

GASOLINE SUPERUSERS

Their Critical Role in Meeting Climate Goals
Their Demographics
How Policy Changes Can Shift Them to EVs

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A retiree drives 2,500 miles a year in her sedan and uses 75 gallons of gasoline. The carpenter who built her deck drives 30,000 miles a year in his pickup and uses 1,500 gallons. Should they both receive the same incentives to convert to electric vehicles when the carpenter's switch would reduce the consumption of 20 times more gasoline?

EXECUTIVE SUMMARY

American drivers are highly unequal in their gasoline use. The top 10% of drivers in terms of gasoline consumption (“gasoline superusers”) burn 32% of gasoline – more than the bottom 60% of drivers combined.

This report demonstrates that converting gasoline superusers to electric vehicles (EVs) at an accelerated rate is necessary to achieve Biden Administration carbon reduction targets. Therefore, EV incentive policies should be changed to focus on reducing gasoline consumption rather than simply selling EVs. The report concludes that gasoline displacement incentives are a more effective and equitable tool to reduce gasoline use than flat EV incentives and that superusers should be prioritized in EV charging policy and EV marketing and education initiatives.

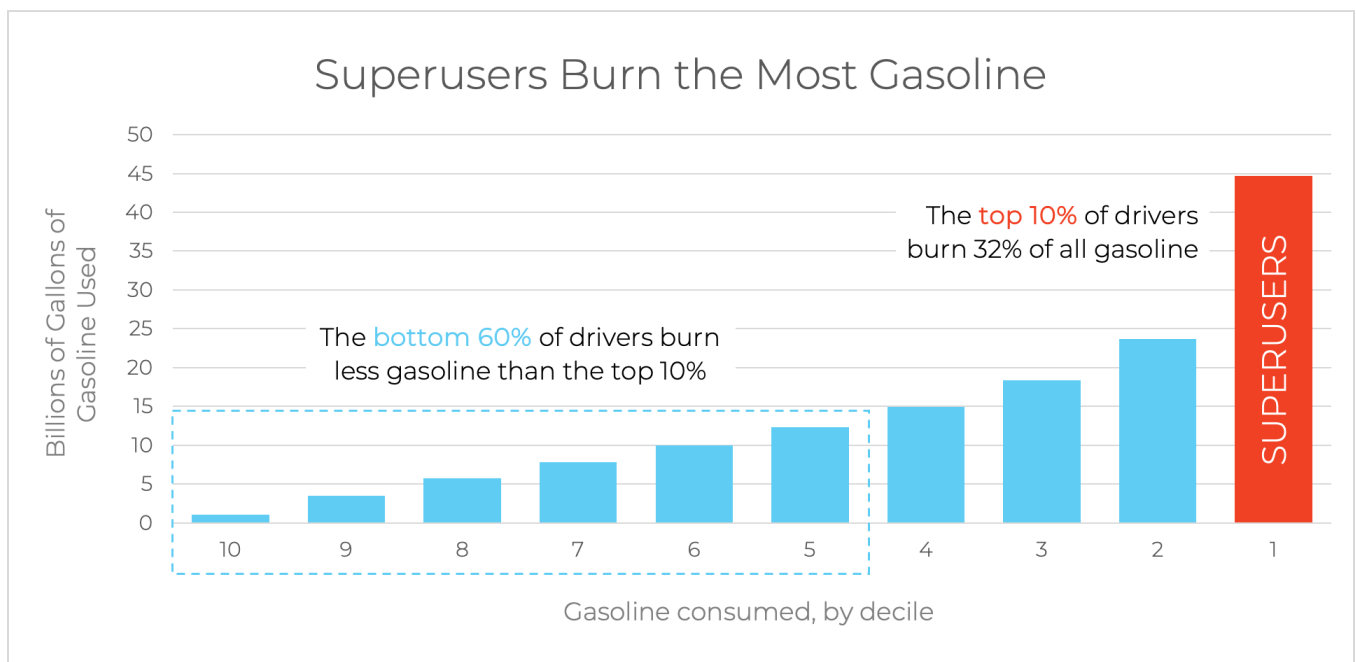


Figure 1: Gasoline Use by Decile. The top 10% of drivers use 32% of the gasoline; the top 20% of drivers use 48% of the gasoline. One decile is equal to ten percent of the population.

Source: NHTS; Coltura Analysis

Part I of this report explores the gasoline usage, vehicle preferences, and demographics of the top 10% of drivers in terms of gasoline consumption (“gasoline superusers”) based on data from the 2017 National Household Travel Survey (NHTS).¹ The data shows that gasoline superusers:

- Use more than 1,000 gallons of gasoline a year
- Drive three times more miles than the average driver
- Are more likely to drive pickups and SUVs
- Are more likely to live in rural areas
- Have similar income and educational levels as the general population
- Have lower average income levels than current EV drivers
- Spend on average 8% of their income on gasoline – more than twice that of average drivers

Part II of this report considers the policy implications of the superuser data. It recommends three policies for converting superusers to EVs:

- Tying EVs incentives to gasoline displacement
- Prioritizing public EV charging in superuser-dense areas
- Targeting EV marketing and education to superusers

The report analyzes three vehicles within the NHTS and finds that a gasoline displacement incentive of \$10/annual gallon consumed would pay for up to half the cost of the purchase price of a new EV for superusers. It finds that when coupled with the resulting savings on fuel and maintenance costs, switching to an EV could be financially compelling for many superusers, even those not in the market for a new vehicle.

It illustrates how basing EV incentive payments on past gasoline consumption could more effectively motivate gasoline superusers to switch to EVs than current policies while increasing equity and bringing additional benefits. It explains how superuser-targeted incentives are more economically efficient than scrappage policies and more politically viable than carbon taxes.

It concludes that optimizing for superusers to achieve emission reduction targets is less costly than existing policies and requires 40% fewer EVs to achieve the same level of carbon reduction.

INTRODUCTION

In 2018, the Intergovernmental Panel on Climate Change (IPCC) gave us a deadline: global carbon emissions must be cut 45% from 2010 levels by 2030 to avoid the worst impacts of climate change.² In 2021, the Biden administration announced a similar target of cutting U.S. emissions 50-52% from 2005 levels by 2030.³

Fossil fuels burned in light duty vehicles — primarily gasoline — account for about 17% of total U.S. carbon emissions.⁴ To contribute their pro-rata share to achieving the IPCC and Biden targets, the light duty vehicles on U.S. roads must cut gasoline use by 80 billion gallons a year, from today's 132 billion gallons to 52 billion gallons — a 61% cut.⁵

We are not on track to achieve this cut. U.S. gasoline consumption and carbon emissions from light duty vehicles have been flat for 20 years, with gains in vehicle efficiency offset by increasing miles traveled.⁶

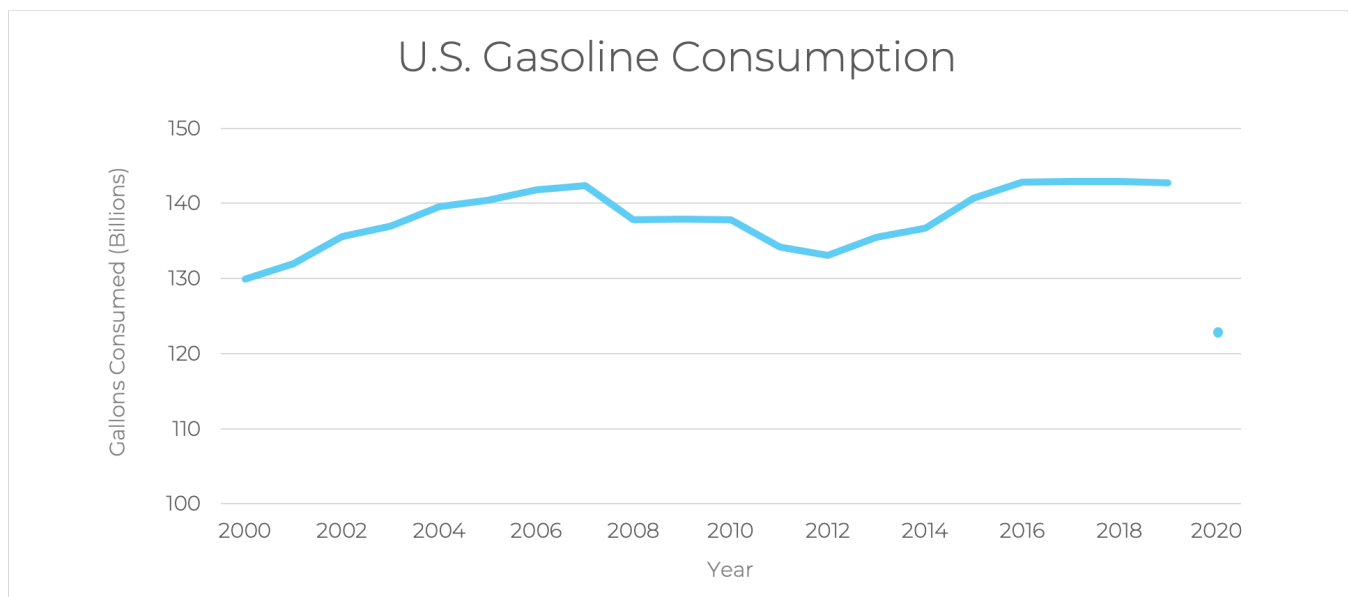


Figure 2: Source: Federal Highway Administration Motor Fuel & Highway Trust Fund

Today's leading policy prescriptions for cutting gasoline use are raising fuel economy standards, phasing out sales of new gas cars, and reducing vehicle miles traveled. These are important long-term strategies for achieving net-zero emissions by 2050, but none can achieve the massive cuts in gasoline use required to meet the IPCC/Biden 2030 climate goals. The first two policies, increased fuel economy and gas car phaseouts, apply to new vehicles only and thus are hindered by the relatively slow rate of turnover of

the 253 million light duty vehicles in the U.S. vehicle fleet. About 17 million new vehicles (6.7% of all vehicles) have been entering the U.S. vehicle fleet in recent years, and about 12 million (4.7%) have been leaving it, resulting in an annual turnover of about 6%.⁷

The Biden Administration is planning to increase emission standards for new light duty vehicles. While details of the plan have not been released at the time of this writing, they are expected to require that the fuel economy of new passenger vehicles increase by about 5% per year, starting around 2023.⁸ Because only 6% of vehicles on the road turn over every year, the annual carbon savings from incremental improvement in new vehicle emissions are likely to be less than 15% by 2030, assuming vehicle miles traveled stay steady.

Some states have introduced or are considering policies requiring that all new cars be EVs or zero emission vehicles (ZEVs) by 2030 or 2035,⁹ and federal lawmakers have called for a 2035 nationwide gas car phaseout.¹⁰ These policies are critical to making a complete transition away from gas-powered cars. Even prior to the effective date, such policies would spur massive investment in EV manufacturing, charging infrastructure, and EV awareness that would likely boost EV sales and result in some gasoline displacement. However, even a federal 2030 sunset date on sales of new gas cars would fall short of achieving the target emissions cuts from light duty vehicles. Again given the low annual vehicle turnover, by 2030, there would still be around 225 million gas-powered light duty vehicles on the road burning 106 billion gallons a year — far more than the 47 billion gallon allowance under the climate goals.¹¹

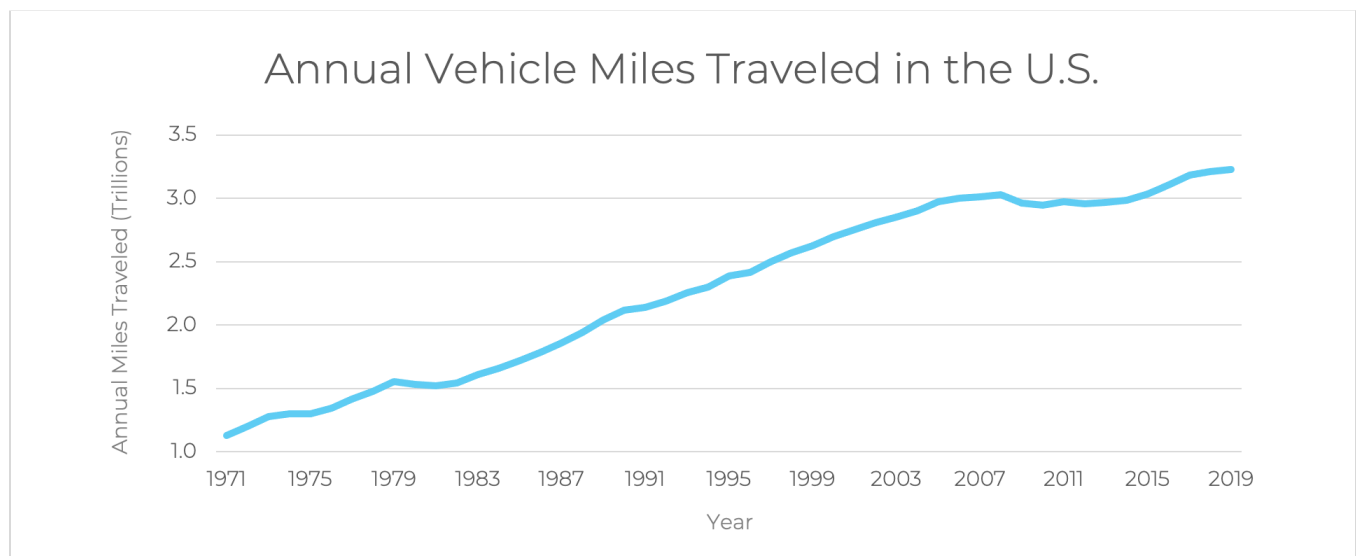


Figure 3: Federal Highway Administration Monthly Traffic Volume Trends Reports

Nor is policy focused on cutting vehicle miles traveled likely to make significant progress toward emissions reduction goals. Vehicle miles traveled have been on a steady march upward for the past 50 years, nearly tripling since 1971.¹² Our land use patterns, heavy reliance on cars,¹³ and the slow pace of development of alternative transportation infrastructure will likely only permit small-scale shifts to public transit, car-sharing, biking, and walking in this decade. Moreover, these shifts will not likely result in large cuts in gasoline use. Superusers' high-mileage driving patterns do not readily lend themselves to anything but driving a vehicle.

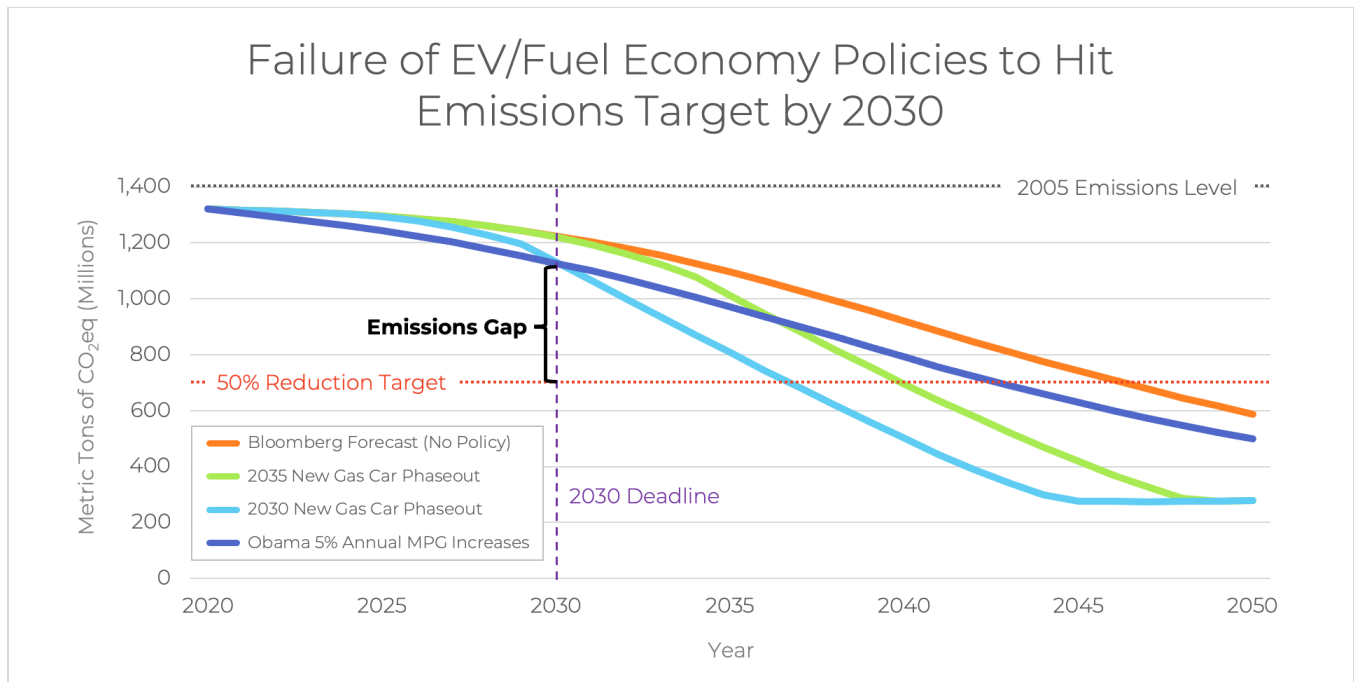


Figure 4: Emissions cuts from light duty vehicles by 2030 under four scenarios: Bloomberg forecast, 2030 and 2035 new gas car phaseout policies, and reinstatement of the Obama 5% MPG Standard. If phaseout policy and Obama standard are combined, the emissions target can be reached sooner. Source: Bloomberg EV Forecast; EIA Energy Grid Estimates; Coltura Analysis

Therefore, different policies are needed to achieve 2030 emissions targets — policies designed to cause massive and accelerated conversion of the heaviest users of gasoline to EVs.¹⁴

The future livability of our planet will be determined in significant part by how completely we transition away from gasoline in the 2020s. With policy focused on gasoline displacement, we can make this change faster, more efficiently, and cost-effectively without sacrificing mobility. We don't have a moment to wait.

PART I: Who Are Gasoline Superusers?

A. Definition of Gasoline Superuser

Gasoline superusers are defined as U.S. drivers in the top 10% of gasoline consumption.¹⁵ They use at least 1,000 gallons of gasoline a year.

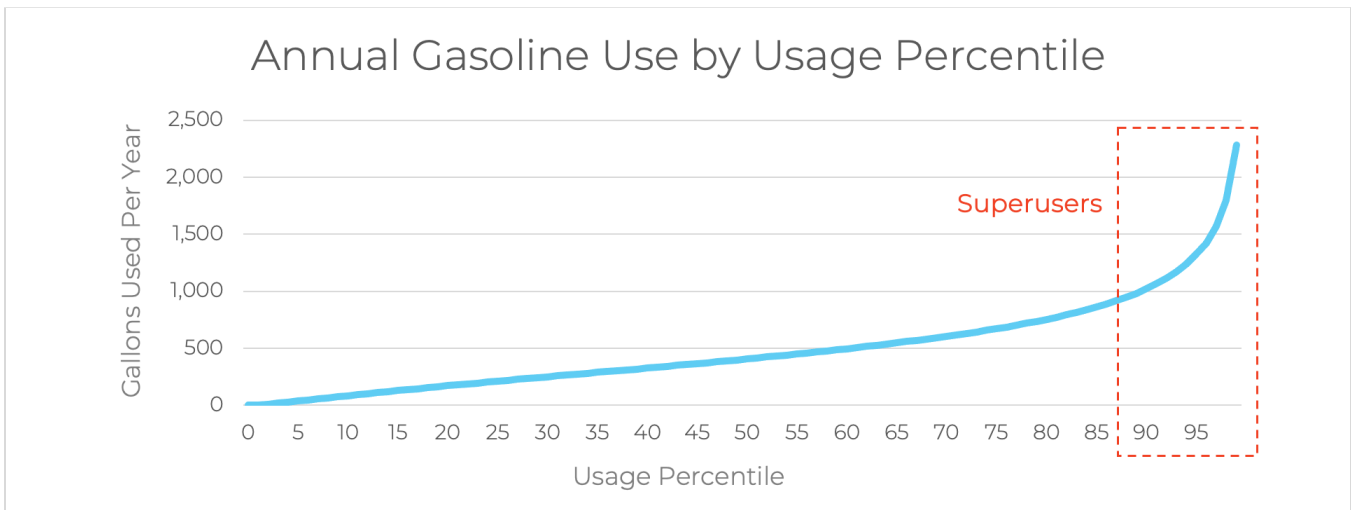


Figure 5: Annual Gasoline Use by Percentile Rank. Source: NHTS; Coltura Analysis

1. Miles Driven

Superusers drive on average 30,348 miles a year — more than three times the 8,698 miles traveled by the other surveyed drivers.

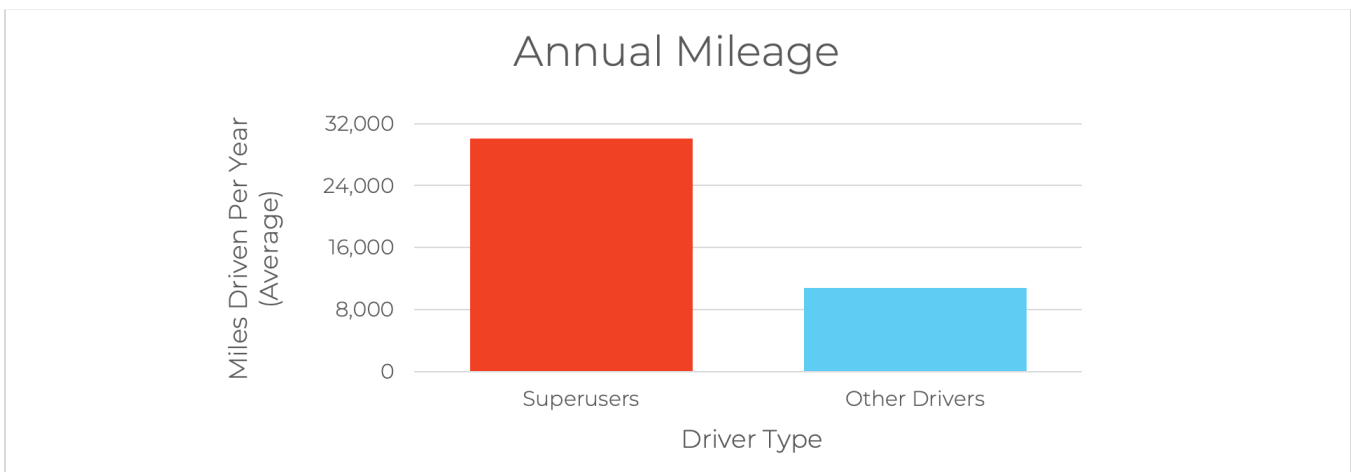


Figure 6: Annual Mileage. Source: NHTS; Coltura Analysis

B. Vehicles Driven

Superusers tend to drive larger vehicles. Nearly 65% of superuser vehicles are pickups or SUVs, compared to 41% for other drivers. Only 28% of superusers drive cars (sedans, hatchbacks, or similar), compared to 53% for other drivers.

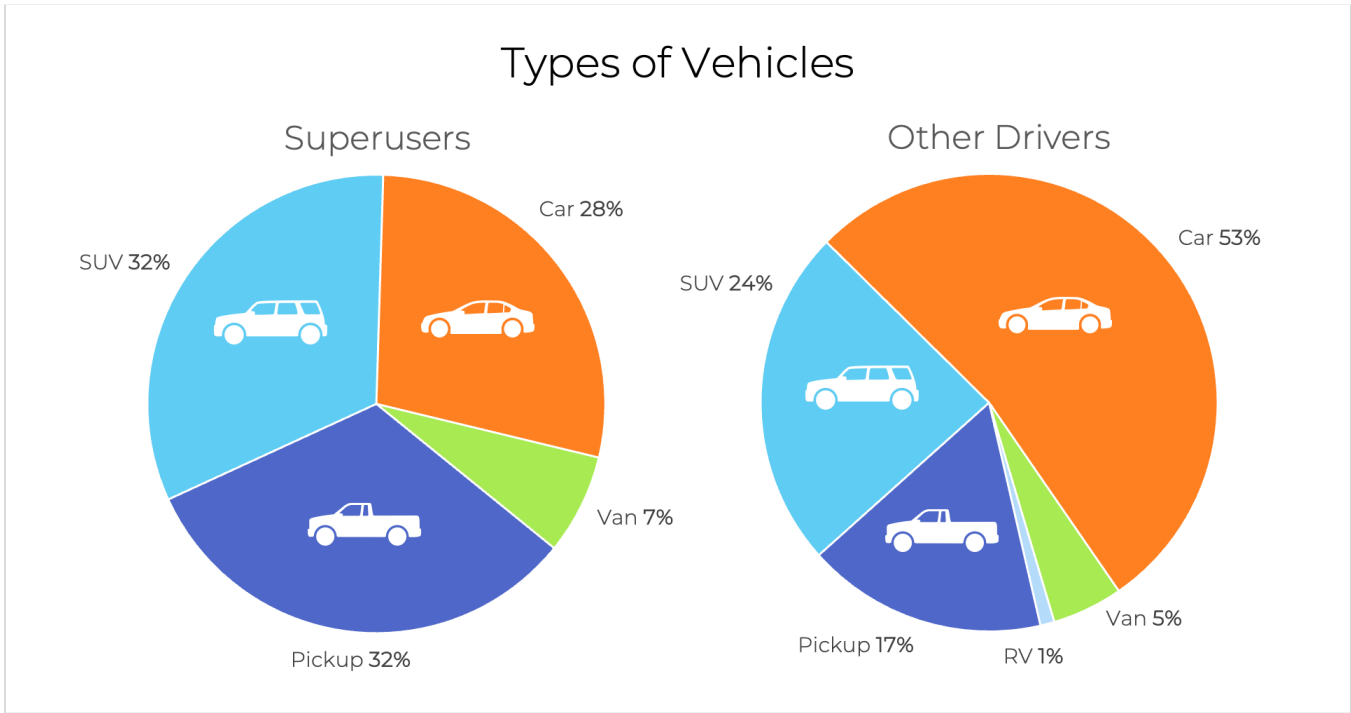


Figure 7: Source: NHTS; Coltura Analysis

Superusers are most likely to drive Ford F-series and Chevy pickup trucks. And 20% or more of the drivers of Ford F-series and Dodge Ram pickups, Chevy full-size SUVs, and Toyota Tundras are superusers.

Top Ten Superuser Vehicles

Rank	Make	Model	Percentage of Superusers Driving Model	Percentage of Model Drivers That Are Superusers
1	Ford	F-Series pickup	9%	21%
2	Chevrolet	C, K, R, V-Series pickup/Silverado	6%	18%
3	Dodge	Ram Pickup	4%	20%
4	GMC	C, K, R, V-series pickup/Sierra	2%	17%
5	Chevrolet	Fullsize Blazer/Tahoe	2%	22%
6	Toyota	Tundra	2%	21%
7	Toyota	Camry	2%	5%
8	Toyota	Tacoma	2%	11%
9	Honda	Accord	1%	5%
10	Ford	Explorer Sport Trac	1%	16%

Table 1: Top Ten Superuser Vehicles. Source: NHTS; Coltura Analysis

C. Geographic Distribution

Superusers are more likely to live in rural areas than other survey respondents and less likely to live in urban and suburban areas.

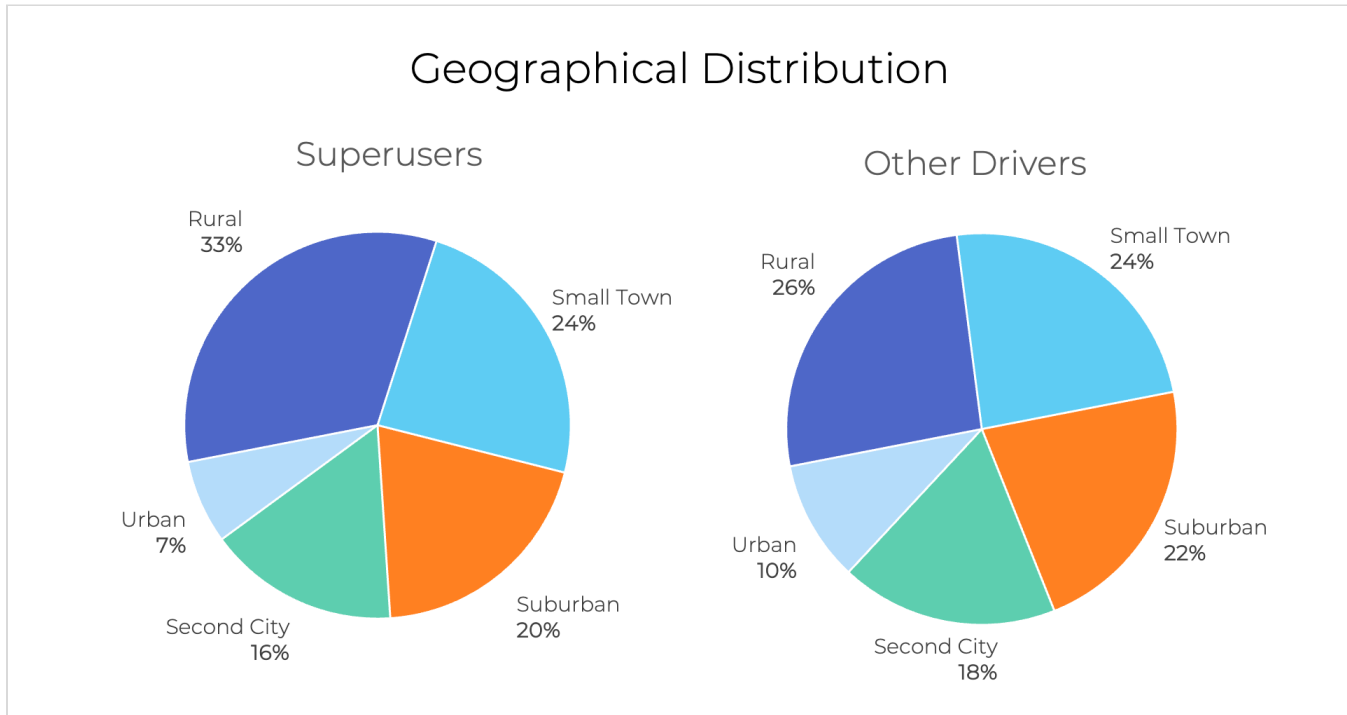


Figure 8: Source: NHTS; Coltura Analysis. Note: Second cities are cities that are population centers of their surrounding communities, such as higher-density suburb cities outside of major metropolitan centers.¹⁶

Among major metropolitan areas, Houston and Detroit have the highest concentration of gasoline superusers. Superusers in these areas use 36% of all gasoline, despite comprising just 12% of the population.

Metro Area		Percent of Superusers in Metro Area	Superusers' Share of Metro Area Gasoline Consumption
1	Houston-The Woodlands-Sugar Land, TX	12.25%	36%
2	Detroit-Warren-Dearborn, MI	12.30%	36%
3	St. Louis, MO-IL	10.92%	36%

4	Charlotte-Concord-Gastonia, NC-SC	11.01%	35%
5	Virginia Beach-Norfolk-Newport News, VA-NC	9.86%	35%
6	Dallas-Fort Worth-Arlington, TX	11.42%	34%
7	Atlanta-Sandy Springs-Roswell, GA	11.02%	33%
8	San Antonio-New Braunfels, TX	10.93%	33%
9	Minneapolis-St. Paul-Bloomington, MN-WI	10.67%	33%
10	Kansas City, MO-KS	10.64%	33%

Table 2: Metropolitan Area Superuser Rankings. Complete statistics for the 36 metro areas with the most gasoline superusers can be found in Appendix A. Source: NHTS; Coltura Analysis

Among states, Louisiana, Wyoming, and Mississippi have the highest percentage of superusers and share of superuser consumption.

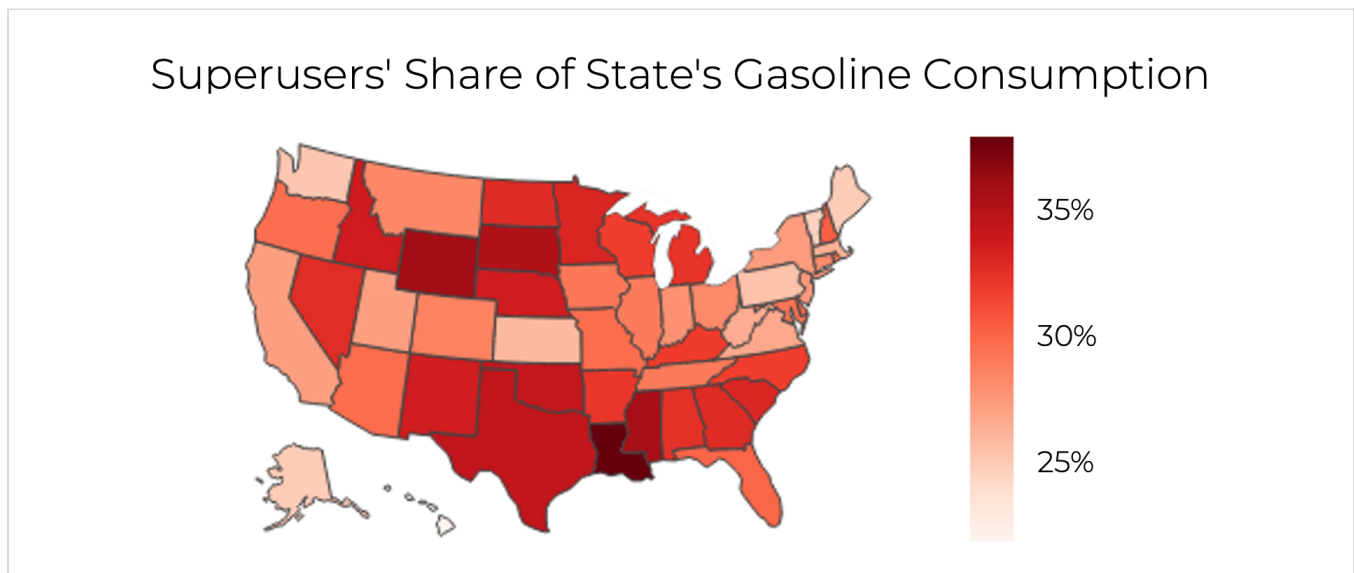


Figure 9: Heatmap indicating the share of gasoline used by superusers in each state. Source: NHTS; Coltura Analysis

Rank	State	Percent of Superusers in State	Superusers' Share of State Gasoline Consumption
1	LA	14%	39%
2	WY	13%	37%
3	MS	15%	37%
4	SD	12%	36%
5	TX	12%	35%
6	OK	11%	35%
7	ID	11%	35%
8	NE	12%	35%
9	NM	9%	35%
10	MN	10%	34%

Table 3: State Superuser Rankings by Superuser Share of State Gasoline Consumption. A full list of the share of gasoline superusers per state is in Appendix A. Source: NHTS; Coltura Analysis

D. Superuser Income

Superusers have roughly the same income levels as other drivers. In contrast, EV drivers tend to cluster at the upper end of the income distribution.

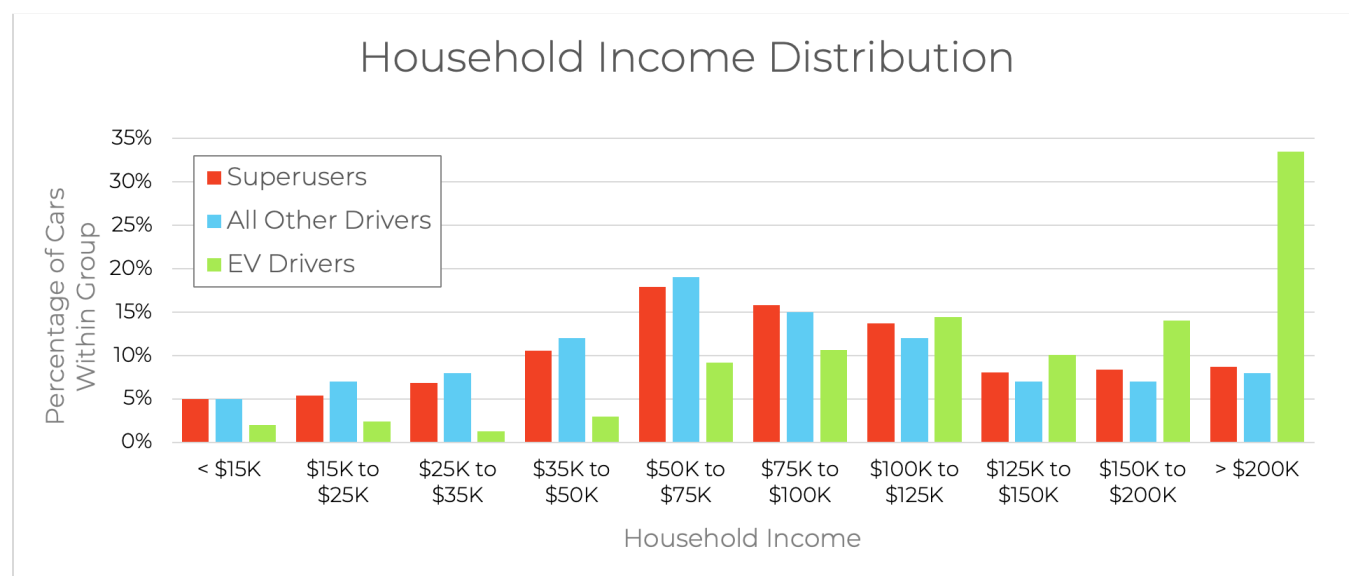


Figure 10: Superusers, All Drivers, and EV Drivers Income Distribution. Source: NHTS; Coltura Analysis

Gasoline makes up 8% of the average superuser household budget – nearly three times the average of the surveyed households. For mid-to-low income superusers, gasoline can consume more than 20% of the household budget.¹⁷

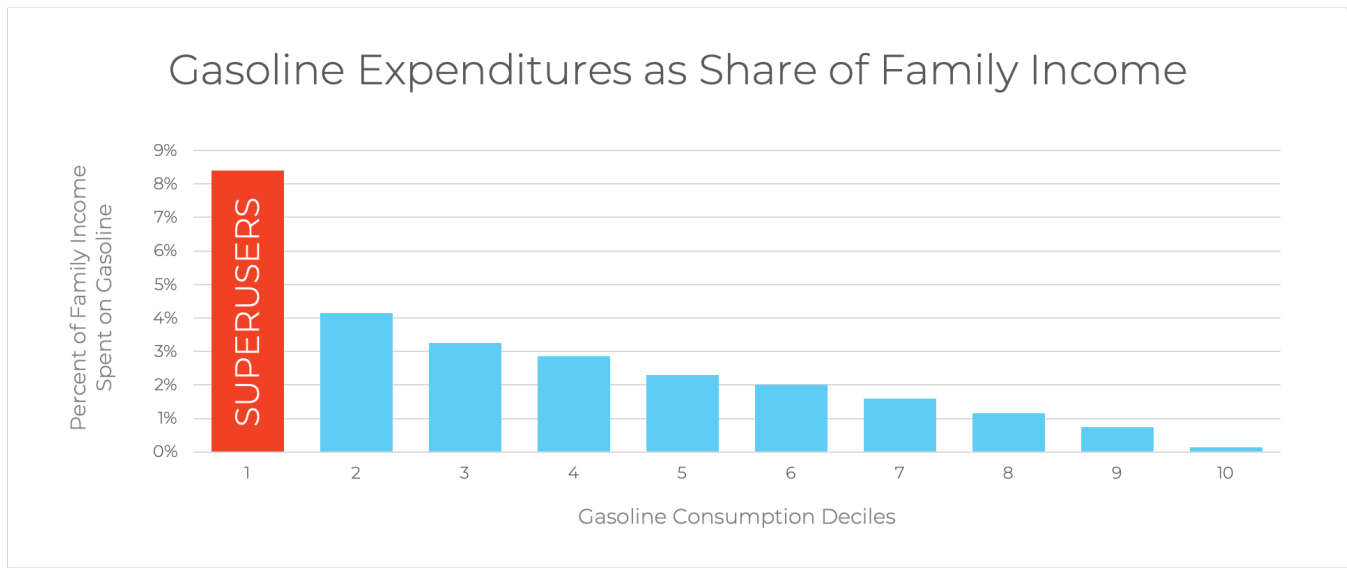


Figure 11: Gasoline Expenditures as Share of Family Income. Source: NHTS; Coltura Analysis

E. Race

Superusers’ racial characteristics generally mirror those of other survey respondents.¹⁸

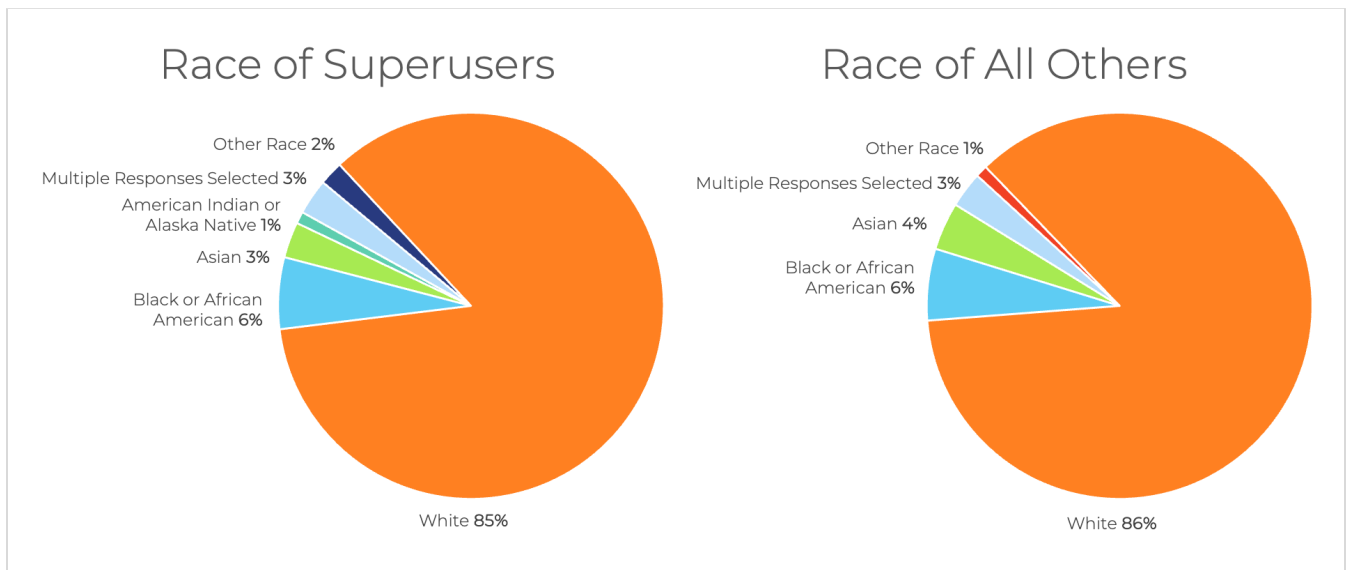


Figure 12: Race of Drivers. Source: NHTS; Coltura Analysis.

PART II

Policies to Transition Superusers to EVs

Currently, state and federal EV incentives are awarded on a per-car basis. The federal incentive for qualifying vehicles is a flat \$7,500 tax credit. The policy changes discussed below would maximize opportunities for gasoline displacement and greatly improve the ability to achieve U.S. climate goals while increasing equity and imparting other benefits.

A. Policy: Replace Flat EV Incentives with Incentives Targeted at Gasoline Displacement

EV purchase incentives should be optimized to maximize gasoline displacement and achieve maximum emissions reductions per taxpayer dollar. This can be done by tying the amount of the EV purchase incentive to the amount of annual gasoline consumption displaced by switching to an EV.¹⁹ For purposes of this report, a hypothetical incentive of \$10 per average annual gallon of gasoline displaced is used.

Figure 13 below shows how a driver could use the incentive of \$10 per gallon displaced to trade in a gasoline vehicle for an EV.

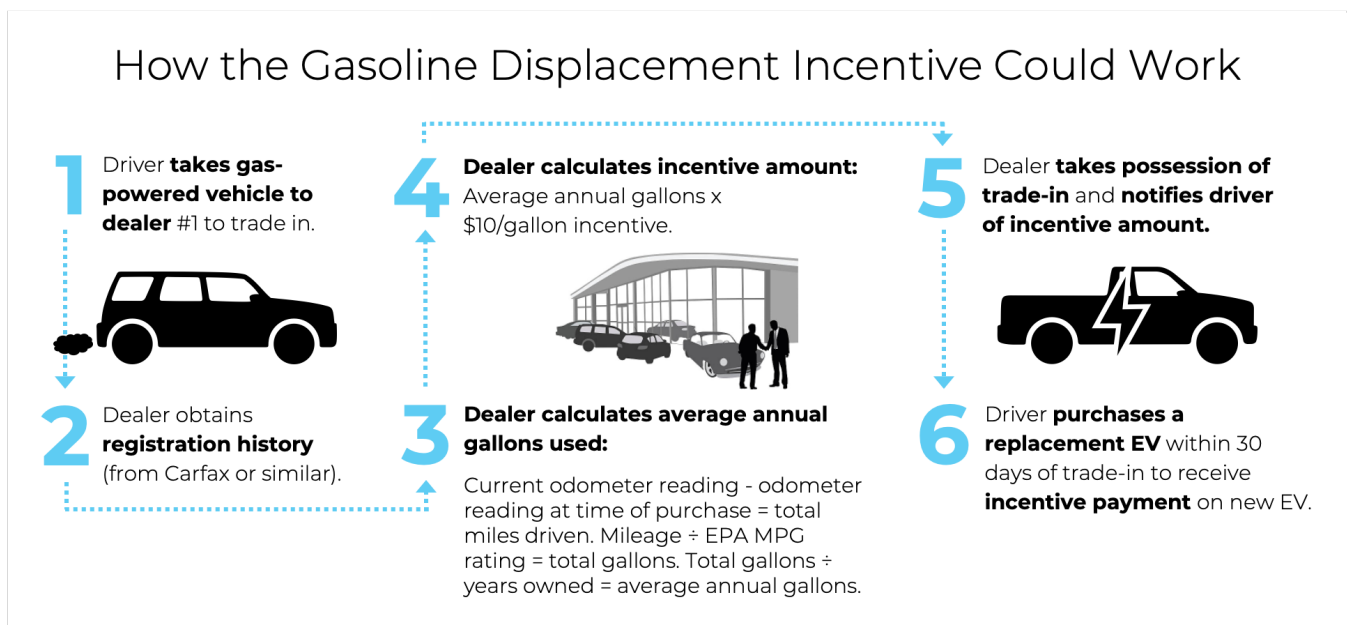


Figure 13: Schematic of step-by-step trade-in process under proposed gasoline displacement focused EV incentive. Source: Coltura Analysis

1. Operation of a Gasoline Displacement Incentive

Table 3 below shows how such an incentive would work for three drivers and their vehicles described in the NHTS. Assuming an EV incentive rate of \$10 per gallon of annual gasoline consumption, the Nissan Rogue driver profiled below, using 259 gallons a year, would receive a \$2,590 incentive to switch to an EV (left column). The Toyota Highlander driver using 468 gallons would receive a \$4,680 incentive (middle column). The superuser driver of the Toyota Tacoma burning 2,335 gallons of gasoline a year would receive a \$23,350 incentive (right column). This method provides the biggest incentive to the driver who uses the most gasoline and reduces emissions the most by switching to an EV.

By contrast, the current flat EV incentives provide the smallest incentive per gallon of gasoline displaced. Under the current federal flat \$7,500 EV incentive, the 259-gallon per year driver would receive \$29 per annual gallon displaced, the 468-gallon driver would receive \$16 per gallon displaced, and the 2,335-gallon superuser driver would receive only \$3 per gallon displaced.

Vehicle	2011 Nissan Rogue	2005 Toyota Highlander	2010 Toyota Tacoma
Location	New York Metro	Milwaukee Metro	Atlanta Metro
Annual mileage	6,000	10,000	45,000
Annual gallons displaced	259	468	2,335
EV incentive @ \$10/gallon displaced	\$2,590	\$4,680	\$23,350
Monthly fuel savings with EV	\$50	\$93	\$475
Monthly maintenance savings with EV	\$15	\$25	\$113
Trade-in value (per Consumer Reports)	\$5,185	\$3,090	\$10,425
Similar EV	Hyundai Kona EV	Tesla Model Y	Ford F-150E
Price of EV	\$40,000	\$55,000	\$44,000

Net EV cost after incentive and trade-in	\$32,225	\$47,230	\$10,225
Monthly car payment on EV (assume 6 years @ 5%)	\$529	\$775	\$168
Monthly cost (savings) to switch to EV	\$464	\$658	(\$420)
Taxpayer cost per gallon displaced under existing flat \$7,500 tax incentive	\$29	\$16	\$3

Table 4: Comparison of vehicles under per gallon and per vehicle incentive scenarios. Assumptions: Vehicles achieve EPA MPG rating. Gasoline \$3/gallon. Electricity 10 cents/kWh. Efficiency .29 kWh/mi. No loan on the existing vehicle. New EV cost is the lowest available sticker price plus 10%, then rounded up to the nearest thousand. Other dollar amounts are rounded to the nearest dollar. Sources: NHTS; Consumer Reports Vehicle Pricing Data; Coltura Analysis

2. Benefits of a Gasoline Displacement Incentive

a. Increased EV Affordability for Superusers

Incentives based on gasoline displacement would allow superusers to better afford the new electric pickup trucks and large SUVs coming to market. Presently, full-size gas-powered pickups and SUVs tend to cost at least 20% more than full-size gas cars.²¹ Assuming EV and gasoline vehicle cost parity among similar models (which many experts predict will occur in the mid-2020s²² and as early as 2022 for larger EVs²³), the current \$7,500 federal EV tax incentive would cover 20% of the average price of a full-size electric car but only 14% of the average price of a full-size electric pickup.

By contrast, an incentive of \$10 per average annual gallon of gasoline displaced would cover as much as 50% of the purchase cost of many EVs for superusers. Moreover, it would apply to drivers of all income levels, including superusers without sufficient taxable income, to take full advantage of the federal tax credit.

b. Fuel and Maintenance Savings

Fuel and maintenance savings bolster the impact of gasoline displacement incentives. Assuming gasoline costs \$3 a gallon, the superuser pickup truck driver in Table 3 above would save \$475 a month by fueling with electricity (and more if the driver could charge at reduced nighttime rates or with rooftop solar panels).²⁴ In addition, the average superuser

pickup driver would save about \$113 monthly in maintenance costs by switching to a new electric pickup.²⁵ The maintenance savings would be particularly significant for lower-income superusers driving aging vehicles.

Many superusers who trade from an old pickup or SUV to a new EV of similar size would have lower monthly all-in vehicle costs by switching to an EV, along with the greater reliability of driving a new vehicle.

c. Increased Equity

Because superusers tend to have racial and income distribution similar to the general population, targeting incentives to superusers would distribute incentives more equitably than the current flat EV subsidies, which have been primarily used by a predominantly affluent, white-centric demographic.

Across the country, fueling with electricity is less than half the cost of fueling with gasoline on average.²⁶ For lower-income superusers, gasoline may account for 20% or more of their household income (compared to 8% for average superuser households).²⁷ Thus, the cost savings realized by switching to an EV would especially benefit lower-income superusers.

Equity benefits could be further enhanced by offering more money per gallon displaced to drivers in lower-income and disadvantaged communities. For instance, these drivers could be offered a \$12 per annual gallon displaced incentive instead of \$10 per gallon for other superusers.

d. Fewer Total EVs Required to Reach Emissions Targets

The more superusers and the other heaviest users of gasoline transition to EVs, the fewer EVs will be needed to cut light duty vehicle emissions in half by 2030.

As depicted in Figure 14 below, if the heaviest gasoline users converted to EVs first, 97 million of America's 253 million light duty vehicles would need to switch to EVs by 2030, or about 11 million per year.

If all drivers converted to EVs at the same rate regardless of how much gasoline they use, it would take 176 million vehicles switching to EVs by 2030 to hit the emissions goal.



If superusers were the last drivers to switch to EVs, it would take 233 million vehicles, or essentially all non-superuser vehicles switching to EVs, to hit the goal.

Even with the strongest policies, EV purchasing will likely fall somewhere between the extremes of all superusers switching first or last. The faster superusers make the switch, the fewer EVs will be needed to hit the target.

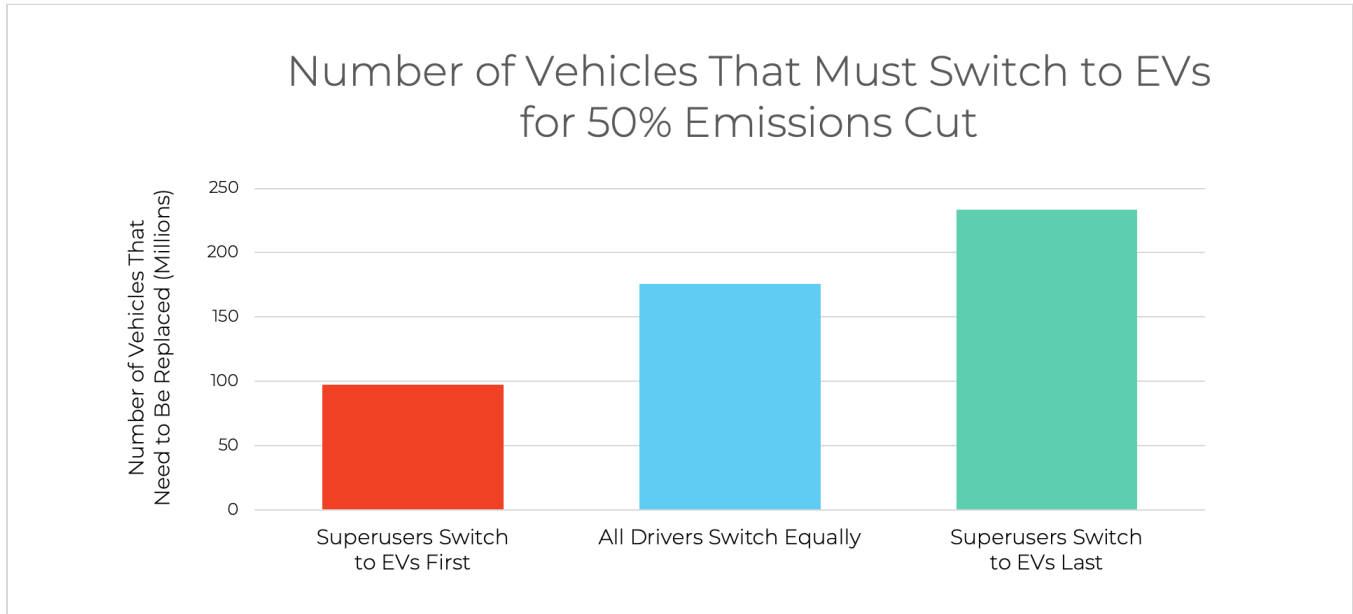


Figure 14: Comparison of the number of vehicles that would need to be replaced with EVs to achieve 50% carbon emissions cut from light duty vehicles under three scenarios. Source: NHTS/Coltura Analysis

e. Taxpayer Savings

Assuming the government pays an incentive of \$10 per gallon of gasoline displaced annually and this incentive succeeds in motivating drivers to switch to EVs,²⁸ the cost of achieving a 50% emissions reduction from light duty vehicles would be about \$800 billion.

By contrast, under the current federal flat incentive of \$7,500 per EV purchased, assuming all drivers adopt EVs at the same rate regardless of how much gasoline they use, the cost of achieving the 50% emissions cut is roughly \$1.32 trillion. This equates to \$16.50 per gallon for the 80 billion gallons that must be displaced, assuming a sufficient number of drivers switch to EVs. If the heaviest gasoline users are the last to take advantage of the \$7,500 tax incentive, many more EV sales would be required to meet the emissions goal, and the cost would likely be close to \$1.75 trillion, or \$21.80 a gallon.



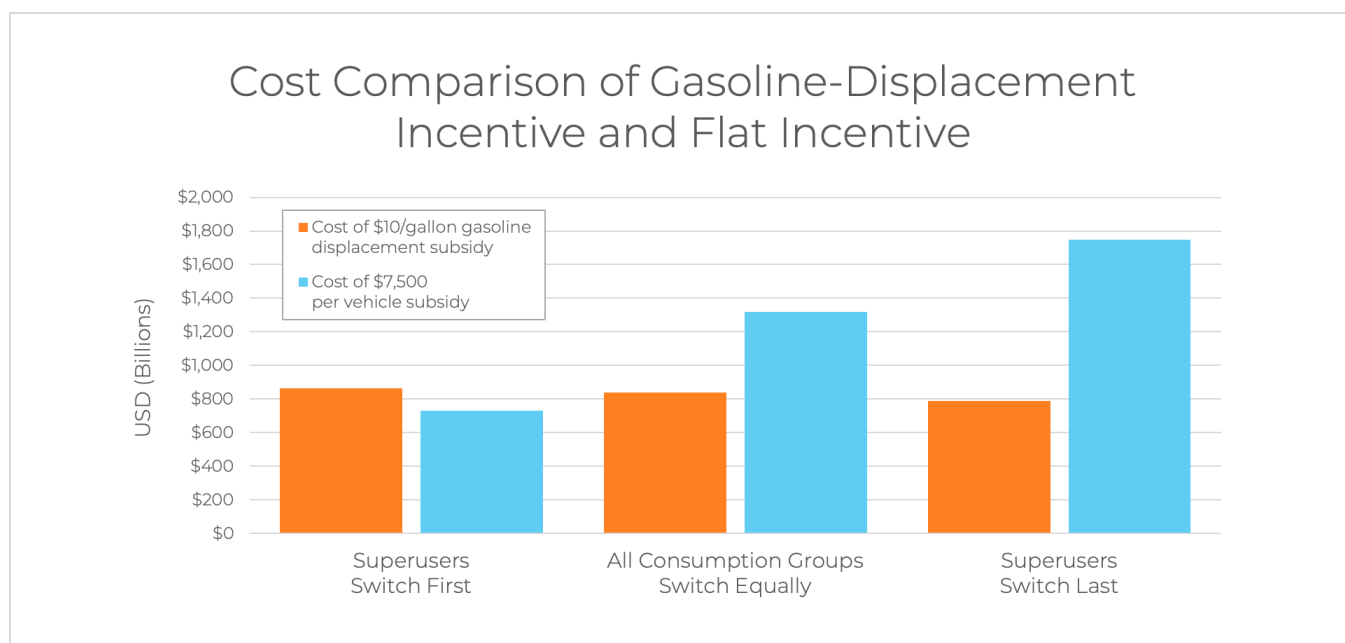


Figure 15: Comparison of total government cost of two incentive models in achieving 50% emissions cuts from light duty vehicles: a \$10 per gallon of gasoline displaced incentive and the current federal \$7,500 per EV tax incentive. Source: NHTS; Coltura Analysis

f. Broader Selection of Electric Trucks and SUVs

Superusers have not switched to EVs in part because of the lack of EV options for the types of vehicles superusers tend to drive — pickup trucks and SUVs. The arrival of the Ford F-150 Lightning, Tesla Cybertruck, Rivian R1T, and other large electric pickups and SUVs in the next few years will provide EV alternatives for the first time across the light duty vehicle types preferred by superusers. Superuser-targeted incentives will spur automakers to produce an even broader selection of electric models of these larger vehicles by providing an indirect incentive for them to do so. Superusers, in turn, will be more likely to switch to EVs if there is a broad selection of electric models that meet their needs. Moreover, trucks and SUVs are the most popular models of vehicles.²⁹ Having more electric models to select from will likely increase EV adoption among the general population as well.

g. Heightened Focus on the Harms of Gasoline

A gasoline displacement incentive would have the added benefit of tying gasoline consumption directly to climate and carbon reduction metrics — a connection infrequently made in current policy and climate discussions. It would raise awareness of the harms of gasoline and the benefits of making deep, rapid cuts in gasoline use.

B. Policy: Increase Charging Availability for Superusers

Superusers will need robust EV charging availability to make the switch to EVs. Because superusers drive three times more miles than the average driver, they will likely need to charge more frequently than average drivers. Some may be able to do all their charging at home, overnight. But those who travel distances exceeding their battery range in a single day or take long road trips will need easy access to high-speed charging. This will require increased public charging in areas with the highest concentration of superusers, often including along rural highways and small towns where the buildout of high-speed EV charging has been slower.

Superusers predominantly live in rural areas where single-family housing and easier access to home charging are the norm. Policymakers also should consider providing additional incentives to build out home charging capability.

C. Policy: Target Superusers with Marketing and EV Education

Misconceptions abound about EVs, particularly in communities with low EV penetration rates — including where many superusers are concentrated (See Figure 16). A strong marketing campaign is needed to dispel these misconceptions and convert superusers to EVs.

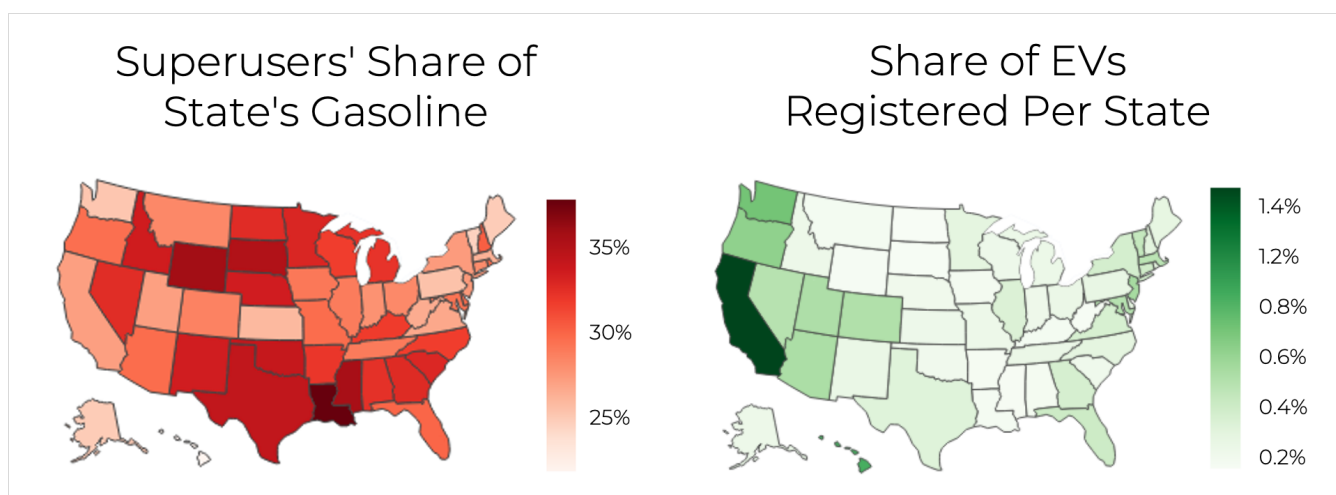


Figure 16: EVs are prevalent in areas where superuser density is relatively low, and EVs are relatively rare in superuser-dense areas. Sources: NHTS U.S. Dept. of Energy Alternative Fuels Data Center; Federal Highway Administration; Coltura Analysis

The rural, middle-income demographic of most superusers is culturally distinct from the urban, affluent demographic of most current EV drivers. Marketing strategies will need to consider these differences in targeting superusers, which may require study of superusers' beliefs and feelings about gasoline and electric cars and an understanding of cultural pathways necessary to accelerate the shift to EVs by people accustomed to heavy gasoline use.

Automakers can play an important role in marketing their EVs to superusers. Automakers would receive large, albeit indirect, benefits from a gasoline displacement incentive subsidizing the development of electric versions of their most profitable vehicle models. The consumer incentives proposed in this paper would strengthen incentives to the auto industry to increase marketing to the biggest users of gasoline.

D. Superuser Policies as Alternatives to Other Vehicle Emission Reduction Policies

1. Carbon Taxes

Both carbon taxes and gasoline displacement incentives put an economic value on carbon reductions. Carbon taxes disincentivize carbon emissions by putting a price on them. Gasoline displacement incentives also price carbon but function by paying people to displace pollution rather than taxing them for polluting. A \$10 per gallon gasoline displacement incentive is of roughly equal value to a \$100/ton carbon price.³⁰ In essence, a carbon tax *charges* drivers \$100 to emit a ton of carbon, and the \$10/gallon displacement incentive *pays* drivers \$100 not to emit a ton of carbon.

Both approaches allow for consumer choice. However, carbon taxes impose higher costs on individuals who pollute and are generally regressive in nature,³¹ while gasoline displacement incentives are paid for out of the overall federal tax base (which tends to fall less heavily on low-income people³²) or with public debt. The American public has demonstrated a strong preference for spending programs over taxes, as evidenced by large and growing federal budget deficits and a federal gas tax which has not increased since 1993.³³ Carbon taxes have largely fallen out of political favor.³⁴

Further, unlike gasoline taxes, which consumers pay in relatively small increments over time, gasoline displacement incentives are realized all at once by the recipient and thus may be more effective in motivating change.

2. Scrappage Policies

Over the years, proposals have been made for the federal and state governments to fund a program to scrap older, less efficient gas-powered vehicles — often referred to as “Cash for Clunkers.”³⁵ These scrappage policies offer incentives without regard to how much gasoline is displaced and without a design to attract superusers in particular. Even if superusers took advantage of the program, the gasoline-reduction impact would be relatively low if they scrapped their vehicles simply to purchase vehicles that are more efficient but still powered by gasoline.

By contrast, under the proposed gasoline-displacement incentive, the superuser must replace the gas-powered vehicle with an electric one. The proposed incentive program also allows the driver to trade in their gas vehicle rather than scrapping it. For superusers, even trade-ins of newer, fuel-efficient gas vehicles are likely to achieve significant gasoline-reduction benefits. A superuser's traded-in gas vehicle becomes available to the general pool of drivers who, on average, use less than half as much gasoline as superusers.

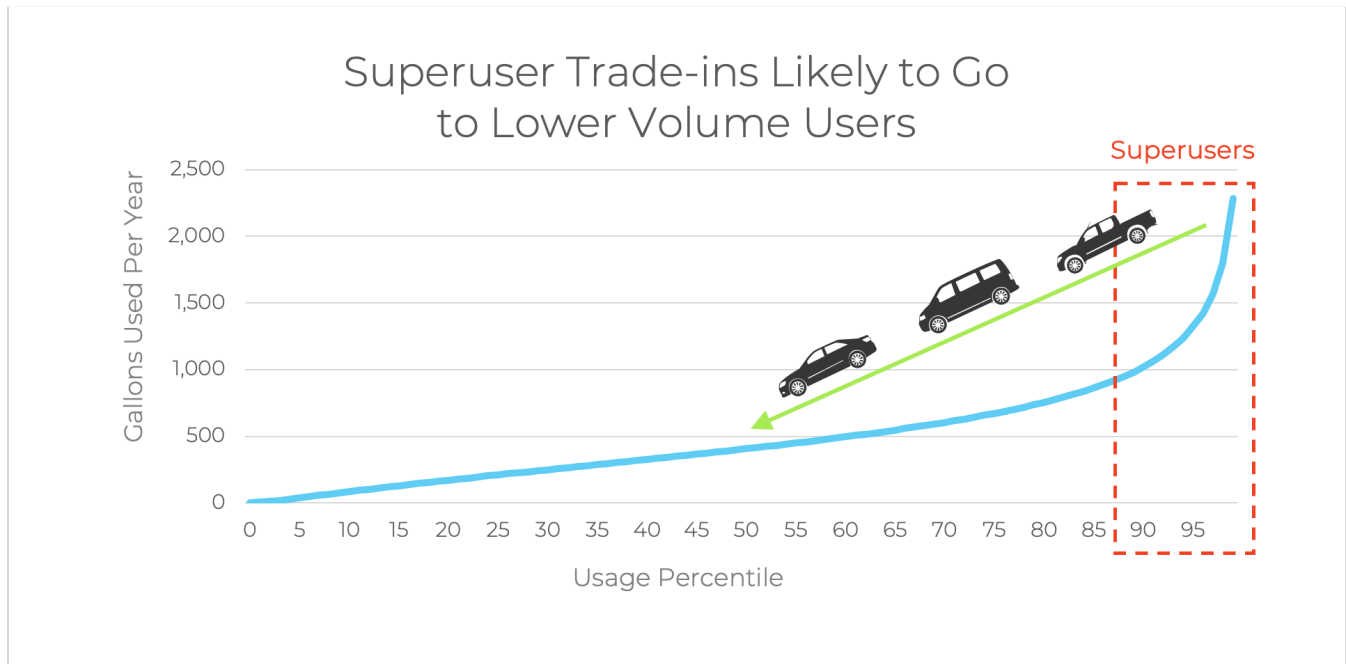


Figure 17: Superusers' traded-in vehicles tend to be acquired by drivers using less gasoline. Source: NHTS; Coltura Analysis

Moreover, to the extent superusers have newer gas vehicles, trading them in avoids wasting the emissions already created to manufacture them while still cutting the amount of gasoline they use by putting them into the hands of drivers who, on average, will drive them less.

Gasoline displacement incentives could also be paired with scrappage incentives to increase gasoline displacement even further. The pairing could be designed to get the older, least efficient gasoline-powered vehicles that are burning the most gasoline off the road. For example, the government could add an extra \$3 incentive to the \$10 incentive per annualized gallon displaced to people who scrap the oldest, most inefficient cars. Such an incentive would likely be disproportionately utilized by lower-income people, who tend to drive older cars.

E. Further Research and Data

The in-depth study of gasoline use is still in its infancy. To hasten the transition off gasoline, we must better understand the drivers who use the most gasoline, their driving and fueling patterns, vehicles, use cases, and demographics — the what, how, why, and where that makes them superusers.

We must also delve into their feelings and attitudes concerning gasoline and electric vehicles and the social, cultural, and psychological pathways and barriers involved in their conversion to EVs. Such studies should be approached from many disciplines, including economics, sociology, marketing, and cultural and ethnic studies.

CONCLUSION

Gasoline superusers are prize candidates for conversion to EVs. State and federal incentive programs can be revised to help these drivers afford EVs and motivate them to replace their gas vehicles with EVs.

An incentive based on gasoline displacement, better charging availability in superuser-dense communities, and improved EV education and marketing are crucial policy tools to move superusers to EVs and move the country towards meeting its climate goals.

ABOUT COLTURA

Coltura is a nonprofit working to improve climate, health, and equity by accelerating the transition from gasoline and diesel to cleaner alternatives. It focuses on changing gasoline supply, gasoline demand, and gasoline culture through innovative legal and policy pathways, media, and art. It is currently leading an effort to put states on a path to requiring vehicles of model year 2030 to be EVs. Learn more at www.coltura.org.

ABOUT THE AUTHORS

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APPENDIX

Rankings: Metro Area Superuser Concentration and Share of Metro Area Gasoline Consumption

	Metro Area	Percent of Superusers in Metro Area	Superuser Share of Metro Area Gasoline Consumption
1	Houston-The Woodlands-Sugar Land, TX	12.25%	36%
2	Detroit-Warren-Dearborn, MI	12.30%	36%
3	St. Louis, MO-IL	10.92%	36%
4	Charlotte-Concord-Gastonia, NC-SC	11.01%	35%
5	Virginia Beach-Norfolk-Newport News, VA-NC	9.86%	35%
6	Dallas-Fort Worth-Arlington, TX	11.42%	34%
7	Atlanta-Sandy Springs-Roswell, GA	11.02%	33%
8	San Antonio-New Braunfels, TX	10.93%	33%
9	Minneapolis-St. Paul-Bloomington, MN-WI	10.67%	33%
10	Kansas City, MO-KS	10.64%	33%
11	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	9.86%	32%
12	Miami-Fort Lauderdale-West Palm Beach, FL	9.20%	32%
13	Cincinnati, OH-KY-IN	10.75%	31%
14	Cleveland-Elyria, OH	10.03%	31%
15	Austin-Round Rock, TX	10.13%	30%
16	Riverside-San Bernardino-Ontario, CA	8.64%	30%
17	Boston-Cambridge-Newton, MA-NH	9.66%	30%
18	Tampa-St. Petersburg-Clearwater, FL	9.51%	30%
19	Rochester, NY	9.23%	29%
20	Providence-Warwick, RI-MA	8.88%	29%
21	Denver-Aurora-Lakewood, CO	8.09%	29%
22	Sacramento—Roseville—Arden-Arcade, CA	8.39%	28%
23	San Diego-Carlsbad, CA	7.71%	28%
24	Chicago-Naperville-Elgin, IL-IN-WI	8.90%	28%
25	Phoenix-Mesa-Scottsdale, AZ	7.97%	28%
26	Baltimore-Columbia-Towson, MD	9.92%	28%
27	Milwaukee-Waukesha-West Allis, WI	8.28%	27%
28	Raleigh, NC	9.04%	27%
29	Portland-Vancouver-Hillsboro, OR-WA	9.07%	27%
30	New York-Newark-Jersey City, NY-NJ-PA	8.06%	26%
31	Los Angeles-Long Beach-Anaheim, CA	6.87%	25%
32	Buffalo-Cheektowaga-Niagara Falls, NY	7.57%	24%
33	San Jose-Sunnyvale-Santa Clara, CA	6.51%	22%
34	Washington-Arlington-Alexandria, DC-VA-MD-WV	6.64%	22%
35	San Francisco-Oakland-Hayward, CA	5.52%	21%
36	Seattle-Tacoma-Bellevue, WA	5.13%	18%

Rankings: State Superuser Concentration and Share of State Gasoline Consumption

State	Percent of Superusers in State	Superusers' Share of State Gasoline Consumption
LA	14%	39%
WY	13%	37%
MS	15%	37%
SD	12%	36%
TX	12%	35%
OK	11%	35%
ID	11%	35%
NE	12%	35%
NM	9%	35%
MN	10%	34%
SC	12%	34%
GA	11%	34%
ND	10%	34%
NV	11%	34%
AL	12%	33%
MI	11%	33%
AR	11%	33%
KY	12%	33%
NC	11%	33%
WI	11%	33%
NH	10%	31%
FL	9%	31%
RI	9%	30%
AZ	9%	30%
MO	10%	30%
DE	9%	30%

State	Percent of Superusers in State	Superusers' Share of State Gasoline Consumption
OR	10%	30%
MD	10%	30%
IA	9%	30%
TN	10%	30%
IL	9%	30%
CO	8%	29%
MT	9%	29%
OH	10%	29%
CT	8%	29%
IN	10%	28%
NJ	10%	28%
NY	9%	28%
CA	8%	28%
UT	9%	28%
VA	8%	27%
WV	8%	27%
MA	8%	27%
KS	10%	26%
PA	8%	26%
WA	7%	26%
AK	8%	25%
ME	9%	25%
VT	8%	25%
HI	7%	22%
DC	6%	21%

ENDNOTES

1. The NHTS is a survey of 129,696 households across the U.S. conducted by the Federal Highway Administration between April 2016 and May 2017. Gasoline consumption, fuel efficiency, and the total number of vehicles on the road have held roughly stable since the survey was taken. The NHTS data is based on vehicles and households. Multiple individuals within a household drive some vehicles, and some individuals drive multiple vehicles, but the NHTS does not capture such usage with precision. This report assumes that each vehicle has only one driver, and each driver drives only one vehicle. The travel survey is available at <https://nhts.ornl.gov/>.
2. See *Summary for Policymakers of IPCC Special Report on Global Warming of 1.5 C Approved by Governments*, Intergovernmental Panel on Climate Change (Oct. 8, 2018), <https://www.ipcc.ch/2018/10/08/summary-for-policymakers-of-ipcc-special-report-on-global-warming-of-1-5c-approved-by-governments/>.
3. See *Fact Sheet: President Biden Sets 2030 Greenhouse Gas Pollution Reduction Target Aimed at Creating Good-Paying Union Jobs and Securing U.S. Leadership on Clean Energy Technologies*, White House (Apr. 22, 2021), <https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/>.
4. For purposes of this report, light duty vehicles are defined as four-wheeled vehicles with a weight under 10,000 pounds. See *Vehicle Weight Classes & Categories*, U.S. Dep't of Energy, <https://afdc.energy.gov/data/10380>, for discussion of light duty vehicle definitions, which vary by government department. Light duty vehicles cause 17% of U.S. carbon emissions: See *Green Vehicle Guide: Fast Facts on Transportation Greenhouse Gas Emissions*, U.S. Env't Protection Agency (June 2021), <https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions>.
5. Coltura's emissions calculations are available at <https://github.com/PROsler/Superusers>. They take into account upstream emissions from gasoline and electricity production but not EV manufacturing, for several reasons. First, estimates of the current carbon intensity of EV battery manufacturing vary enormously. See, e.g., Dale Hall and Nic Lutsey, ICCT 2018. *Briefing: Effects of Battery Manufacturing on Electric Vehicle Life-cycle Greenhouse Gas Emissions*, Int'l Council on Clean Transportation (Feb. 9, 2018), <https://theicct.org/publications/EV-battery-manufacturing-emissions>. Second, the future carbon intensity of EV battery manufacturing is hard to predict with certainty, given rapidly changing battery chemistry, manufacturing methods, and recycling technology. Third, EV batteries' function as energy storage devices, both during and after their service in an EV, is also relevant to the carbon accounting analysis.
6. See *Light Duty Vehicle, Short Wheel Base and Motorcycle Fuel Consumption and Travel*, Bureau of Transportation Statistics, <https://www.bts.gov/content/light-duty-vehicle-short-wheel-base-and-motorcycle-fuel-consumption-and-travel>; *Light Duty Vehicle, Long Wheel Base Fuel Consumption and Travel*, Bureau of Transportation Statistics, <https://www.bts.gov/content/light-duty-vehicle-long-wheel-base-fuel-consumption-and-travel>.

7. For annual car sales statistics, see *Total Vehicle Sales*, FRED (Jun. 2021), <https://fred.stlouisfed.org/series/TOTALSA>. For cars leaving the fleet, see *Motor Vehicles Scrapped*, Bureau of Transportation Statistics, <https://www.bts.gov/content/motor-vehicles-scrapped>.
8. Coral Davenport, *Here's How Biden Aims to Increase Electric Car Sales*, N.Y. Times (Jul. 2, 2021), <https://www.nytimes.com/2021/07/01/climate/biden-electric-cars-tailpipe-emissions.html>.
9. See Washington State's "Clean Cars 2030" legislation, passed by the legislature but vetoed by the governor in 2021. *Clean Cars 2030*, Coltura, <https://www.coltura.org/washington-clean-cars>.
10. See *Twelve U.S. States Urge Biden to Back Phasing Out Gas-Powered Vehicle Sales by 2035*, Reuters (Apr. 21, 2021, 4:26 AM), <https://www.reuters.com/business/twelve-us-states-urge-biden-back-phasing-out-gas-powered-vehicle-sales-by-2035-2021-04-21/>.
11. See <https://github.com/PROsler/Superusers> for Coltura analysis.
12. See *Annual Vehicle Miles Traveled in the United States*, Fed. Highway Admin. (Feb. 2020), <https://afdc.energy.gov/data/10315>.
13. In the U.S., 86% of commuters use their own car to get to and from work. See Felix Richter, *Cars Still Dominate the American Commute*, Statista (May 29, 2019), <https://www.statista.com/chart/18208/means-of-transportation-used-by-us-commuters>.
14. The scope of this paper is limited to the results of the NHTS pertaining to vehicles owned and operated by private households. It does not address medium and heavy duty vehicles, public fleets, corporate fleets, and rental car fleets. However, significant climate and financial benefits would result if gasoline and diesel displacement were prioritized for those vehicles as well.
15. Superusers can be identified by state motor vehicle databases that record odometer readings when vehicles are bought and sold or undergo a smog check.
16. For further explanation regarding "second cities," see *Assessing the Role of Urbanicity*, Claritas (2018), available at https://nhts.ornl.gov/assets/Assessing_the_Role_of_Urbanicity.pdf.
17. For a detailed discussion of the cost of ownership of vehicles by income group, see Gordon Bauer, Chih-Wei Hsu, and Nic Lutsey, *When Might Lower-Income Drivers Benefit From Electric Vehicles? Quantifying the Economic Equity Implications of Electric Vehicle Adoption*, (Int'l Council on Clean Transportation, Working Paper, 2021) available at <https://theicct.org/publications/EV-equity-feb2021>.
18. The demographics of NHTS survey respondents vary considerably from the U.S. census demographics. Of the households answering the NHTS, 86% were white, compared to 76% according to July 2019 census numbers. Blacks make up 13.4% of the U.S. population per the census but only 6% of NHTS respondents.
19. Annual gasoline consumption can be estimated by dividing miles traveled since a vehicle was purchased by its miles per gallon (MPG) rating issued by the U.S. Environmental Protection Agency (EPA) and the number of years it has been owned. For example, a vehicle with an EPA rating of 20 MPG that has traveled 100,000 miles during the five years it was owned would have an annual consumption of 1,000 gallons.
20. See Bauer et al., *supra* note 17.
21. Average cost for a full-size car in 2020 was \$36,487, full-size pickup \$41,424, and full-size SUV/crossover \$66,811. See Ben Luthi, *What is the Average Price for a New Car?*, Experian (Dec. 2, 2020), <https://www.experian.com/blogs/ask-experian/what-is-the-average-price-for-a-new-car/>

22. See, e.g., Jasper Jolly, *Electric Cars ‘as cheap to manufacture’ as Regular Models by 2024*, The Guardian (Oct. 1, 2020), <https://www.theguardian.com/environment/2020/oct/21/electric-cars-as-cheap-to-manufacture-as-regular-models-by-2024>.
23. See Elisabeth Behrmann, *Where We Are on the Road to Electric Vehicles*, Bloomberg (June 25, 2021), <https://www.bloomberg.com/news/articles/2021-06-26/where-we-are-on-the-road-to-electric-vehicles-quicktake?sref=JN1HDH2Z>.
24. One policy option to maximize emissions reductions from conversion to EVs would be to provide additional incentives to drivers who install rooftop solar or purchase an interest in a community solar program. A nine-kilowatt solar system would supply much of the electrical power needed for an average superuser’s EV. See Spencer Fields, *How Many Panels Do You Need for Your EV?*, EnergySage (Oct. 17, 2019), <https://news.energysage.com/how-many-panels-do-you-need-for-your-ev/>.
25. For discussion of relative maintenance costs for gas-powered vehicles and EVs, see Chris Harto, *Electric Vehicle Ownership Costs: Today’s Electric Vehicles Offer Big Savings for Consumers* (2020), available at <https://advocacy.consumerreports.org/wp-content/uploads/2020/10/EV-Ownership-Cost-Final-Report-1.pdf>.
26. *Id.*
27. See Bauer et al., *supra* note 17.
28. Because of the lack of reliable data on how gasoline displacement-based incentives motivate EV sales, it is difficult to predict the size of incentives required to motivate enough drivers to switch to EVs to achieve 50% emissions cuts. Historical experience is not a trustworthy guide because electric pickups and large SUVs are only now entering the market, charging availability is only now becoming widespread, and EV awareness, while increasing, is still low. For a comprehensive discussion of the difficulties of determining the path of EV adoption, see James E. Archsmith et al., *Future Paths of Electric Vehicle Adoption in the United States: Predictable Determinants, Obstacles and Opportunities* (Nat’l Bureau of Econ. Rsch., Working Paper No. 28933, June 2021).
29. Since the NHTS was completed in 2017, the percentage of light trucks has continued to increase throughout the entire vehicle fleet. In 2020, 76% of all new vehicles sold were light trucks, a category which includes pickups, SUVs, crossovers, and minivans.
30. The math is as follows: 1 metric ton is equal to 2,204 pounds. 1 gallon of gasoline emits 25 pounds of CO₂. 110 gallons of gasoline emit 2,750 pounds of CO₂. Therefore, a price of \$100/ton of CO₂ is roughly equal to \$1.20 per gallon of gasoline. Given that the carbon reduction benefits of an electric vehicle will likely accrue for 8+ years, the \$10 per gallon gasoline incentive and the \$100/metric ton carbon tax are quite close in their valuation of carbon. For similar calculations, see Ed Hirs, *What Will an American Carbon Tax Cost You?*, Forbes (Jul. 21, 2020, 9:28 AM), <https://www.forbes.com/sites/edhirs/2020/07/21/what-will-an-american-carbon-tax-cost-you/?sh=1e82d5346c76>.
31. See, e.g., William A. Pizer and Steven Sexton, *The Distributional Impacts of Energy Taxes*, Rev. Env’t Econ. & Pol’y, 2019, vol. 13, no. 1, at 104-123.
32. See, e.g., David Splinter, *US Tax Progressivity and Redistribution*, Nat’l Tax J., 2020, vol. 73, no. 4, at 1005-1024.
33. See, e.g., Marianne Lavelle and Judy Fahys, *The Petroleum Industry May Want a Carbon Tax, but Biden and Congressional Republicans are not Necessarily Fans*, InsideClimateNews (Mar. 8, 2021), <https://insideclimatenews.org/news/08032021/carbon-tax-biden-gina-mccarthy-api-petroleum-industry-ceraweek/>; Frederick Hewett, *Putting a Price on Carbon: It Was Hot, Now It’s Not*, WBUR

(Aug. 3, 2020),

<https://www.wbur.org/cognoscenti/2020/08/03/carbon-pricing-tax-climate-change-policy-fred-erick-hewett>.

34. See, e.g., Theodore J. Kury, *The Gas Tax's Tortured History Shows How Hard it is to Fund New Infrastructure*, *The Conversation* (June 22, 2021), <https://theconversation.com/the-gas-taxs-tortured-history-shows-how-hard-it-is-to-fund-new-infrastructure-163152>,
35. See, e.g., Sean Szymkowski, *Electric 'Cash for Clunkers' Plan Revs Up Following Remarks from Chuck Schumer*, *CNET* (Mar. 17, 2021), <https://www.cnet.com/roadshow/news/electric-cash-for-clunkers-chuck-schumer-president-bid-en/>; Andrew J. Hawkins, *Chuck Schumer Wants to Replace Every Gas Car in America with an Electric Vehicle*, *TheVerge* (Mar. 17, 2021, 11:23 AM), <https://www.theverge.com/2021/3/17/22334634/schumer-electric-vehicle-swap-discount-infrast-structure-interview>.