



June 2021



**Teri Viswanath**

*Lead Economist  
Power, Energy and Water*



## Co-op EVolution – Bridging the Rural-Urban Divide on EV Adoption

### Key Points:

- Given new commitments by car manufacturers, expanded policy incentives, and ambitious build-out of charging infrastructure, electric vehicles could make up 10% of all new car sales by 2025 – a five-fold increase from current levels.
- Several factors will help rural communities close the EV adoption gap with urban cities. Cost savings over the life of most EVs is greater for rural communities, the sticker price is coming down, and the variety of mainstream car models is expanding. By mid-decade, 2% to 5% of all new car sales in rural communities could be electric.
- From a grid management perspective, the amount of electricity the U.S. consumes will no doubt increase with greater EV adoption, up to 38% by one estimate. However, many regions already have sufficient generation capacity if vehicles are charged during off-peak hours.
- With 80% or more of EV re-charging taking place at home, rural electric cooperatives will play an influential role preparing for membership adoption. Proactive steps might include membership education programs, closer collaboration with local dealerships, EV purchase and charging incentives, building public charging infrastructure closer to work places, and assisting in transitioning public service fleet vehicles.



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# Introduction

About every two years, CoBank has assessed market conditions to understand whether a shift in consumer behavior might lead to greater electric vehicle (EV) adoption for rural communities. In 2017, we predicted that EV adoption rates in urban and suburban areas would far outpace those of rural areas. At that time we felt this trend would persist for the better part of the next decade, keeping adoption rates near zero for these communities. We reassessed the market in 2019 through the lens of vehicle to grid integration, but still found conditions largely unchanged to radically shift our original assessment.

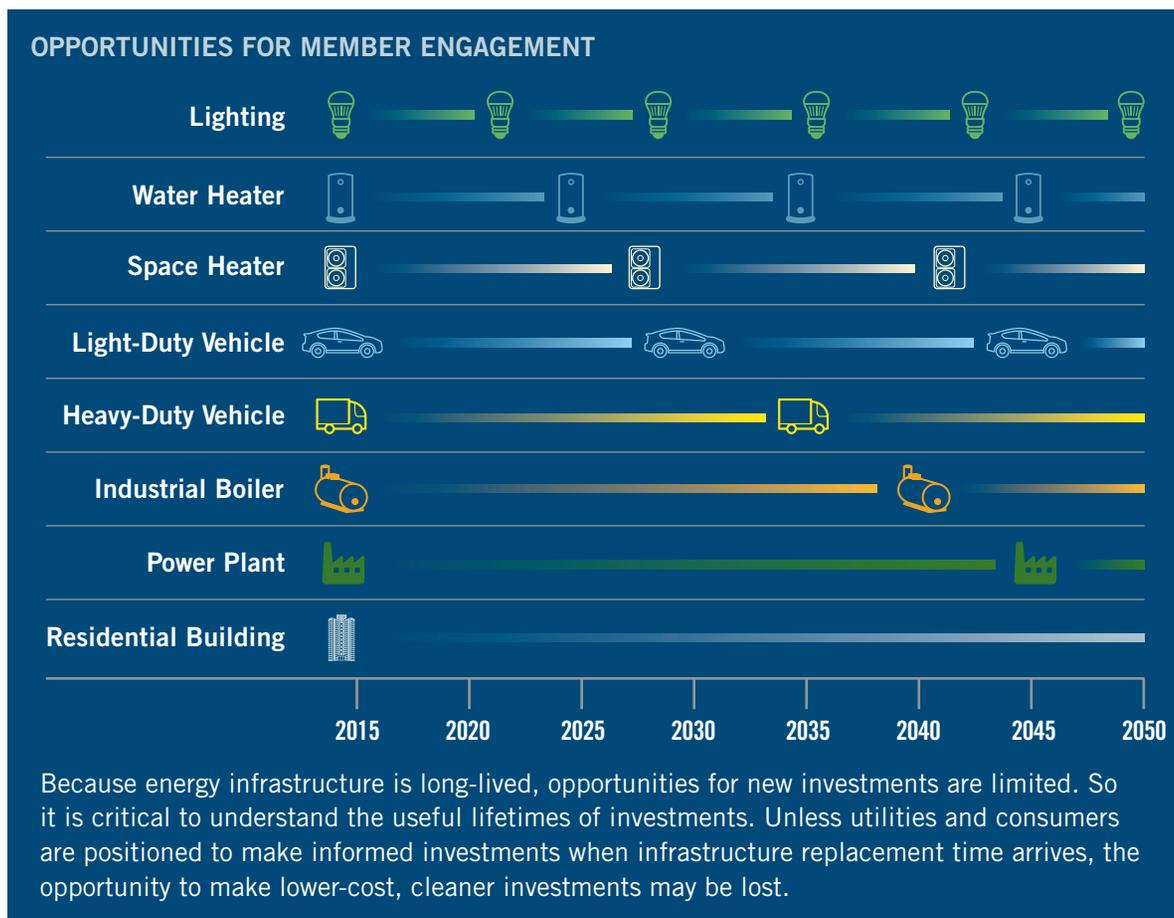
Taking stock of the major obstacles to rural adoption today – initial cost of ownership, model availability, barriers to re-charging, and range – we see a much different landscape. The unveiling of the new Ford F-150 Lightning has in no small way improved the odds that rural Americans might be swayed to acquire their first EV. With Ford’s announcement that the most popular vehicle in America is going electric (followed by similar messages by automakers of other popular, top-selling trucks), the chances that rural communities will begin to bridge the adoption gap looks increasingly possible. The F-150 Lightning has greater functionality than its gasoline-fueled legacy, an aggressive entry-level price, an extended range of about 300 miles, and expanded re-charging options. Ford’s unveiling feels like a game-changer.

An initial assessment by the *Farm Journal* noted half the farmers surveyed will remain on the sidelines, though proven performance out of the gate might sway others toward adoption. Indeed, given new commitments by car manufacturers, expanded policy incentives, and a build-out of charging infrastructure, rural transport electrification is becoming a reality.

## Time for Rural Electric Co-ops to Prepare for EVs

Major household purchases can occur abruptly, and under stressful conditions. A furnace or air-conditioner breaks down in the height of winter or summer, or a high-mileage car dies and now must be replaced overnight. Because household investment in energy infrastructure is long-lived and the window of opportunity is short, it is critical that electric cooperatives inform and educate consumer members about their options before a replacement decision arrives.

The replacement period for the average U.S. car has increased over the past decade and is now approaching 12 years. That means most adult drivers will replace their vehicles only three to five times. As Brian Sloboda from NRECA advises, “From a distribution engineering perspective, from a member engagement perspective, it’s about planning, having that plan, executing the plan, and then changing the plan as this fast-moving road of EVs continues to evolve.”



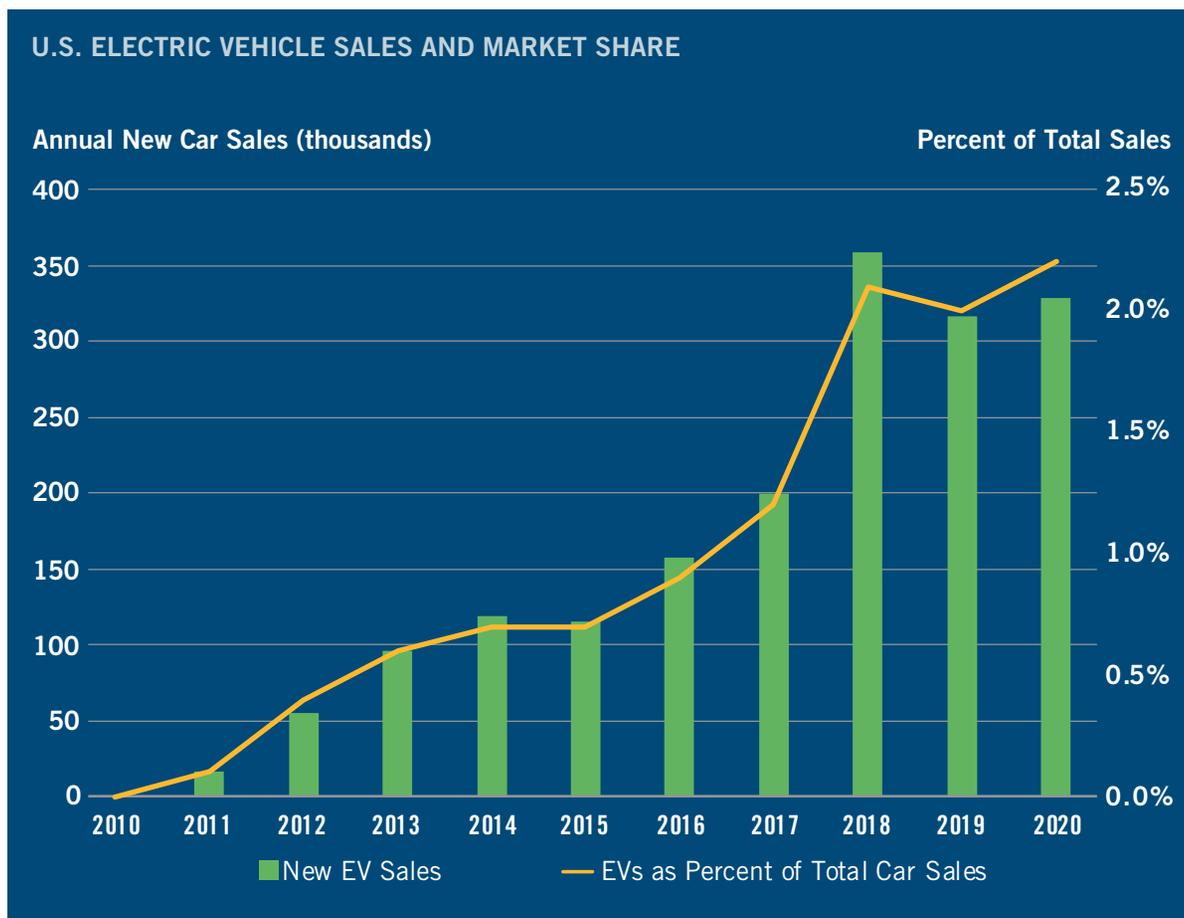
Source: Regulatory Assistance Project, *Beneficial Electrification: Ensuring Electrification in the Public Interest*, June 2018.

## EV Market Share is Growing

Electric vehicle sales have steadily increased over the past decade, from nearly non-existent in 2010 to 328,000 in 2020. Despite declining sales for the first nine months of 2020, fourth quarter sales ensured a 4% year-over-year increase. This is striking, in that total vehicle sales in the nation fell 14.6% from previous year levels. Further, analysts point to more important developments that might make 2020 a watershed year in hindsight.

Last year, California, New Jersey and Washington set policies to curb tail-pipe emissions with the aim of ending the sale of gasoline fueled light-duty vehicles. At the same time, several major automakers shifted toward electric vehicle manufacturing and more than half of Americans are now seriously considering electric vehicle adoption.

All told, the momentum suggests accelerated consumer adoption.

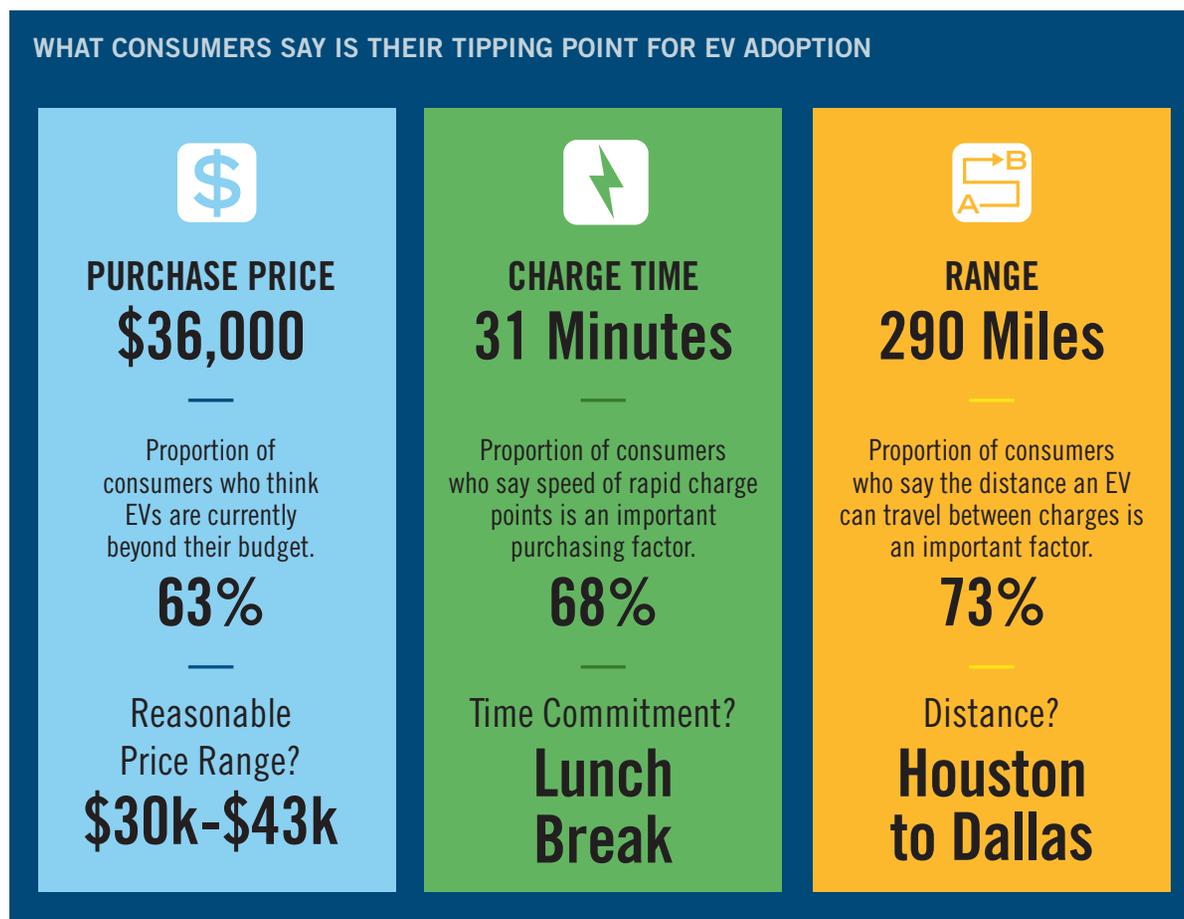


Source: EV-Volumes

## Consumers Are Concerned About Price, Charging Time, and Range

Endless surveys over the past several years attempted to pinpoint the reasons why Americans are not rushing out to buy electric vehicles. The Castrol 2020 survey pointed to three major categories: an entry purchase price that is just out of reach for most buyers, the amount of time to recharge a vehicle, and limited driving range.

The Castrol survey found that between \$30,000 and \$43,000 is the reasonable price range for most consumers in the market for a new electric car. The breaking point in patience for re-charging that car, while away from home on the road, is about 30 minutes or the time it would take for a quick lunch break. To overcome consumers' range anxiety, a full charge would need to enable 300 miles of travel, or the distance between Houston and Dallas. According to that survey and many others, Americans aren't completely turned off by electric cars but they are waiting for these vehicles to meet a few minimum requirements.

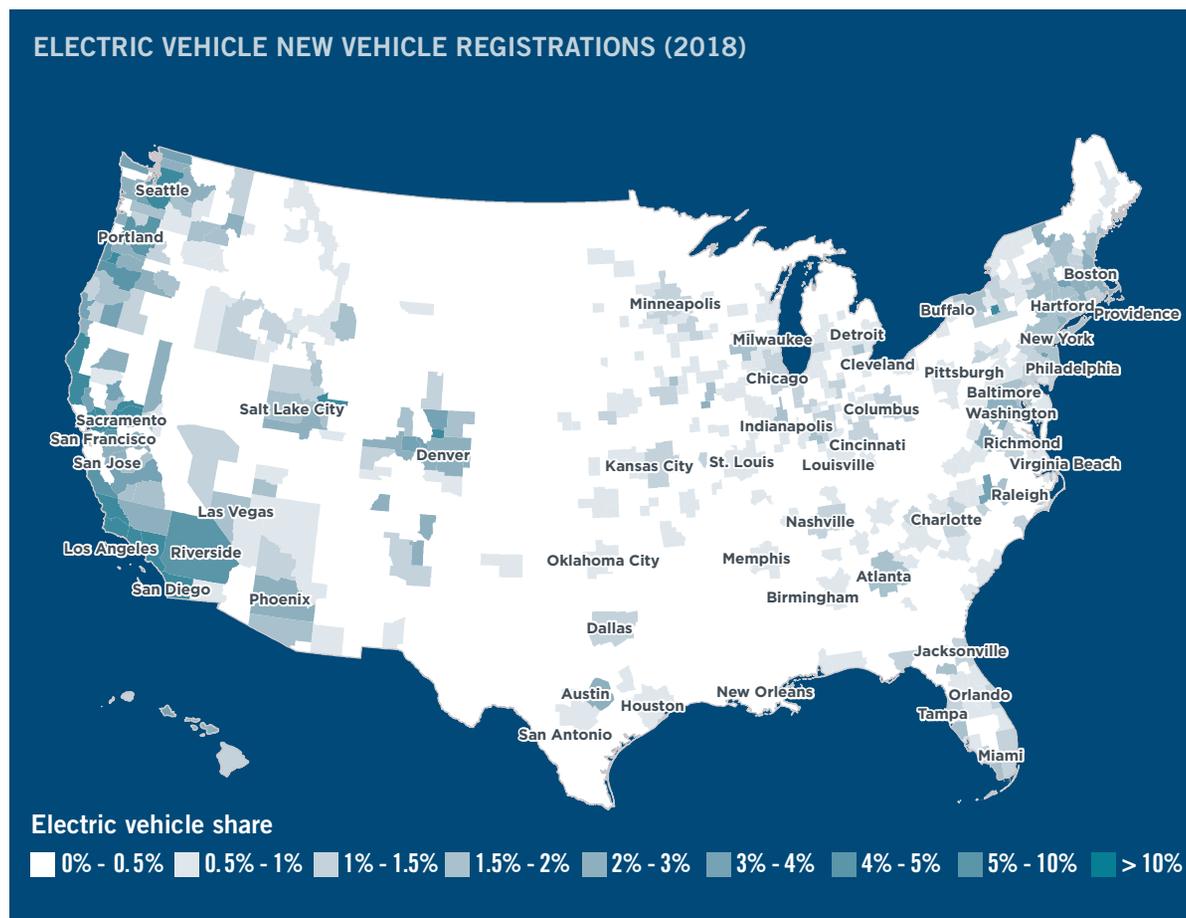


Source: Castrol EV Survey, 2020

## What's Driven Electric Vehicle Adoption?

The International Council on Clean Transportation (ICCT) took a close look at U.S. communities with high electric vehicle adoption rates, noting three important commonalities for that increased ownership: a greater availability of vehicle options, financial incentives to help reduce upfront acquisition cost, and greater access to charging stations to relieve possible range anxiety.

ICCT noted that the top five markets for U.S. electric vehicle sales had at least 25 electric models available compared to more than half the country with access to fewer than 12 models. The top 10 markets also had state incentives, typically worth \$2,000 to \$5,000, to lower the overall cost of buying the electric vehicle. Lastly, looking beyond the west coast to other major metropolitan areas (including Austin, Boston, Denver, Hartford, New York, Phoenix, and Washington D.C.), the agency noted that these cities can boast of 450 public chargers per million population.

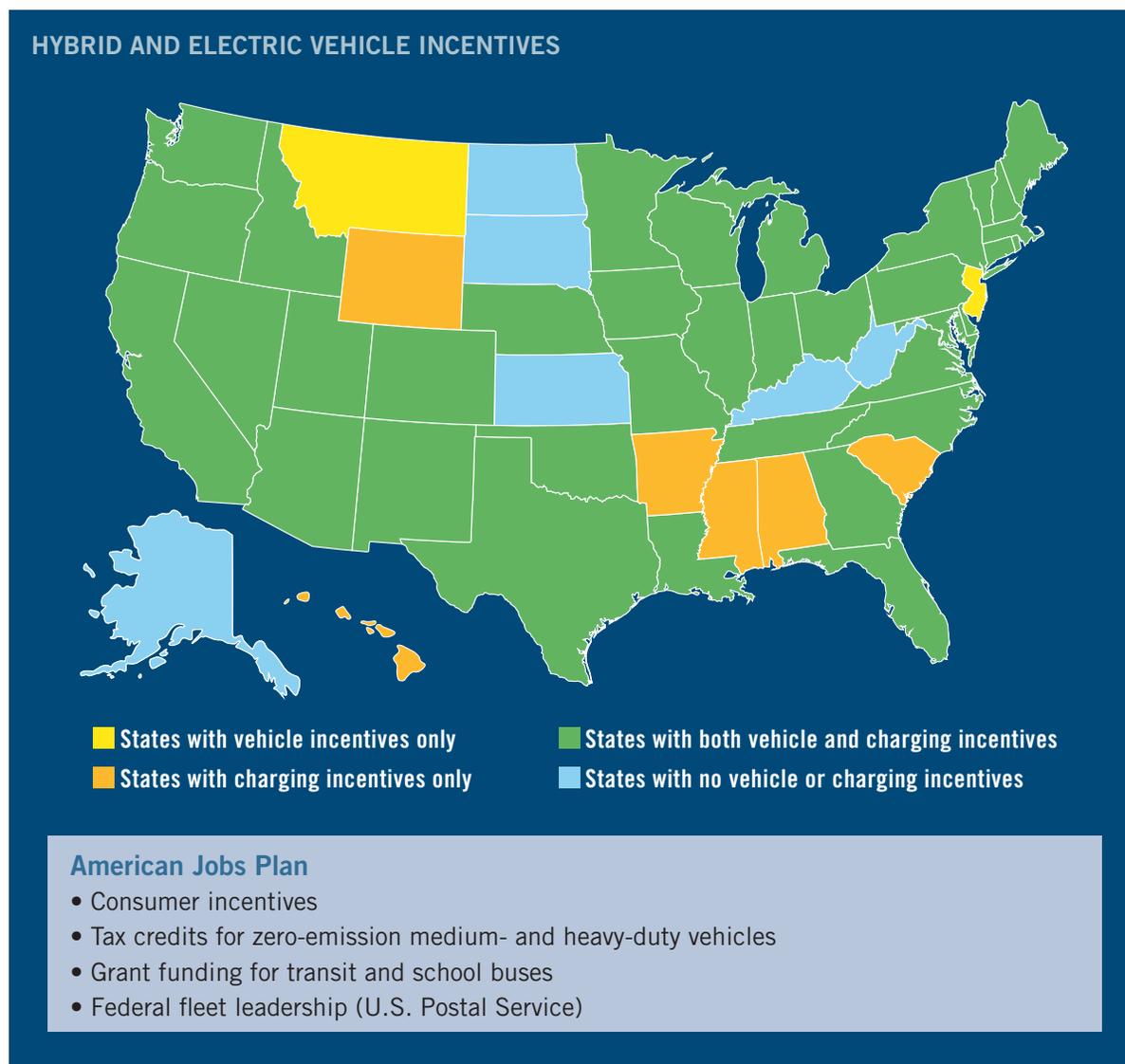


Source: The International Council on Clean Transportation (ICCT)

## Federal, State and Local Incentives Drive Down Prices

One major factor driving down the purchase price of a new electric vehicle is incentives. The plug-in electric drive motor vehicle credit was originally enacted in the Energy Improvement and Extension Act of 2008, providing a tax credit for eligible passenger vehicles and light trucks. The credit begins to phase out for a manufacturer's vehicles when at least 200,000 qualifying vehicles have been sold. While the greater share of consumer offsets occur at the federal level, 45 states and the District of Columbia also provide incentives, either through a specific utility operating in the state or through state legislation.

More recently, Biden's American Jobs Plan has outlined a more expansive program to encourage even greater adoption. It would change the existing tax code to expand the number of vehicles qualifying for credit. As taken up by the Senate, the program would phase out over three years once 50% of U.S. passenger vehicle sales were EVs. Also, the value of the credit increases if the car is manufactured in the U.S., and even more so if the workers who make the car are unionized. In total, the value of the credit could reach up to \$12,500 for some consumers.

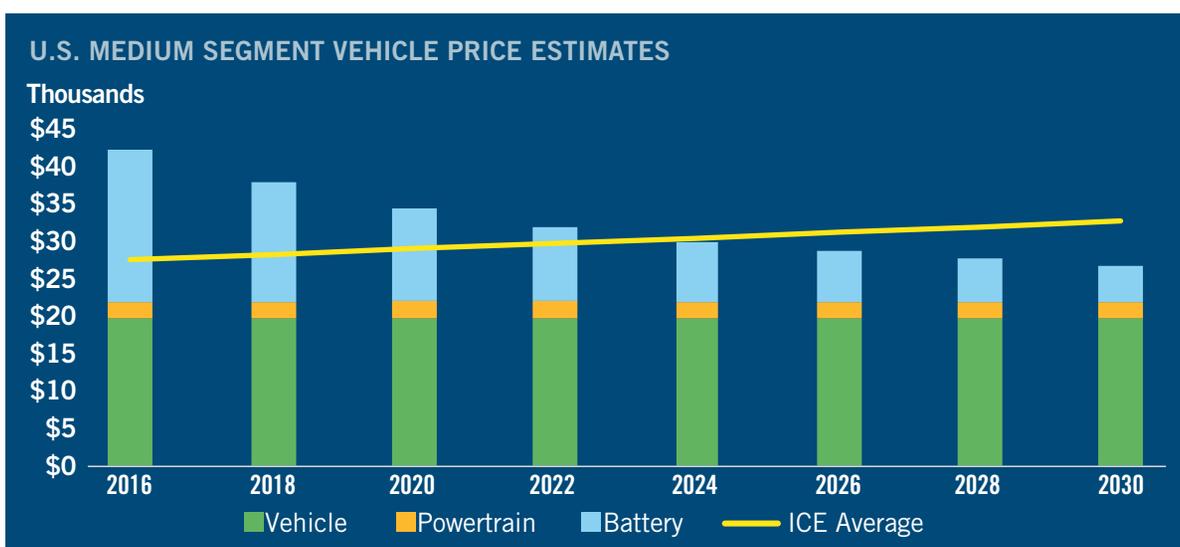


Source: Eco-Engineers

## Falling Battery Costs Enable EVs to Reach Parity

While recent proposals could keep consumer subsidies in place through the next decade, more directly, the shrinking costs of technology could lower the sticker price. Battery prices are dropping faster than expected, with analyst projections of reaching price-parity (when an electric vehicle won't need government subsidies to be cheaper than a gasoline model) within just a few years. The average price paid for all new cars in the U.S. in the fourth quarter of last year crossed over \$40,000 for the first time.

Yet, the real key to EV cost savings is to increase energy density for the battery technology. Battery prices represent one of the biggest costs for electric cars, but that cost has plummeted over the past decade. According to the latest forecast from BloombergNEF (BNEF), the price of a lithium-ion battery pack has fallen 89% in real terms from \$1,183/kWh in 2010 to \$135/kWh in 2020. Ahead of Tesla's planned 'Battery Day' last September, Elon Musk has suggested the U.S. electric carmaker may be able to mass produce batteries with 50% more energy density in just 3 to 4 years, potentially halving battery costs by 2025.

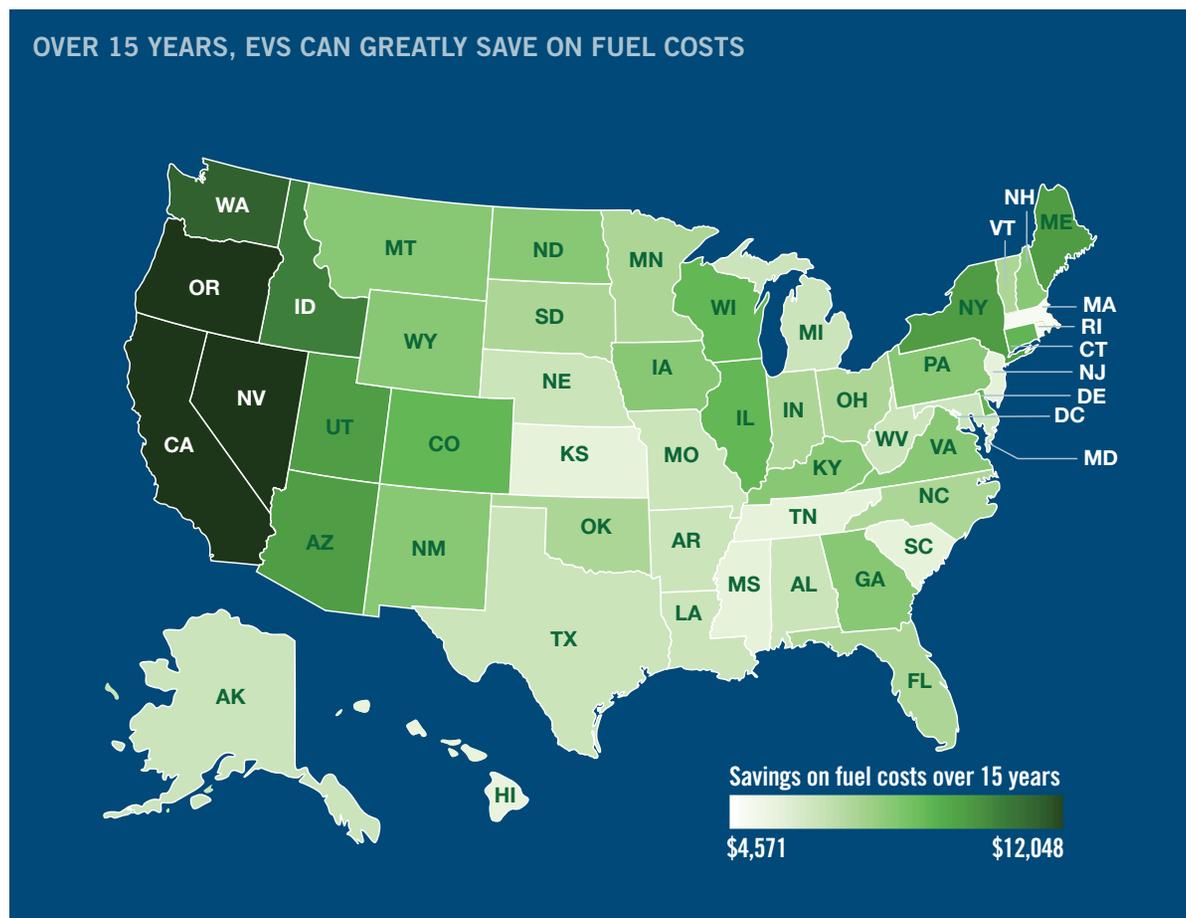


Source: NRECA, BloombergNEF, "Electric Cars to Reach Price Parity by 2025", 23 June 2017

## EV Fuel Savings Over Vehicle Life Nearly \$8,000

The best-selling electric vehicle in the country, the Tesla Model 3, has a starting MSRP of \$39,490, which is roughly comparable to the average new car price paid in 2020. However, fuel and maintenance costs of car ownership add up to even more than the original investment. New analysis conducted by researchers at the DOE's National Renewable Energy Laboratory and Idaho National Laboratory found motorists can save as much as \$14,500 on fuel costs over 15 years by driving an electric vehicle instead of the gasoline-fueled alternative.

The new governmental research makes a deep-dive assessment of state-level costs associated with EV charging (considering when, where, and how a vehicle is charged) and then compares the cost of charging against the price of gasoline to estimate total fuel cost savings over a vehicle's lifetime. On average, most consumers can expect to save nearly \$8,000 in fuel costs over the useful life of an electric vehicle.

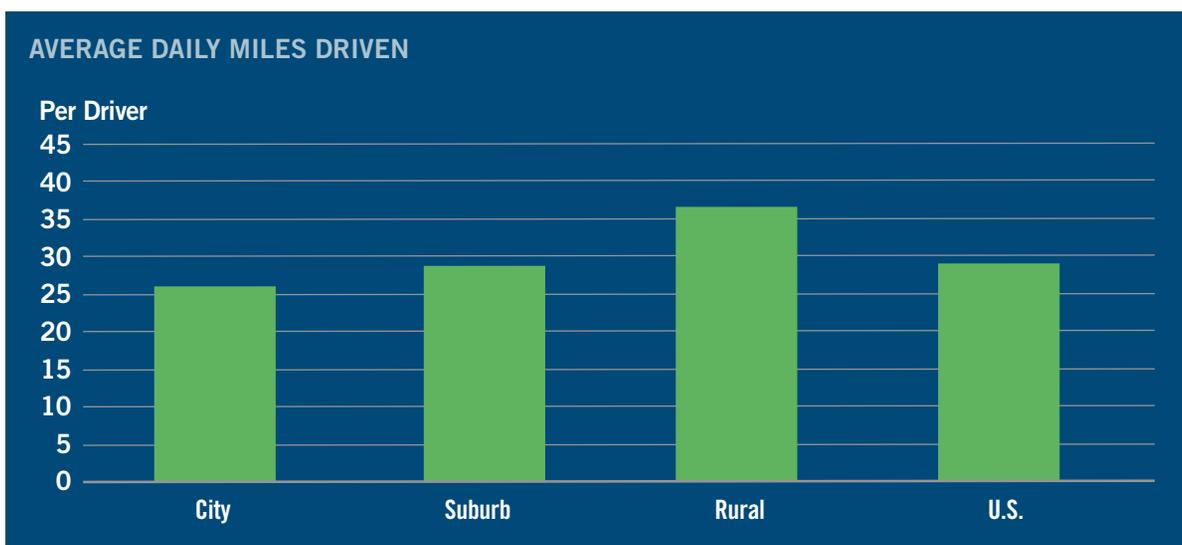
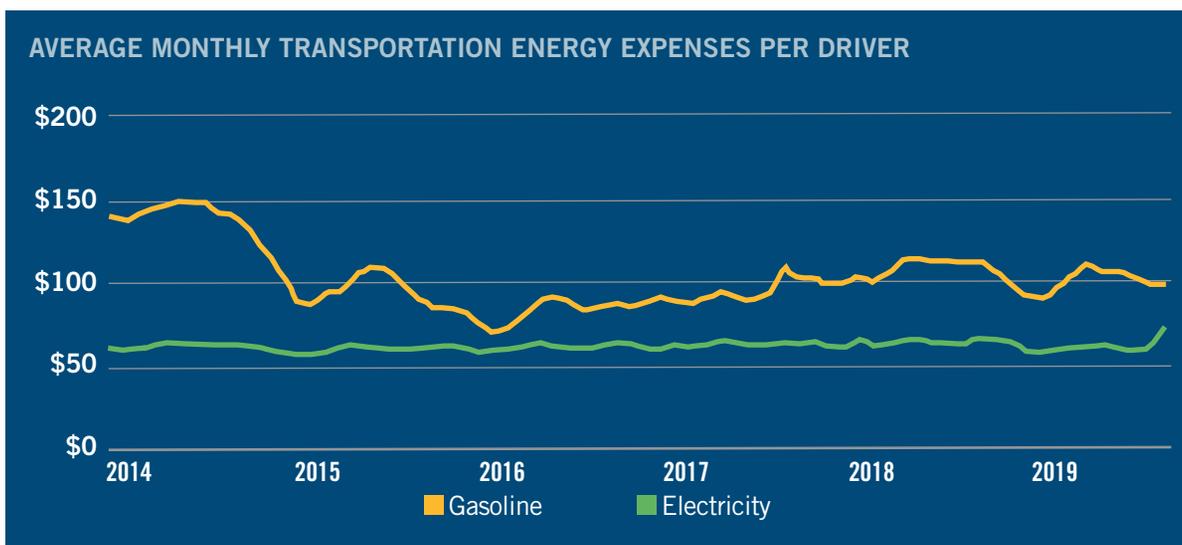


Source: NREL, "Levelized Cost of Charging Electric Vehicles in the United States," 2020.

## Rural Factors Amplify EV Cost Savings, Convenience

Fuel costs – and savings on them – have a bigger impact on consumers living in rural communities compared to urban drivers. Drivers living in rural areas tend to drive an average of 10 more miles a day than those who live in cities, according to the most recent National Household Travel Survey.

A recent study conducted by M.J. Bradley & Associates affirms that the typical rural driver would spend anywhere from \$1,900 to \$2,800 less every year on an electric vehicle compared to a comparable gasoline car. The consultancy noted that rural residents tend to spend more of their income on gasoline – which means bigger benefits from adopting an electric vehicle instead. Moreover, rural residents are more likely than urban residents to live in single-family homes, improving their ability to charge their own vehicles and possibly encourage continued future electric vehicle purchases. One of the more compelling factors associated with limited studies on discontinuance – that is, EV buyers switching back to gasoline-fueled cars – relates to charging convenience, with apartment dwellers more apt to revert than single-family homeowners.

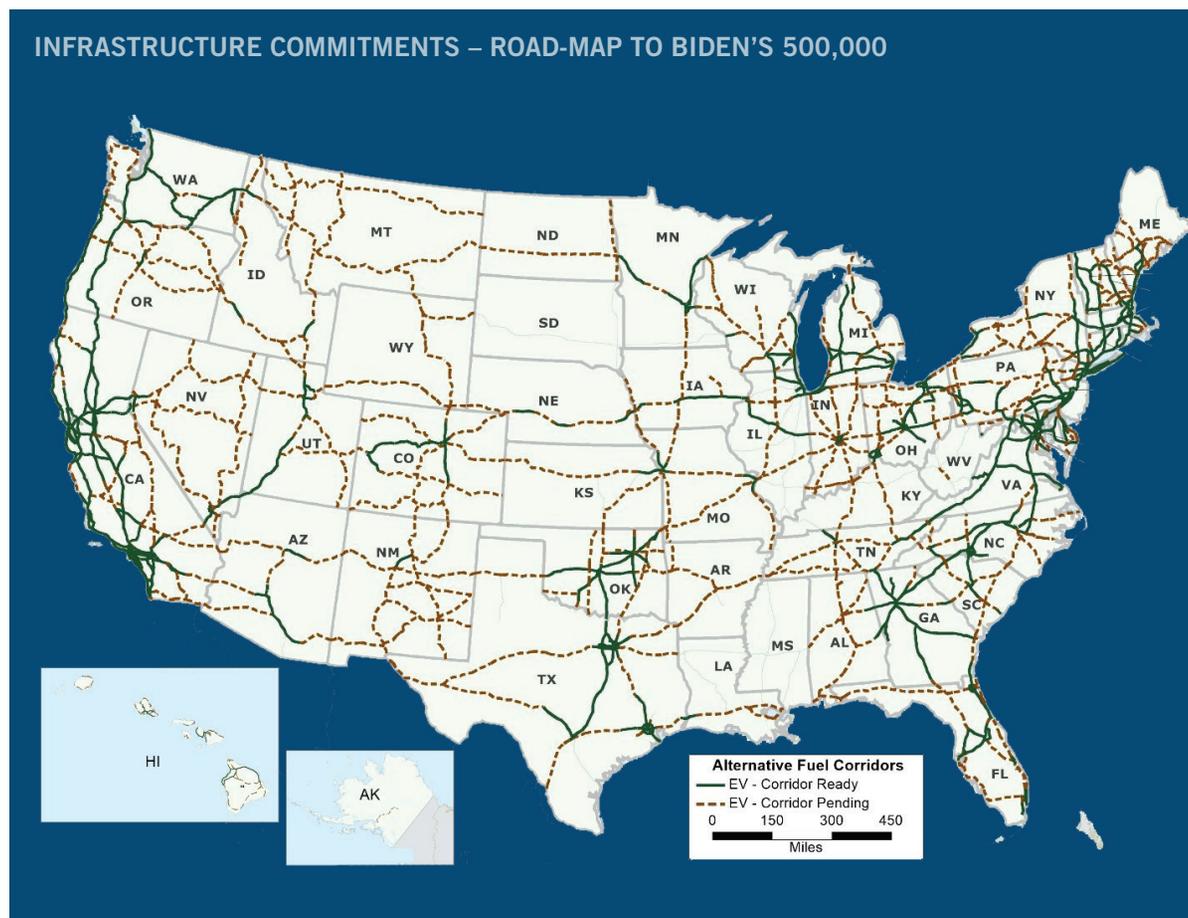


Source: Drive Electric Vermont (Cost of EV Ownership), DOE, and Federal Highway Administration (FHWA) 2009 figures.

## The Plan to Have Charging Stations “Everywhere”

According to the U.S. Department of Energy (DOE) most EV drivers do more than 80% of their charging at home. The cost to charge the typical electric vehicle, over the course of a year, can be less than running an air conditioner. Or, according to General Motors an average 2,520 kWh per year for the Chevy Volt, which is less than required for a typical water heater. Yet, putting affordability aside, the biggest remaining obstacle to ownership is the concern of running out of power.

According to the DOE's Alternative Fuels Data Center, there are 42,440 U.S. public charging stations, with one-third concentrated in California. President Biden has proposed spending at least \$15 billion to increase the number of charging stations twelve-fold, with the goal of reaching 500,000 nationwide by 2030. By comparison, the National Association of Convenience Stores reports that there are slightly more than 150,000 gasoline-fueling stations.



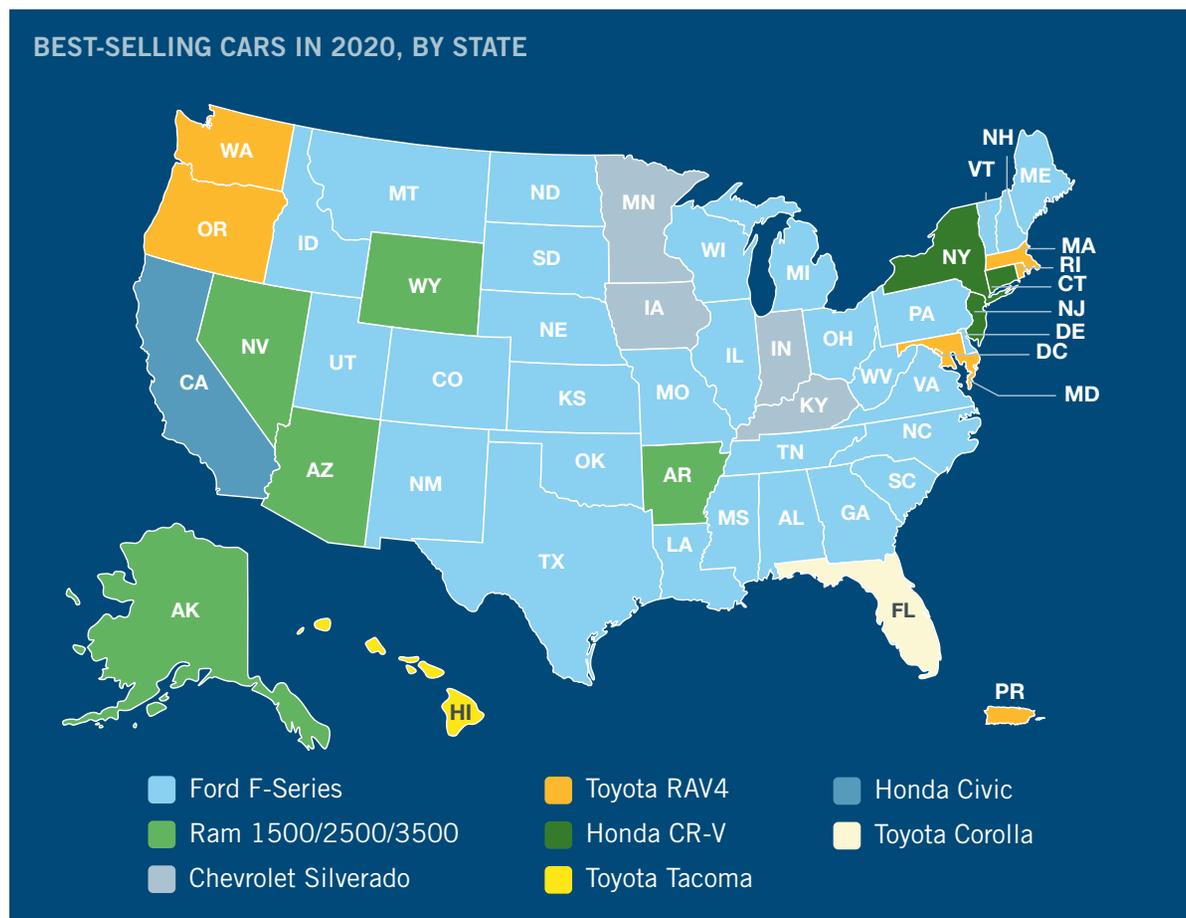
Source: White House, Biden Administration Advances Electric Vehicle Charging Infrastructure, April 2021.

## Equivalent Vehicle Model Choice Matters

Another prerequisite for wider EV adoption is the availability of vehicles that most consumers would want to drive.

The ICCT study showed that greater availability of electric models can shift consumer behavior. But which models, and will they increase adoption in rural communities? Surprisingly, most buyers will likely opt for one of the 10 most popular vehicles, no matter where they live. The Ford F-Series is not only the top-selling model in more than 30 states, it has reigned as America's best-selling truck for 40 straight years and the best-selling vehicle for 35 years in a row.

Thus far, the lack of diverse EV model options has limited the appeal of ownership for rural Americans – especially as data shows drivers in rural areas are more likely to own medium- and heavy-duty pickup trucks. However, Ford's introduction of the F-150 Lightning will likely prove a game-changer for rural drivers who never before would have considered buying an EV.



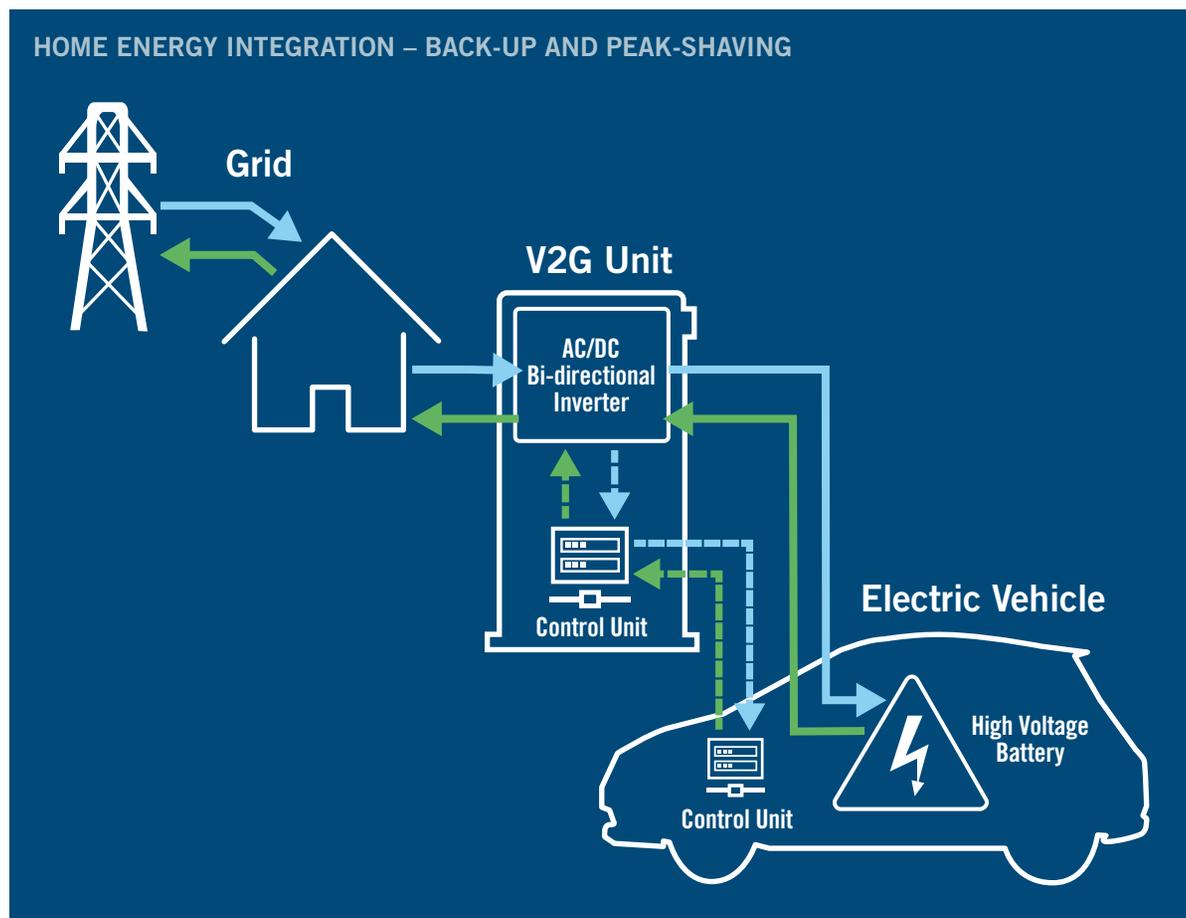
Source: Edmunds, *Most Popular Cars in the U.S., 2020*

## Ford F-150 Lightning Clears EV Hurdle Plus Delivers Back-up Battery Power

From the perspective of cost, brand appeal, a quick charge and extended range, the Ford F-150 Lightning checks all of the boxes. Priced below \$40,000 with a range of 300 miles on a full battery, the vehicle targets mainstream consumers already loyal to the brand. Moreover, the new F-150 provides a timely solution for commercial fleets contemplating a switch to electric vehicles as companies face increased shareholder pressure and possibly imminent zero-emission regulations.

Additionally, Ford delivers a mainstream bi-directional car charger, or what's known as vehicle-to-building charging. Its extended-range battery can restore full-home power for up to three days, or as long as 10 days if power is rationed.

Tesla, which has dominated the domestic EV market, also makes a separate Powerwall backup battery system for homes, but has yet to incorporate that functionality into its vehicles. By combining the two technologies at an affordable price, Ford is positioned to become the pacesetter for the industry.

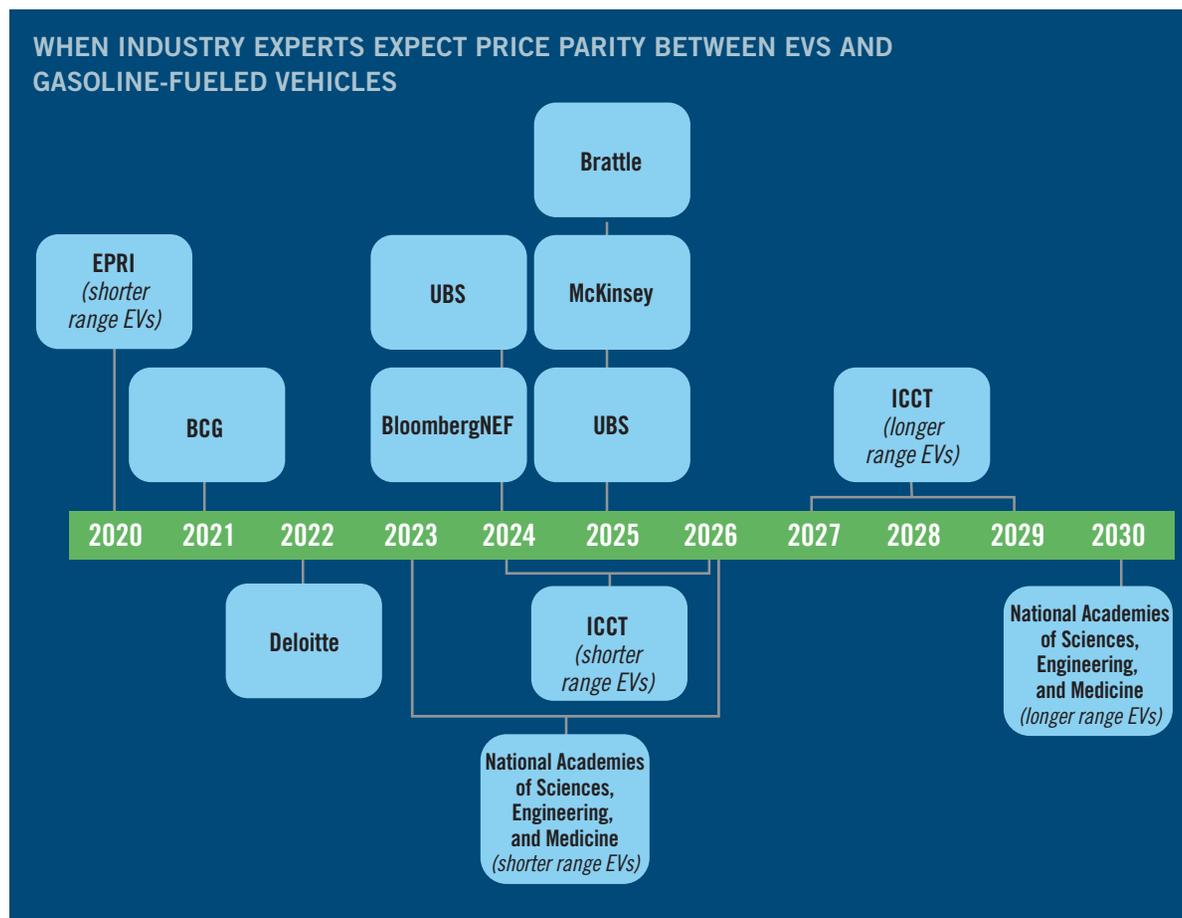


Source: Ford Motor Company and Sunrun

## Lower Cost EVs Accelerate Adoption

The single leading factor that discourages potential electric car buyers is the upfront cost. Expanded government incentives make these vehicles far more affordable, likely even cheaper than their gasoline-fueled equivalent. Moreover, with analysts predicting that price parity will be achieved at some point in the mid-2020s, acquisition costs could fall further.

Given a horizon of increasingly affordable vehicles and ambitious build-out of the charging infrastructure, electric vehicles could make up 10% of all new car sales by 2025 according to updated analyst consensus – a five-fold increase from current levels. With total ownership savings over the life of most EVs greater for rural owners, plus falling sticker prices and an expanding variety of mainstream models, the adoption gap with urban areas could begin to close. Notably, in the next 5 years we see adoption taking hold in fresh areas of the market.

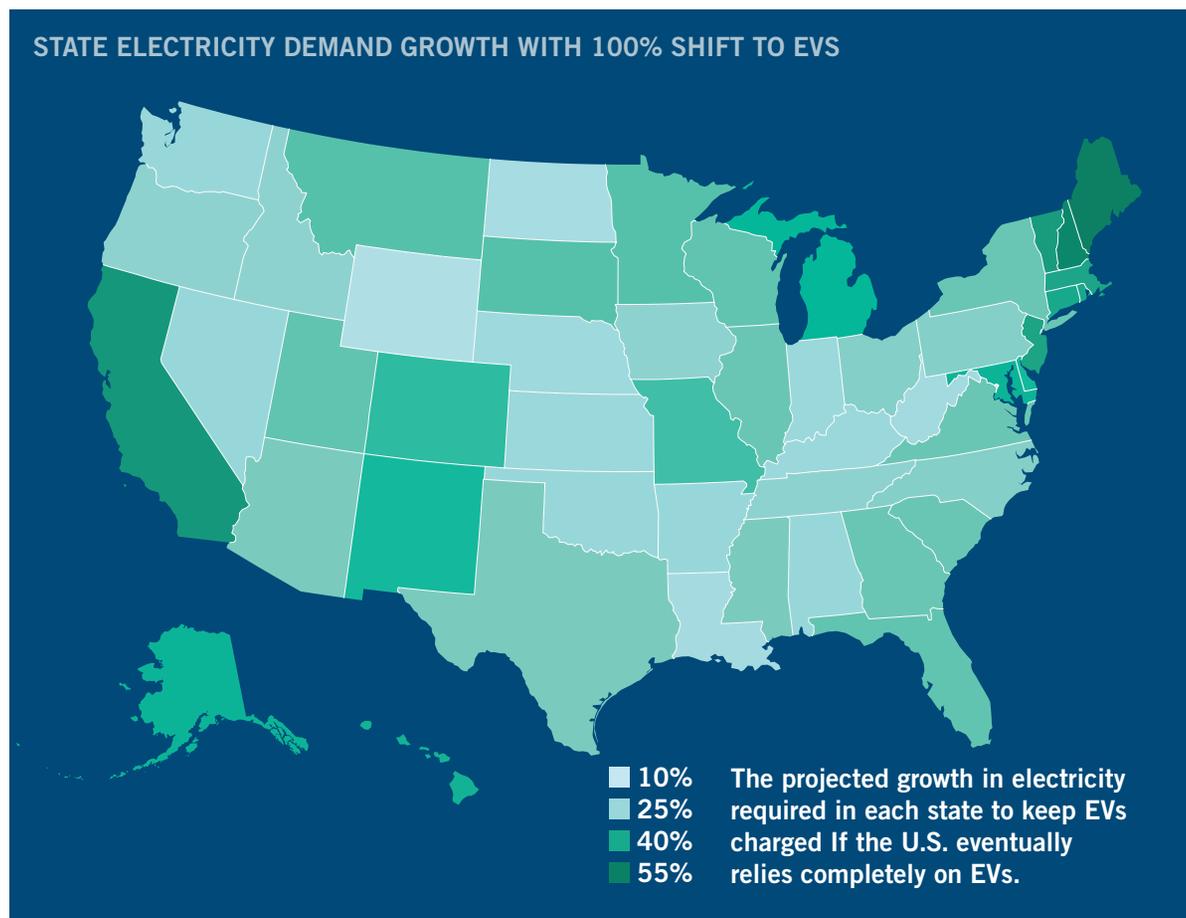


Source: MJ Bradley and Associates, *Electric Vehicle Market Status – Update*, April 2021

## Shift to EVs Could Boost Electricity Demand By 38%

When the DOE's National Renewable Energy Laboratory explored the impacts of widespread electrification in all U.S. economic sectors – commercial and residential buildings, transportation, and industry – it found most of the demand growth would come from electric vehicles. By 2050, the *Electrification Futures Study* estimates that widespread electrification would increase U.S. electricity consumption by 20% in the medium adoption scenario and 38% in the high adoption scenario.

University of Texas researchers' complementary study assessed state-by-state the amount of electricity needed to charge an electrified fleet of personal cars, trucks, and SUVs. They found that EVs' impact will vary based on the current profile of the state and when the vehicle is charged. For the electric industry wrestling with future requirements, the researchers' key finding is that timing seems to be everything: "While EVs might increase the amount of electricity the U.S. consumes, the investment required to accommodate them may be smaller than it appears. Many regions already have sufficient generation capacity if vehicles are charged during off-peak hours."



Source: University of Texas at Austin's Energy Institute

## Summary

Given new commitments by car manufacturers, expanded policy incentives, and ambitious build-out of charging infrastructure, electric vehicles could make up 10% of all new car sales by 2025 – a five-fold increase from current levels. With roughly 17 million new car and truck sales occurring each year, the 1.5 to 2 million potential new EVs hitting the road will begin to make a difference as the U.S. vehicle inventory turns over. At present only 1% of the roughly 250 million light-duty vehicles on the road are electric but an acceleration in adoption rates could mean that 15% of the operating fleet will be electric by 2035. While getting to a committed 100% electric inventory by 2050 will still be stretch, there are more signs that adoption rates will continue to trend higher.

For rural communities, we see the possibility of real change taking hold, with 2% to 5% of all new car sales likely to be electric by mid-decade. Transitioning from a gasoline-powered car to an electric vehicle represents a significant cost savings over the lifetime of the vehicle. And because rural residents tend to drive longer distances than their urban counterparts, the savings could be even larger for these drivers. With total ownership savings over the life of most EVs greater for rural communities, the reduced sticker price, and an expanded choice of mainstream car models, we think the adoption gap with urban cities will begin to narrow.

From a grid management perspective, the amount of electricity the U.S. consumes will no doubt increase with greater EV adoption, up to 38% by one estimate. However, many regions already have sufficient generation capacity if vehicles are charged during off-peak hours.

With 80% or more of re-charging taking place at home, rural electric cooperatives will play an influential role preparing for membership adoption. Proactive steps might include membership education programs, closer collaboration with local dealerships, EV purchase and charging incentives, building public charging infrastructure closer to work places, and assisting in transitioning public service fleet vehicles.

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