

ELECTRIC VEHICLE CHARGING FOR RETAILERS



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EXECUTIVE SUMMARY

The Center for Climate and Energy Solutions (C2ES) has partnered with the Retail Industry Leaders Association, Atlas Public Policy, and David Gardiner and Associates (DGA) to assess the market and current barriers for electric trucks and charging infrastructure within the retail sector. This joint initiative assesses the market landscape, challenges, and opportunities for electric truck and passenger charging infrastructure adoption among retailers and their transportation partners.

The project team previously developed an independent total cost of ownership analysis, *Assessing Financial Barriers to Adoption of Medium- and Heavy-Duty Electric Vehicles*, along with a publicly available total cost of ownership analysis tool, to help retailers better understand options available to them and their transportation providers. As part of this collaboration, the project team also published a brief reflecting interviews with retail and trucking companies that have piloted electric vehicle trucks within their businesses, to assess their perspective on the state of the industry.

In this next phase of the initiative, the project team interviewed utilities, charging station service providers, and non-profits to investigate whom retailers should be engaging as they design, install, and operate fleet and passenger vehicle charging infrastructure at their buildings. The scope of this brief touches on charging infrastructure for light-, medium-, and heavy-duty vehicles. Retailers will also want to provide charging for customers' personal light-duty vehicles, as passenger vehicle demand is projected to increase in the future.¹ Additionally, retailers are likely to use medium- and heavy-duty vehicles throughout their operations. We concluded that utilities, charging station service providers, retailers' product suppliers, delivery service providers, and retail customers are the most critical stakeholders to engage. This brief provides important insights for retailers on the key issues they should be discussing with these groups, and why engaging them will benefit retailers' efforts to design, install, and operate fleet and passenger charging infrastructure.

KEY TAKEAWAYS

- The key external stakeholders for retailers to engage during the charging infrastructure development process are utilities, charging station service

providers, product suppliers, delivery services providers, and retail customers. These groups provide access to financial incentives, technical

advice, and customer insights.

- Of these stakeholder groups, utilities are the most important because they can provide retailers information about commercial rebates and consulting services that assist with fleet electrification. They are the parties most involved during the entire infrastructure process.
- Early and continuous communication between retailers and utilities is essential for success throughout the process. The utility needs to be aware of where and when fleet charging station installations are happening and plan for any potential utility infrastructure upgrades, especially for medium- and heavy- duty vehicle and Direct Current Fast Charger (DCFC) loads.
- Selecting a charging network service provider who has worked with other retailers on deploying fleet and passenger charging infrastructure within the same business segment such as a fueling station or grocery store is ideal. The charging network service provider's experience can avoid or forestall technical issues the retailer otherwise would not have anticipated.
- For passenger and fleet charging, charging network service providers offer amenities that benefit customers and retailers. This includes visibility into and control of charging stations to provide real-time data and insights for future planning, syncing with the grid to provide adaptability with time-of-use rates, and allowing customers to use a mobile phone app to manage charging and make payments.
- Since many retailers do not own their delivery vehicles, engaging with their third-party logistics providers about potentially using EVs and the fleet charging options retailers plan to implement at their sites is key. This will allow retailers to meet their internal supply chain targets while reducing fuel and logistics costs for both retailers and supplier fleets.
- As vehicle electrification becomes more commonplace over time, retail customer preferences and charging behavior are likely to change, along with technology availability. Surveying customers regularly to assess their experiences at retail charging locations is key to maintaining a competitive edge in the market.

INTRODUCTION

In 2019, battery electric, plug-in hybrid, and hybrid electric vehicles (EVs) made up 1.8 percent of all new vehicle sales, up from 1.6 percent in 2018.² By 2022, at least seven electric pickup truck models are expected to be available on the market.³ Many states are now adopting stronger emission reduction targets and most analyses of needed reductions to meet mid-century goals, including one by C2ES, show a need for half of new light-duty sales in 2035 to be electric.⁴ There are now more than 40 models of EVs for consumers to choose from, with 40 additional new battery electric models coming to market by 2025.^{5,6} Although there are many available EVs and prices are steadily decreasing, many passenger vehicle consumers still cite the lack of charging infrastructure as one of the main reasons for not purchasing a vehicle.⁷ In the fleet space, truck electrification is an emerging trend as well. In 2018, Walmart announced 30 pre-orders of the Tesla Semi, the Class 8 semi electric truck, making it one of the largest holders of reservations with a total of 45.⁸ In

2020, UPS committed to purchasing 10,000 EVs from EV company Arrival, as well as completing a minority investment in the company.⁹

The purpose of this brief is to advise retailers on consulting and engaging key stakeholders as they prepare to install fleet or passenger EV charging infrastructure and the benefits and information they can provide. Retailers and their property partners, who have site control, are key players helping to build more charging infrastructure for fleet and passenger EV drivers across the country.

This brief builds on a previous publication, *Insights on Electric Trucks for Retailers and Trucking Companies*, and provides a collection of learnings C2ES collected from seven interviews with a range of utilities, charging station service providers, and nonprofit organizations. The scope of this brief touches on all applications of charging infrastructure since retailers are likely to use a portfolio of medium- and heavy- duty vehicles within

their supply chains and may consider providing charging services as an additional revenue stream for customers with personal light-duty vehicles. This brief, however, is not intended to identify or suggest how retailers should consider prioritizing which type of charging infrastructure to deploy, or offer a detailed breakdown of different charging infrastructure business models and financial scenarios for site hosts (for a detailed guide on this topic, see *Public EV Charging Business Models for Retail Site Hosts*). Rather, this brief assumes that EV deployment continues to occur at a rapid pace and further assumes the demand for charging infrastructure also significantly increases over time.

BACKGROUND ON EV INFRASTRUCTURE DEPLOYMENT

As of April 2020, more than 85,000 public and private EV charging ports are in place across the country. Of these, approximately 64,900 are Level 2 ports and 13,700 are Direct Current Fast Chargers (DCFC) ports.¹⁰ From 2016 to 2020, the number of charging ports grew 154 percent, from approximately nearly 34,000 to more than 85,000. Without major policy changes, by 2030 the number of EV sales is projected to grow rapidly, to 18.7 million vehicles. However, state and federal policies can accelerate these rates of adoption. Charging infrastructure to support these EVs will require an additional 9.6 million charging ports, or about 1.95 ports per EV.¹¹ These stations will be needed in single family homes, multi-unit dwellings, workplaces, and other public areas. To address this need, both the public and private sectors must play a role in deploying chargers and have already started doing so in recent years.

In the public sector, many states are taking the lead to increase their investments in EVs and the necessary associated charging infrastructure. While California has installed the most charging stations, other states have passed legislation to electrify their highways and thoroughfares or allocated funds from the Volkswagen settlement.¹² For example, New Jersey called for a statewide, public plug-in EV charging system and directed state agencies to develop a plan to install at least 400 public DCFC and 1000 Level 2 charging stations by the end of 2025.¹³ In Minnesota, the state is spending \$1.4 million on DCFC for its highways and more than \$150,000 on Level 2 chargers for public charging, workplaces, and multi-unit dwellings.¹⁴ Nevada is also using \$3.7 million to build out its Electric Highway, a connected set of Level

2 chargers and DCFC throughout the state.¹⁵ There are also regional planning efforts such as REV West, where eight western states—Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming—have signed a memorandum of understanding to coordinate infrastructure planning to enable EVs to travel across these signatory states.¹⁶ Many cities are also working to deploy public charging infrastructure. For example, New York City is investing \$10 million to develop DCFC hubs, with up to 20 chargers per site, to meet a goal of having 20 percent of its motor vehicle registrations be electric by 2025.¹⁷ In San Francisco, there are 600 public EV charging stations installed within its city limits.¹⁸ Many cities are highly committed to the public health and greenhouse gas emission reduction benefits that come from EVs – they help displace fossil fuel combustion vehicles, which helps cities meet their greenhouse gas emission reduction goals and also reduce criteria air pollutants, which contribute to many public health concerns.¹⁹

In the private sector, the Volkswagen settlement had jumpstarted charging station buildouts throughout the country when Electrify America, a Volkswagen subsidiary, submitted a National Investment Plan to deploy both Level 2 and DCFC charging stations throughout select cities.²⁰ Through February 2020, Electrify America has installed more than 400 DCFC stations in 20 months, each capable of charging vehicles up to power levels of 350 kW, even though as of 2020 many EVs cannot receive that much power.²¹ Utilities are also playing a role, deploying infrastructure in their local service territories. Pacific Gas and Electric (PG&E) installed 7,500 Level 2 chargers in multi-unit dwellings and workplaces between 2018 and 2020.²² Duke Energy is deploying 530 charging stations in Florida for residential and commercial customers through its “Park and Plug” program.²³ Rocky Mountain Power announced in 2020 it will invest \$50 million in EV charging infrastructure across Utah, connecting rural areas and enhancing tourism opportunities at national parks and travel destinations. The utility will install DCFC stations along highway and interstate corridors, adding to the previously installed 1,036 Level 2 chargers and 50 DCFC stations. Private sector collaborations are also rolling out charging infrastructure. For example, the National Highway Charging Collaborative, a partnership between charging station company ChargePoint and NATSO (which represents travel plazas and truck stops across the United States) plans to invest \$1 billion in capital to install charging stations across 4,000 travel plazas and fuel stops by 2030 to serve highway trav-

TABLE 1: Retail Charging Station Deployment

COMPANY	NUMBER OF STATIONS AND LOCATIONS	CHARGING STATION SERVICE PROVIDER PARTNER(S)
<i>Walmart</i> ²⁴	120+ stations in 34 states	Electrify America
<i>Target</i> ²⁵	Plans to install stations at 600+ parking spaces in 20+ states	ChargePoint, Electrify America, Tesla
<i>IKEA</i> ²⁶	Stations at 37 stores worldwide	Blink
<i>Walgreens</i> ^{27, 28}	Stations at 400 stores	EVgo, SemaConnect
<i>Wawa</i> ²⁹	32 stations planned by end of 2020	Tesla
<i>Sheetz</i> ^{30, 31}	21 stations	Electrify America, EVgo
<i>Simon Property Group</i> ³²	645 stations at 110 properties across 20 states	Electrify America, EVgo

ers and rural communities.³³ Other companies have also been deploying charging stations, particularly in the retail sector. **Table 1** summarizes these efforts and the charging station service providers retailers partnered with to install infrastructure at their stores.

There is an increasing trend among retailers to install EV charging as an amenity on their properties. At many headquarters and corporate offices, employees have a place to plug in their passenger vehicles for workplace

charging, while at retail store locations customers have a place to charge while visiting their stores. In addition, some retailers are starting to incorporate EVs into their fleets and supply chains, through the use of electric medium- and heavy-duty vehicles, and these can be supported through installing charging infrastructure at locations such as distribution centers. Overall, fleet and passenger vehicle charging infrastructure to support EVs can help retailers meet their own sustainability goals.

RETAILERS' ENGAGEMENT WITH STAKEHOLDERS

Moving forward on a plan to install EV infrastructure can be challenging for a retailer. Errors can be time-consuming and expensive to fix. Fortunately, retailers do not need to proceed alone. Electric utilities, charging station service providers, product suppliers, delivery services providers, and even store customers can help retailers identify cost-effective solutions and which services to prioritize.

Communicating with each of these groups is a valuable practice because they each provide important pieces of technical feedback to assist retailers. Retailers can obtain information about how much and which type of charging infrastructure their customers and delivery vehicle suppliers need, how to choose the right type of charging equipment suitable for a retailer's deployment goals, optimal site design, available financial incentives, and observations about the charging experience.

Depending on the charging station business model, retailers will also need to discuss the price for charging and coordinate maintenance.³⁴

ELECTRIC UTILITIES

Retailers should prioritize consultation with utilities during the charging infrastructure deployment process. Utilities have knowledge about other planned EV charging locations and the necessary power to support the desired charging infrastructure type. Additionally, utilities can offer technical expertise to retailers throughout the design and installation process because they routinely assist others who develop similar projects. Utilities may also offer financial incentives to offset capital costs, which can include broad fleet electrification infrastructure programs that have specific criteria or rebate programs for charging stations installed at businesses.³⁵

A natural alignment exists between utilities and those installing charging infrastructure, since vehicle electrification means utilities will be able to sell more electricity. Many utilities are offering commercial rebate programs for vehicle electrification to their customers to incentivize deployment. See **Table 2** below for examples of the incentives offered by utilities for Level 2 and DCFC stations. For a resource database of incentives, see the Alternative Fuels Data Center: <https://afdc.energy.gov/laws>.

Most utilities are also agnostic about the technology a retailer may choose. Some utilities, such as Georgia Power, offer extra services, including step-by-step technical assistance. Georgia Power offers a free consultant service to assist businesses and helps answer general questions they have about electrification. If businesses wish to proceed with installing charging stations, the utility offers turnkey solutions that includes things such as a site assessment, design and permitting, hardware installation, warranty services, and maintenance.³⁶ In addition, local utilities can recommend project developers and contractors.

Utilities also offer insights about the best locations for charging station installations and potential power upgrades that may be needed. If they are not consulted early in the process, they may not have enough lead time to implement the proper power upgrades, which could slow down a retailer’s project. High-speed charging sites

can draw a significant amount of power—for example, six 150 kW DCFC stations could use up to one MW, equivalent to the load from a high-rise office building.³⁷ Additionally, utilities still offer advice on smaller scale installations, such as Level 2 chargers.

Figure 1 illustrates PG&E’s EV fleet program.³⁸ The graphic illustrates how an ideal customer (e.g., retailer) would work with a utility during the vehicle fleet electrification process. The utility is involved with initial design, working with the electrical contractor (likely a charging station service provider), constructing electrical infrastructure, and providing other technical expertise essential to the retailer’s project. This flow chart provides an indication of lead time involved in executing a charging station installation project and highlights the importance of communication between the retailers and their utility. From preliminary design to execution, an ideal customer can complete a project between 9 to 13 months.

Many utilities, including PG&E, are assisting local and state governments to achieve their greenhouse gas reduction goals by installing charging infrastructure at customer sites and by providing research about technology needs and options. Research about the technology needs can be a valuable resource for policy makers, customers, and even owners of light-, medium-, and heavy-duty EVs in the region. For example, Southern California Edison (SCE) developed an analysis, Pathway 2045, where it pro-

TABLE 2: Utility Incentives for Charging Stations

UTILITY	LEVEL 2 INCENTIVE	DCFC INCENTIVE
<i>Sacramento Municipal Utilities District</i> ⁵⁷	\$1,500 for each Level 2 charger port	\$80,000 for each DCFC station
<i>Rocky Mountain Power</i> ⁵⁸	\$1,000 for each single port Level 2 station, up to 75% of total charger costs \$1,500 for each multi-port Level 2 station, up to 75% of total charger costs	\$30,000 for each single port charger, up to 75% of the total charger and installation costs (subject to a cap) \$42,000 for a multi-port charger, up to 75% of the total charger and installation costs (subject to a cap)
<i>DTE</i> ⁵⁹	\$2,500 for each Level 2 port with a minimum of two ports per site and cap of 20 port rebates per site and 100 port rebates per business	\$50,000 per DCFC and requiring at least two be installed per site to qualify
<i>Georgia Power</i> ⁶⁰	\$500 for each Level 2 charger businesses purchase and install	N/A

jected a need to convert 75 percent of the state’s vehicles to EVs to assist the state meet its goal of achieving carbon neutrality by 2045.³⁹

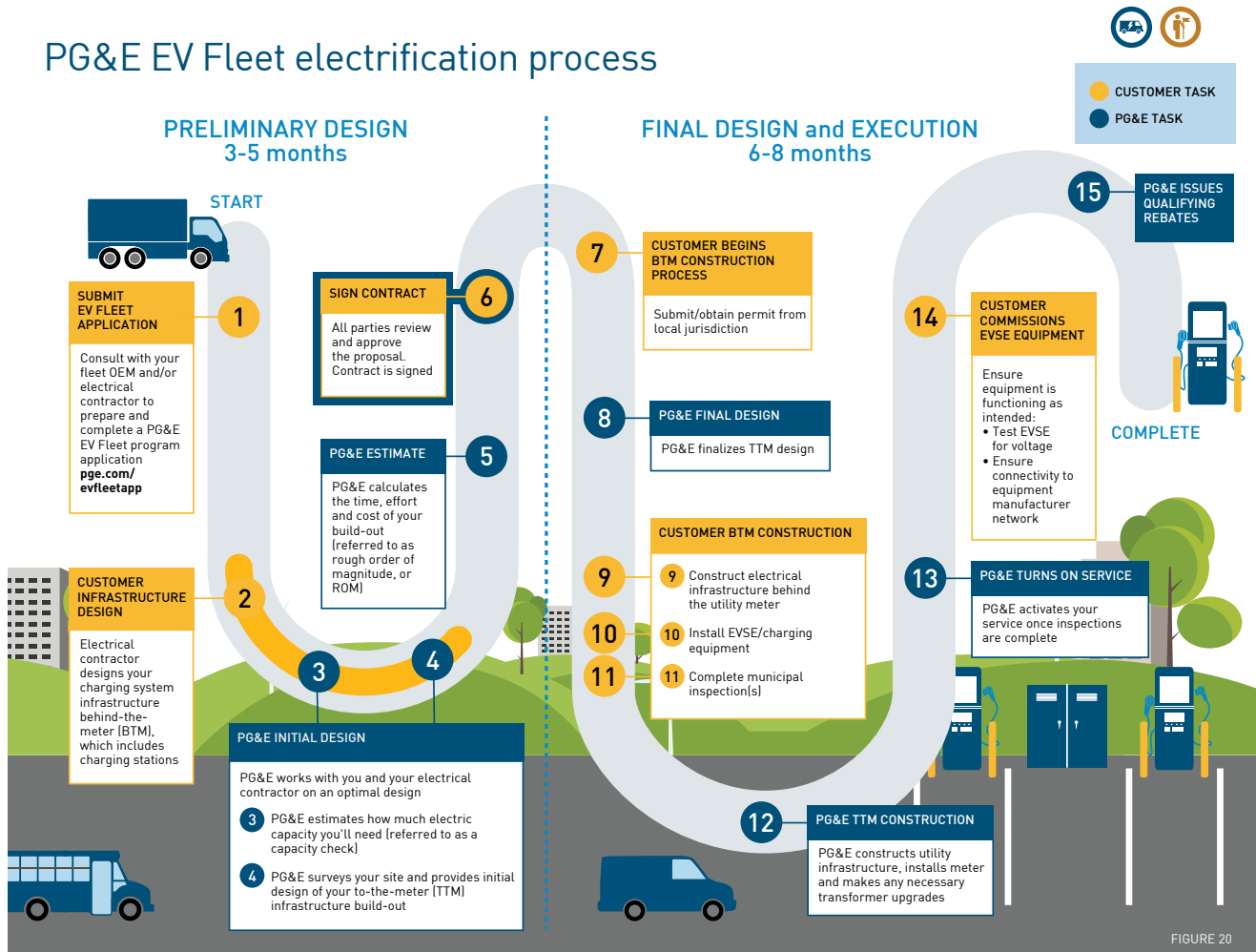
CHARGING STATION SERVICE PROVIDERS

Business Models

There are two widely used business models for charging station installations on retailers’ sites: Retailers can own and operate the equipment, or retailers can lease the site to a third-party owner-operator. If a retailer is an owner-operator, it purchases the charging equipment from a service provider such as Blink or ChargePoint,⁴⁰ and will

then be responsible for construction, installation, coordination with the utility, operating costs, and ongoing maintenance. Outside contractors may need to perform these additional tasks. Additionally, the charging station is typically connected to the retailer’s electricity meter, since it is an additional resource on the property, typically referred to as “behind the meter.” Some utilities may charge retailers that are behind-the-meter demand charges (fees for extended periods of electricity usage, like EV charging.) If a retailer elects to use a third-party owner-operator such as EVgo or Electrify America, the retailer leases space to these service providers, and these third party owner-operators then typically have control over what prices to charge customers at the stations and

FIGURE 1: EV Fleet Electrification Process



Source: Pacific Gas and Electric

take responsibility for utility coordination, operational costs, and ongoing maintenance.^{41,42} The third-party owner-operator could also take responsibility for metering the charging stations, which can be done away from the retailer’s property. **Table 3** below summarizes these two business models. For additional information on potential financial scenarios for passenger charging at retail locations, see *Public EV Charging Business Models for Retail Site Hosts*. The primary advantage of a retailer as an owner-operator is control over pricing—retailers can have complete autonomy in choosing the pricing structure they offer their customers and being responsive to customers’ demands. However, a major disadvantage is the ongoing operation and maintenance of the charging stations, which is challenging if a retailer does not have a dedicated technical team capable of managing multiple charging stations across various locations. These services can be contracted out to a third party, but at an additional cost and responsibility to the retailer.

Alternatively, leasing the space and operation of charging stations to a third-party owner-operator has many other advantages. The third-party owner-operator is responsible for the entire process, from installation to ongoing maintenance, which is helpful, since retailers typically lack this type of in-house expertise. In addition, the retailer can gain revenue from lease payments made by the third-party owner-operator, regardless of the profitability of the charging stations.⁴³ One disadvantage, however, is that if any operational or maintenance issues arise and customers are dissatisfied, the retailer would have limited control and must rely on the third-party owner operator to remedy those issues. Moreover, retail customers may provide feedback about the chargers directly to the retailer about their experiences, but the retailer will have to work with the third-party owner-op-

erator to implement any changes, creating inefficiencies. In addition, negative customer experiences may result in negative consequences for the retail brand.

Choosing a Service Provider

Retailers should consider the importance of engaging with reputable network charging station service providers that have experience working with major retailers. These providers have a network of charging stations across the United States (and in some cases Canada).^{44, 45} Each has its own business model and will offer a retailer different services, depending on whether the retailer is the owner-operator or if they lease the site to a third-party owner-operator. Our interviewees recommended network charging station service providers since they already work with retailers and offer services that benefit retailers and their customers. These network charging station service providers offer drivers a mobile app, enabling customers to track their charging status and make payments. The service providers also install “smart” chargers which are adaptable to utility’s time-of-use rates, if available in the retailer’s area. Retailers can track charging station usage easily based on the customers’ usage on the network, providing retailers with more data that can be used for future planning and maintenance. A retailer can choose a service provider with the business model best suited to fit the retailer’s needs, as well as one that has already worked with a retailer within the same business segment, such as a fueling station, grocery store, movie theater, etc. Site design has been cited as an extremely complex process that requires months of lead time, and a service provider familiar with a retailer’s operations can likely accelerate this process and mitigate obstacles a retailer cannot foresee on their own.⁴⁶

TABLE 3: Charging Station Business Models

RETAILER AS OWNER-OPERATOR	RETAILER LEASING TO THIRD-PARTY OWNER-OPERATOR
Retailer purchases equipment from a charging station service provider.	3rd party owner-operator provides equipment.
Retailer installs charging stations, coordinate w/utility, operates and maintains chargers.	3rd party owner-operator installs charging stations, coordinates with utility, operates and maintains chargers.
Retailer controls charging price.	3rd party owner-operator controls charging price.
Retailer meters the charging stations on own property.	3rd party owner-operator meters the charging stations separately from the retailer’s property.

Warranty Packages

Service providers may also offer a warranty package for their charging stations that provides comprehensive servicing needs. Service providers will offer different types of packages, depending on their business model. Warranty packages are important because frequently used chargers can require a high degree of maintenance. Some service providers perform analyses on the components that fail most frequently and will have a maintenance schedule for these parts. Examples of such components and their maintenance issues include broken connectors due to vehicles driving over them, broken screen interfaces due to vandalism, or missing pieces of wire due to theft. The price of the warranty package will make up most of the maintenance cost, and some service providers may offer renewable warranties, while others will be fixed. Costs will vary due to site-specific characteristics but can range from \$575 per charger per year to \$8,000–\$15,000 per site, per year.⁴⁷ Warranties can last for a variety of terms, although one utility recommended a plan ranging from 3–5 years. Some service providers will also offer a package to a retailer to perform these services.

When assessing the type of warranty package to purchase, retailers should consider the costs of general maintenance, including cleaning, labor, repairs, and shipment of replacement parts to the site.⁴⁸ For periodic preventative maintenance (an additional cost if a retailer is the owner-operator), a technician from the service provider will come on site to perform a variety of tasks. This may include visual, environmental, mechanical, and electrical inspections of the charging stations, operation controls, and a general walkthrough of the site to ensure all equipment and software are operating smoothly and to help the retailer with any outstanding technical issues.⁴⁹ Where possible, retailers should consider a warranty contract independent from the rest of the procurement so that they have more flexibility. In general, a shorter time frame for the contract offers more options for renegotiation.⁵⁰ Retailers should also consider what penalties will be incurred by the vendor if the charging stations are not maintained within a set period of time and up to a standard set by the retailer. Retailers should also inquire whether a customer support call center is available for both charging customers and retailers and how maintenance tickets are managed through a vendor's system.

Technical Services

Service providers offer a wide array of technical services for retailers, depending on whether a retailer chooses to be the owner-operator or leases the site to a third-party owner-operator. If a retailer is the owner-operator, a service provider may offer a warranty package to cover repair and replacement parts for charging stations. If the service provider is the owner-operator, it can support the retailer by completing the installation, engaging the utility, operating the chargers, and managing ongoing maintenance for the stations. Regardless of the business model retailers choose, they may wish to consider the benefits of a network service provider that can offer a suite of benefits that allows them to easily access charging data, manage pricing, and produce insights that can help with strategic planning.

PRODUCT SUPPLIERS AND DELIVERY SERVICES PROVIDERS

When considering the installation of charging stations, retailers should work with product suppliers and delivery services providers, depending on the type of infrastructure they are considering. For example, if a retailer is considering using electric delivery trucks, particularly if the retailer does not own or lease its fleet, the retailer should work with third-party product suppliers or delivery services providers to assess how many Level 2 or DCFC stations would be needed on site, so vehicles can charge while deliveries stay on schedule.

For retailers considering their Scope 3 emissions, which include transportation emissions upstream or downstream from a company, it is critical for retailers and their product suppliers to collaborate on improving goods movement and sustainable supply chains.⁵¹ For example, IKEA plans to make all-electric deliveries in New York City and Los Angeles County by the end of 2020 and 100 percent zero-emission home deliveries in North America by 2025. To achieve these goals, IKEA needs to work with its third-party providers, since IKEA does not own its delivery trucks.⁵²

Third-party providers will need charging infrastructure along their delivery routes—both where drivers leave the trucks overnight, and where they drop off or pick up goods. Retailers sharing plans to install charging stations with product suppliers may also assist third-party providers in decisions about using EVs for deliveries.

Once that decision is reached, it can help product suppliers better schedule their delivery routes and factor in charging time at retailers' distribution centers, factors that can potentially save the retailer and supplier fuel and logistical costs.

CUSTOMERS

Lastly, retailers should consider engaging the customers driving to their stores. Initial outreach can assess customer interest, the types of charging stations most desired, the mobile phone applications customers use to find charger locations, and the payment systems customers prefer. This outreach can also alert customers about the existence of the charging units, help create brand value, and provide customers with an additional service. IKEA, for example, surveyed its customers to assess their electric mobility preferences, then implemented a variety of EV charging stations, shuttle vans, and other electric transportation solutions across its retail locations.^{53, 54} Building on this initial outreach with follow-up surveys and other communication channels can also evaluate consumer satisfaction, preferences, acceptable pricing structures, and even help predict future needs. As electrification of vehicles becomes more prevalent in

the next 5–10 years, charging will become an even more important amenity for consumers and could broaden the competitive advantage for some retailers.

Interviewees for this brief often highlighted a theme of futureproofing—preparing a retailer to minimize the shocks of future events. It is difficult to predict the behavior of EV drivers in 2030 and project the precise ratio of public to private charging stations, or the number of Level 2 and DCFC stations. At present, what retailers can control is who they communicate with: utilities, charging station service providers, product suppliers, delivery services providers, and retail customers. Retailers should ensure that their relevant staff are engaged as well, including fleet managers, energy procurement teams, corporate sustainability teams, and supply chain teams. Retailers must be prepared to adapt to change: EV technology and behavior patterns are likely to change in the future, which can influence the types of charging provided for retailers' suppliers and customers. As electrification becomes more prevalent, it will be critical for retailers hoping to maintain a competitive edge to remain engaged with these groups to anticipate change and to be ready for the next tool or hardware that can become a potential retail amenity.

CONCLUSION

Electrification is occurring at a rapid pace across the country, and the public and private sectors are actively deploying EV charging infrastructure for light-, medium-, and heavy-duty vehicles. In many states, regional and national retailers have already jumpstarted efforts by installing charging stations at many of their locations. They have partnered with major charging station service providers in their efforts, citing customer demand as

a reason to take action.^{55, 56} As new retailers set out to install charging infrastructure to help vehicle electrification and meet their sustainability goals, it will be critical for them to engage utilities, charging station service providers, product suppliers, delivery service providers, and their retail customers to get the information, experience, and technical support they need to be successful.

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ENDNOTES

- 1 “Target’s Charging Up Its Electric Vehicle Program to Reach More Than 20 States,” Target, accessed April 2, 2020, <https://corporate.target.com/article/2018/04/electric-vehicles>.
- 2 “Electric Vehicle Sales: Facts & Figures” Edison Electric Institute, accessed March 31, 2020, https://www.eei.org/issuesandpolicy/electrictransportation/Documents/FINAL_EV_Sales_Update_April2019.pdf.
- 3 Peter Valdes-Dapena, “The electric pickup wars are about to begin” *CNN*, February 14, 2020, <https://www.cnn.com/2020/02/14/cars/electric-pickup-truck-wars/index.html>.
- 4 *Getting to Zero: A U.S. Climate Agenda*, (Arlington, VA: Center for Climate and Energy Solutions: 2019), <https://www.c2es.org/document/getting-to-zero-a-u-s-climate-agenda>.
- 5 “EV Models Currently Available in the US,” EVAdoption, Accessed April 8, 2020, <https://evadoption.com/ev-models>.
- 6 Mark Matousek, “40 electric cars you’ll see on the road by 2025,” Business Insider, July 10, 2019, <https://www.businessinsider.com/electric-cars-that-will-be-available-by-2025-2018-1>.
- 7 “Survey: Price, range and weak charging network are top reasons consumers avoid EVs,” Autolist, Accessed March 21, 2020, <https://www.autolist.com/news-and-analysis/survey-electric-vehicles>.
- 8 Fred Lambert, “Tesla Semi receives order of 30 more electric trucks from Walmart,” Electrek, September 6, 2018, <https://www.electrek.co/2018/09/06/tesla-semi-new-order-electric-truck-walmart>.
- 9 “UPS Invests In Arrival, Accelerates Fleet Electrification With Order Of 10,000 Electric Delivery Vehicles,” UPS, Accessed April 21, 2020, <https://pressroom.ups.com/pressroom/ContentDetailsViewer.page?ConceptType=PressReleases&id=1580304360144-453>.
- 10 “Electric Vehicle Charging Station Locations,” U.S. Department of Energy, Accessed March 21, 2020, https://afdc.energy.gov/fuels/electricity_locations.html#/analyze?country=US&access=private&access=public&fuel=ELEC.
- 11 Adam Cooper and Kellen Schefter, *Electric Vehicle Sales Forecast and the Charging Infrastructure Required Through 2030* (Washington, DC: Edison Electric Institute, 2018), https://www.edisonfoundation.net/iei/publications/Documents/IEI_EEI%20EV%20Forecast%20Report_Nov2018.pdf.
- 12 In October 2016, the U.S. government granted final approval of a \$14.7 billion settlement against Volkswagen for equipping more than 500,000 of its diesel vehicles to cheat U.S. vehicle emissions tests in violation of the Clean Air Act.
- 13 New Jersey § Senate No. 2252 (2020) https://www.njleg.state.nj.us/2018/Bills/S2500/2252_U2.HTM.
- 14 Minnesota Department of Transportation, Minnesota Pollution Control Agency, Great Plains Institute, *Accelerating Electric Vehicle Adoption: A Vision for Minnesota* (Minneapolis, MN: Minnesota Department of Transportation, 2019), <http://www.dot.state.mn.us/sustainability/docs/mn-ev-vision.pdf>.
- 15 “Nevada Electric Highway,” Nevada Governor’s Office of Energy, accessed April 21, 2020, <http://energy.nv.gov/uploadedFiles/energyngov/content/Programs/NEH%20Fact%20Sheet%20-%20January%202020.pdf>.
- 16 “REV West,” National Association of State Energy Officials, accessed April 21, 2020, <https://www.naseo.org/issues/transportation/rev-west>.
- 17 “Leading the Charge: Mayor Announces Fast-Charging EV Hubs in All 5 Boroughs,” New York City, accessed April 1, 2020, <https://www1.nyc.gov/office-of-the-mayor/news/600-17/leading-charge-mayor-fast-charging-ev-hubs-all-5-boroughs>.

- 18 “Clean Vehicle Infrastructure,” SF Environment, accessed April 5, 2020, <https://sfenvironment.org/electric-vehicle-charging-stations>.
- 19 Alliance for a Sustainable Future, *American Mayors and Businesses: Building Partnerships for a Low-Carbon Future Volume III* (Arlington, VA: U.S. Conference of Mayors and the Center for Climate and Energy Solutions, 2020), <https://www.c2es.org/site/assets/uploads/2020/01/Mayors-and-Businesses-Building-Low-Carbon-Future-Volume-3.pdf>.
- 20 *National ZEV Investment Plan: Cycle I: Public version*. Volkswagen Group of America. April 2017. <https://www.epa.gov/sites/production/files/2017-04/documents/nationalzevinvestmentplan.pdf>.
- 21 Fred Lambert, “Electrify America completes 400 EV charging stations – about twice as fast as Tesla Supercharger rollout,” Electrek, February 3, 2020, <https://electrek.co/2020/02/03/electrify-america-400-ev-charging-station-tesla-supercharger-rollout>.
- 22 “EV Charge Network,” Pacific Gas and Electric, accessed April 11, 2020, https://www.pge.com/en_US/large-business/solar-and-vehicles/clean-vehicles/ev-charge-network/program-participants/about-the-program.page.
- 23 “Park & Plug,” Duke Energy, accessed April 2, 2020 <https://www.duke-energy.com/our-company/florida-future/park-and-plug>.
- 24 “Electrify America, Walmart Announce Completion of over 120 Charging Stations at Walmart Stores Nationwide with Plans for further Expansion,” Electrify America, accessed March 21, 2020 <https://media.electrify-america.com/en-us/releases/62>.
- 25 “Target’s Charging Up Its Electric Vehicle Program to Reach More Than 20 States,”
- 26 Brielle Jaekel, “IKEA adds electric car charging station following positive adoption,” *Retail Dive*, accessed March 29, 2020, <https://www.retaildive.com/ex/mobilecommercedaily/ikeas-latest-electric-car-charging-station-fol-lows-positive-consumer-adoption>.
- 27 Gail Kalinoski, “EV Stations Spark Broad-Based Change,” *Commercial Property Executive*, September 19, 2019, <https://www.cpexecutive.com/post/ev-stations-spark-broad-based-change>.
- 28 Katherine Tweed, “Walgreens Choose DC Fast Charging Where It Can,” *Greentech Media*, August 30, 2011, <https://www.greentechmedia.com/articles/read/walgreen-chooses-dc-fast-charging-where-it-can>.
- 29 Kyle Field, “Wawa Looks To Add More EV Chargers To Its Locations After Initial Trial,” *Clean Technica*, August 8, 2019, <https://cleantechnica.com/2019/08/08/wawa-looks-to-add-more-ev-chargers-to-its-locations-after-initial-trial>.
- 30 “Sheetz Powers Up Its Electric Vehicle Charging Initiative,” CS News, March 19, 2019, <https://csnews.com/sheetz-powers-its-electric-vehicle-charging-initiative>.
- 31 Samantha Oller, “EVgo Opens Its 800th Fast-Charging Location,” CSP Daily, March 4, 2020, <https://www.cspdailynews.com/fuels/evgo-opens-its-800th-fast-charging-location>.
- 32 Simon Property Group is a real estate investment trust, and the largest in the United States.
- 33 “ChargePoint and NATSO Launch Collaborative to Significantly Expand EV Charging along Nation’s Highways and in Rural Communities,” ChargePoint, accessed March 21, 2020 <https://www.chargepoint.com/about/news/chargepoint-and-natso-launch-collaborative-significantly-expand-ev-charging-along>.
- 34 Charles Satterfield and Nick Nigro, *Public EV Charging Business Models for Retail Site Hosts* (Washington, DC: 2020), accessed March 25, 2020, <https://atlaspolicy.com/rand/public-ev-charging-business-models-for-retail-site-hosts>.
- 35 Lisa Arellanes, “Energy for What’s Ahead” (webinar, Accelerating the EV Market: Medium and Heavy Duty

Trucks, March 25, 2020), <https://www.c2es.org/event/accelerating-the-ev-market-medium-and-heavy-duty-trucks>.

36 “Electric vehicle charging for your business,” Georgia Power, accessed March 29, 2020, <https://www.georgiapower.com/business/products-programs/business-solutions/electric-transportation-business-programs/ev-charging-for-business.html>.

37 Chris Nelder, Emily Rogers, *Reducing EV Charging Infrastructure Costs* (Basalt, CO: Rocky Mountain Institute, 2019), <https://rmi.org/insight/reducing-ev-charging-infrastructure-costs>.

38 Pacific Gas and Electric, *Take Charge: A Guidebook to Fleet Electrification and Infrastructure* (San Francisco, CA: Pacific Gas and Electric), https://www.pge.com/pge_global/common/pdfs/solar-and-vehicles/your-options/clean-vehicles/charging-stations/ev-fleet-program/PGE_EV-Fleet-Guidebook.pdf.

39 Southern California Edison, *Pathway 2045* (Rosemead CA: Southern California Edison, 2019), https://newsroom.edison.com/internal_redirect/cms.ipressroom.com.s3.amazonaws.com/166/files/201910/201911-pathway-to-2045-white-paper.pdf.

40 These are only examples of service providers, not recommendations. There are also other service providers that can provide charging station equipment.

41 Charles Satterfield and Nick Nigro, *Public EV Charging Business Models for Retail Site Hosts*.

42 These are only examples of third-party owner-operators, not recommendations. There are also other service providers that can act as third-party owner operators.

43 Charles Satterfield and Nick Nigro, *Public EV Charging Business Models for Retail Site Hosts*.

44 Network charging station providers include Blink, ChargePoint, ElectrifyAmerica, EVConnect, EVgo, FLO, Greenlots (now owned by Shell), SemaConnect, Tesla, Volta, and Webasto.

45 “The Essential Guide to EV Charging Networks in North America,” Plugshare, accessed April 12, <https://www.plugshare.com/EV-Charging-Networks-North-America.html>.

46 Lisa Arellanes, “Energy for What’s Ahead.”

47 Chris Nelder, Emily Rogers, *Reducing EV Charging Infrastructure Costs*.

48 Alternative Fuels Data Center, *Electric Vehicle Charger Selection Guide: Minor Update* (Washington, DC: U.S. Department of Energy, 2018), https://afdc.energy.gov/files/u/publication/EV_Charger_Selection_Guide_2018-01-112.pdf.

49 “Preventative Maintenance for EV Charging Stations: Statement of Work” Schneider Electric, last modified October 1, 2014, https://download.schneider-electric.com/files?p_enDocType=Data+Bulletin&p_File_Name=SSAO-9REUE6_R0_EN.pdf&p_Doc_Ref=SPD_SSAO-9REUE6_EN.

50 Chris Nelder, Emily Rogers, *Reducing EV Charging Infrastructure Costs*.

51 “Meet the Smartway Partners and Affiliates,” U.S. Environmental Protection Agency, accessed April 4, 2020, <https://www.epa.gov/smartway/meet-smartway-partners-and-affiliates>.

52 Lisa Davis, “IKEA: People & Planet Positive.”

53 Ibid.

54 Brielle Jaekel, “IKEA adds electric car charging station following positive adoption.”

55 “Target’s Charging Up Its Electric Vehicle Program to Reach More Than 20 States.”

56 Lisa Davis, “IKEA: People & Planet Positive.”

57 “Business Electric Vehicle,” Charging forward, accessed March 29 2020, <https://www.smud.org/en/Going->

Green/Electric-Vehicles/Business.

58 “Utah incentives for charging equipment,” Rocky Mountain Power, accessed March 29, 2020, <https://www.rockymountainpower.net/savings-energy-choices/electric-vehicles/utah-incentives.html>.

59 “Charging infrastructure incentives,” DTE, accessed April 26, 2020, <https://www.newlook.dteenergy.com/wps/wcm/connect/dte-web/home/service-request/business/electric/electric-vehicles/pev-biz-charge-frwd>.

60 “Electric vehicle charging for your business,” Georgia Power, accessed March 29, 2020, <https://www.georgiapower.com/business/products-programs/business-solutions/electric-transportation-business-programs/ev-charging-for-business.html>.

Other EV Resources:

Insights on Electric Trucks for Retailers and Trucking Companies

<https://www.c2es.org/document/insights-on-electric-trucks-for-retailers-and-trucking-companies>

Public EV Charging Business Models for Retail Site Hosts

<https://atlaspolicy.com/rand/public-ev-charging-business-models-for-retail-site-hosts>

Assessing Financial Barriers to the Adoption of Electric Trucks

<https://atlaspolicy.com/rand/assessing-financial-barriers-to-the-adoption-of-electric-trucks>

Fleet Procurement Analysis Tool

<https://atlaspolicy.com/rand/fleet-procurement-analysis-tool>

Alternative Fuels Data Center

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



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