations around EV charging station access and prioritization.

For municipal decision makers the provision of workplace EV charging opportunities is but one tool in a more expansive portfolio of corporate- and community-focused actions to achieve a low carbon transportation sector. Corporate-focused actions include the electrification of light- and heavy-duty fleets and transit vehicles. However, it is community-focused actions, such as amendments to existing land use planning and development acts and bylaws, the development of green development standards and the initiation of pilot projects for on-street residential EV charging opportunities (among other options) that stand to achieve significantly increased EV adoption to the level required for successful action against climate change. With a focus on corporate and community action, municipalities can build towards the development of an encompassing "EV ecosystem" and balanced portfolio of workplace, home and public EV charging opportunities.

ADDITIONAL RESOURCES

Sample policy documents

Edison Electric Institute, (2015). EV Workplace Charging Policy.
This resource is a sample workplace EV charging policy document that can be used as a template to the addition of text into employee policy document materials.

Alternative Fuels Data Center, (2015). Sample Workplace Charging Policy.
This resource provides examples of EV charging station access and prioritization rules and guidelines for employees.

Additional case study information

Plug-in EV Collaborative, 2013. Amping up California workplaces: 20 case studies on plug-in electric vehicle charging at work.
This resource provides an additional compilation of 20 Californian-based workplaces that provide EV charging programs.

City of Ottawa Economic Development and Long-Range Planning, (2017). Corporate Electric Vehicle Charging Station Policy.
This council-approved policy document provides further information on how the City of Ottawa is providing EV charging opportunities at their corporate facilities.

City of Markham Sustainability and Asset Management, (2017). EV Workplace Charging Pilot.
This council-approved policy document provides further information on how the City of Markham is providing workplace EV charging opportunities in partnership with Alectra Utilities.

City of Vaughan Environmental Sustainability Office, (2015). Workplace EV Charging Policy.
This council-approved policy document provides further information on how the City of Vaughan are providing workplace EV charging opportunities at their corporate facilities.

City of Kingston Real Estate and Environmental Initiatives, (2017). Kingston EV Strategy.
This council-approved policy document provides further information on how the City of Kingston plans to provide community and corporate EV charging opportunities throughout the city.

Humber College Office of Sustainability, (2018). EV Parking on campus.
These webpages provide further information on Humber College is providing on-campus EV charging opportunities to employees, students and the wider community.

EV charging station purchasing, installation and other preliminary considerations

Partners in Project Green, (2015). Charge Up Ontario: a guide for business to invest in EV charging stations.
This resource provides additional guidance on the purchasing and installation of EV charging stations.

Energetics Incorporated, (2015). Workplace charging: guiding employers through the process of planning, installing and managing charging infrastructure for EVs.
This resource provides a useful checklist of tasks (see page 10) that stakeholders can follow to guide them through the effective planning, installation and management of workplace EV charging stations.

Wider promotion of EVs in the workplace

US Department of Energy, (2014). PEV Outreach Resources for Your Employees.
This resource provides a number of additional ways in which stakeholders can promote EVs in the workplace alongside the provision of workplace charging opportunities.