

BRIEFING

JULY 2019

Early steps in the transition to electric vehicles in the Midwest

This briefing takes an in-depth look at the 2018 market for electric vehicles in the 12-state Midwest region of the United States. It examines electric vehicle market uptake versus conventional vehicles, and how it relates to charging availability, electric vehicle model availability, and promotional actions that states, cities and utilities are taking to support market growth.

INTRODUCTION

The transition to electrified transportation is occurring across the United States at different rates due to vehicle model availability, charging infrastructure, government engagement, and other factors. The Midwest region¹ has, so far, not been a leader in electric vehicle sales, but sales are increasing. Some markets have a relatively higher share than others, providing the opportunity to garner Midwest-specific lessons that can be applied to neighboring markets. This study examines the top 15 Midwest metropolitan areas by population as defined by the census metropolitan statistical areas.²

1 Based on U.S. Census designations, the Midwest includes the 12 states of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

2 Metropolitan and Micropolitan, U.S. Census Bureau, 2018, <https://www.census.gov/programs-surveys/metro-micro/about.html>

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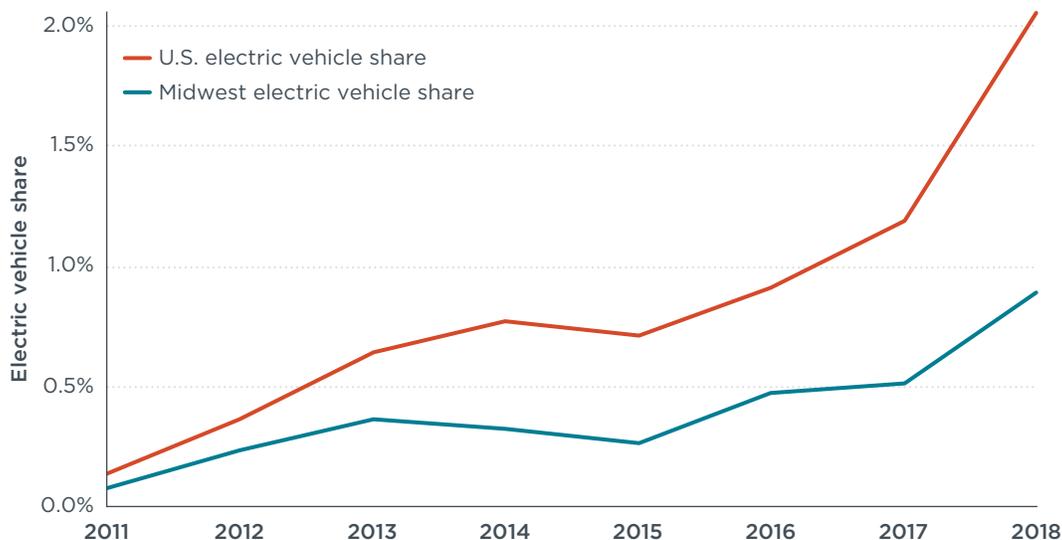


Figure 1. Electric vehicle shares in the Midwest and the United States. (New light vehicle registration data by calendar year provided by IHS Markit)

Figure 1 shows the electric vehicle share of the light-duty vehicle market from 2011 through the end of 2018 for the United States and the Midwest. Electric vehicles made up 2.1% of U.S. light-duty vehicle sales in 2018, while the Midwest market had a 0.9% electric vehicle market share.³ Although the United States has a larger market share of electric vehicles, the Midwest market grew at a similar pace for the 2-year period beginning in 2017 to the end of 2018. In the Midwest, the number of newly registered 2017-2018 electric vehicles was 82% of 2011-2016 Midwest electric vehicle registrations; this compares nationally to 2017-2018 electric vehicle registrations reaching 94% of registrations over the prior six years. Given this growth trajectory, electric vehicles in the Midwest can be expected to reach approximately 2% of conventional light-duty vehicle sales by the end of 2020.

This growth is fueled primarily by consumer demand, but also by complementary policies at the state and local level. Policy actions include financial and nonfinancial incentives, public charging infrastructure installation, fleet programs, and public information campaigns.

While previous reports⁴ detail actions to encourage electric vehicle sales nationwide, this report focuses on 15 Midwest cities, including examination of smaller metropolitan areas not included in previous analyses.

³ Electric vehicles include battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs). Based on new U.S. car and light truck gross vehicle weight class 1-2 registrations, excluding three-quarter-ton and one-ton light trucks, provided by IHS Markit (New vehicle registration data, 2019), <https://ihsmarkit.com/>.

⁴ Peter Slowik and Nic Lutsey, *The surge of electric vehicles in United States cities*, (ICCT: Washington, D.C., 2019), <https://www.theicct.org/publications/surge-EVs-US-cities-2019>; Peter Slowik and Nic Lutsey, *The continued transition to electric vehicles in U.S. cities*, (ICCT: Washington, D.C., 2018), <https://www.theicct.org/publications/continued-EV-transition-us-cities-2018>; Peter Slowik, and Nic Lutsey, *Expanding the electric vehicle market in U.S. cities*, (ICCT: Washington, D.C, 2017), <https://www.theicct.org/publications/expanding-electric-vehicle-market-us-cities>

ACTIONS TO PROMOTE ELECTRIC VEHICLE UPTAKE

This section describes the promotional actions for electric vehicles in the Midwest in three key areas: consumer incentives, charging infrastructure development, and other promotion actions including policy and planning. A brief description of each is provided below.⁵

CONSUMER INCENTIVES

Consumer incentives, or those that have a monetary or time benefit to the consumer, include purchase, operation, parking, and high occupancy vehicle lane access. As the electric vehicle market has not fully developed, there are additional upfront costs that these incentives help ameliorate. These incentives have been linked with vehicle uptake in numerous studies.⁶

Purchase incentives. Purchase incentives help to lower the effective purchase price of an electric vehicle in order to prompt the decision to buy. The U.S government provides a tax credit of up to \$7,500 when a consumer purchases or leases a qualifying electric vehicle. There are no state purchase incentives in any Midwest state.

Vehicle operation incentives. Incentives that lower the cost of owning or operating an electric vehicle exist in 11 of the 15 metropolitan areas studied. Seven have a state fee reduction or emission-testing exemption, and six had no annual electric vehicle fee in 2018. Chicago and Cleveland have both a fee exemption and impose no additional electric vehicle fee. However, in 2019, several states will begin to charge annual electric vehicles fees, joining Michigan and Missouri, who already charge an annual fee of \$135 and \$75, respectively. The fees are intended to cover road use and compensate for the lack of gasoline tax revenue from electric vehicles. However, annual fees do not vary with usage, and electric vehicles are separately taxed through utility bills. There is little agreement on how to recoup electric vehicle impact on the road, how much is fair to charge, and if electric vehicles should be exempted from certain fees until they gain foothold in the market.

Parking incentives. Another strategy that cities employ to encourage electric vehicle uptake is parking incentives. The only Midwest city to offer parking incentives is Cincinnati with free parking at city parking meters and at a city owned parking garage. However, some cities provide free charging with paid parking.

5 A fuller description of methods is available in Slowik and Lutsey, *The continued transition to electric vehicles in U.S. cities*; and Slowik and Lutsey, *Expanding the electric vehicle market in U.S. cities*.

6 Lingzhi Jin, Stephanie Searle, S., and Nic Lutsey, Evaluation of State-Level U.S. Electric Vehicle Incentives, (ICCT: Washington, D.C. 2014), <https://theicct.org/evaluation-state-level-us-electric-vehicle-incentives>; Nic Lutsey, Stephanie Searle, Sarah Chambliss, and Anup Bandivadekar, *Assessment of Leading Electric Vehicle Promotion Activities in United States Cities* (ICCT: Washington, DC, 2015), <https://www.theicct.org/leading-us-city-electric-vehicle-activities>; Nic Lutsey, Peter Slowik, and Lingzhi Jin, *Sustaining Electric Vehicle Market Growth in U.S. Cities*, (ICCT: Washington, DC, 2016), www.theicct.org/leading-us-city-electric-vehicle-2016; Gil Tal and Michael Nicholas, *Exploring the Impact of the Federal Tax Credit on the Plug-In Electric Vehicle Market*, (University of California, Davis, 2016), <https://trid.trb.org/view.aspx?id=1392922>; Sydney Vergis, Belinda Chen. *Understanding Variations in U.S. Plug-In Electric Vehicle Markets* [Research Report UCD-ITS-RR-14-25], (University of California, Davis, 2014), <https://its.ucdavis.edu/research/publications/>

CHARGING INFRASTRUCTURE

Public charging infrastructure is an important element to support the purchase and operation of electric vehicles. It is statistically linked to vehicle uptake as demonstrated in several studies.⁷ Estimates of how many charging points will be needed in the top 10 most populous Midwest metropolitan areas by 2025 is explored in Nicholas et al.⁸

In the early stage of market development, drivers primarily use home-charging points, as there is insufficient geographic coverage of public charging stations due to low demand. The Midwest is in an early stage of electric market penetration and therefore requires more support per driver than is required in more mature markets. Several Midwest stakeholders are increasing nonhome charging support, including cities, utilities, and private initiatives such as Electrify America. This support can come in the form of incentives, direct installation, expedited permitting, or electric vehicle ready building codes. Support for home charging is very important as well since home charging is typically the primary source of charging if it is available.⁹

Progress in the Midwest for nonhome charging is shown in Figure 2.¹⁰ The number of chargers in each metropolitan area in three charging categories is normalized by population. Workplace charging is defined as chargers located at workplace parking lots that are primarily used by company employees. Public Level 2 charging is defined as publicly accessible non-work charging. Public DC fast charging typically supplying 10 times the power or more than other charging types.¹¹

7 Dale Hall, Hongyang Cui, and Nic Lutsey, *Electric Vehicle Capitals of the World: What Markets Are Leading the Transition to Electric?* (ICCT: Washington, DC, 2017), www.theicct.org/publications/EV-capitals-of-the-world-2017; Dale Hall and Nic Lutsey, *Literature Review on Power Utility Best Practices Regarding Electric Vehicles*, (ICCT: Washington, DC, 2017), <http://theicct.org/literature-review-power-utility-best-practices-regarding-EVs>; Peter Slowik and Nic Lutsey, *The continued transition to electric vehicles in U.S. cities* (ICCT: Washington, DC, 2018), <https://www.theicct.org/publications/continued-EV-transition-us-cities-2018>; Yan Zhou, Danilo Santini, Kelly Vazquez, and Marcy Rood, *Contributing Factors in Plug-in Electric Vehicle Adoption in the United States: A Metro/County Level Investigation*, (Argonne National Laboratory, 2017), <https://trid.trb.org/view.aspx?id=1439160>

8 Michael Nicholas, Dale Hall, and Nic Lutsey, *Quantifying the electric vehicle charging infrastructure gap across U.S. markets*, (ICCT: Washington, DC, 2019), <https://www.theicct.org/publications/charging-gap-US>

9 U.S. Department of Energy (2018) "Charging at home" Available from: <https://www.energy.gov/eere/electricvehicles/charging-home> accessed 12 April, 2019

10 Charging data are from PlugShare (Charging infrastructure data, 2019), <https://www.plugshare.com/>.

11 More detailed descriptions of each charging station type can be found in Michael Nicholas, Dale Hall, and Nic Lutsey, *Quantifying the electric vehicle charging infrastructure gap across U.S. markets*

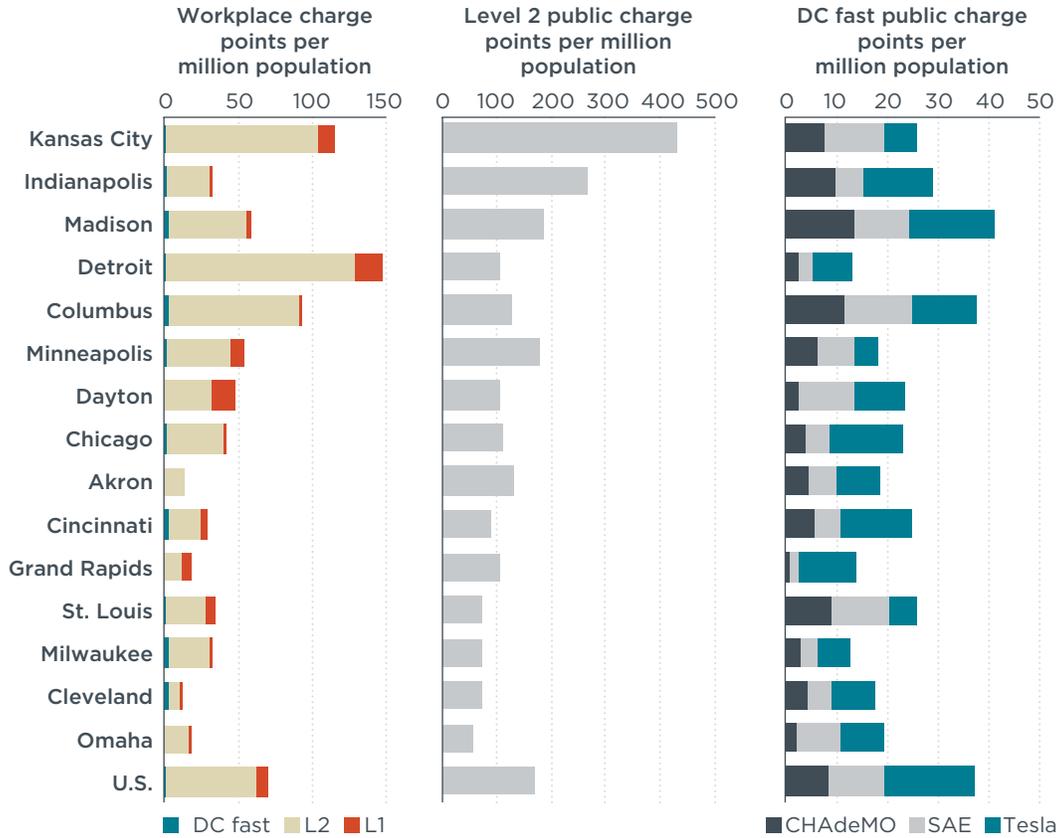


Figure 2. Chargers per million population in the 15 Midwest metropolitan areas. (Charging infrastructure data provided by PlugShare)

Showing chargers normalized by population is especially relevant in early markets as it is a proxy for network coverage or the likelihood that an electric vehicle driver will encounter a station in the course of travel. There are clear leaders in each charging category. Madison has doubled its DC fast charging relative to 2017 to lead the Midwest in 2018 with Columbus nearly equal. Kansas City residents have the greatest access to public Level 2 charging due to its large utility funded installations.¹² Detroit leads in workplace charging likely due to its large auto sector workplace charging installations. In some cases, such as in Detroit, an abundance in one category is matched with a decrease in other categories suggesting one type of charging can substitute for another.

The charging infrastructure in 12 Midwest states and the largest 15 metropolitan areas in those states is shown in Figure 3. Areas with darker blues indicate more total chargers per million people. Level 2 chargers are in yellow and DC fast chargers are shown as black or red dots depending on connector type.¹³

12 “KCP&L Becomes Electric Vehicle Infrastructure Leader With Groundbreaking Announcement,” Chargepoint, accessed 9 April 2019, <https://www.chargepoint.com/about/news/kcpl-becomes-electric-vehicle-infrastructure-leader-groundbreaking-announcement/>

13 “Alternative Fuels Data Center: Electric Vehicle Charging Station Locations,” U.S. Department of Energy, accessed June 4, 2019, www.afdc.energy.gov/fuels/electricity_locations.html; Charging infrastructure by U.S. metropolitan areas (dataset), PlugShare, 2018.

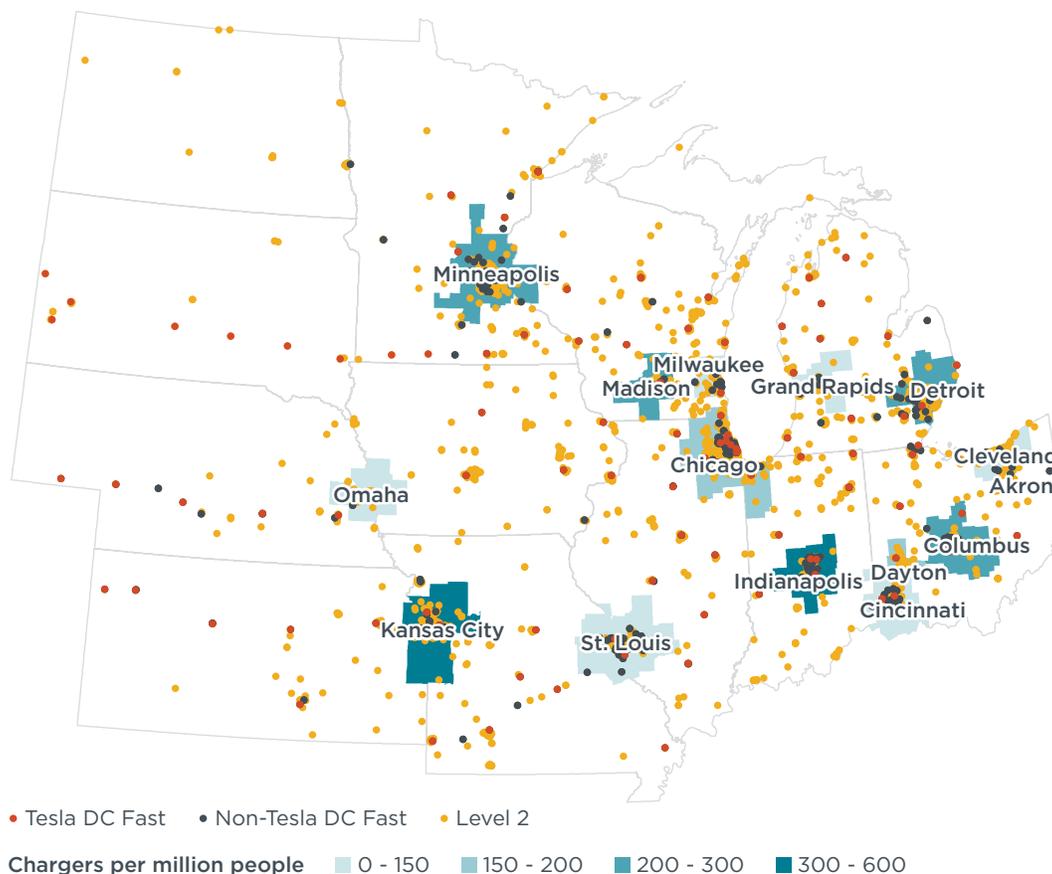


Figure 3. Charging infrastructure in 15 most populous Midwest metropolitan areas. (Charging infrastructure data provided by PlugShare)

Public Level 2 and workplace charging infrastructure in metropolitan areas is widespread across the states studied. Although DC fast charging is most heavily used within cities, enabling easier travel outside of metropolitan areas with DC fast charging will become more important as the market expands. Approximately 90% of the DC fast charging points were installed by Tesla and are incompatible with other vehicle makes. Tesla has 450 fast chargers at 60 sites outside of the top 30 metropolitan areas, while other makes can only access 62 fast chargers at 26 sites. Electrify America plans to invest in inter-city-travel DC fast charging, with much of it to be installed in 2019.¹⁴

City, state, and utility infrastructure actions. Charging infrastructure development can be aided by cities and utility companies, particularly to establish a network. Through 2018, nine cities and five utility companies have installed infrastructure.

Investor-owned utilities must get permission from state utility commissions to use ratepayer money for capital projects such as charging infrastructure. Madison Gas and Electric have installed charging installations at 34 locations.¹⁵ Kansas City Power and Light previously announced plans to install over 1000 chargers in its service territory

¹⁴ Electrify America LLC, "National ZEV Investment Plan: Cycle 1," Volkswagen Group of America (April 9, 2017), <https://elam-cms-assets.s3.amazonaws.com/inline-files/National%20ZEV%20Investment%20Plan.pdf>

¹⁵ "MGE's Public Charging Network," MGE, accessed 9 April 2019, <https://www.mge.com/environment/electric-vehicles/charging-network.htm>

but the project has been rejected by the state utility commission thus far.¹⁶ Consumers Energy in Michigan was initially denied but was recently granted permission in 2019 for a \$10 million pilot to provide financial incentives for residential, multi-unit dwelling, public Level 2, and DC fast charging. Detroit Edison is applying for a \$13 million in rebate support for 32 fast chargers, 1,000 Level 2 chargers, and 2,600 home smart chargers.¹⁷ State utility commissions in Iowa, Indiana, Minnesota, and Ohio are considering allowing larger rate-based charger support programs. Municipal utilities do not have to get permission from state utility commissions and are instead locally accountable. Columbus has specifically targeted support for multi-unit dwelling (MUD) chargers.¹⁸

The rationale for utilities to invest in public charging infrastructure is that electric vehicles put downward pressure on rates for all users.¹⁹ Selling electricity to charging points during periods of low system-wide usage at low prices can still provide revenue in excess of the cost to the system.²⁰ This revenue in excess of cost reduces everyone's rates even if they are not electric vehicle users. Electric vehicle owners pay more than it costs to serve them off peak, in effect defraying the cost of rebates for chargers.

While states are not dedicating their own funds to support charging infrastructure, Appendix D mitigation funds from the Volkswagen settlement distributed to states allow 15% of these funds to be applied for this purpose. Every Midwest state has utilized this maximum to be dedicated for electric vehicle infrastructure. These funds differ by state according to Volkswagen sales, but as an example, 15% of Michigan's funds total \$9.7 million.²¹

PLANNING, POLICY, AND OTHER PROMOTION ACTIVITIES

Additional supporting activities which fall outside direct incentives for either cars or infrastructure include state regulation, policy planning, electric vehicle fleet promotion, utility policies, and outreach.

States. States can enact policies that can encourage or discourage electric vehicle adoption. The largest electric vehicle maker by volume, Tesla, is restricted from selling

16 Order denying KCP&L'S application for approval of its clean charge network project and electric vehicle charging station tariff, Kansas Corporation Commission (September 13, 2016), <http://estar.kcc.ks.gov/estar/ViewFile.aspx/20160913110134.pdf?Id=4b0556f3-425d-4469-8eb1-a105109511ec>

17 In the matter of the application of Consumers Energy Company for authority to increase its rates for the generation and distribution of electricity and for other relief (Case No. U-20134), Michigan Public Service Commission, (January 9, 2019), <https://mi-psc.force.com/sfc/servlet.shepherd/version/download/068t00000036VO3AAM>; Jay Greene, "DTE proposes rate increases, electric vehicle plan," *Crains Detroit Business*, July 6, 2018, <https://www.crainsdetroit.com/article/20180706/news/665451/dte-proposes-rate-increases-electric-vehicle-plan>

18 Smart Columbus, "Smart Columbus multi-unit dwellings (MUD) incentive program application," (August 17, 2018), <https://smart.columbus.gov/uploadedFiles/News/Smart%20Columbus%20MUD%20Program%20Application%20Round%202%20-%208.20.18.pdf>

19 Illinois Citizens Utility Board, "Charging Ahead: Deriving value from electric vehicles for all electricity consumers," (March, 2019), <https://www.citizensutilityboard.org/wp-content/uploads/2019/03/Charging-Ahead-Deriving-Value-from-Electric-Vehicles-for-All-Electricity-Customers-v6-031419.pdf>; Nancy Ryan and Lucy McKenzie, (2016). "Utilities' role in transport electrification: Capturing benefits for all ratepayers," *Public Utilities Fortnightly*, April, 2016 www.fortnightly.com/fortnightly/2016/04/utilities-role-transport-electrification-capturing-benefits-all-ratepayers

20 Michael Nicholas, *Ensuring driving on electricity is cheaper than driving on gasoline*, (ICCT: Washington, DC, 2018), www.theicct.org/publications/ensuring-driving-on-electricity-cheaper-than-gasoline

21 Michigan Department of Environmental Quality, "Michigan Volkswagen settlement beneficiary mitigation plan" (October 2018), https://www.michigan.gov/documents/deq/MichiganVolkswagenSettlementBeneficiaryMitigationPlan_637134_7.pdf

in 8 of 15 metropolitan areas because they do not have traditional dealerships located in these states. States that bar sales or limit dealerships are Michigan, Wisconsin, Nebraska and Ohio. Three states, Illinois, Indiana, and Missouri, provide electric vehicle manufacturing incentives. Finally, Minnesota has joined the United States Climate Alliance, which represents states that coordinate and defend policies, including clean car regulations, to advance the goals of the Paris climate accord.²²

Cities. Columbus, selected for the U.S. Department of Transportation's smart city challenge,²³ developed a plan that included increasing charging infrastructure, electrifying city fleets, holding outreach events, and modifying parking codes to incentivize the installation of charging infrastructure.

Many of the actions mentioned above in the Columbus city plan are implemented in other cities as well. Having an electric vehicle strategy is also an effective way to help lower the barriers to adoption. Four metropolitan areas with electric vehicle strategies are Cleveland, Kansas City, Columbus, and Indianapolis. Only Chicago has implemented streamlined charger installation permitting allowing electricians to receive permit approvals in just 1 day.

City actions that improve access and exposure to electric vehicles are important as well. Studies have shown that awareness of electric vehicle options is very low, and potential electric vehicle customers don't have the information or experience necessary to make an informed purchase. Several actions have been implemented in Midwest cities, including city electric ride-hailing programs in two cities, city electric carsharing programs in five cities, informational materials offerings in six cities, and outreach events in 13 cities. In Indianapolis, BlueIndy is notable for having an electric carsharing program with a goal of 500 electric vehicles and 200 charging stations. Finally, Columbus has engaged dealers through their electrified dealer program, helping dealers promote and better inform customers about electric vehicles and their benefits at the point of sale.²⁴

Cities are also incorporating electric vehicles into municipal fleets and public transportation. Six cities have fleet adoption targets and four have incorporated plug-in buses into city bus fleets. Columbus has plans to incorporate 200 electric vehicles in its fleet and Madison intends on replacing 20 of its gasoline cars with electric ones by 2020 and will replace three diesel buses with electric buses in 2020.²⁵

Utilities. Utility companies and commissions play an important role as they determine the cost of the electricity that powers electric vehicles. They can also encourage the use and adoption of electric vehicles in other ways. As previously discussed, electric vehicles can take advantage of excess utility grid capacity at low cost. Utilities in 12 of the 15 metropolitan areas studied have implemented time-of-use

22 Alliance principles, United States Climate Alliance, accessed June 4, 2019, <https://www.usclimatealliance.org/alliance-principles>

23 City of Columbus, "Beyond Traffic: Smart City Challenge Phase 2," (July 29, 2016), <https://smart.columbus.gov/uploadedFiles/Content/Projects/Smart%20Columbus%20-%20Volume%201%20Technical%20Application%20-%20REVISED%2008092016.pdf>

24 Zach McGuire, "How the Electrified Dealer Program Boosts EV Sales," Smart Columbus, (2019), <https://smart.columbus.gov/Playbook-Assets/Electric-Vehicle-Consumer-Adoption/How-the-Electrified-Dealer-Program-Boosts-EV-Sales/>

25 Abigail Becker, "Madison receives state grant to buy 20 electric vehicles" *The Cap Times*, (March 6, 2019), https://madison.com/ct/news/local/govt-and-politics/madison-receives-state-grant-to-buy-electric-vehicles/article_99438ca3-ee84-52c7-ba5d-93ed449adad5.html

pricing where the price of electricity fluctuates according to demand. Utilities in four metropolitan areas have established special electric vehicles rate tailored to vehicle charging. Some utilities, such as Xcel energy Minnesota, also offer separate metering for electric vehicles.

Other utility actions include offering electric vehicle informational materials on their website, which is present in all 15 areas, and providing tools to calculate savings of an electric vehicle versus operating a gasoline vehicle, which is present in 10 areas. Another class of information that is becoming increasingly important is that for installing charging in multi-unit housing. Information on installing charging infrastructure in multi-unit housing geared towards both property owners and residents is only available in two of 15 Midwest metropolitan areas. Finally, utilities in 9 of the metropolitan areas have incorporated electric vehicles in their fleet, which gives the companies insight into charging infrastructure needs.

SUMMARY OF ACTIONS

The actions described above are summarized in Table 1. They are ordered by number of total actions taken in each metropolitan area in 2018. Overall, Columbus, Ohio is the leader in the number of actions taken to foster the growth of electric vehicles in 2018 with 20 of the 43 possible actions adopted while Akron, Ohio has adopted the least number at five actions.

ANALYSIS OF THE ELECTRIC VEHICLE MARKET

In this section, electric vehicle uptake in 2018 is examined in the context of the factors that underlie uptake, including the actions described above. The metric for uptake used is the share of all new light-duty vehicle registrations in 2018 that are plug-in electric.²⁶ New registrations over the full calendar year closely match new vehicle sales. The underlying factors analyzed include public charging infrastructure, model availability, policy incentives, and promotional actions across the major metropolitan areas.

ELECTRIC VEHICLE UPTAKE

As mentioned above, the share of electric vehicles sold in the Midwest overall is 0.9% versus the United States as a whole at 2.1%. However, the Midwest made significant gains in electric vehicle adoption in 2018. The market shares for 2018 for the top 30 metropolitan areas by population are shown in Figure 4.

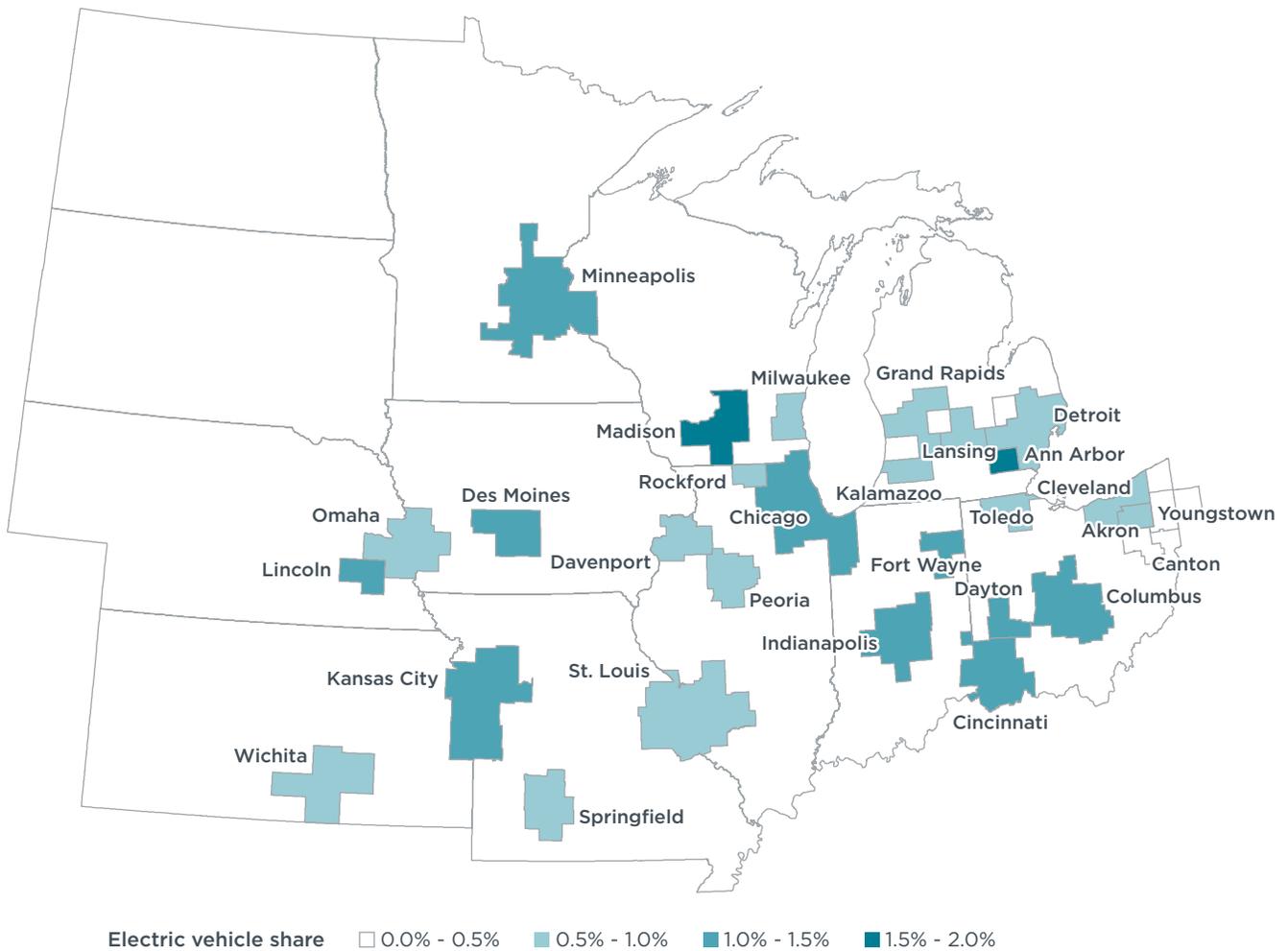


Figure 4. Electric vehicle new share in 30 most populous Midwest metropolitan areas. (New light vehicle registration data for calendar year 2018 provided by IHS Markit)

26 Registration data by IHS Markit (New vehicle registration data, 2019), <https://ihsmarkit.com/>.

Individual areas with the largest electric market shares include Madison with the highest at 1.9%, followed by Minneapolis and Chicago at 1.4%. One notable outlier not in the top 15 Midwest areas by population is Ann Arbor with a 1.6% market share. Madison and Ann Arbor have large universities, which have been found to be common in region-leading electric vehicle uptake markets.²⁷ Ann Arbor has the additional benefit of being near the vehicle manufacturing center of Detroit. Southern Ohio appears to have a relatively high share of electric vehicles, possibly due to the Smart Columbus initiative. Kansas City also has a relatively high uptake, possibly due to greater availability of public charging infrastructure.

CHARGING INFRASTRUCTURE

The relationship between charging infrastructure and sales of vehicles can also be examined. As stated earlier, normalizing the number of chargers to population is an indication of the geographic coverage of charge points and the number of people for whom charging is relevant. Figure 5 shows the 2018 electric vehicle sales share for 2018 and DC fast chargers per million population.

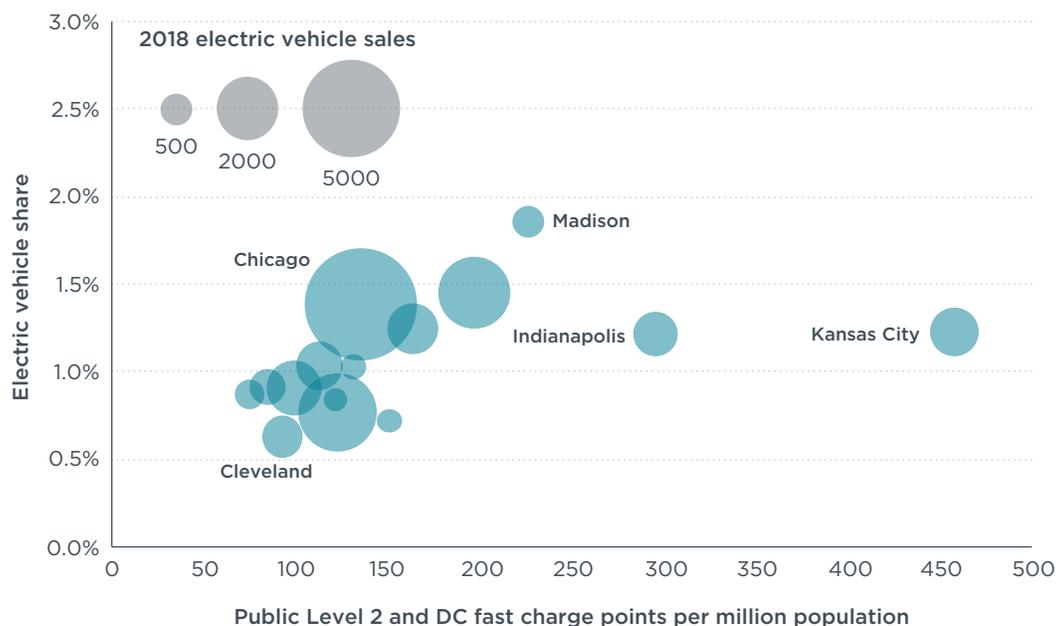


Figure 5. Electric vehicle share versus public chargers per million population in 2018. (New light vehicle registration data for calendar year 2018 provided by IHS Markit. Charging infrastructure data provided by PlugShare)

Kansas City and Indianapolis stand out as having more extensive charging infrastructure, indicating the ability to handle a higher number of electric vehicles than currently exist for 2018. Aside from those outliers, the graph shows a trend from Cleveland to Madison of infrastructure growth to support more vehicles.

²⁷ Irene Kwan, Nic Lutsey, Peter Slowik, and Lingzhi Jin, *Identifying the leading regional electric vehicle markets in the United States*, (ICCT: Washington, DC, 2016), <https://www.theicct.org/publications/identifying-leading-regional-electric-vehicle-markets-united-states>

MODEL AVAILABILITY

Model availability has been linked to electric vehicle uptake in publications previously mentioned. In general, there are fewer models available in the Midwest than in the coastal areas of the country.²⁸ At 20 models, Chicago has the highest number of models available. Table 2 shows the availability of models by metropolitan area where shaded cells indicate an available model. A model was counted as available if more than 20 new vehicles were registered in the market for 2018. The darkest colors indicate the largest market share and lighter colors indicate less market share for that model, with gray being the least market share. Shading must be read down columns not across rows. For example, more Outlanders are sold in Chicago by volume than Minneapolis, but the percent of electric vehicle sales in Chicago is less than 5% of the market while it is greater than 5% in the Minneapolis market earning it a dark indicator. Markets are ordered by population.

Table 2. Models available in the top 15 Midwest metropolitan areas.

	Model 3	Model S	Model X	Bolt	LEAF	Prius Prime	Clarity	Volt	Pacifica	Fusion	530	i3	Outlander	X5	Niro	XC60	XC90	Countryman	Panamera	GLC	C-Max	Models available	
Chicago	Dark	Dark	Dark	Light	Light	Light	Light	Light	Light	Light	Dark	Dark	Light	Dark	Light	Light	Light	Dark	Dark	Dark	Light	Light	20
Detroit	Light	Light	Light	Dark	Light	Light	Light	Dark	Dark	Dark	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Dark	12
Minneapolis	Light	Light	Dark	Dark	Dark	Light	Light	Light	Light	Light	Light	Light	Dark	Light	Light	Dark	Dark	Light	Light	Light	Light	Light	15
St. Louis	Dark	Dark	Light	Light	Light	Dark	Light	Light	Light	Light	Light	Light	Light	Light	Dark	Light	Light	Light	Light	Light	Light	Light	12
Cincinnati	Light	Light	Light	Light	Dark	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	10
Kansas City	Dark	Light	Light	Dark	Light	Dark	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	9
Cleveland	Light	Dark	Light	Light	Light	Light	Dark	Light	Light	Light	Dark	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	11
Columbus	Light	Light	Light	Light	Light	Light	Dark	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	10
Indianapolis	Dark	Light	Dark	Light	Light	Light	Dark	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	9
Milwaukee	Light	Dark	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	8
Grand Rapids	Light	Light	Light	Dark	Light	Light	Light	Dark	Dark	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	4
Omaha	Light	Light	Light	Light	Dark	Light	Light	Light	Light	Dark	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	9
Dayton	Light	Light	Dark	Light	Light	Light	Dark	Dark	Dark	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	6
Akron	Light	Dark	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	2
Madison	Light	Light	Light	Dark	Dark	Dark	Light	Dark	Dark	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	Light	8

With the exception of Madison at 8 models available, in most metropolitan areas follow a greater variety of models correlates to a greater electric vehicle market share.

²⁸ Peter Slowik, and Nic Lutsey, The surge of electric vehicles in United States cities, (ICCT: Washington, DC, 2019), <https://www.theicct.org/publications/surge-EVs-US-cities-2019>

Individual models also appear to make a difference in the markets with the largest sales share. For example, in Madison, the Toyota Prius Prime is more popular as a share of vehicles than in other Midwest areas. The Mitsubishi Outlander PHEV with 4-wheel drive capability is more popular in Minnesota. The Chicago market meanwhile shows a relatively greater affinity for Tesla Model S and Model Xs. Partially explaining low Tesla uptake in the Detroit, Madison, Milwaukee, Omaha, direct sales of Tesla models are prohibited in Michigan, Nebraska, and Wisconsin. With more model availability, vehicle offerings have a greater chance to cater to market preferences. For comparison, Los Angeles has 37 models available compared to the top Midwest metropolitan area of Chicago at 20 models.

COMPARISON OF 15 MAJOR MIDWEST METROPOLITAN AREAS

A summary comparison of the top 15 Midwest metropolitan areas from the data described above is shown in Figure 6. The metropolitan areas are listed from the greatest electric vehicle market share to the least. Charging availability from Figure 2 is condensed to include workplace, Public Level 2 and DC fast charging points. Model availability and promotional actions described in previous sections are also shown. With some exceptions, the data shows the general trend that more charging points, more model availability, and more promotional actions results in greater electric vehicle market share.

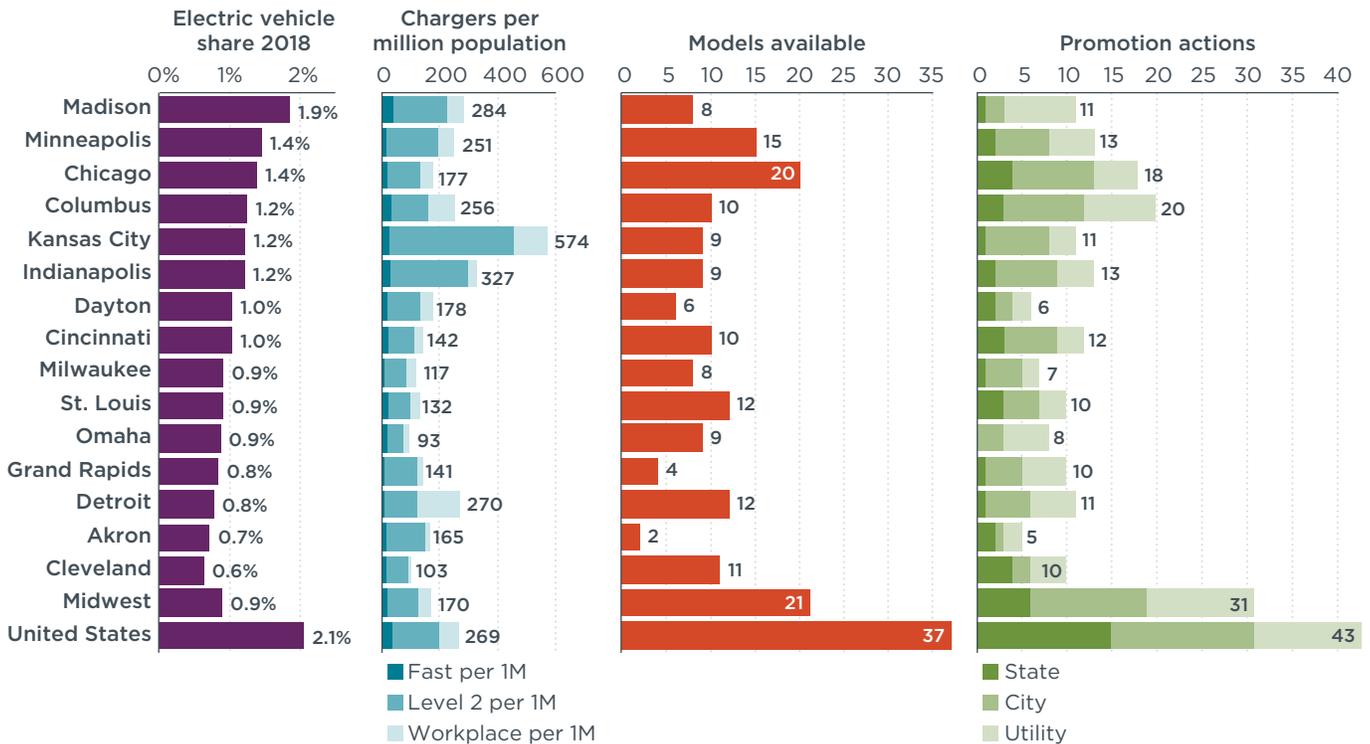


Figure 6. Summary of vehicle sales share and underlying market factors. (New light vehicle registration data in left-most column provided by IHS Markit. Charging infrastructure data in second column provided by PlugShare)

Even though there is a general U.S. trend towards more of each category aligning with greater market share, Madison has neither a leading number of models available nor a

large number of promotional actions, suggesting that Madison is poised for additional growth if more supportive actions are done or more vehicle models become available.

Growth in the charging network is also important for growth in electric vehicle sales. Kansas City and Indianapolis have more charging available than others with a higher market share, but top markets, with the exception of Chicago, have more than 200 chargers per million people.

Model availability is key to electric vehicle share as well. The large cities of Chicago and Minneapolis enjoy a wider model variety than smaller areas and rank first and third in electric vehicle market share. Finally, Columbus leads the Midwest in the number of promotional actions, and the top four metropolitan areas with the greatest number of promotion actions are in the top six in market share.

CONCLUSIONS

No single action or underlying condition explains the differences in electric vehicle market share in the Midwest. Factors such as market preference, model availability, public charging infrastructure, and local actions taken by different states, cities, and utilities differ across the metropolitan areas. On their own, these factors do not explain electric vehicle market share, but taken together they can have a large influence on electric vehicle adoption rates in metropolitan areas. Analyzing these factors in the Midwest allows us to evaluate region-specific solutions to help advance the electrification of transportation.

Growth in the Midwest electric vehicle market is on pace with the rest of the nation, but overall market share is delayed by two years. Comparing the electric vehicle sales share in the United States to that of the Midwest shows the Midwest electric vehicle percentage market share is approximately equal to that of the United States two years ago. Maintaining the growth trajectory in the Midwest will require charging infrastructure growth, more model availability, and engagement from the state, city and utilities.

Increased engagement and specific promotional actions spur growth in the electric vehicle market. Actions taken by city governments and utilities have been a driving force in the Midwest, with states doing less to encourage the electric vehicle market. Columbus, Indianapolis, and Minneapolis have engaged in more promotional activities than any other area in the region and are also in the top six areas by market share in the Midwest. Utility companies in Columbus and Minneapolis are the most engaged by number of actions but are not as active as elsewhere in the United States. Few utilities offered rebates for private or public chargers in the Midwest in 2018, but recent announcements for public and private charger support indicate an encouraging trend.

Midwest states have been relatively reluctant to provide incentives and, in some cases, have actively discouraged electric vehicles by prohibiting sales, imposing annual fees, and preventing state utility commissions from allowing rate-based infrastructure. Minnesota was an exception in 2018 as a member of the U.S. Climate Alliance. Since analysis above of 2018 developments, in 2019 three additional Midwest states— Illinois, Michigan, and Wisconsin—joined the U.S. Climate Alliance to coordinate in implementing and defending clean car policies.

Model availability is key to market growth in the Midwest. Several markets with the largest uptake have one electric vehicle model that is much more popular than other models. For example, uptake is high for a particular electric model in the two top markets of Minneapolis and Madison, a pattern that is not seen in other areas. This suggests that as market niches are filled and dealers engage more, electric vehicle share will grow. In general, larger markets including Chicago and Minneapolis enjoy a larger electric vehicle selection, but these markets still see far fewer models than markets outside the Midwest. Michigan, Nebraska, and Wisconsin prohibit direct sales of Tesla models, limiting availability and possible market growth.