reach anxiety

As concerned citizens demand action to address climate change, cities and states are adopting ever more aggressive electric vehicle (EV) targets to tap the breaks on the country's biggest contributor of carbon dioxide emissions. Despite these policies and incentives, we are still facing considerable barriers to adoption, especially when it comes to affordability. Which has us wondering... when it comes to EVs and equity, can we ensure that everyone can sit in the driver's seat?

ILLUME | Published in INGENUITY AND RESILIENCE, Vol. II

CITIES AND STATES TAKE MATTERS INTO THEIR OWN HANDS

According to the most recent U.S. Energy Information Administration's energy review, in 2018 the transportation sector accounted for more than 1.9 MMT of carbon dioxide (CO_2) emissions, earning the dubious distinction of the number one polluter ahead of the industrial, residential, and commercial sectors.[1]

Dissatisfied with the status quo, states are taking matters into their own hands. Ten states have followed California, the first state in the country to establish Zero Emission Vehicle (ZEV) legislation to support its aggressive goals. For example, the State of Minnesota hit the ground running with its framework, *Accelerating Electric Vehicle Adoption: a Vision for Minnesota,* calling for a 20% increase in EVs by 2030.[2]

In neighboring Tennessee, the state's *Drive Electric Roadmap* lays out an aggressive timetable to get 200,000 EVs on the road in the next 10 years (an increase of 3,900%). Cities are not far behind, navigating unchartered territory as they develop their own frameworks to reduce the impact of transportation emissions. In the South, the city of Atlanta passed an EV ordinance requiring all new homes and facilities to accommodate EVs.

STATES WITH AGGRESSIVE EV GOALS

LOCATION	# EVs ON ROAD	EV GOAL #	PERCENT INCREASE	GOAL YEAR
Tennessee	5,000	200,000	3,900%	By 2028
Massachusetts	18,000	300,000	1,567%	By 2025
Minnesota	7,000	200,000	2,757%	By 2030 (20% of sales)
California	550,000	5,000,000	809%	By 2030

EVERYONE IS TALKING ABOUT EVs, BUT OWNERSHIP IS LIMITED TO FEW

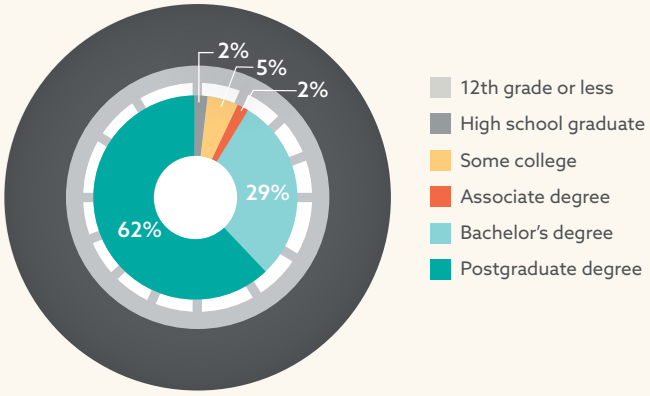
EV proliferation is a trending topic in industry panels and conference discussions. EV talk has evolved from skeptical, to theoretical, to tactical. Similarly, the EV market is showing signs that we're on a path to ubiquity as Amazon announced its fleet electrification, Tesla, Rivian, and Ford are electrifying America's internal combustion darling—the pickup-truck—and the Federal Transit Administration invested $80M in grants to electrify public buses.[3] Yet data compiled by ILLUME shows that EV ownership is out of reach for many.

EDUCATIONAL **ATTAINMENT**

EV Owners Are Mostly College Graduates

When we look at the intersection of EVs and educational attainment, these two factors provide unsettling insights into equity and early adoption. According to the Year Three Report of the Massachusetts Offers Rebates for Electric Vehicles (MOR-EV) program, 91% of EV owners who responded to the survey have a Bachelor's or Postgraduate degree.[4]

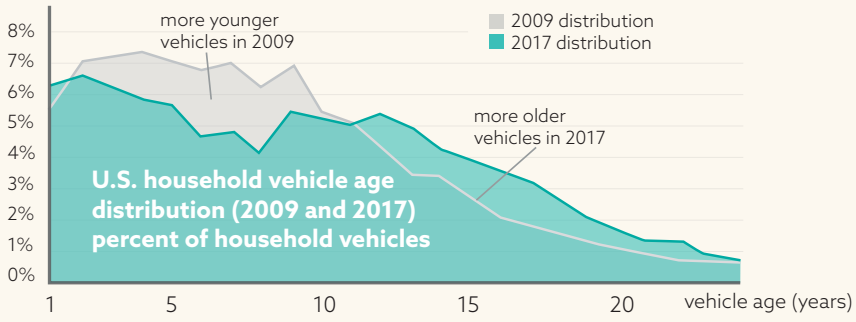
Source: Massachusetts Department of Energy Resources



VEHICLE AGE **DISTRIBUTION**

U.S. Households Are Holding on to Their Vehicles Longer

Americans are holding on to their vehicles longer. This doesn't bode well for aggressive EV targets if we're expecting Americans to change car ownership habits, let alone pivot to more expensive modes of transportation.[5]



Source: U.S. Department of Transportation, Federal Highway Administration, 2017 National Household Travel Survey

The turnover of household vehicles has slowed since 2009. The 2017 National Household Travel Survey (NHTS) reported that households held on to their cars, trucks, and vans longer. The average vehicle age has increased from 9.3 years in 2009 to 10.5 years in 2017, suggesting that many households have delayed the purchase of a new vehicle thus continuing a trend of U.S. households operating vehicles longer.

CHARGING **INFRASTRUCTURE**

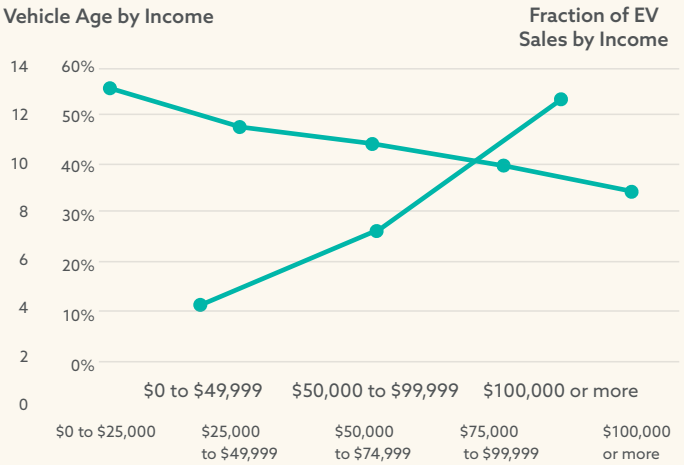
EV Owners Want Quick Charging, Governments Want to Pay Less for Charging Infrastructure

The equity gap does not present a short-term threat for EV makers like Tesla and Porsche that have come to depend on affluent customers and export markets. But as fewer people participate, it creates a dual economy wherein less affluent customers are subsidizing clean energy for the few while at the same time paying higher costs for fossil fuels—and postponing a switch to cleaner vehicles—further delaying the benefits EVs can offer.

TYPE OF STATION	**SPEED OF CHARGE** (miles per minute)	**EST. PER INSTALLED STATION COST** (USD)	**MINUTES OF CHARGE TO DRIVE 100 MILES**
Level 1 120 Volt (AC)	0.1	$500 - 1,000	1080 min (18 hrs)
Level 2 240 Volt (AC)	0.4	$2,000 - 5,000	240 min (4 hrs)
50 KW (DC)	2.9	$60,000 - 100,000	35 min
150 kW (DC)	8.7	$100,000 - 150,000	12 min
350 kW (DC)	20.4	$150,000 and up	5 min

Source: Minnesota Department of Transportation, Accelerating Electric Vehicle Adoption: A Vision for Minnesota (2019)[6]

As Average Income Americans Are Holding on to Aging Cars, the Affluent Are Claiming EV Rebates



Source: U.S. Department of Transportation 2017 National Household Travel Survey,[8] National Center for Sustainable Transportation.[9]

While EV sales are increasing, so is the average vehicle age of an owned car. Households with the lowest incomes are holding on to their cars the longest, 13 years on average. Incentives have encouraged EV purchases, but who is buying? Not the average household. A Congressional Research Service study found nearly 80% of EV credits were claimed by households with adjusted gross incomes of more than $100,000.[7] **The average U.S. household income in 2018 was $61,937**. To meet our aggressive EV goals, we will need to determine how to get EVs to everyone.

WAITING FOR THE LIGHT
TO TURN GREEN ON EQUITY

As states like California aggressively position themselves to put 1.5M EVs on the road by 2025, here's ILLUME's take on what it's going to take to get the rest of the country there—equitably.

EVs Are Still For The Wealthy

States need to combine aspirational roadmaps with financial incentives/innovative car-ownership structures to give underrepresented communities access to lease, purchase, or share EVs. In a study that looked at the intersection of income and EVs (Massachusetts Offers Rebates for Electric Vehicles: MOR-EV), less than 5% of new EV owners in the Commonwealth reported median household incomes between $24,999 and 49,999. The median household income of new EV owners in Massachusetts? $150 - 200k.[10]

Battery Costs Drive Upfront Price Parity

In 2015, batteries accounted for half the cost of an EV. And though research by BloombergDEF[11] predicted this percentage could drop to 20% by 2025 (and bring about greater price parity between EVs and internal combustion vehicles), a new MIT report suggests not to expect much downward movement in the price of EVs since the price of batteries is unlikely to reach $0/kWh with production volume increases.[12]

Think Beyond New

The market for used and "certified-used" EVs is out there. Many consumers don't want to purchase a new car (and by extension a new EV) because of concerns around depreciation, environmental consciousness, or fear of new technology. Current EV programs are most likely reaching environmentally savvy early adopters with resources to make this type of purchase. To reach our aggressive goals, we need to figure out ways to engage all buyers.

Luxury EVs And Trucks Are Driving Prices The Opposite Direction

2019 was a year of EV debuts from the Porsche Taycan ($103k), Tesla Cybertruck ($39 – 69k), Ford Mach-E SUV ($43k), and other plug-ins that don't dip below the $39,000 mark. However, nearly 60% of respondents in a national survey who were considering buying or leasing a new or used vehicle within the next two years said a lower purchase price would be most effective in increasing the likelihood of buying an electric vehicle.[13] Another affordability obstacle? Long term car loans of more than 60 months accounted for 72% of new car loans in Q1 of 2019 according to Experian.[14]

Diverse Communities Want In

Empowering diverse consumers with information on the costs/benefits, range, and infrastructure needs of EVs is critical to moving the market. An EV survey by the Union of Concerned Scientists and Consumer Reports showed that people of color are more likely to consider an EV for their next vehicle compared to all buyers combined (42 percent vs. 36 percent).[15] ILLUME research conducted for Georgia Power in Atlanta found similar sentiments, as 69% of African American customers feel neutral or positive on the ability of EVs to meet their needs. However, nearly 80% indicate price is a barrier when thinking about EVs.

A Business Case For Charging Infrastructure

Drivers are accustomed to stopping at the gas station, loading up on snacks, and traveling hundreds of miles. Though most EV charging takes place at home, utilities, cities, and the private sector may have an opportunity to think through new business cases. This year, a Maryland gas station operator was the first in the country to convert his gas station into an electric fueling station thanks to a grant by the Electric Vehicle Institute and the Maryland Energy Administration. Drivers will appreciate fast charging with their coffee and donuts, while gas station owners may be ready to part ways with structured oil and gas station contracts that limit suppliers and maintenance support.[16]

1. U.S. Energy Information Administration. "Monthly Energy Review." Accessed October 31, 2019, https://www.eia.gov/totalenergy/data/monthly/pdf/sec11.pdf.

2. Crotty, Fran, Jordan, Brendan, McFarlane, Dane, Sexton, Tim and Simmons, Siri. "Accelerating Electric Vehicle Adoption: A Vision for Minnesota." Minnesota Department of Tranportation, 2019. http://www.dot.state.mn.us/sustainability/docs/mn-ev-vision.pdf.

3. U.S. Federal Transit Administration. "U.S. Department of Transportation Announces $85 Million in Grants for Projects Nationwide to Expand Advanced Bus Technologies." Accessed November 22, 2019. https://www.transit.dot.gov/about/news/us-department-transportation-announces-85-million-grants-projects-nationwide-expand.

4. Massachusetts Department of Energy Resources. "MOR-EV: Massachusetts Offers Rebates for Electric Vehicles Year Three Report (July 2016-Oct 2017)." October 2018. Accessed November 22, 2019. https://mor-ev.org/sites/default/files/docs/MOR-EV_Year_Three_Report.pdf.

5. U.S. Department of Transportation. "2017 National Household Travel Survey." Accessed October 20, 2019. https://nhts.ornl.gov.

6. Crotty, Fran, Jordan, Brendan, McFarlane, Dane, Sexton, Tim and Simmons, Siri. "Accelerating Electric Vehicle Adoption: A Vision for Minnesota." Minnesota Department of Tranportation, 2019. http://www.dot.state.mn.us/sustainability/docs/mn-ev-vision.pdf.

7. The Editorial Board. "The Electric-Vehicle Subsidy Racket." *Wall Street Journal* online. September 2, 2019. https://www.wsj.com/articles/subsidize-my-electric-car-please-11567459952.

8. U.S. Department of Transportation. "2017 National Household Travel Survey." Accessed October 20, 2019. https://nhts.ornl.gov.

9. Muehlegger, Erich & David Rapson. "Understanding the Distributional Impacts of Vehicle Policy: Who Buys New and Used Alternative Vehicles?" UC Davis: National Center for Sustainable Transportation, 2018. https://escholarship.org/uc/item/0tn4m2tx.

10. Massachusetts Department of Energy Resources. "MOR-EV: Massachusetts Offers Rebates for Electric Vehicles Year Three Report (July 2016-Oct 2017)." October 2018. Accessed November 22, 2019. https://mor-ev.org/sites/default/files/docs/MOR-EV_Year_Three_Report.pdf.

11. Bullard, Nathaniel. "Electric Car Price Tag Shrinks Along with Battery Cost." *Bloomberg* online. April 12, 2019. https://www.bloomberg.com/opinion/articles/2019-04-12/electric-vehicle-battery-shrinks-and-so-does-the-total-cost.

12. MIT Energy Initiative. "Insights into Future Mobility." Cambridge, MA: MIT Energy Initiative, 2019. http://energy.mit.edu/insightsintofuturemobility.

13. Union of Concerned Scientists; Consumer Reports. "Electric Vehicle Survey: Findings and Methodology." July 2019. https://www.ucsusa.org/sites/default/files/attach/2019/07/2019-EV-Survey.pdf.

14. Zabritski, Melinda. "State of the Automotive Finance Market." Accessed November 22, 2019. https://www.experian.com/content/dam/marketing/na/automotive/quarterly-webinars/credit-trends/q1-2019-safm-final-v2.pdf.

15. Union of Concerned Scientists and Consumer Reports. "Electric Vehicle Survey: Findings and Methodology." July 2019. https://www.ucsusa.org/sites/default/files/attach/2019/07/2019-EV-Survey.pdf.

16. Douglas, Jacob. "First gas station in America to ditch oil for 100% electric vehicle charging opens in Maryland." *CNBC* online. September 26, 2019. https://www.cnbc.com/2019/09/26/first-gas-station-to-ditch-oil-for-electric-vehicle-charging-now-open.html.