



January 28, 2021

## WHAT YOU NEED TO KNOW ABOUT Electric Vehicle Adoption

### PRO POINTS

- **U.S. automakers are making record investments** in electric vehicles in an effort to catch up with China and Europe, but consumer adoption is still constrained by a lack of awareness, inadequate charging infrastructure and limited purchasing incentives that help make electric vehicles more affordable.
- **Environmental groups have been at the vanguard of pushing EV adoption**, but corporate giants from Detroit to Silicon Valley to Wall Street are also doubling down on EVs, in concert with emission reduction targets at the state and federal level.
- **Democrats, now in control of Congress and the White House**, are poised to make major investments in charging infrastructure and could approve expansions of consumer tax credits for EV purchases.

### HOW WE GOT HERE

Electric vehicles are having a boom, with battery technology improvements nearly erasing concerns about range and automakers fully investing in a major change from internal combustion to electrification — but they haven't yet taken off in the marketplace.

Plug-in electric vehicles account for less than 2 percent of U.S. auto sales, though sales increased slightly in the United States in 2020, even as vehicle sales overall were down 15 percent. "Range anxiety" issues have largely been resolved with new batteries able to travel upward of 300 miles between charges, though consumers may not be aware of this. Manufacturers are beginning to adapt EVs to align with U.S. consumer preferences for SUVs and light trucks.

In Washington, a major vehicle electrification push could happen this year, with Congress and the White House angling for a huge investment in charging infrastructure. GOP efforts to eliminate the EV tax credit are losing ground to Democratic plans to expand it. President Joe Biden wants to replace the federal government's 645,000-strong fleet of vehicles with electric ones. And all of these positive steps at the federal level pale in comparison with decisions being made by states, many of which have banded together to expand incentives and create charging corridors.

The electrification of buses, delivery vans and even heavy trucks is intensifying, and fleet overhauls like the one Biden is proposing are happening in cities around the country and military installations around the world. But with almost 30 percent of U.S. emissions coming from transportation and about 60 percent of transportation emissions coming from light-duty vehicles, the Rocky Mountain Institute estimates that about one in five cars on the road will need to be electric by 2030 to keep global warming below 2 degrees Celsius below pre-industrial levels, widely considered to be a tipping point for catastrophic climate events.

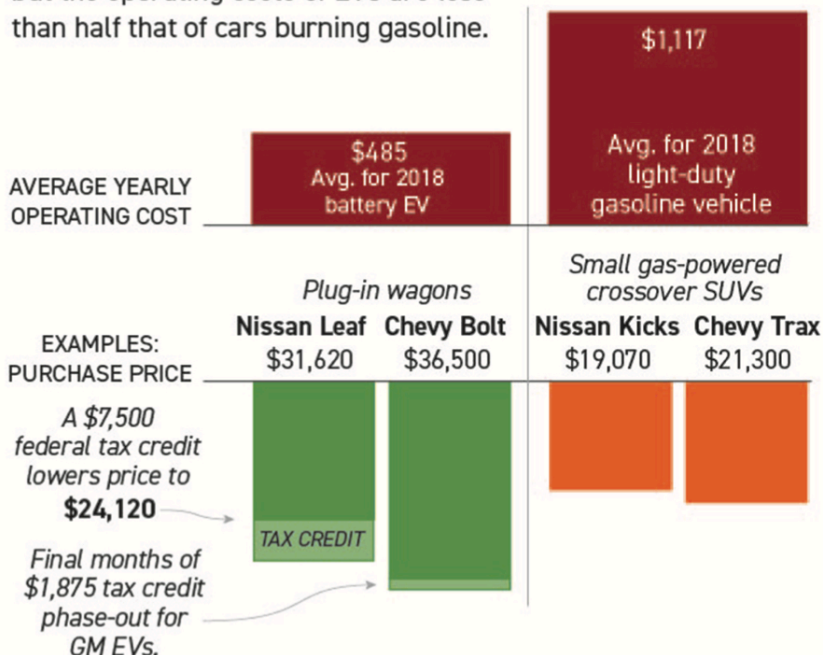
EV advocates say their environmental benefits are clear: The energy they use would be the equivalent of a gas-powered vehicle getting 100 mpg, and the ongoing greening of the electrical grid, with an increasing share of renewables in the energy mix, will only make EVs greener.

But they're battling a trio of challenges: Cost, infrastructure and a lack of consumer awareness.



## EVs are pricey, but cheaper to operate

The purchase prices of electric vehicles are higher than equivalent gasoline-powered models, but the operating costs of EVs are less than half that of cars burning gasoline.



Sources: University of Michigan's Transportation Research Institute, Department of Energy, manufacturer 2021 base prices

Developers have invested billions into battery research, driving battery costs down by nearly 90 percent in recent years. And without gas to pay for and a \$7,500 federal tax credit, the life-cycle costs of vehicles nearly balance out. But the upfront cost of an electric vehicle, often \$10,000 to \$15,000 more than a comparable combustion engine vehicle, causes sticker shock.

The relative lack of roadside charging infrastructure — in comparison with gas stations, especially — is a much smaller problem than it seems, given that most EV owners do more than 80 percent of their charging at home. Charging is also available in some office buildings and grocery stores, allowing drivers to charge “opportunistically” while they work or shop. Most EV owners almost never have to go to a place that looks like a gas station. But in order to buy an EV, most people will need to feel assured that roadside charging is available when and where they need it.

### WHAT'S NEXT

While the House and Senate versions of a pending surface transportation reauthorization, and President Joe Biden's infrastructure plan, all provide a large boost in funding for charging infrastructure, they don't require those stations to provide fast charging. Even the fastest charging takes half an hour to get an 80 percent charge, much longer than a typical gas station trip. A regular outlet can take 60 hours to fully charge a car. Advocates warn that focusing on slow chargers would squander the investment Washington is poised to make.



# U.S. EV sales stagnate under pandemic and phase-outs of federal tax-credits

Sales of electric vehicles grew rapidly through 2018, but have since maintained a relatively steady pace of about 72K cars per quarter, down from 2018's peak of 90K per quarter.

## EV sales, by quarter

1,695,617  
EVs sold,  
2011-2020

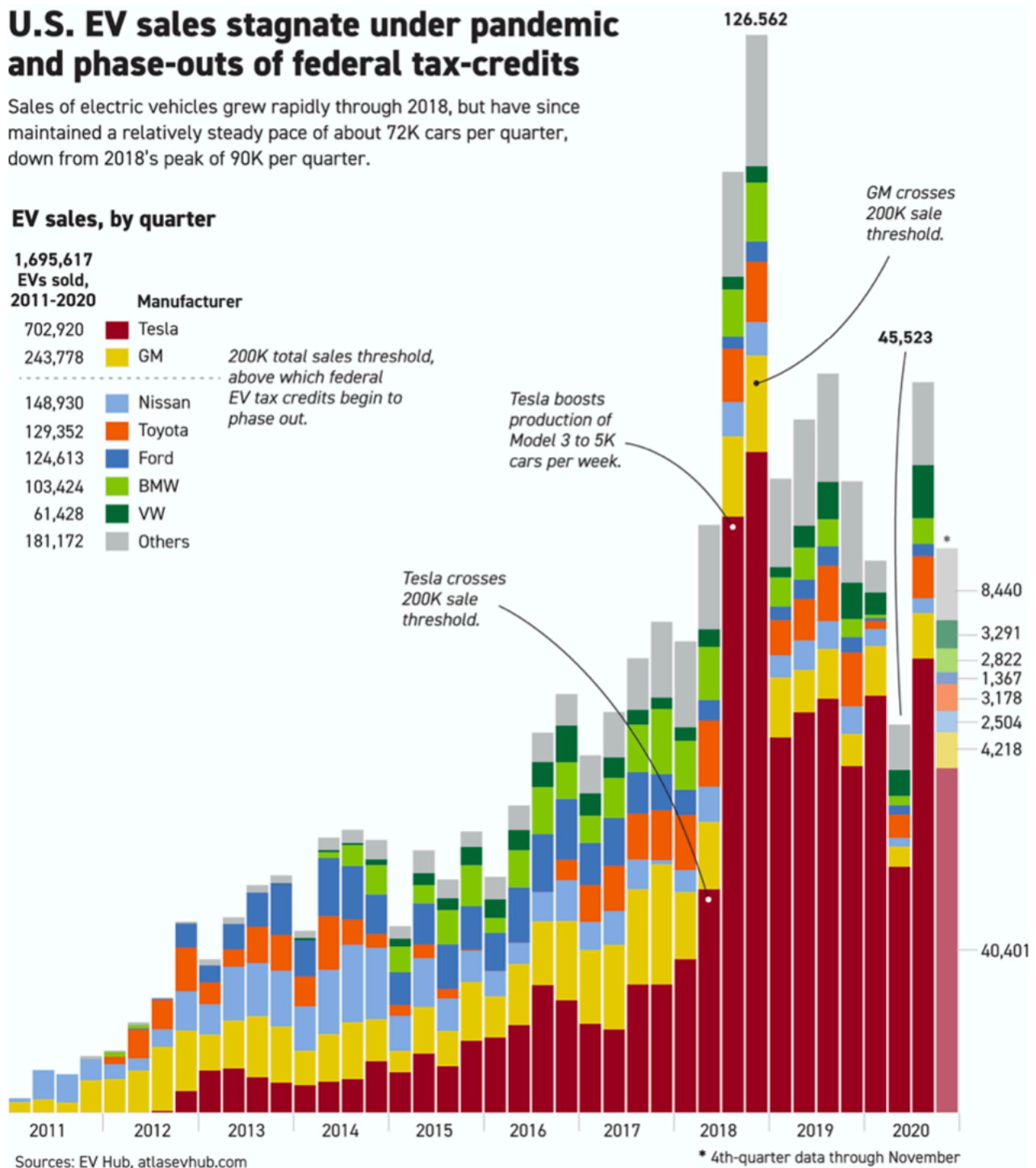
Manufacturer	Sales
Tesla	702,920
GM	243,778
Nissan	148,930
Toyota	129,352
Ford	124,613
BMW	103,424
VW	61,428
Others	181,172

200K total sales threshold,  
above which federal  
EV tax credits begin to  
phase out.

Tesla boosts  
production of  
Model 3 to 5K  
cars per week.

Tesla crosses  
200K sale  
threshold.

GM crosses  
200K sale  
threshold.





Some moneyed interests also have worked against EVs adoptions. For instance, the oil industry has worked overtime fighting utility company investments in charging infrastructure and lobbying against state and federal zero-emission policies. And the traditional auto dealership model has not worked well for EVs, with many dealers opting to send EVs back to the manufacturers when given the chance. Traditional dealers are often unfamiliar and uncomfortable talking about EVs, and since EVs require less maintenance, dealers don't make as much money on them.

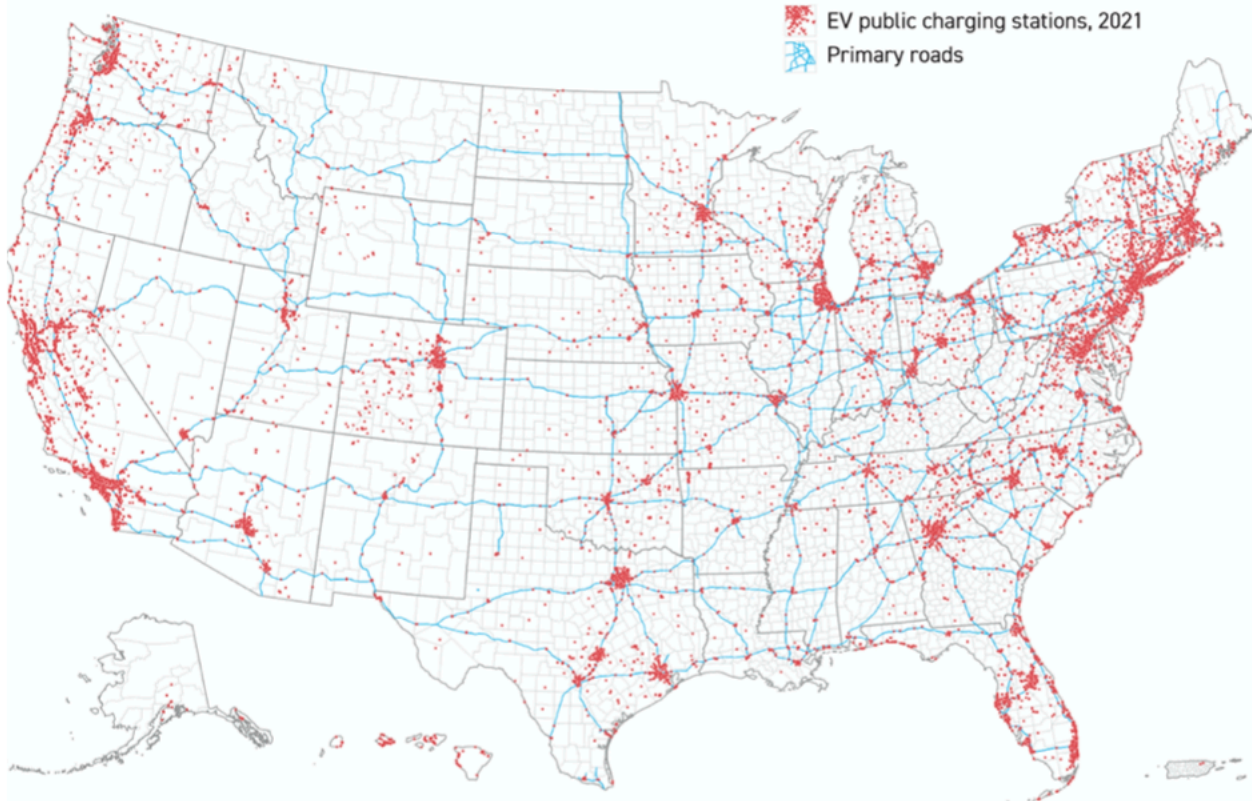
But automakers have jumped on board with the electrification revolution, partly out of fear of losing to China and Europe, which have led the way on EV development, and partly as a result of climate policies requiring emissions reductions. Car companies are planning \$250 billion of investment in EVs just over the next two to three years. But even with an estimated 130 models expected on the U.S. market by 2025, EVs won't lower emissions if consumers don't buy them.

Expanded purchasing incentives could help. The \$7,500 tax credit for EV purchases is capped at 200,000 vehicles per manufacturer, and Tesla and GM have already hit that cap. Republican lawmakers criticize the tax credit as a subsidy for the wealthy to buy fancy cars, but advocates say it's key to making EVs accessible to middle-income households. Other kinds of incentives, like the ability to use HOV lanes, or limitations on gas-powered vehicles in downtown areas that don't apply to EVs, can also incentivize electric vehicles.



## Biden wants half a million more electric vehicle public charging stations

President Joe Biden wants to add 500,000 EV charging stations to the 29,000 that are currently available in the U.S. California offers the greatest number of public chargers (7,009), but Vermont has the most per resident, at 1 public charger for every 2,444 residents. Louisiana has the fewest per resident: 1 public charger for every 37,462 residents.



### Federal incentives for EVs

The Qualified Plug-in Electric Drive Motor Vehicle Tax Credit of \$7,500 for plug-in light-duty EVs begins to phase out after a manufacturer has sold more than 200,000 vehicles. Tesla and GM EVs are no longer eligible.

### State tax credits for EVs

Many states offer some form of electric vehicle tax credit or rebate. Not included here are utility incentives or private incentives.

 State EV tax credit

 No state EV tax credit



Sources: DOE's Alternative Fuels Data Center, EnergySage.com



## POWER PLAYERS

- **China:** With a new goal of net-zero emissions by 2060, China is planning to ban gas-powered vehicles within 15 years and has built vertically-integrated supply chains to produce battery packs and vehicles. The prospect of losing the automotive race to China is propelling U.S. policymakers and automakers to action.
- **Volkswagen:** As part of its redemption after the Dieselgate scandal, Volkswagen was ordered to invest \$2 billion in infrastructure and education to support zero-emission vehicles, much of which is helping states build charging stations. VW announced in 2018 that it would produce only electric vehicles after 2026.
- **Elon Musk:** Eccentricities aside, Musk blazed the trail on electric vehicles and poured billions into battery research when hardly anyone else was even thinking about it. Tesla accounts for more than half of all U.S. EV sales.
- **Jennifer Granholm:** The former Michigan governor is Biden's pick for secretary of Energy, a post from which she can promote policies to accelerate the deployment of electric vehicles. Granholm has served on the boards of an EV charging company and a electric bus manufacturer and has pushed the auto industry to redouble its efforts to go electric.
- **Sen. Tom Carper (D-Del.):** As the top Democrat on the Environment and Public Works Committee when Republicans were in control — and a diehard coal-stater holding the gavel — Carper managed to get the first climate title ever in a surface transportation bill, complete with \$1 billion for electrification. Now he's in charge, and he's prepared to go farther.