



Published March 2020

Workplace Charging: Lessons from Sustainability Trailblazers

Best Practices for Reducing Emissions with
Electric Vehicle Charging in the Workplace

Marsha Willard, Ph.D., Professor Presidio Graduate School

With research assistance from Presidio Graduate School
students **Kylie Flanagan** and **Eric Fleishman**

Executive Summary

The research team at Presidio Graduate School based this report upon recent published research as well as in-depth interviews conducted in late 2019 with sustainability leaders in 24 organizations across the U.S., some with operations around the globe. This report shares the experiences and best practices from industry leaders who have embraced electric vehicles (EVs) as part of their greenhouse gas reduction efforts. We found that while still most common in Europe and in the coastal states of the US, the speed of electric vehicle adoption makes creating the charging infrastructure an imperative for both the public and private sector. Leading businesses have made the case for providing charging and other EV related employee incentives or benefits. Below are some of the key findings of the study:

- Employers play an important role in facilitating EV adoption and EV charging is increasingly easy to justify.
- EV commuting and EV fleets help organizations realize greenhouse gas reduction targets.
- Related benefits increase employee satisfaction and make it easier to attract and retain workers.
- Employers recognize that demand for charging will only grow and in many regions is already both an expectation of employees and a mandate from cities and states.
- Employers are worried less about upfront costs and are thinking long-term about strategies to future-proof their investment.

Why workplace charging is important to sustainability leaders

Currently the biggest limitation on the trend toward a full electric vehicle conversion is the lack of a wide spread, fully accessible charging infrastructure. While utilities and other public entities play an important role in ensuring equitable and efficient access to charging stations for drivers, businesses and nonprofits are beginning to step into the arena to offer EV (electric vehicle) charging to customers and employees (Engel, Hensley, Knupfer, & Sahdev, Shivika, 2018). In addition to supporting a national need for infrastructure, employers in both the public and private sector are finding that supporting EV commuting helps meet internal sustainability targets as well as provide an attractive benefit to employees.

“Vehicle electrification isn’t an *if* or a *when* question anymore; it’s only a question of *how fast* and *can we be ready in time*. With EV adoption sporting compound annual growth rates of 30–40% in recent years in the U.S., the path to an electrified future is now simpler and more straightforward than it has ever been.... What we need to do now is to understand how and where to build charging infrastructure, and then start building it to meet the demand of oncoming EVs.”

(Fitzgerald & Nelder, 2017, p10)

Our study participants did not report difficulty making the case for providing EV charging for employees or customers even though there is no demonstrable direct financial return on the investment. The case for electric vehicle supply equipment (EVSEs) lies in the other benefits employers realize from offering this service to employees.

Helps meet sustainability goals

Those companies serious about reducing their carbon footprints understand the important role electric vehicles can play. After energy used by buildings, carbon emissions related to business travel, product distribution and employee commuting are the biggest source of greenhouse gas emissions for most businesses. EV policies become an important component to a greenhouse gas reduction portfolio. In addition to greenhouse gas reduction, providing EVSEs meets criteria for green building standards such as LEED which encourages the inclusion of EV charging infrastructure in the construction or renovation of buildings.

For those organizations serious about carbon reduction, providing EVSEs could be an important part of a set of strategies. Sprint, for example, has set a target for its operations to be carbon neutral by 2025. Their EV program will be a supportive element in helping them achieve this ambitious goal.

“We don’t have a lot of operational control over commute emissions. We measure them but we don’t have a high-impact way to nudge employees to take a more low-carbon commute option except by offering EV charging. That really aligns with our sustainability objectives as an organization.”
— *Workday*

Encourages EV adoption

Most of the participants in our research cited their desire to expand EV adoption as among the primary motivators for their programs. Julien Gervreau, Vice President of Sustainability at Jackson Family Wines, described their program in “Field of Dreams” terms. He believed that if they provided chargers for their employees, that more employees would convert to EVs because it would resolve the range anxiety issue. His prediction came true. When the chargers were first installed at their headquarters, there were only 4-5 EV drivers. Three years later there are close to 40. This supports the research that indicates that employees at workplaces that provide charging are 6X more likely to drive an EV than the average worker (US Department of Energy, 2016).



Bank of America, Pennington, New Jersey

Attracts and retains talented employees

Creating an attractive workplace is about more than good wages, especially as the workforce becomes dominated by millennials who seek jobs with organizations that share their values and allow them to contribute to making the world a better place (Pelosi, 2018). The companies in our survey were clear that an EV program lent itself to this kind of workplace. EV charging provides a visible indicator of a company's commitment to the environment and to helping employees participate in that commitment.

The impending ubiquity of electric vehicles may soon put employers at a distinct disadvantage in competing for talent if they are not able to offer charging at work. Much in the same way that the public has come to expect WiFi in every building, employees and customers will soon expect to be able to plug in their cars at places where they plan to spend more than an hour of their time. Workplace charging helps relieve EV drivers of range anxiety and enables EV driving employees to feel secure in using their vehicles to commute to work and still run necessary errands before or after. Even for non-EV drivers, the availability of chargers at work is an attractive addition to employee benefits packages. HP Inc. in Palo Alto, California discovered that 20% of their employees were planning to buy an electric vehicle within the next two years. Offering on site charging was a way to provide a meaningful benefit to employees (The Climate Group, 2019).

“A question we hear often from applicants and recruits is ‘what are you doing for the environment?’ The EV charging and EV purchase incentive is part of our ready response.” — *Bank of America*



Bank of America, Brea, California

Establishes leadership in sustainability

Commitment to supporting electric vehicles also contributes to a business' public image. Unlike other energy or greenhouse gas reduction strategies like building retrofits and HVAC upgrades, EVs and EV charging are publicly visible signs to employees, customers and other stakeholders that the organization is serious about sustainability. HP Inc. reported that joining EV100 (a global initiative sponsored by the Climate Group that brings together forward-looking companies committed to accelerating the transition to electric vehicles) gave recognition to their program both within the company as well as externally. Having external recognition is a big driver that helps the company embed sustainability in internal processes. For example, for any new leased locations landlords are asked to provide EV charging. Similarly, Sprint joined the Department of Energy's EV Everywhere Charge Challenge in 2014, because then CEO (Dan Hesse) believed that sustainability was a brand differentiator, and good for business.

Aligns actions with organizational mission and values

For some organizations it is about more than image. Not pursuing strategies like carbon free transportation runs afoul of stated values and sometimes even the core mission of the organization. Shawna Cain at the Oregon Food Bank found that their EV program helped leaders think more broadly about sustainability and the relationship to their mission. Her leaders tended not to think of themselves as having an environmental impact, but she was able to link the EV program with the social value of equity, making the case that saving the environment has social benefits as well. In this case providing environmentally friendly driving options brings the added benefit of being more equitable because EVs are a lower-cost transportation method. Shawna further believes that aligning the program with the core mission of the Food Bank also helped her win a recent grant from Portland General Electric to support the EV program at Oregon Food Bank. Similarly, Genentech made the easy connection between their EV program and health. As a major player in the pharmaceutical industry, playing to this advantage makes strong sense.

“As a healthcare company committed to improving people’s lives, we think decreasing the use of diesel vehicles can be significant given the harmful particulates they emit. We have long been committed to environmental sustainability in all aspects of our business, including sustainable commute options for our employees. By supporting employees’ personal use of EVs on campus and converting our commuter bus fleet to EVs, we can make an impact on people’s health and climate change in the long term.” — *Genentech*

Contributes to health and clean air

Cars and trucks are the single largest contributor to air pollution in the U.S. They emit a number of harmful gases, soot, and fine particulate matter that contribute to ailments like asthma, bronchitis, heart disease and even cancer. Vehicle noise is also damaging to our hearing and contributes to human stress, and oil leaks pollute our soil and water (Green, 2018). Taken together, these impacts contribute to thousands of premature deaths each year. The economic impact of this pollution and resulting health problems is estimated to cost the global economy about \$2.6 trillion annually. In response, 26 cities around the world have pledged to set up “zero emission zones” by 2030 (The Climate Group, 2019).

Given these impending policy trends and that fact that the average American spends over 50 minutes a day driving back and forth to work, employers have the opportunity to drastically improve air quality in their communities while at the same time preempting regulatory requirements by encouraging and supporting employee EV commuting (Ingraham, 2017). Research conducted by Northwestern University found that EVs have a net positive impact on air quality and climate change even when the energy they use is produced by fossil fuels (Beck & Morris, 2019)

This aspect of EV charging was important to Workday. Erik Hansen, Workday’s sustainability director, considered the company’s daily commuters and the impact they were having on air quality. “The sustainability lens that I’ve tried to use is that local air pollution from 5,000 daily commuters is really impactful to the community every single day, so even though EVs do have a carbon footprint, there are no tailpipe emissions. Air pollution directly kills 200,000 people in the US each year. That’s a crisis! We should be doing our part to reduce our impact on that.”

What keeps employers from providing EV charging, and how have sustainability leaders overcome these obstacles?

While the case for providing workplace charging is strong, organizations may hesitate because of perceived challenges or obstacles. Below are some of the most common concerns sustainability leaders encounter with regard to providing charging and examples of what early adopters have done to remove or mitigate these barriers.

What are the costs I can expect?

The primary costs associated with providing onsite charging include the cost to install the charger(s), the cost of the charging hardware and software to manage the chargers, and the cost of the electricity consumed by charging the vehicles.

Installation costs will vary depending on how many chargers are installed and any potential upgrades needed to existing panels and transformers. Installation costs can often be mitigated through incentives or grants. The Oregon Food Bank, for example, was able to start their program at no cost through a grant from Forth Mobility, a nonprofit organization whose mission is to promote EV adoption. For-profit businesses may be eligible for federal, state or municipal incentives or special offers from their utility company. As of 2017, there were 44 U.S. utility companies that offer discounts or rebates on purchase or implementation of EV charging capacity. That's nearly double what it was two years before. For example, the Los Angeles Department of Water and Power offers a rebate of up to \$4,000 for level 2 charging station installation (Fleetcarma, 2017).

Another method to offset initial costs is to implement a charging solution that has power management capabilities. Many organizations want to expand their charging infrastructure without having to make substantial investments in electrical upgrades at the start. With power management capabilities, the need to upgrade can potentially be offset or delayed.

Tips for Minimizing EVSE Costs

- Right size the feature of your EVSE to manage current and future needs
- Choose dual port EVSE to maximize installation cost efficiencies
- Keep the number and level of EVSE units to within electrical load availability
- Site EVSE's close to existing electrical service
- Contact your utility for help managing consumption and demand charges
- Consider future needs as you prepare for installation to make future expansion easier.

(US Department of Energy, 2015)

Discounts and Incentives

Find federal and state laws and incentives for alternative fuels and vehicles, air quality, fuel efficiency, and other transportation-related topics.

<https://afdc.energy.gov/laws>

“Be sure to research rebates and credits for installing and managing EV stations. We weren’t aware of them initially and only just learned about them. Explore your options to make sure that you’re getting everything you’re entitled to.” — *VMware*

How does EV charging reduce our carbon footprint?

Providing EV charging reduces greenhouse gas emissions for both scope 2 and 3 emissions. If a business owns a fleet and converts the fleet to electric vehicles, it eliminates the greenhouse gases associated with gasoline or diesel consumption. EVSEs for employees reduce scope 3 emissions related to employee commute and business travel.

Calculating the greenhouse gas savings from electric vehicle use depends on knowing the generation source of the electricity used to charge the vehicles. In those parts of the country where energy is generated primarily from coal, EVs still help reduce carbon emission, though not as dramatically as they do in other parts of the country. For example, EVs powered by the grid in the middle states of the U.S. produce the equivalent greenhouse gas as a gas powered car that gets about 50 miles to the gallon, while in the western states, the greater contribution by renewables makes EV emissions equivalent to a gas car that gets about 100 mile to the gallon (Union of Concerned Scientists, 2018). Forward thinking companies in our research, like ClifBar, Jackson Family Wines, Ingka Group and Zappos, are investing in their own renewable energy sources to assure complete carbon neutrality. Sprint recently signed two virtual power purchase agreements for wind projects in Texas that will generate enough energy to offset 30% of their carbon footprint by 2021. For those organizations that lack access to renewable sources, the US Department of Energy provides an online service that reports the generation source particular to each state and its implication for various auto type emissions. (U.S. Department of Energy Alternative Fuels Data Center)



IKEA, Halifax, Canada

What if we don't own our building?

Owning a building certainly makes it easier to justify and conduct capital improvements like the addition of EVSEs, but being a tenant in someone else's building does not preclude having charging stations for your employees. Building owners see the same trends as employers and understand that charging stations may eventually make the difference between a rentable and unrentable space. Tenants can often negotiate charging stations into their leases. SAP, for example, leveraged their long-term relationship with their Palo Alto location landlord to provide chargers. This benefitted not only SAP but the other tenants in the building as well. For smaller tenants, banding together with other building tenants to request chargers may provide enough negotiating power to make it happen. You can increase the likelihood of convincing a landowner to provide chargers if you come to the conversation with information about the benefits, the costs and expected use estimates. If possible, you can make the deal easier to accept if you are willing to cover all or some of the installation costs under tenant improvement agreements.

As EV charging stations have become a necessary component of a building's infrastructure in many markets, office owners have the next-highest level of urgency. As a growing share of commuting workers drive EVs—and as an increasing number of tenants' visitors and clients drive EVs to office buildings—there is an expectation among tenants that charging stations will be offered at the workplace. Offering EV charging stations is a contributing factor to properties achieving top-of-market positioning. ([RCLCO, 2020](#))

“With locations across the country, Cisco utilizes a combination of leased and owned facilities that offer charging. When looking for new properties, Cisco lists workplace charging as a preferred lease requirement for potential properties. In this way, Cisco can find out immediately whether a property manager has or will install charging at its facility. Not all new properties have been conducive to installing charging stations, but by Cisco including charging in their written lease preferences, they have been able to open this dialogue early on”

(“Alternative Fuels Data Center: Workplace Charging at Leased Facilities Charges Up Tenants and Property Managers,” 2015).

How do we manage it?

For organizations concerned about carbon reduction, optimal use of charging stations is important. Larger organizations rely on the management features of their smart chargers. The user apps that accompany these services are able to notify users when their car is charged or when their time limit has been reached. The apps also alert drivers when a station is available or help users find working chargers as they drive. They can also connect them to the EV community to make direct contact with other EV drivers in their company.

“When we rolled the Waitlist feature out a couple of years ago, employees were thrilled because it made their lives easier. They were concerned about the over-the-limit fee but once they had Waitlist it enabled them to go down and unplug their cars. This also reduced the number of people abusing the system by over half.” — *Adobe*

How will an EV program complement my transit initiatives?

In spite of the growing demand for EV charging from employees in all kinds of organizations, some of the participants in our study experienced some resistance to their EV programs from those trying to promote public transportation. While commuting in an EV does address greenhouse gas and air pollution issues, it still contributes to traffic congestion.

EV charging can still make a very important contribution to commute impact reduction efforts, however, when seen as part of a complete transportation package. Almost two-thirds of our participating organizations offer benefits for other commuting options, like transit passes, campus shuttles, bike programs and carpool programs, in addition to EV charging. An EV charging program is an important complement to other commute options as no single commute option can meet everyone’s needs.

Including an EV charging benefit as part of a portfolio of options also helps create a more equitable benefits program. Offering a benefit that only applies to transit commuters and excludes commuters that need to drive, can have tax as well as fairness implications. The point of an EV program will never be to provide a charger for every car, but it does enable those who must drive a chance to contribute to the organization’s carbon reduction goals.

“When it comes to commuter programs, there are people that need to drive to work, and if you can encourage them to do that in an electric vehicle by having onsite charging, that’s a win-win for you and your employee.” — *LinkedIn*



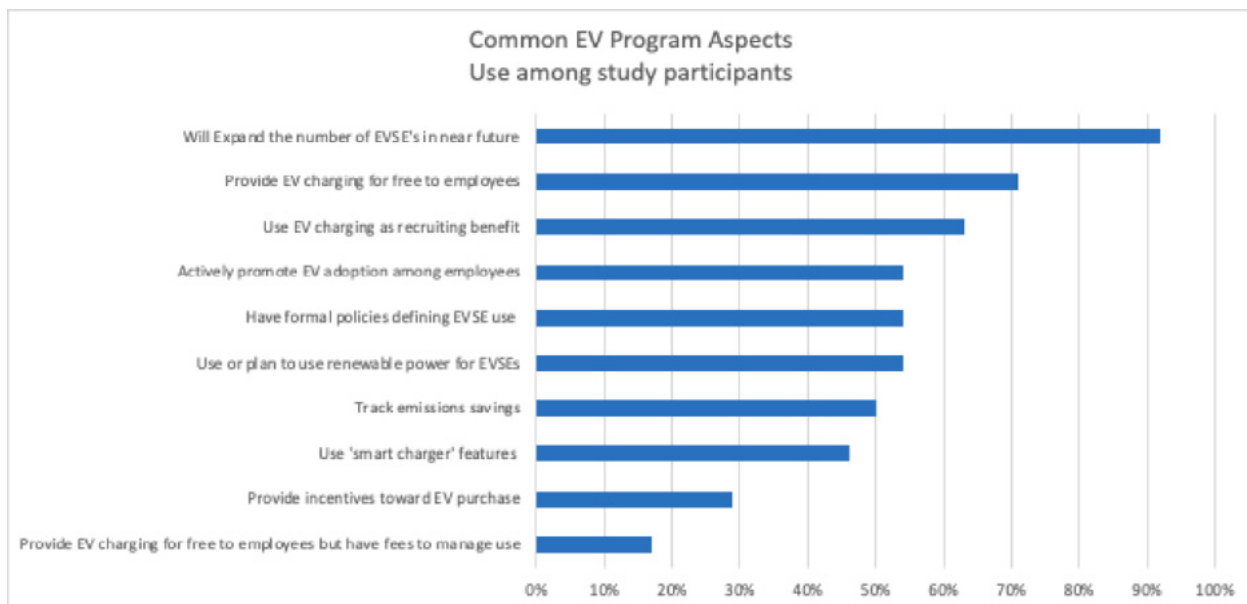
LinkedIn, Sunnyvale, California

How Leaders Manage Their EV Programs

Enrolling and empowering employees

Enrolling employees in their EV charging programs was not a problem for any of the organizations in our study; quite the opposite. In many cases, the impetus for the program came from employee requests. If you are not confident in the “build it and they will come” approach, begin by surveying the interest among employees. Signaling that you are considering this may be enough to tip employees to convert to electric.

To maintain and grow participation, our study participants found several strategies useful including integrating information about the program in new employee orientations, showcasing the EV program and the benefits of EV driving at annual sustainability fairs, conducting periodic information webinars or lunch and learns. PG&E and SAP both maintain an internal web page devoted to information about EVs. By all reports from our research participants, EV drivers are a particularly passionate group. Our study participants found that they could leverage and support this enthusiasm with newsletters, Slack groups, periodic surveys, and EV committees made up of EV employee enthusiasts. In many cases, the EV community self-organized to sponsor events and promote EV driving within the larger employee community.



“While it’s tempting to start your program small, bear in mind that it will grow and that you are likely better off installing a good number of chargers at the beginning; because if you provide the charging, the drivers will come. We have had a nearly 50% increase in the number of EV drivers from 2017 to 2018 alone.” —*Bank of America*

“We conduct an annual sustainability fair where we promote EV use and our charging program. We also have a “Jam” page on our portal that is dedicated to EV use commuters. It has helped build a community among drivers and keeps them connected through the user blog and notifications.”
— SAP

Providing employee incentives

Most of our study participants found that offering free charging has been incentive enough to encourage participation. That benefit alone has increased EV ownership sometimes by double digits. Several other of our organizations have taken incentives to the next level and actually help subsidize the purchase or lease of an EV. Clif Bar’s “Cool Car” program offers employees up to \$6,500 toward the purchase of a hybrid or electric car. So far, about a third of their employees have used the offer (The Climate Group, 2019). Bank of America has a similar program which offers up to \$4,000 per employee, helping 1,600 employees purchase EVs thereby increasing their charging participation rate at some locations by a factor of 10 since the start of their program (The Climate Group, 2019).

Reporting impact

Demonstrating success for an EV charging program necessitates gathering data on its use and impacts. For those organizations in our study that are not using chargers with reporting capabilities, they rely on self-created tracking systems that monitor the number of registered EV drivers and self-reporting employee surveys to gather information on commuting habits. This approach has proven workable for smaller organizations. Most of the participants in our study, however, make use of the sophisticated tracking systems featured in “smart” chargers. These are chargers that are connected to a network that enable monitoring and managing the use of the stations. They collect information like station usage and availability as well as energy demand. Using these systems, businesses can track the number of users and the energy consumed. Their systems also help them manage use to assure the chargers are being appropriately used and have optimal turnover during the day.

LinkedIn’s EV Charging Data

- Avoided 3,290 MT greenhouse gas (GHG) emissions
- 223 charging spots
- 55% increase in driver growth (from 2018 to 2019)
- 27% increase in charging sessions (from 2018 to 2019)
- 54% of charging spots are highly utilized
- 75%+ utilization weekdays 9am-5pm

Reference: <https://www.chargepoint.com/solutions/customer-stories/linkedin/>



LinkedIn Campus

“Over the course of the first two years, we saw peak daily occupancy increase from 27% to 60% utilization rate. That’s an increase from 171 to 427 sessions per month!” — *Sprint*

How to get started

Once an organization decides to provide EV charging, there are a series of decisions that need to be made to launch it. This section outlines an approach and shares lessons learned from our research participants.

How many chargers should we install?

Many of our study participants provided EV chargers in response to employee requests, so they had some notion of the number they would need to start. Other organizations conducted surveys to test the demand. No one envisions the need to have a charger in every parking spot, but what is the right number? State and municipal regulations are beginning to require EVSE-ready parking for any new construction. The required number varies by city. Salt Lake City and Montgomery County, Maryland both require that 1% of business parking spaces provide charging capabilities. In Duluth, Minnesota it’s 2% and 3% in Middletown, Connecticut (Cooke & Ross, 2019). In Portland, Oregon the requirement stipulates that 5% of open parking spaces must be available for electric vehicle charging stations (“Commercial Building Permits: Electric Vehicle Parking | News & Events | The City of Portland, Oregon,” 2017). Forward thinking businesses, like those in our study, believe these requirements are conservative. LinkedIn is building toward covering 10% of their parking spots with chargers eventually achieving a target of 20%.

Should the chargers be available to the public or reserved for employees only?

The driving principle behind the EV charging programs among our study participants was to provide a service to their employees. A few among them, however, made their chargers available to visitors. The choice to make your chargers publicly available will impact where you place them, how you will manage paying for the power and whether they are linked with a publicly available mapping app. Whether or not they are available to the general public, putting chargers in a prominent place on your property has the advantage of sending a visible signal about your company’s commitment to sustainability.

Should we charge a fee or make it free?

Most of the respondents in our research chose initially to provide EV charging for free to their employees. Most charge station providers can make this easy. Though they have the capability to charge users directly, the sponsoring business can just as easily pick up the tab. Some of the study participants evolved to adding fees or charges for employees mostly as a station management issue to prevent ‘squatting’ and assure maximum utilization of the spots. SAP, for example, allows employees to charge for free, but next year will implement a parking fee for cars that sit at a charger for more than 4 hours. This “idle” fee is typically set after a certain time period, to ensure that drivers are monetarily incentivized to move their EV, enabling other EVs to get a charge. Of course, any attempt to charge will require a system that enables use tracking. Since several of our study members started with a free program and then later decided to add charges, going initially with chargers that do not enable this kind of dynamic pricing or ability to track by user, limits your ability to change up your program.

What Are the Trends to Watch?

The rate of growth in EV adoption forces us to look forward and anticipate what the next few years will require. The leading organizations we interviewed have revealed where they see this trend going and what they plan to do in the coming years.

Expanding your EV charging footprint (while reducing your carbon footprint)

Of the participating organizations in this study, 92% have plans to expand the number of EV chargers in their programs. The growth in use they have experienced speaks to the growth in EV adoption and the popularity of this benefit among employees. And it's not just employee programs that are expanding. EV use is quickly penetrating commercial vehicles as well. There are over 120 million commercial or "fleet" vehicles in the United States, traveling millions of miles a day (Kobernick, 2018). Amazon recently announced plans to purchase 100,000 electric vans as part of its commitment to go carbon neutral by 2040 (Bade, 2019). Ingka Group too is shifting its entire fleet to electric vehicles by 2025.

For those not motivated by employee or customer demand, regulation may provide the tipping point. Many of our research participants expect to see future clean air or climate change mitigation requirements from cities and states to necessitate including EV charging. This is especially true for new construction projects. Our participating companies are getting ahead of the EV growth curve, giving them a lasting advantage in employee recruitment and risk mitigation.

"Plan your infrastructure accordingly to growth. Employees everywhere are asking for more chargers. Since the cost of installing is the biggest expense, better to plan for growth and build the capacity once." — *PG&E*

Ingka Group (formerly IKEA Group) — 4 big commitments to the future

- By 2020 we will provide access to EV charging stations in all touch points (stores, centers, offices). If have parking space have charger.
- By 2025, have all customer deliveries last mile be electric or other zero emissions vehicles (cargo bikes or EV).
- By 2025, all fleet cars will be electric and all leased or shared vehicles will be electric or other zero emission
- By 2025 reduce relative emission from coworker/customer travel in 1/2



IKEA, Halifax, Canada

Lowering the carbon footprint further

Most of our study participants power their chargers with lines from their existing building panels, so the electricity comes from the same generation source as their buildings. This is the most cost-effective method for powering the chargers, but it links the carbon impact to the generation source provided by the region's utility. If the local utility is powered mostly by coal generation plants, the carbon savings may be negligible.

Organizations serious about using an EV program to lower their carbon footprints may find an increasing need to invest in renewable power. Amazon, for example, plans to increase its renewable energy usage from 40 percent to 100 percent by 2030 (Bade, 2019). Bank of America already sources 91% of its energy from renewable sources and will be rolling out on-site solar generation at more than 60 of its locations in the next two years. A number of our research participants have already invested in their own on-site generation, and 55% report that they are looking to add this feature in the future. If self-generation is not feasible, increasingly organizations have opportunities through their utilities to source energy from renewable sources. At least 50% of customers in the U.S. already have the option to purchase renewable electricity directly from their power supplier, and everyone has the option of purchasing renewable energy certificates, which help foster the development of new renewable generation (Bird and Hutchinson, 2019).

Utilizing power management features

Our study participants understood that the expected increase in demand for workplace charging will require more attention to power management. In addition to meeting the extra demand without over-tapping their capacity, EV program managers also want to assure the most efficient use of the charging. Power management features available on some EVSEs enable site managers to maximize the number of charging ports before having to upgrade existing wiring or panels. These systems also enable management to assure that charging EVs never exceed the maximum aggregate electrical load, thus avoiding potential peak load charges. The algorithms built into the charging infrastructure assures that EVs charge as fast as possible without ever exceeding site capacity. These systems also enable managers to control when and how much energy is being tapped to maximize consumption during those times of the day when renewable power is most plentiful.

Conclusion

As the U.S. vehicle fleet makes the inevitable conversion from internal combustion engines to electric vehicles, workplace charging will become increasingly expected since most of the country's charging needs will still occur at home and at work. Fortunately, the benefits return to employers in the form of public image, employee satisfaction and retention, and the contribution towards greenhouse gas reduction goals, making this service increasingly justifiable for business. Farsighted employers are getting ahead of the growing demand from both employees and regulators and thinking beyond first cost investment to reap longer term benefits.

Acknowledgements

We thank ChargePoint for choosing Presidio Graduate School to conduct this white paper. In addition, we are grateful to the organizations that participated in our research interviews.

Adobe

Scott Hiller,
Site Operations Manager

Bank of America

Beth Wytiaz,
SVP, Global Environmental
Operations Manager

Black & Veatch

Maryline Lewett,
Director of Business
Development, Transformative
Technologies

Cisco

Andy Smith,
Global Energy Management
and Sustainability

ChargePoint

Christine Nguyen Vaeth,
Corporate Marketing

Constellation Energy

Rand Havens
Megan Sparks

FreeWire

Arcady Sosinov, CEO
Ethan Sprague, VP Sales

Genentech

Katie Excoffier,
Sustainability Manager

HP

Erin McNichol,
Global Sustainability
Program Manager

Ingka Group

(formerly IKEA Group)

Angela Hultberg,
Head of Sustainable Mobility

Intuit

Tom Harrington,
Global Commute Solutions Leader,
Workplace

Intuitive Surgical

Cynthia Arteaga,
Senior Program Manager
Workplace Services

Jackson Family Wines

Julien Gervreau,
Vice President of Sustainability

Kohl's

Ryan Piedot,
Sr. Manager of Environmental Com-
pliance and Sustainability

LinkedIn

Danielle Glaser,
Head of Bay Area Transportation

Oregon Food Bank

Shawna Cain,
Sustainability Leader

PG&E

Justin Sadler,
Manager, Project and
Construction Management,
Electric Vehicles

Raytheon Corporation

Dimitri Shanin,
Senior Manager, Sustainability
Operations and Environmental
Management

SAP

Larry Morgan,
Senior Facilities Manager

Sprint

Amy Bond,
Sustainability Manager

VMware

Kailor Gordy,
Transportation Manager

Volta Charging

Scott Oltman,
Manager of site sales
(business development)

Workday

Erik Hansen,
Sustainability Director

Zappos

Amy Stewart,
Assistant Event Coordinator

References

- Alternative Fuels Data Center: Emissions from Hybrid and Plug-In Electric Vehicles. (n.d.-a). Retrieved October 25, 2019, from https://afdc.energy.gov/vehicles/electric_emissions.html
- Alternative Fuels Data Center: Emissions from Hybrid and Plug-In Electric Vehicles. (n.d.-b). *U.S. Department of Energy*. Retrieved January 31, 2020, from https://afdc.energy.gov/vehicles/electric_emissions.html
- Alternative Fuels Data Center: Workplace Charging at Leased Facilities Charges Up Tenants and Property Managers. (2015, January). *U.S. Department of Energy*. Retrieved November 21, 2019, from <https://afdc.energy.gov/case/2809>
- Author, N. G. (2017). *Workplace Charging Challenge Progress Update 2016: A New Sustainable Commute* (No. DOE/GO--102016-4929, 1416166). doi:[10.2172/1416166](https://doi.org/10.2172/1416166)
- Bade, G. (2019, September 22). Amazon to buy 100,000 electric delivery vans for 2040 carbon neutrality plan. *POLITICO*. Retrieved December 16, 2019, from <https://politi.co/2V7gfkx>
- Beck, J., & Morris, A. (2019, April 12). Electric vehicle adoption improves air quality and climate outlook. Retrieved December 5, 2019, from <https://news.northwestern.edu/stories/2019/04/electric-vehicle-adoption-improves-air-quality-and-climate-outlook/>
- Bird, L., & Hutchinson, N. (2019, November 19). 4 Emerging Ways to Pair Electric Vehicles and Renewable Energy. *World Resources Institute*. Retrieved December 16, 2019, from <https://www.wri.org/blog/2019/11/4-emerging-ways-pair-electric-vehicles-and-renewable-energy>
- Buying Clean Electricity. (n.d.). *Energy.gov*. Retrieved December 16, 2019, from <https://www.energy.gov/energysaver/buying-and-making-electricity/buying-clean-electricity>
- Carnegie Mellon Researchers Report Barriers to Electric Vehicle Adoption. (2013). *Travel & Leisure Close—Up*; Jacksonville. Retrieved from <https://search.proquest.com/docview/1459252391/abstract/CE617533D90E4C65PQ/3>
- ChargePoint. (2019). *LinkedIn Pioneers the Future of Work with ChargePoint EV Charging*. Retrieved from <https://www.chargepoint.com/solutions/customer-stories/linkedin/>
- Charging 101. (n.d.). *Forth Mobility*. Retrieved November 17, 2019, from <https://forthmobility.org/why-electric/charging-options>
- Commercial Building Permits: Electric Vehicle Parking | News & Events | The City of Portland, Oregon. (2017). Retrieved November 26, 2019, from <https://www.portlandoregon.gov/bds/article/656307>
- Cooke, C., & Ross, B. (2019). *Summary of Best Practices in Electric Vehicle Ordinances* (p. 26). *Great Plains Institute*. Retrieved from https://www.betterenergy.org/wp-content/uploads/2019/06/GPI_EV_Ordinance_Summary_web.pdf
- Davies, A. (2014, October 14). An Easy-to-Install Solar Charger That Juices Your EV Off the Grid. *Wired*. Retrieved from <https://www.wired.com/2014/10/envision-solar-ev-charger/>
- Davis, L. W. (2019). How much are electric vehicles driven? *Applied Economics Letters*, 26(18), 1497–1502. doi:[10.1080/13504851.2019.1582847](https://doi.org/10.1080/13504851.2019.1582847)
- Electric Power Research Institute. (2015). *Electrifying Transportation Reduces Greenhouse Gases and Improves Air Quality: Executive Summary* (p. 4).
- Electric Utility led EV incentive programs help grid stability, reduce emissions, manage costs, and provide greater efficiency. (2017, July 24). *FleetCarma*. Retrieved from <https://www.fleetcarma.com/electric-utility-led-ev-incentive-programs-grid-stability-emissions/>
- Engel, H., Hensley, R., Knupfer, S., & Sahdev, Shivika. (2018, August). The basics of electric-vehicle charging infrastructure | McKinsey. *McKinsey & Company*. Retrieved November 14, 2019, from <https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/charging-ahead-electric-vehicle-infrastructure-demand>
- Europe and North America to Cross 1 Million Workplace EV Chargers by 2025. (2019, November 9). *Energy Monitor Worldwide; Amman*. Amman, United States, Amman. Retrieved from <https://search.proquest.com/docview/2313009133/citation/F8F90E64A52D4BACPQ/14>
- Evatran. (n.d.). The Ultimate Guide to EVs with Wireless EV Charging (Including Tesla). *Plugless Power*. Retrieved November 23, 2019, from <https://www.pluglesspower.com/learn/wireless-charging-evs-guide-tesla/>

Fitzgerald, G., & Nelder, C. (2017). From Gas to Grid: BUILDING CHARGING INFRASTRUCTURE TO POWER ELECTRIC VEHICLE DEMAND. *Rocky Mountain Institute*, 90.

Fitzgerald, G., Nelder, C., & Newcomb, J. (2016). *ELECTRIC VEHICLES AS DISTRIBUTED ENERGY RESOURCES* (p. 78). Rocky Mountain Institute. Retrieved from http://www.rmi.org/pdf_evs_as_DERs

Frommer, M. (2018, October 23). Cracking the Code on EV-Ready Building Codes. Southwest Energy Efficiency Project. Retrieved from <https://www.swenergy.org/cracking-the-code-on-ev-ready-building-codes>

Green, J. (2018, March 13). Effects of Car Pollutants on the Environment. *Sciencing*. Retrieved December 5, 2019, from <https://sciencing.com/effects-car-pollutants-environment-23581.html>

Hall, D., & Lutsey, N. (n.d.). Emerging best practices for electric vehicle charging infrastructure, 54.

Idaho National Laboratory. (2016). *Workplace_Charging Do's and Don'ts* (p. 2).

Ingraham, C. (2017, February 22). Analysis | The American commute is worse today than it's ever been. *Washington Post*. Retrieved December 5, 2019, from <https://www.washingtonpost.com/news/wonk/wp/2017/02/22/the-american-commute-is-worse-today-than-its-ever-been/>

Jerram, L. (2018, April 24). Charged EVs | What's the current state of wireless EV charging? Retrieved November 23, 2019, from <https://chargedevs.com/features/whats-the-current-state-of-wireless-ev-charging/>

Kent, M. (2013, February). Charged EVs | Workplace charging: Employers face a maze of issues when considering EV charging. Retrieved November 22, 2019, from <https://chargedevs.com/features/workplace-charging-employers-face-maze-issues-when-considering-ev-charging/>

Kobernick, P. (2018, September 26). (46) 3 Ways to Get More Electric Vehicles on the Road Now, by Focusing on Fleets | LinkedIn. Retrieved from <https://www.linkedin.com/pulse/3-ways-get-more-electric-vehicles-road-now-focusing-fleets-kobernick/>

Kylstra, C. (2014, February 26). 10 Things Your Commute Does to Your Body. *Time*. Retrieved November 21, 2019, from <https://time.com/9912/10-things-your-commute-does-to-your-body/>

Larkin, J. (2019). SolarEdge Collaborates with Google to Integrate EV Charging with the Google Assistant. *Automotive Industries*, 23–23.

Mitchell, R. (2017, December 18). Your workplace may get EV charging stations—Thanks to VW's cheating scandal. *Los Angeles Times (Online)*; Los Angeles. Retrieved November 15, 2019, from <https://search.proquest.com/docview/1978321717/abstract/F8F90E64A52D4BACPQ/6>

New Data Show Electric Vehicles Continue to Get Cleaner. (2018, March 8). *Union of Concerned Scientists*. Retrieved January 31, 2020, from <https://blog.ucsusa.org/dave-reichmuth/new-data-show-electric-vehicles-continue-to-get-cleaner>

NYC to Double its Use of Electric Vehicles, Hits New Milestone. (2019). *Waste360*, N.PAG-N.PAG.

Oleksak, S. (2014, November). Survey Says: Workplace Charging is Growing in Popularity and Impact. *Energy.gov*. Retrieved November 22, 2019, from <https://www.energy.gov/eere/articles/survey-says-workplace-charging-growing-popularity-and-impact>

Pelosi, P. (2018, February 20). Millennials Want Workplaces With Social Purpose. How Does Your Company Measure Up? *Chief Learning Officer—CLO Media*. Retrieved from <https://www.chieflearningofficer.com/2018/02/20/millennials-want-workplaces-social-purpose-company-measure/>

Petrara, D. (2019, August 7). Next Gen Batteries Will Power Up the Electric Vehicle Installed Base to 100 Million by 2028. NewsBank. Retrieved August 7, 2019, from https://infoweb.newsbank.com/apps/news/document-view?p=AWNB&t=&sort=YMD_date%3AD&-fid-base-0=alltext&maxresults=20&val-base-0=electric%20vehicle%20adoption&dcref=news/1752A30AB02FD4A8

RCLCO. (2020). Electric Vehicle Charging Station Strategy for Real Estate Implementation in the United States (p. 16). Retrieved from <https://info.chargepoint.com/rclco-whitepaper.html>

RethinkX+Report_102517 Tony Seba.pdf. (n.d.).

Roberson, B. (2019, June 6). What Does It Actually Cost To Charge Up An Electric Car? *Forbes*. Retrieved November 22, 2019, from <https://www.forbes.com/sites/billroberson/2019/06/06/what-does-it-actually-cost-to-charge-up-an-electric-car-it-depends-on-where-you-live/>

Scheele, L. (2015). INL reports analysis results from the largest collection of light-duty plug-in electric vehicle (PEV) and charging infrastructure demonstrations in the world. *INL*. Retrieved from <https://inl.gov/article/electric-vehicle-charging-habits-revealed/>

Smith, M. (2017). Implementing Workplace Charging within Federal Agencies, 23.

The Climate Group. (2019). *Business Driving Demand for Electric Vehicles: EV100 Progress and Insights Annual Report, February 2019*. Retrieved from https://www.theclimategroup.org/sites/default/files/downloads/ev100_annual_progress_and_insights_annual_report_february_2019.pdf

US Department of Energy. (2013). *Plug-In Electric Vehicle Handbook for Workplace Charging Hosts*.

US Department of Energy. (2015). *Costs Associated With Non-Residential Electric Vehicle Supply Equipment* (p. 43). Retrieved from https://afdc.energy.gov/files/u/publication/evse_cost_report_2015.pdf

Vehicles, Air Pollution, and Human Health. (2014, July 18). *Union of Concerned Scientists*. Retrieved November 21, 2019, from <https://www.ucsusa.org/resources/vehicles-air-pollution-human-health>

Vellequette, L. P. (2019). EV conundrum: How to handle used batteries: VW recycling pilot to extract minerals for a 2nd life. *Automotive News*, 93(6871), 1–1.