The New York Times | https://nyti.ms/3vePUir

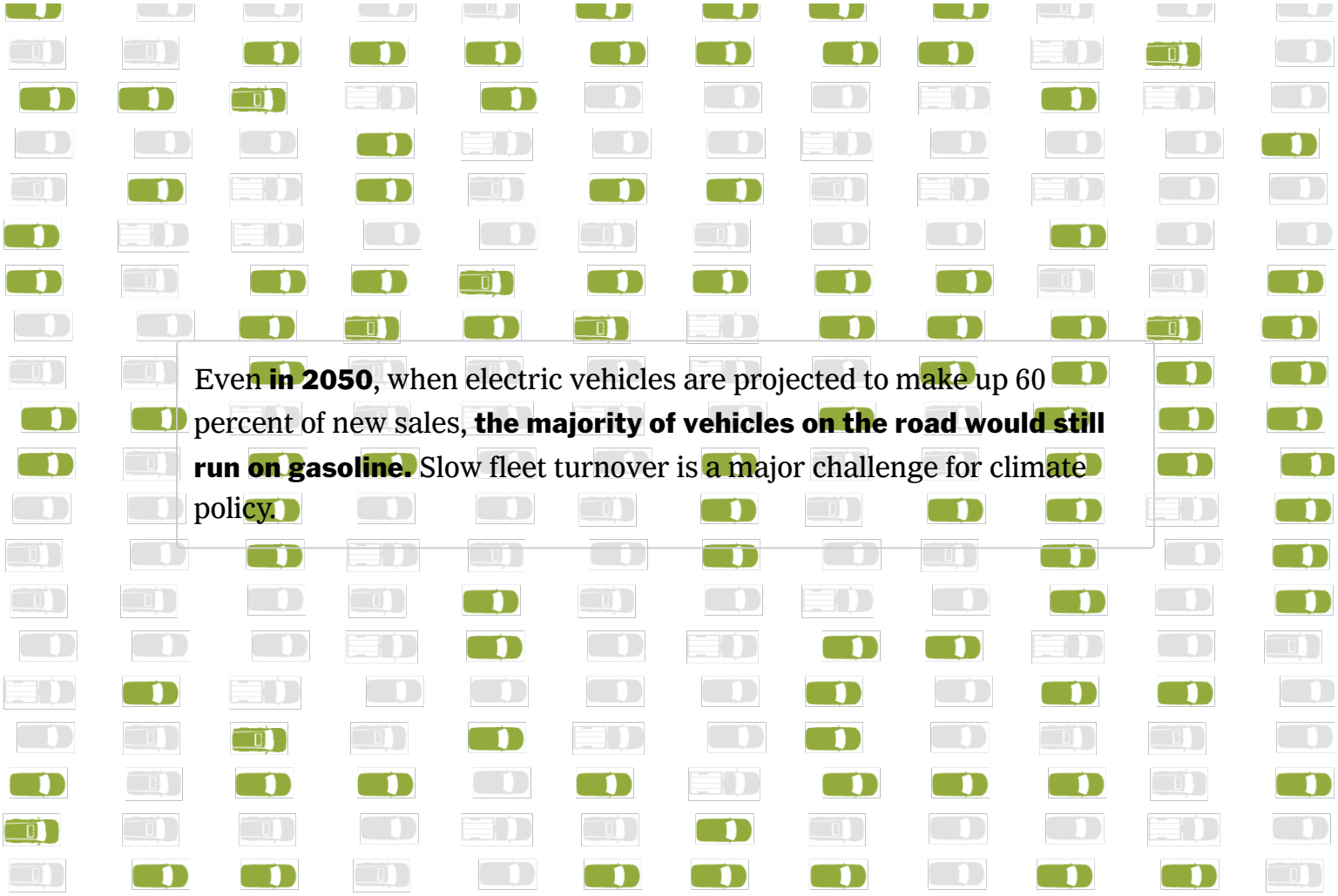
Electric Cars Are Coming. How Long Until They Rule the Road?

By Brad Plumer, Nadja Popovich and Blacki Migliozzi March 10, 2021

These vehicles represent the 250 million cars, S.U.V.s, vans and pickup trucks on America's roads today. The vast majority **run on gasoline**. Fewer than 1 percent are **electric**.

Automakers are now shifting to electric vehicles, which could make up one-quarter of new sales **by 2035**, analysts project. But at that point, **only 13 percent** of vehicles on the road would be electric. Why? Older cars can stick around for a decade or two.

VEHICLES ON THE ROAD IN **2050**



Even **in 2050**, when electric vehicles are projected to make up 60 percent of new sales, **the majority of vehicles on the road would still run on gasoline.** Slow fleet turnover is a major challenge for climate policy.

If the United States wanted to move to **a fully electric fleet by 2050** — to meet President Biden's goal of net zero emissions — then sales of gasoline-powered vehicles would likely have to end altogether by around 2035, a heavy lift.

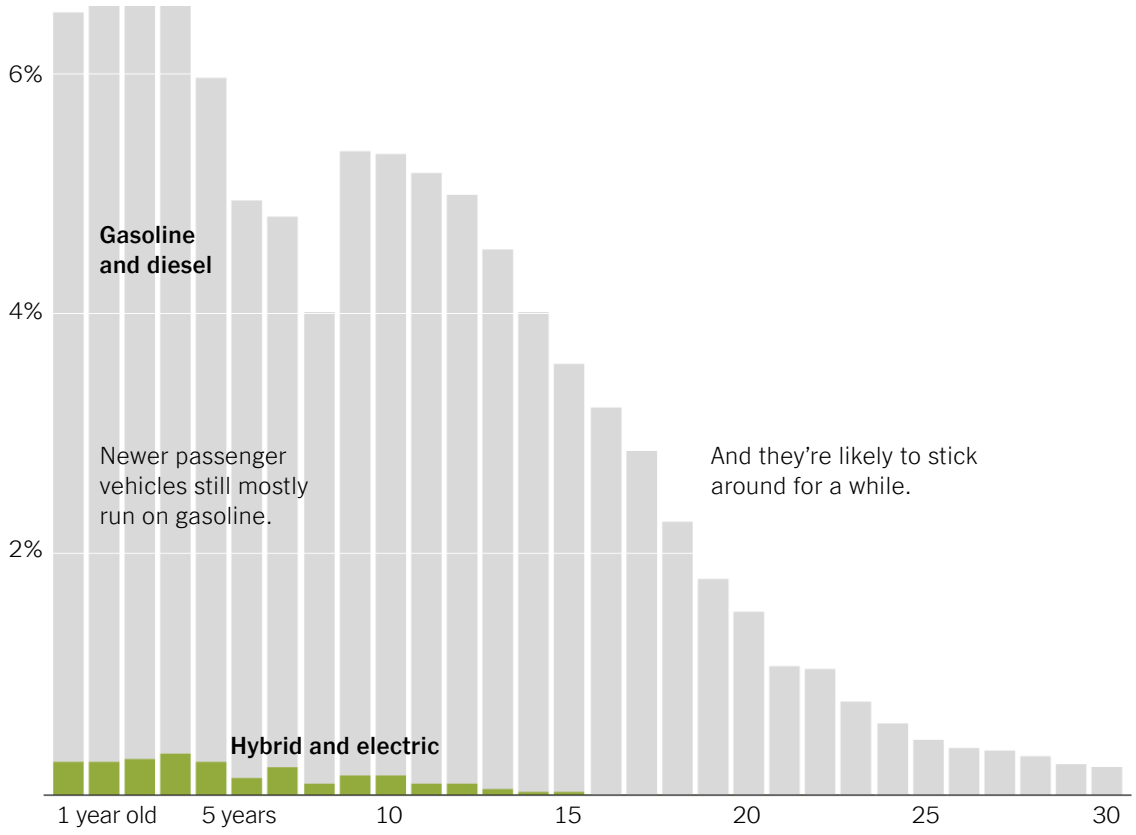
Around the world, governments and automakers are focused on selling newer, cleaner electric vehicles as a key solution to climate change. Yet it could take years, if not decades, before the technology has a drastic effect on greenhouse gas emissions.

One reason for that? It will take a long time for all the existing gasoline-powered vehicles on the road to reach the end of their life spans.

This “fleet turnover” can be slow, analysts said, because conventional gasoline-powered cars and trucks are becoming more reliable, breaking down less often and lasting longer on the road. The average light-duty vehicle operating in the United States today is 12 years old, according to IHS Markit, an economic forecasting firm. That’s up from 9.6 years old in 2002.

“Engineering quality has gotten significantly better over time, in part because of competition from foreign automakers like Toyota,” said Todd Campau, who specializes in automotive aftermarket analysis at IHS Markit.

Age of cars and light trucks on U.S. roads



Source: 2017 National Household Travel Survey

Today, Americans still buy roughly 17 million gasoline-burning vehicles each year. Each of those cars and light trucks can be expected to stick around for 10 or 20 years as they are sold and resold in used car markets. And even after that, the United States exports hundreds of thousands of older used cars annually to countries such as Mexico or Iraq, where the vehicles can last even longer with repeated repairs.

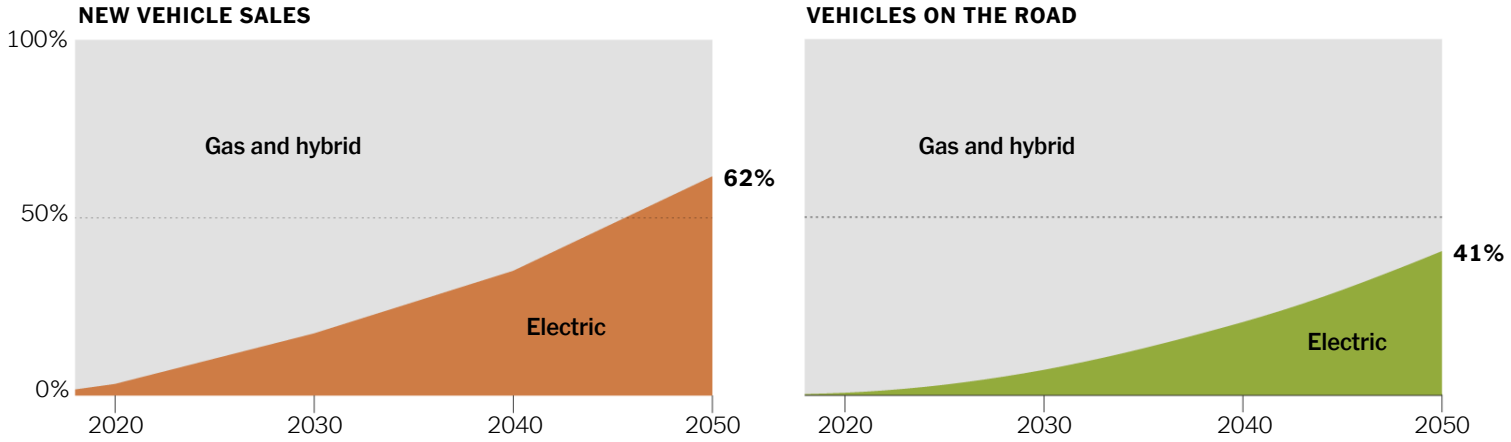
Cutting emissions from transportation, which accounts for nearly one-third of America's greenhouse gas emissions, will be a difficult, painstaking task. President Biden has set a goal of bringing the nation's emissions down to net zero by 2050. Doing so would likely require replacing virtually all gasoline-powered cars and trucks with cleaner electric vehicles charged largely by low-carbon power sources such as solar, wind or nuclear plants.

If automakers managed to stop selling new gasoline-powered vehicles altogether by around 2035, to account for the lag in turnover, that target might be attainable. Both California's

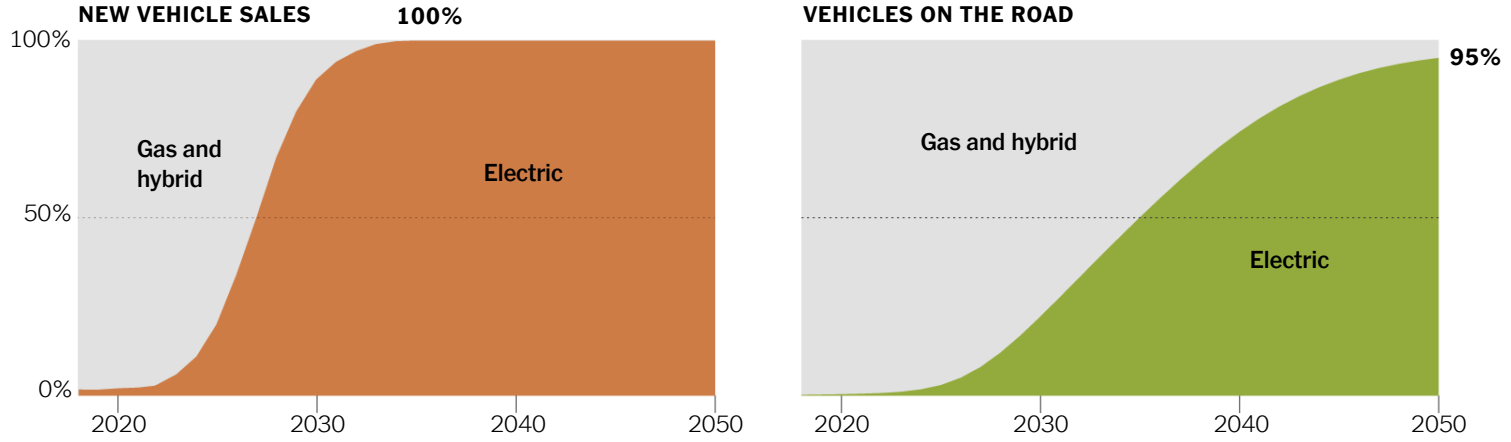
governor and General Motors have announced that they hope to sell only zero-emissions new cars and trucks by that date. But those goals are still aspirational at this point, and they have not yet been widely adopted.

How 'Fleet Turnover' Lags New Car Sales

If electric vehicle sales gradually ramped up to 60 percent over the next 30 years, as projected by analysts at IHS Markit, about 40 percent of cars on the road would be electric in 2050.



In order for almost all cars on the road to be electric by 2050, new plug-in sales would need to quickly ramp up to 100 percent in the next 15 years.



Sources: Fleet turnover model via Alarfaj, Griffin and Samaras in Environmental Research Letters; Electric vehicle sales projection via IHS Markit

What's more, some economic research suggests, if automakers like G.M. phased out sales of new internal combustion engines, it's possible that older gasoline-powered cars might persist for even

longer on the roads, as consumers who are unable to afford newer, pricier electric cars instead turn to cheaper used models and drive them more.

So policymakers may need to consider additional strategies to clean up transportation, experts said. That could include policies to buy back and scrap older, less efficient cars already in use. It could also include strategies to reduce Americans' dependence on car travel, such as expanding public transit or encouraging biking and walking, so that existing vehicles are driven less often.

"There's an enormous amount of inertia in the system to overcome," said Abdullah Alarfaj, a graduate student at Carnegie Mellon University who led a recent study that examined how slow vehicle turnover could be a barrier to quickly cutting emissions from passenger vehicles.

That study suggested several options for speeding up the rate of turnover. For instance, policymakers could focus on electrifying ride-sharing programs like Uber and Lyft first, since those vehicles tend to drive more miles on average and get retired sooner.

There are also options for getting older gas-guzzlers off the road. In 2009, the United States government ran a program called "Cash for Clunkers" that offered Americans rebates to turn in their older cars for newer, more fuel-efficient models. In all, the government spent about $2.9 billion to help 700,000 car owners upgrade their vehicles.

Some Democrats have proposed reviving that program to accelerate the shift to electric vehicles. Senator Chuck Schumer, the majority leader, has proposed a $392 billion trade-in program that would give consumers vouchers to exchange their traditional gasoline-powered vehicles for zero-emissions vehicles, like electric cars.

Still, a “Cash for Clunkers” program could prove relatively inefficient, said Christopher R. Knittel, an economist at the M.I.T. Sloan School of Management who has studied the policy. The original program often benefited Americans who were on the verge of trading in their vehicles anyway, he said, and it often missed the drivers who were driving particularly gas-guzzling vehicles long distances.

“It’s a blunt tool, although there are likely ways to improve the program,” Dr. Knittel said.

As an alternative, Dr. Knittel noted, a tax on carbon dioxide emissions could prove more effective, by increasing the price of gasoline and giving drivers a clear incentive both to upgrade to cleaner vehicles and drive less. Yet lawmakers have often steered clear of hiking gas taxes, worried about both political blowback and the effects on low-income drivers.

That leaves a final, potentially powerful option: Cities could reshape their housing and transportation systems so that Americans are less reliant on automobiles to get around. Some cities have had success in reducing their dependency on cars: Since 1990, Paris has reduced the share of trips taken by car in city limits by 45 percent, by building new bus and train lines, expanding bike paths and sidewalks, and restricting vehicle traffic on certain streets. In Germany, the city of Heidelberg has made reducing car dependency the central plank of its plan to reduce emissions.

Most American cities are far from looking like Paris or Heidelberg. But there are still plenty of changes that cities could make to reduce car travel at the margins, said Beth Osborne, director of Transportation for America, a transit advocacy group. That could entail adding denser housing in walkable urban areas, expanding public transportation or making neighborhoods safer to walk

around. Governments could also redirect spending away from constructing new roads that tend to induce sprawl and more driving.

“While we’re ramping up to full electrification, we want to make sure that we’re not increasing emissions from all the other cars still on the road,” said Ms. Osborne.

Finding ways to curb private vehicle travel even modestly could have a significant impact, researchers have found.

One recent study in Nature Climate Change looked at what it would take to drastically slash emissions from passenger vehicles in the United States. If Americans keep driving more total miles each year, as they have historically done, the country may need some 350 million electric vehicles by 2050 — a daunting figure. Doing so would also require a massive expansion of the nation’s electric grid and vast new supplies of battery materials like lithium and cobalt.

But the study also explored what would happen if the United States kept overall vehicle travel flat for the next 30 years. In that scenario, the researchers found, the United States could cut emissions just as deeply with around 205 million electric vehicles.

“We’re not saying everyone would have to take the bus to work,” said Alexandre Milovanoff, an energy and sustainability researcher at the University of Toronto and lead author of the study. “A lot of people do need private vehicles to get around, and in those cases, electric cars make a lot of sense as a climate solution. But we shouldn’t limit ourselves to thinking about electric vehicles as the only option here.”

To be sure, it’s conceivable that fleet turnover could end up happening even faster than current models predict as automakers invest more heavily in electrification. One possibility is that the nation reaches a tipping point: As more and more plug-in vehicles start appearing on the roads, gas stations and crude oil refineries

start closing down, while auto repair shops shift to mainly servicing electric models. Eventually, it might be too much of a hassle for people to own conventional gasoline-powered cars.

“It would not shock me if the transition eventually starts accelerating,” said Dr. Knittel of M.I.T. “Right now it can be inconvenient to own an electric vehicle if there are no charging stations around. But if we do get to a world where there are charging stations everywhere and few gas stations around, suddenly it’s less convenient to own a conventional vehicle.”