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Zero-Emission Vehicles Factbook

A BloombergNEF special report
prepared for COP26

UN CLIMATE
CHANGE
CONFERENCE
UK 2021

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Introduction and key messages

This special report has been produced by BloombergNEF at the request of the U.K. COP26 Presidency and in partnership with Bloomberg Philanthropies, to coincide with COP26, the 2021 United Nations Climate Change Conference.

Since the last Conference of the Parties in late 2019, global momentum towards zero-emissions road transport has accelerated significantly. Just a few signs of progress include:

- Annual electric vehicle sales are on track for around 5.6 million units in 2021, up from 2.1m in 2019 and 3.1m in 2020. 7.2% of new cars sold globally in the first half of this year were electric, up from 2.6% in 2019 and 4.3% in 2020. The global clean road transport market will be worth around \$244 billion this year.
- There are more than 500 zero-emission vehicle models available to buy globally, up 37% since 2019.
- Proposed and confirmed rules in the U.S., EU and China imply that EVs will be roughly 20-30% of car sales in those markets by 2025.
- Automakers have collectively committed to sell around 40 million EVs per year by 2030, and automakers with planned phase-outs of combustion engines now account for 27% of the global auto market.

This *Zero-Emission Vehicles Factbook* documents the progress that has been made towards global net zero in the road transport sector, and shows that the future is brighter than ever for zero-emission vehicles (ZEVs).

Still, while many of the indicators in this report are pointing in the right direction, most of them still have a long way to go before we can be confident that we are on a zero-emissions trajectory.

National, regional and local governments will need to continue to raise ambition and implement stable, long-term policies that induce the growth of zero-emissions transport, and manage the phase-out of polluting vehicles. Manufacturers and technology companies will need to accelerate the development and deployment of vehicles and supporting technology, such as batteries, infrastructure and software. And the private and public sectors will need to work together to grow and develop the new supply chains and skills bases required to enable the transition in all countries.

Particular attention is needed to support the transition to zero-emission transport in developing economies. Stronger international collaboration and financial and technical assistance will be needed to accelerate ZEV adoption in these countries.

This report is structured around four key elements of the zero-emission vehicles (ZEV) transition: (1) ZEV market overview, (2) market drivers, (3) corporate commitments and (4) government commitments.

We hope you find this factbook valuable, and that it stimulates further debate and discussion on pathways to zero-emission transport.

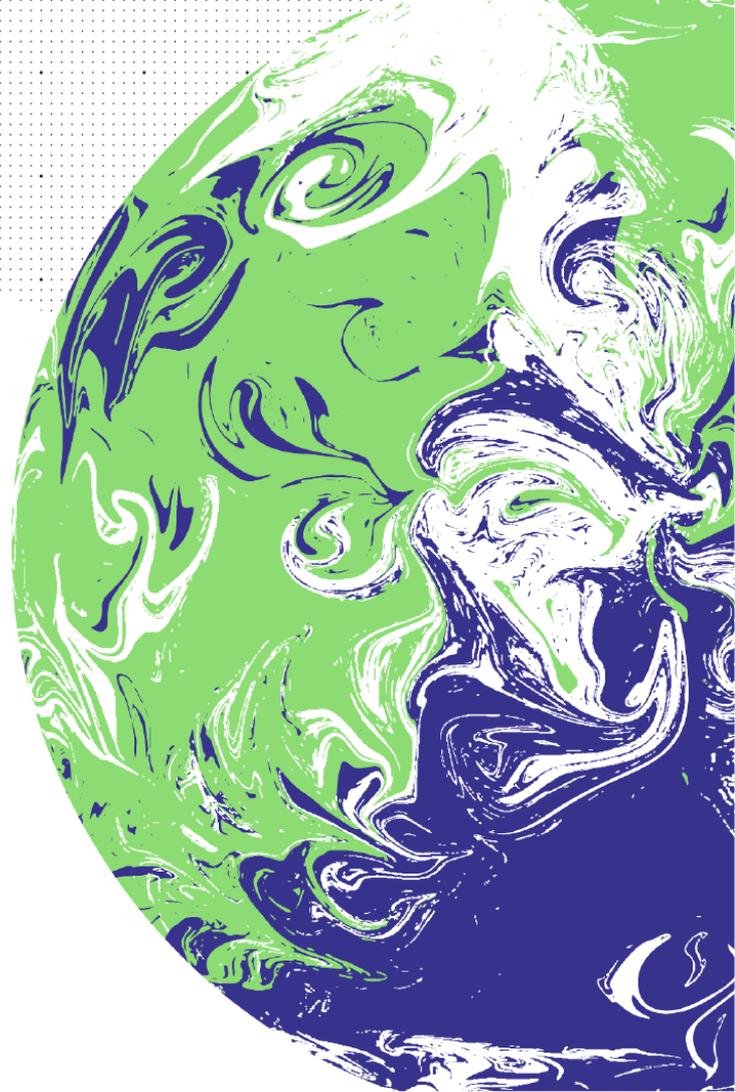
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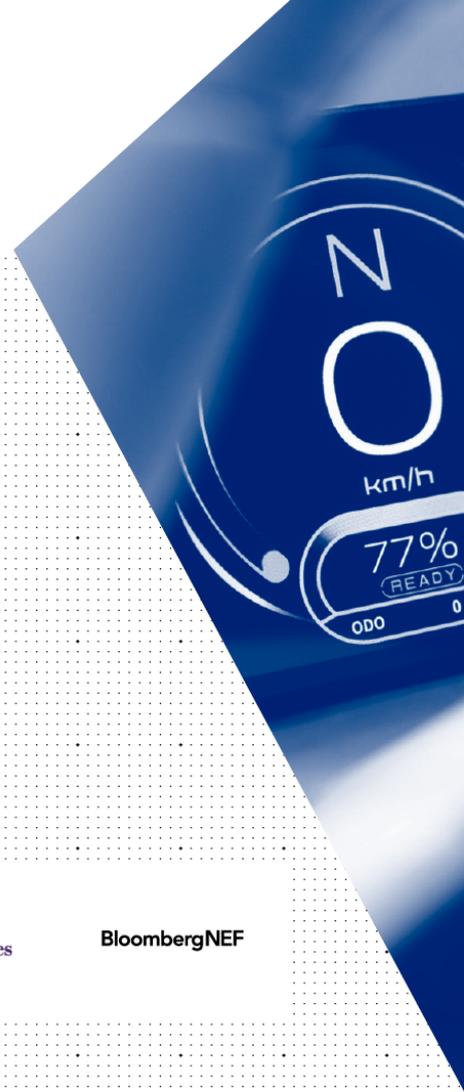
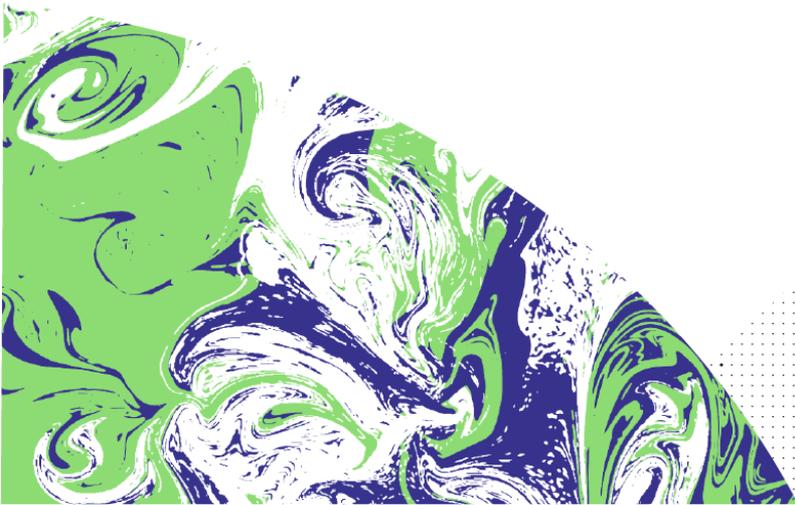
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Zero-emission vehicles (ZEV) Market overview

Rapid progress, rising momentum

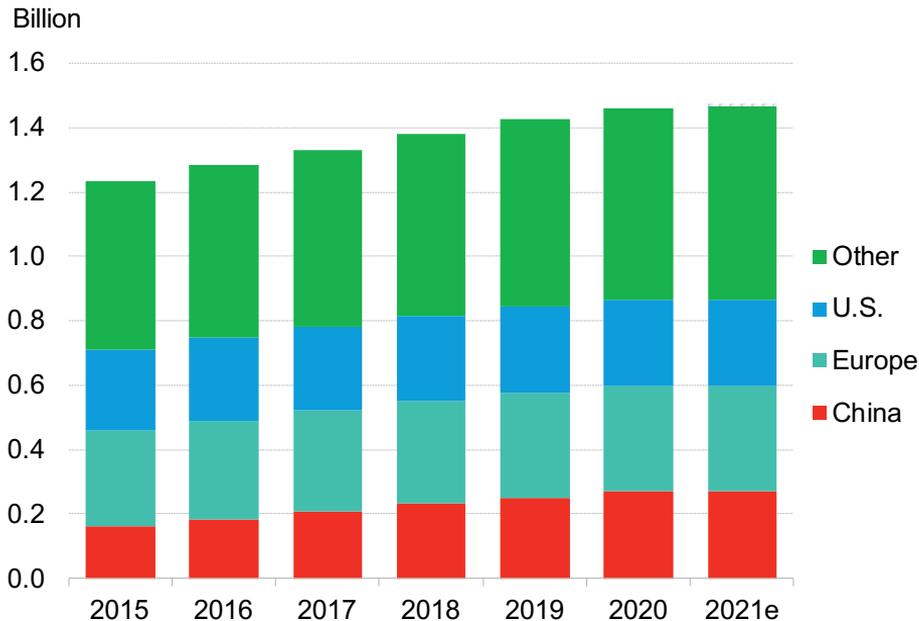


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The global road vehicle fleet continues to grow

Global four-wheeled vehicle fleet by region



The global fleet of four-wheeled road vehicles continues to rise and currently stands at close to 1.5 billion vehicles.

- This total includes cars, trucks and buses.
- The growth rate is positive but slowing, reaching only about 1% in 2021.
- This growth rate is faster in countries outside of the largest markets in the U.S., China and Europe – marked 'Other' in the chart.

More than 50 million cars, trucks and buses were added to the global fleet between 2019 and mid-2021.

China accounted for about 40% of the increase and, by end-2021, the country is likely to be home to the largest fleet of four-wheeled vehicles globally.

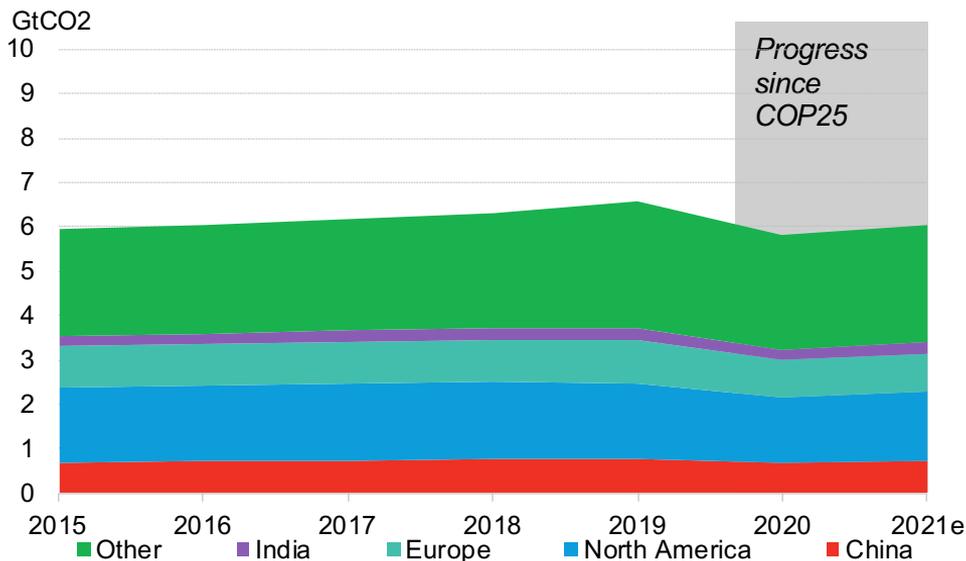
The global fleet of two- and three-wheelers is almost as big, exceeding one billion.

China, India and countries in Southeast Asia are by far the largest markets for two- and three-wheelers globally.

Source: BloombergNEF, national statistical agencies. Note: includes passenger cars, commercial vehicles and buses; excludes two- and three-wheel vehicles

Global road transport emissions are rebounding from the Covid-19 shock

Global CO2 emissions from road transport by region



Global road transport emissions are on the rise again, after falling in 2020 due to the Covid-19 pandemic.

Zero-emission vehicles can, and have, played a role in curbing increases in road transport emissions, but there is much work to do to decarbonize the road transport sector moving forward.

North America has the highest emissions from road transport, at an estimated 1.5 GtCO₂ in 2021.

BNEF estimates that North American road transport emissions will be up 4% by the end of 2021, compared to 2020.

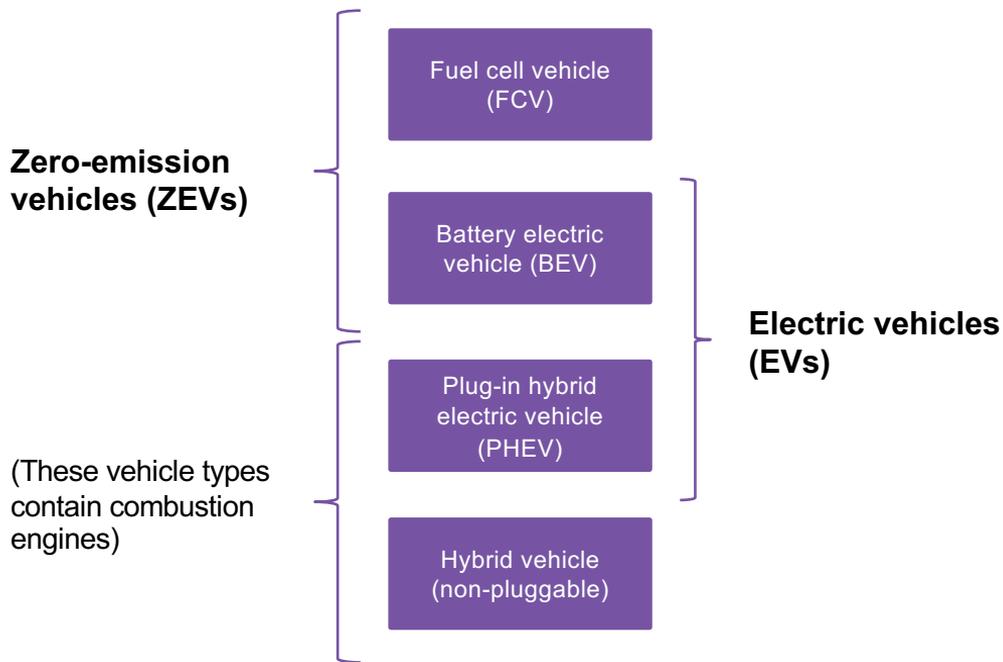
Europe and China are the next highest emitters, with road transport emissions at around 0.90GtCO₂ and 0.70GtCO₂, respectively, in 2021.

India and the Rest of the World make up 48% of global road transport emissions today.

These two regions saw emissions reduced collectively by 8% since 2019, to an estimated 2.9GtCO₂ in 2021. More effort is needed to address the need for market and supply chain transition to net-zero in emerging and developing economies.

Source: BloombergNEF. Note: includes passenger vehicles, commercial vehicles, buses and two- and three-wheeler emissions from tailpipe, power. 2021 is estimated amount based on changes to the EV fleet through the end of 2021.

Electric vehicles (EVs) and zero-emission vehicles (ZEVs): scope



For the purposes of this report, we define zero-emission vehicles (ZEVs) as those vehicles that never emit carbon dioxide from their tailpipes.

This means that ZEVs, in this report, only include pure BEVs and FCVs, neither of which have internal combustion engines.

It is understood that these vehicles should be fueled from clean electricity / hydrogen if they are to be truly zero-emission in operation.

Electric vehicles (EVs) as a category are commonly understood to include plug-in hybrids (PHEVs).

In this report, as in all other BNEF publications, we include PHEVs in our definition of electric vehicles (EVs), alongside pure BEVs. However, PHEVs are excluded in some pages of this report that are focused on the ZEV definition above.

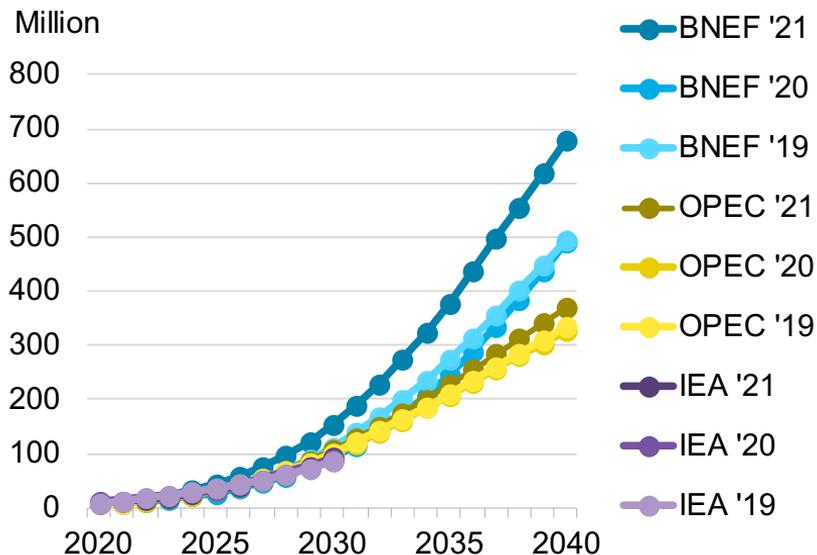
Some slides in this report focus on a wider definition “EVs and FCVs”, encompassing all of the above.

Hybrid vehicles that cannot be charged from an external power source are not included in our definitions of ZEV or EV in this report.

Note: categorisations are for the purpose of clarifying this report only.

The outlook for zero-emission vehicles has improved markedly

Global passenger and commercial ZEV fleet, various outlooks



Long-term outlooks for battery electric and fuel cell vehicle adoption have become more bullish in the last two years. Companies forecasting ZEV adoption now see tens of millions more battery electric vehicles (BEVs) and fuel cell vehicles (FCVs) on the road in the future than they expected in 2019.

In its 2021 Long-Term Electric Vehicle Outlook, BNEF projects the global passenger and commercial ZEV fleet to hit 677 million vehicles by 2040.

In 2019, this forecast called for just 495 million ZEVs on the road in 2040. The latest outlook sees passenger ZEVs making up 39% of the 2040 passenger vehicle fleet, up from 26% in the 2019 report. Commercial ZEVs hit 24% of the 2040 commercial fleet in EVO 2021, up from 19% in 2019. In total, across passenger and commercial vehicles, the 2040 ZEV fleet share went from 25% in 2019 to 36% in the 2021 report.

Other firms have also become more bullish in their most recent publications, increasing their ZEV adoption outlooks.

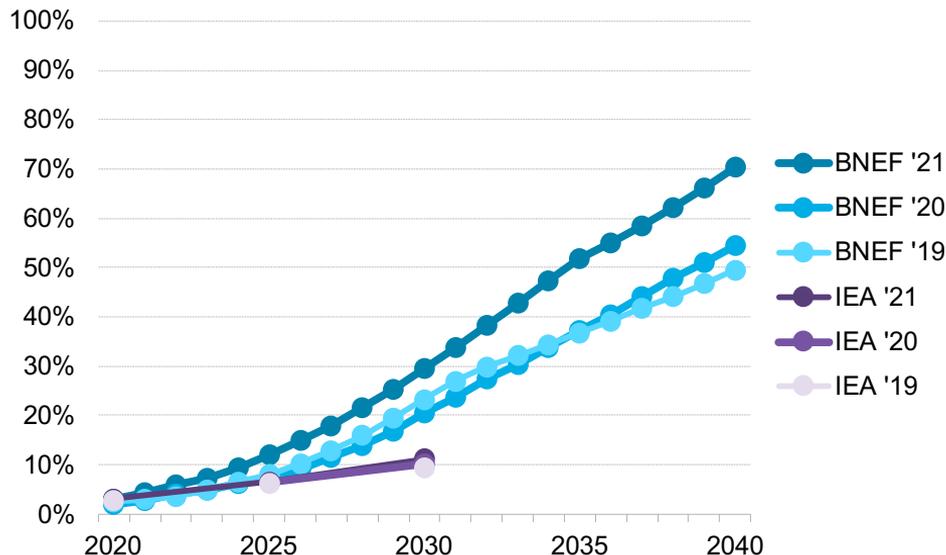
The IEA's latest Global EV Outlook* increases its BEV fleet by 7%, to 91 million in the 2021 report, from 86 million in 2019. OPEC has revised its projected 2040 EV and FCV fleet up by 11% in its most recent *World of Oil* publication, to 369 million EVs and FCVs on the road.

Source: BloombergNEF, IEA, OPEC. Note: IEA is their base-case (state policy scenario for 2020 and 2021, new policy scenario for 2019). BNEF '20 and '21 are BEVs and FCVs (excl. PHEVs). OPEC includes all EVs and FCVs. BNEF '19 and IEA reports are BEVs only. (*) IEA report only goes through 2030.



ZEVs are now expected to take more market share, sooner

Global ZEV share of passenger vehicle sales, various outlooks



Recent major reports are projecting ZEVs to capture a higher share of passenger vehicle sales, sooner than previously expected.

Share of sales is a useful metric, distinct from total ZEV sales. This is because different reports have diverging views of how overall global vehicle sales will change over time. These depend on differing views on overall car ownership trends, as well as the roles of autonomous and shared mobility technologies, and other modes of transport.

In BNEF's Long-Term Electric Vehicle Outlook 2021, ZEVs' share of passenger vehicle sales reaches 70% globally by 2040. This is up 20 percentage points from the 2019 report.

In 2019, BNEF expected BEVs would hit 50% of passenger vehicle sales by 2040 (outlook did not include FCVs).

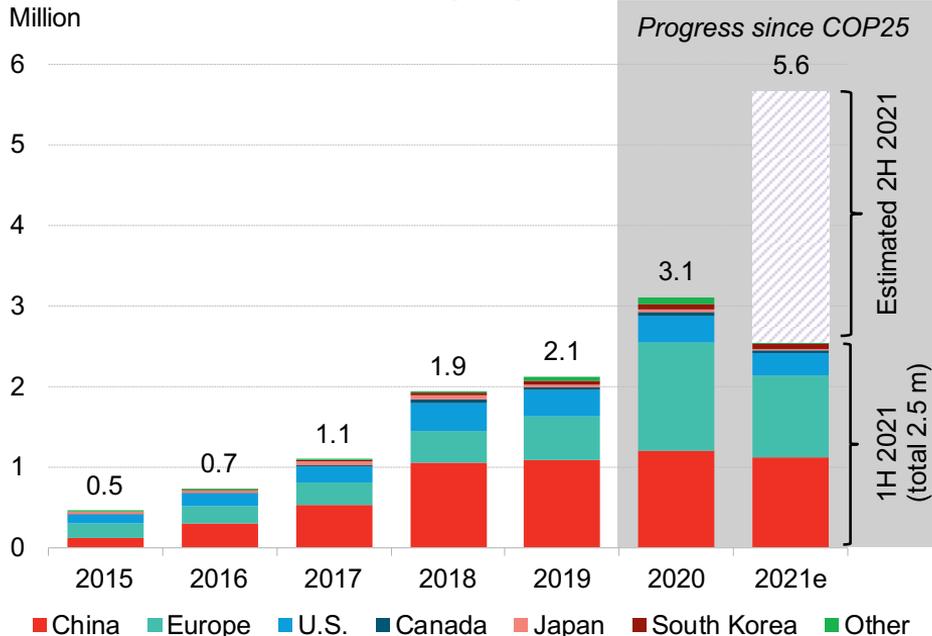
IEA's Global EV Outlook in 2021 calls for an estimated 11% BEV share of passenger vehicle sales by 2030. BNEF's 2021 report calls for ZEV share of sales of 29% by then.

The 2019 IEA forecast was lower, at an estimated 9% BEVs share of new passenger vehicle sales in 2030.

Source: BloombergNEF, IEA. Note: IEA is their base-case (state policy scenario for 2020 and 2021, new policy scenario for 2019). BNEF '20 and '21 are BEVs and FCVs (excl. PHEVs). IEA BEV share of sales are estimates based on the data provided in their reports. Official reports available at organization websites.

Passenger electric vehicles sales have accelerated significantly since COP25

Global electric vehicle sales by region



Global passenger EV sales grew by 47% in 2020, to more than 3.1 million.

This surge in EV sales was in stark contrast to the overall decline in the passenger vehicle market, which was down 14% due to the pandemic.

The EV surge has continued into 2021.

In the first six months of 2021, over 2.5 million EVs were sold globally – over 140% more than in 1H 2019.

China and Europe have led the global passenger EV and FCV market since 2015, and have stretched out their advantage in the last two years.

Europe and China were responsible for 82% of global EV sales in 2020 and 84% in 1H 2021. The next largest market was the U.S. at 11% of the global market in 1H 2021.

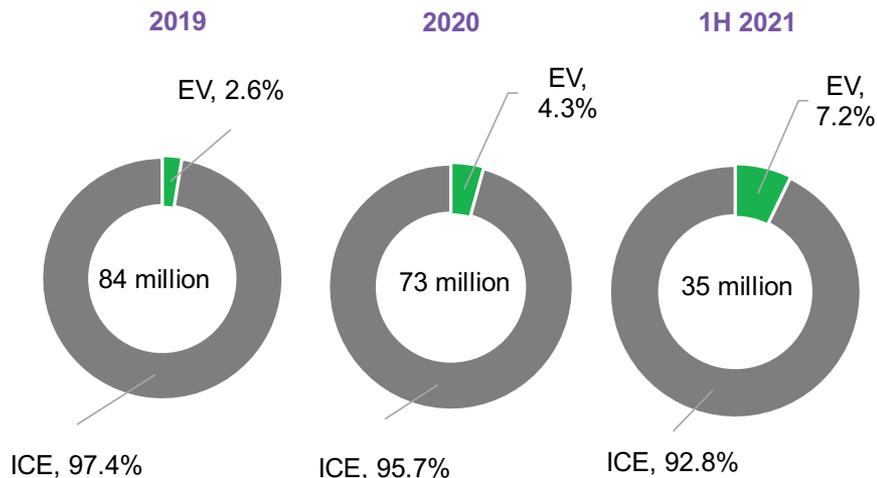
BNEF expects 2021 to be yet another record year for EV sales globally, at 5.6 million sold in total.

This would put 2021 passenger EV sales 83% higher than in 2020, and 168% higher than in 2019.

Source: BloombergNEF, Marklines, EAFO, government registration agencies. Note: Includes BEV, PHEV and FCV vehicles.

EVs are now more than 7% of the global passenger vehicle market

Global passenger vehicle sales by drivetrain



Electric vehicles exceeded 7% of global car sales in 1H 2021, up from just 2.8% in 2019.

Record high EV sales in 2020 put a dent in sales of internal combustion engine (ICE) vehicles. These were down 16% globally in 2020, allowing for EVs to gain market share.

China and Europe are visibly pulling ahead in market share terms, just as they are in absolute terms.

11% and 17% of cars sold in China and Europe, respectively, were electric in 1H 2021, in contrast to 1% in Japan and 3% in North America.

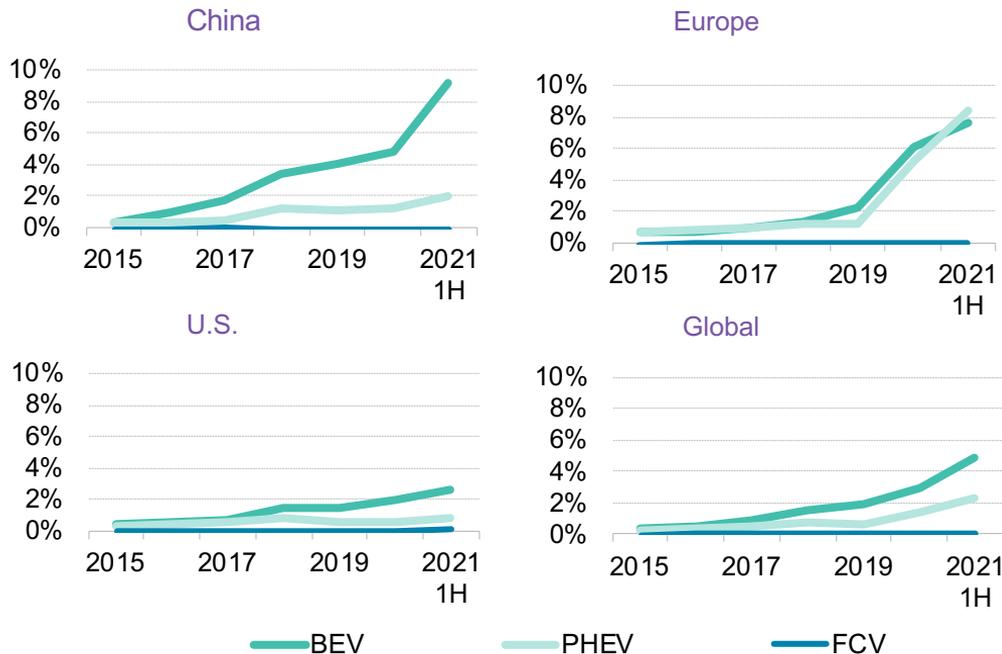
The biggest car markets in Europe have made significant progress since 2019. Between 1H 2019 and 1H 2021, the EV share of sales has increased:

- From 3% to 22% in Germany
- From 2.8% to 16% in France
- From 0.5% to 8% in Italy

Source: BloombergNEF.

Pure battery EVs are beating out plug-in hybrids, except in Europe

Passenger vehicle share of sales by drivetrain



Globally, sales of battery electric vehicles outweigh those of plug-in hybrids and fuel cell vehicles.

- BEVs were nearly 5% of 1H 2021 global passenger vehicle sales, while PHEVs were just over 2%.
- FCVs are a miniscule portion of the passenger vehicle market, below 1% of sales globally.

China and the U.S. follow this same trend.

In China, BEVs' market share increased from 4% in 2019 to around 9% in the first half of 2021. Meanwhile, in the U.S., BEVs accounted for about 2.6% of all vehicles sold in 1H 2021.

Plug-in hybrids (PHEVs), which are not strictly zero-emission vehicles, have fared considerably better in Europe.

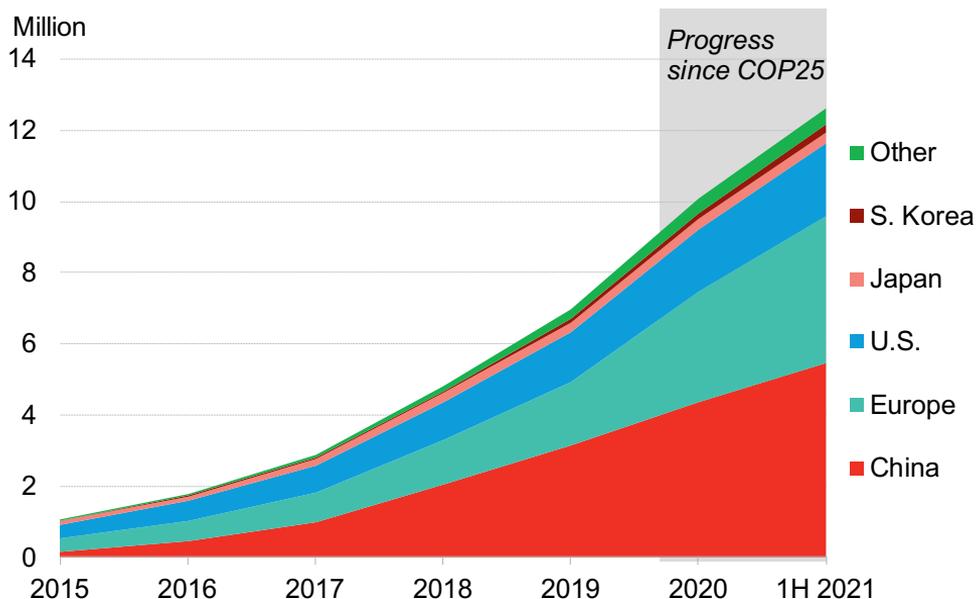
Over half of all EVs sold in Europe in 1H 2021 were PHEVs, up from 35% in 2019. Europe's PHEV share of passenger vehicle sales has jumped as a result, from over 1% in 2019 to 8% in the first half of 2021.

Source: BloombergNEF.



There are now nearly 13 million passenger EVs and FCVs on the road....

Global passenger EV and FCV fleet



Source: BloombergNEF. Note: EV includes BEV and PHEVs.

The fleet of passenger electric and fuel cell vehicles has doubled in size since 2019.

A cumulative total of 12.6 million EVs and FCVs had been sold up to 1H 2021, up from just 6.9 million at the end of 2019. We assume the majority of these vehicles are still on the road.

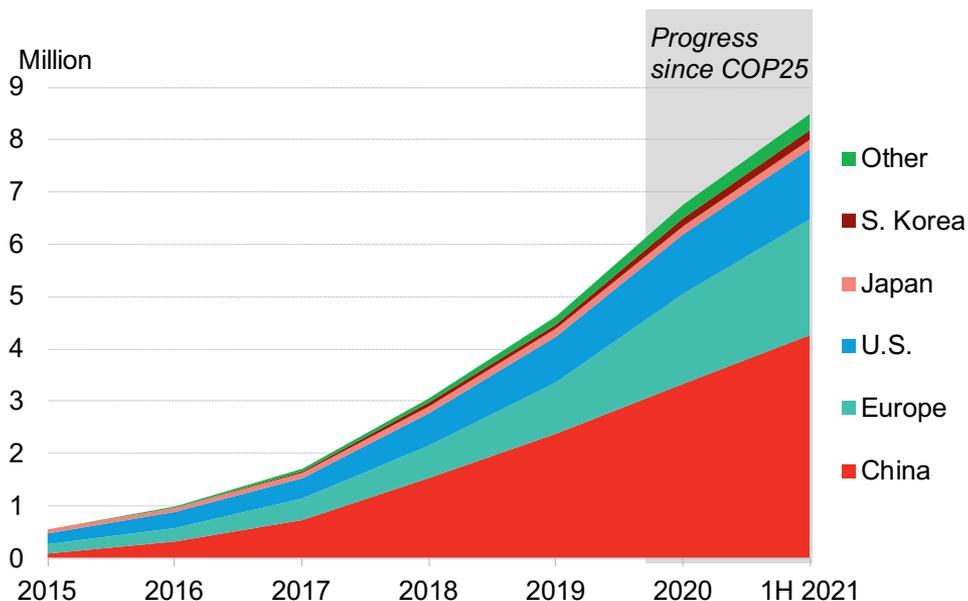
This equates to just 1% of the global fleet of passenger vehicles,

China and Europe are home to 76% of that fleet.

- There are now nearly 5.5 million EVs in China.
- There are 4.1 million EVs in Europe – more than twice the 2019 level.
- The U.S comes in third, with an EV and FCV passenger fleet of 2 million vehicles – around half of that in Europe.

....but only around 9 million are truly zero-emission

Global passenger ZEV fleet (excludes plug-in hybrids)



Using stricter criteria, the fleet of true zero-emission passenger vehicles (excluding PHEVs) has also nearly doubled in size since 2019.

Cumulative all-time sales of zero-emission passenger vehicles reached 8.5 million by the middle of 2021, up from just 4.6 million at the end of 2019.

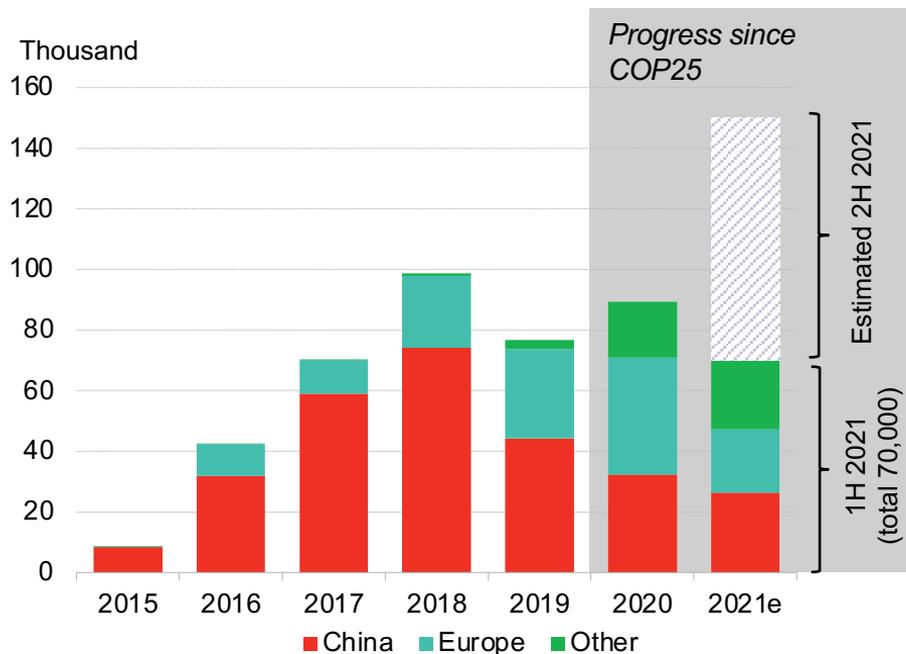
Despite Europe's higher share of PHEVs, it is still the second biggest ZEV market globally, after China.

- There are now nearly 4.3 million ZEVs in China, followed by Europe at 2.2 million – more than twice the 2019 level.
- The U.S is in third place, with a ZEV passenger fleet around 40% of that in Europe, at 1.3 million vehicles.

Source: BloombergNEF. Note: ZEVs only include battery electric vehicles (BEVs) and fuel cell vehicles (FCVs).

Commercial ZEV sales are growing from a lower base

Global commercial ZEV sales, by region



Sales of electric vans and trucks are rising but remain low compared to the progress seen in passenger cars.

Only 0.8% of vans and trucks were zero-emission models in 1H 2021. Most are electric light-duty vans and trucks in some EU countries, China and South Korea.

Adoption in 2020 ranged from less than 1% in China, to 2-3% in France and Germany, and more than 12% in South Korea.

Zero-emission vehicles in heavier segments are only now starting to become available in various markets.

Sales of zero-emission medium- and heavy-duty trucks were just over 3,500 units in 2020, accelerating to 2,500 in 1H 2021. Such vehicles are currently used in urban and suburban routes mostly for garbage collection, city and regional distribution and as yard tractors. The availability of these vehicles is gradually increasing in Europe, China and the U.S.

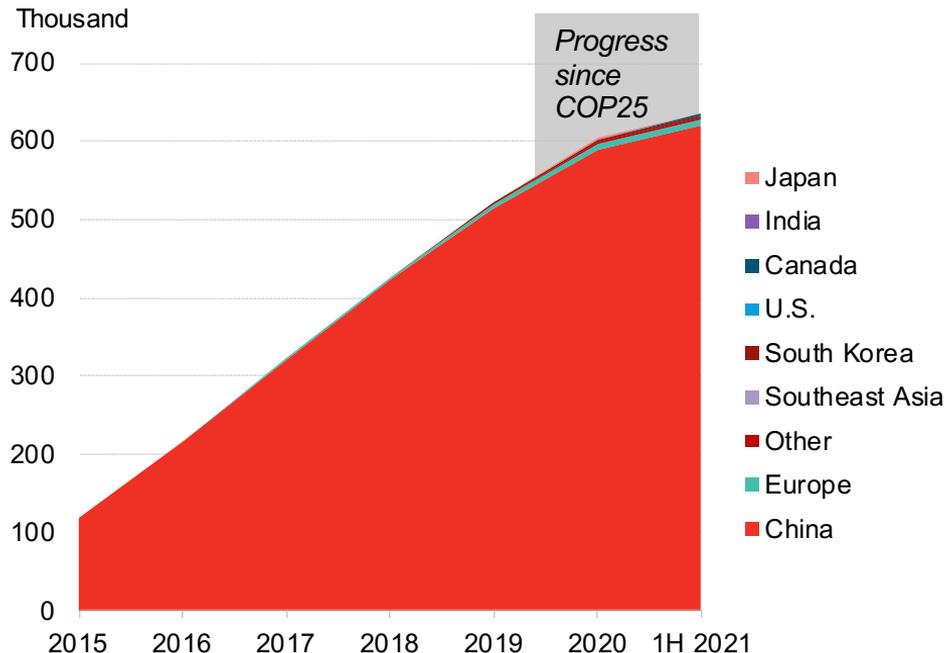
Fuel cell trucks are still at the trial phase.

Trucks powered by hydrogen are still at an earlier stage of development and commercialization. Large truck makers are planning to begin sales of hydrogen trucks later in this decade.

Source: BloombergNEF, EAFO, CAIN, Korea Ministry of Transport, national registration agencies.

The global zero-emission bus fleet has undergone a huge expansion

Global zero-emission bus fleet by region/country



Source: BloombergNEF, various governments and trade associations.

The global zero-emission bus fleet has risen by 22% since COP25, and six-fold since 2015.

In 2019, there were about 522,000 zero-emission buses on the road globally. By mid-2021, we estimate that this number had grown to around 636,000 units. Most of these buses – 99% of the ZEV fleet – are electric buses (e-buses).

China continues to lead the market, making up about 97% of the global fleet.

China's zero-emission fleet is 619,000 units – 20% higher than two years ago. Cities have led the transition, with some such as Shenzhen hitting a 100% ZEV fleet in 2017.

The European zero-emission bus fleet has grown by 71% since 2019, from over 5,000 units to 8,700 units.

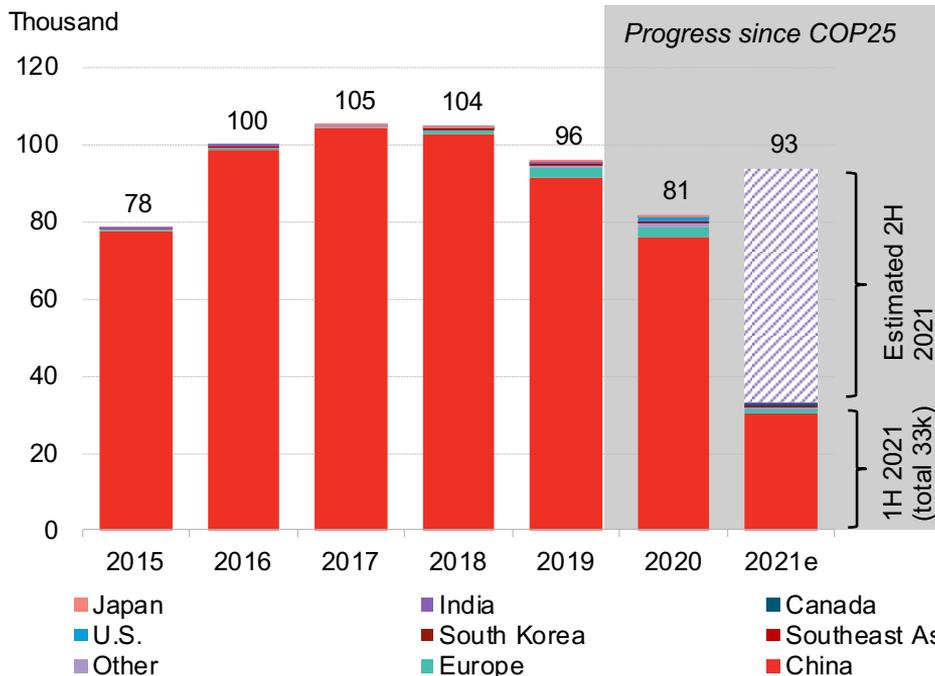
This expansion is being driven by commitments from major cities to begin procuring only zero-emission buses. Examples include London, Copenhagen, Paris and Madrid.

E-bus deployment in the U.S. is still in its infancy.

The U.S. e-bus fleet grew by 170% to 1,300 units since 2019. California is the main driver of growth to date. There are only limited fuel cell buses in the fleet.

Zero-emission bus sales are returning to growth, driven by China

Global zero-emission bus sales by region/country



Source: BloombergNEF. Note: China includes muni and non-muni buses. 2021 sales are estimated.

Global zero-emission bus sales are expected to rise to over 93,000 units in 2021.

While this represents 15% growth from 2020, it is essentially flat since 2019.

The global zero-emission bus market has been propelled primarily by growth in China, unlike passenger ZEVs which have taken off in many markets.

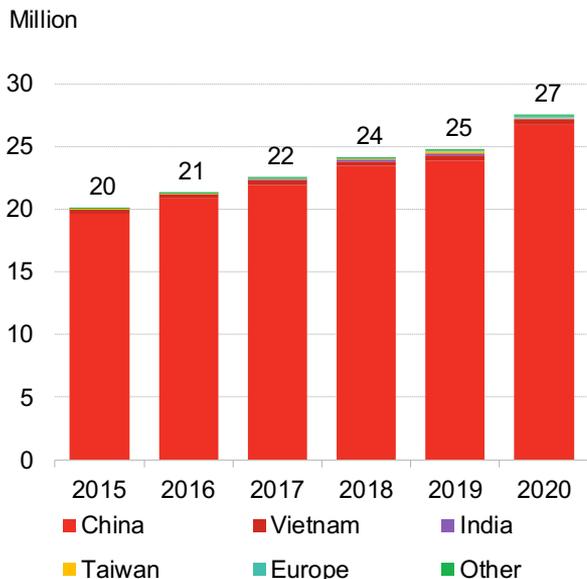
- Growth to date has been driven by national subsidies, and municipal policy to transition bus fleets to zero-emission resources. In the first half of 2021, around 30,000 zero-emission buses have been sold.
- China's zero-emission bus market is typically stronger in the second half of the year, and there will be a desire among buyers and manufacturers to claim subsidies before they phase out in 2022.

Europe's zero-emission bus sector was the second largest after China, with over 2,300 units sold in 2020.

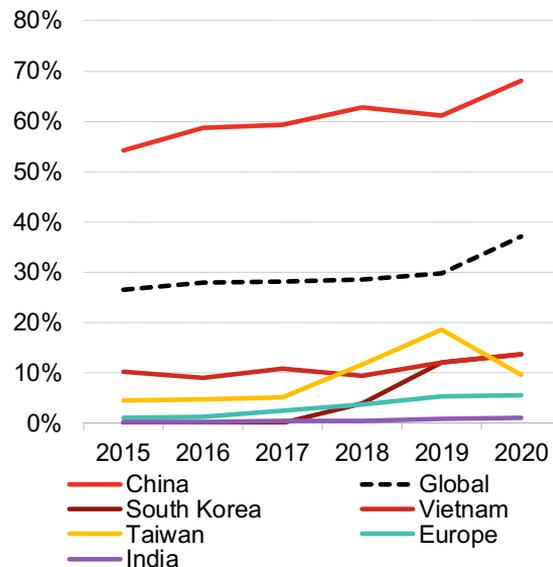
The last few years have seen stronger sales in the region as more and more cities begin to decarbonize.

Sales of electric two-wheelers were 9 times higher than passenger EVs in 2020

Electric two-wheeler sales



EV share of two-wheeler sales in key markets



Electric two-wheelers are selling in very large numbers, totaling 27 million units in 2020 – and their market share surged during the pandemic.

While global sales of two-wheelers were down 11% in 2020, sales of the electric variety grew by 11%.

Nearly 70% of two-wheelers sold in China, and just under 40% globally, were electric in 2020.

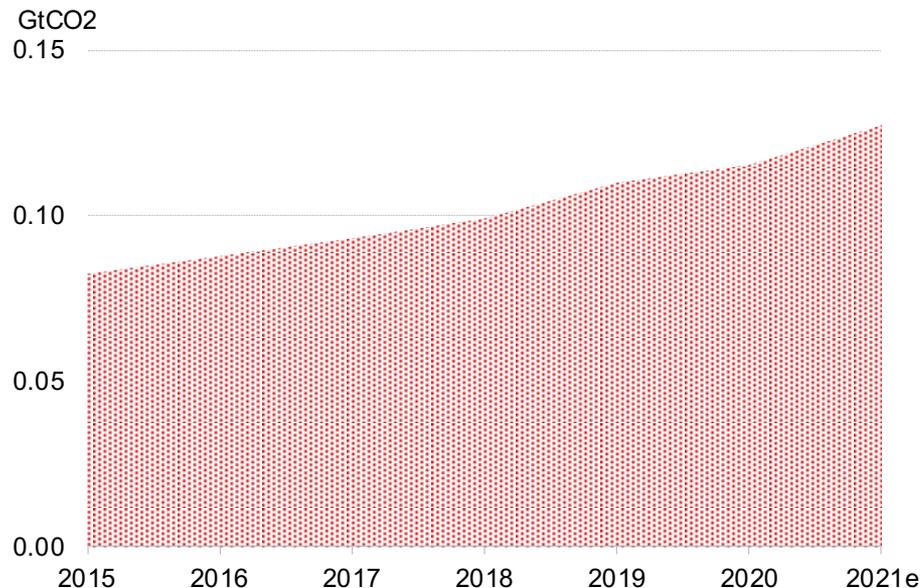
- New national e-bike standards introduced in China in 2019 require all electric bicycles and mopeds to have pedals along with an electric motor. This drove demand in China to over 25 million units.
- In Europe, increasing demand for personal mobility and the availability of purchase incentives drove electric two-wheeler sales up 15% in 2020, to 85,000 vehicles.

Source: BloombergNEF.



EVs and FCVs are avoiding 72 million metric tons of emissions per year

Avoided net annual emissions from road transport from EVs and FCVs



Source: BloombergNEF. Note: chart emissions includes passenger vehicles, commercial vehicles, buses and two- and three-wheeler emissions avoided from tailpipe and then subtracting power sector emissions. 2021 is estimated amount based on changes to the EV and FCV fleet through the end of 2021.

A growing global EV and FCV fleet is already helping to avoid carbon dioxide emissions.

Electric vehicles will be eliminating about 127MtCO₂ per year of global road transport emissions by the end of 2021. This is a 'net' figure, which accounts for the small increase in power-sector emissions resulting from higher electricity demand. It will rise as more ZEVs roll out.

Avoided emissions at the end of 2021 will be up about 16% from 2019.

At the end of 2019, net emissions avoided sat at just below 110MtCO₂, and have been increasing as the EV and FCV fleet grows. The growth would have been faster if the pandemic had not altered mileage baselines.

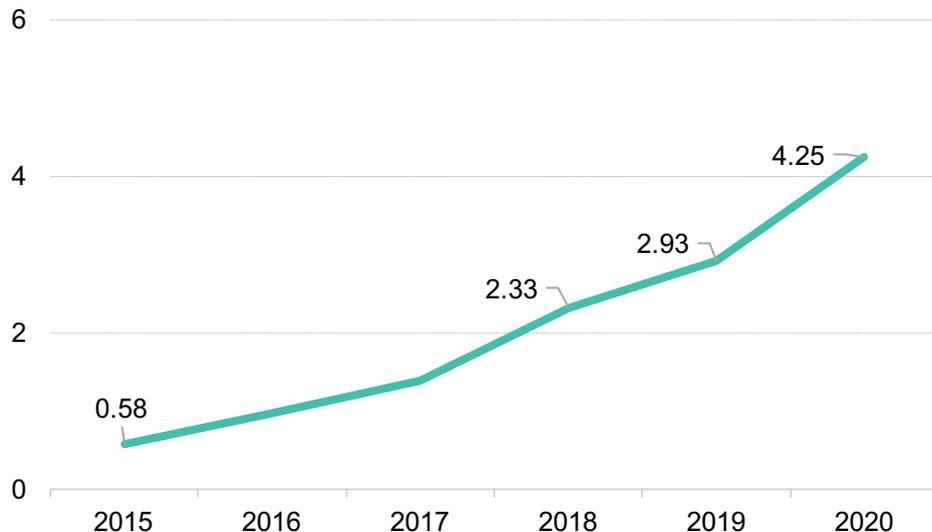
Still, there is a long way to go – the avoided emissions estimated for 2021 are only a small portion of all road transport emissions.

The net avoided emissions represent about 2.1% of all the road transport emissions we expect for 2021.

Leading automakers are 45% more committed to EVs than they were in 2019

BNEF automaker EV exposures: industry-wide score

Volume-weighted segment scores



Source: BloombergNEF Note: *qualifying automakers must have sold a minimum of 250,000 vehicles that year and have transparent financial information. In 2015-2018, only BEVs and PHEVs were scored as a part of industry scoring. FCVs were added in 2019-2020. For full criteria, see Automaker EV Exposure Scores report.

BNEF's automaker EV exposure scores provide a quantitative measure of automakers' exposure to the passenger EV and FCV market.

The scoring assesses automakers* on three factors: 1) EV sales, 2) EV revenue and 3) EV model count.

The volume-weighted, industry-wide score has increased 45% since 2019.

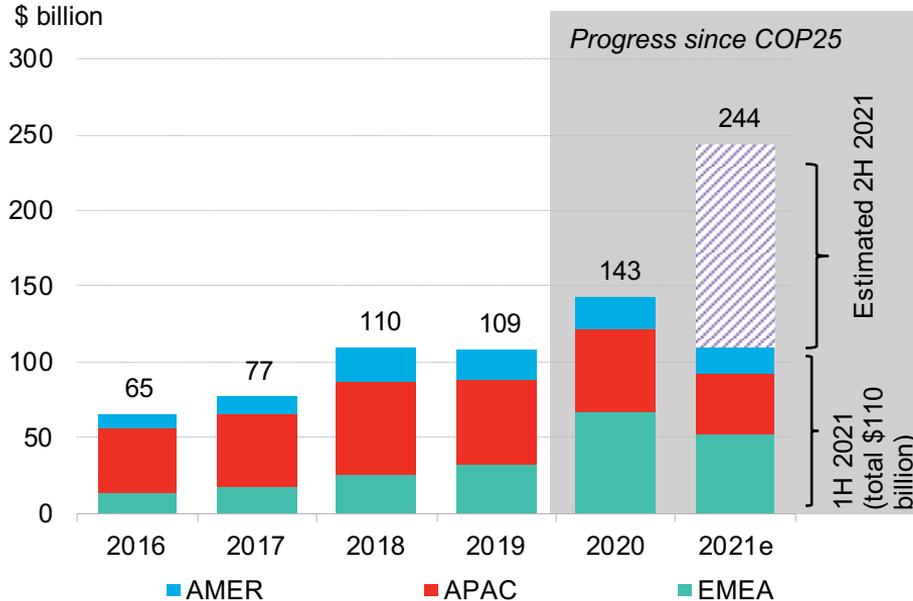
This can be understood as rising exposure, and commitment, to the EV market. Still, the industry-wide average score is only 4.25 in 2020. In theory, an automaker could achieve a score of 100 if all their sales and revenues came from EVs.

Total EV revenues for our sample of automakers has increased 37% in 2020, compared to 2019.

- EV revenues for qualifying automakers jumped from \$81 billion in 2019 to \$111 billion in 2020.

Clean transport investment will exceed \$240 billion in 2021

Global investment into clean road transport vehicles and infrastructure



Global investment into clean road vehicles and infrastructure – including BEVs, PHEVs and FCVs – has hit over \$600 billion cumulatively from 2016 through the first half of 2021.

BNEF tracks investments across an array of subsectors, including clean passenger vehicles, commercial vehicles, buses and home and public charging infrastructure. This figure includes final purchases of vehicles and investment in infrastructure, but not investment into manufacturing plant or other supply chain steps.

Since COP25, the EMEA region has seen the most EV and FCV investment, at \$120 billion in that period.

The APAC and AMER regions have seen the second and third most at \$95 billion and \$38 billion, respectively.

Global clean road transport investment in the first half of 2021 was almost equal to the full-year total in 2019.

We expect the final total for 2021 to exceed \$240 billion, more than double the 2019 total.

Passenger vehicle investments far outweigh the other segments.

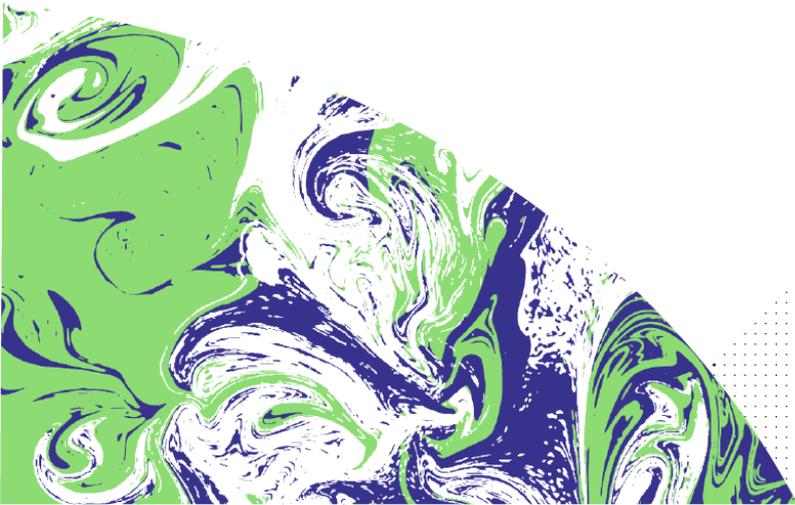
Passenger EVs and FCVs accounted for 88% of total expenditures in 1H 2021.

Source: BloombergNEF. Note: includes passenger and commercial vehicles, buses, public and home charging and hydrogen refueling. BEVs, PHEVs, FCVs.



Market drivers

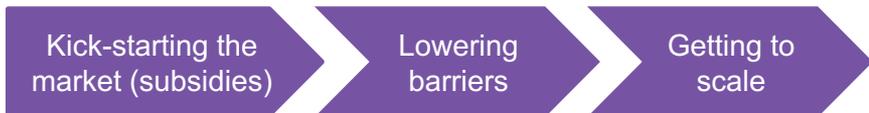
Policy, technology and infrastructure



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Policies have evolved from subsidies to market-based mechanisms



- Manufacturing subsidies
- Direct purchase subsidies
- Tax credits
- Company car allowances

- Charging infrastructure funding / public procurement
- Charging standards

- Fuel economy / emissions regulations
- EV quotas
- City restrictions on polluting vehicles
- Internal combustion engine bans



Effective, but **expensive**

Inexpensive, competitive, **scalable**

Direct purchase incentives, which lower the upfront cost of an EV, are an effective tool in incentivizing EV adoption, but are expensive for governments to support in the long term.

China has had some of the most generous subsidies in place since 2010, but has been reducing them annually, and these are now set to expire by 2022.

Supply side policies – like fleet-wide fuel economy targets – are gaining in importance.

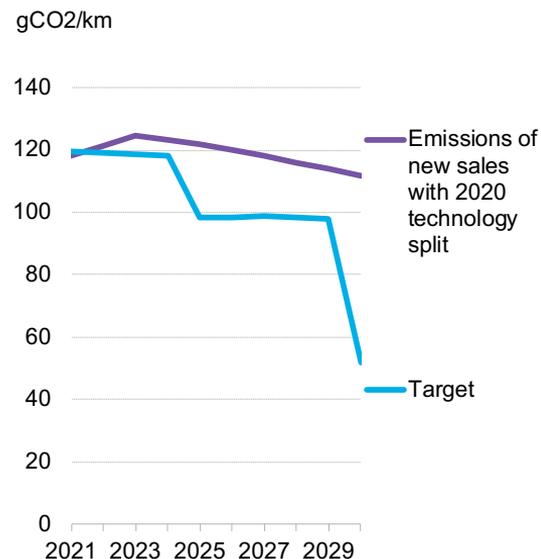
- Europe and China have some of the most stringent fuel economy targets in place globally, which automakers must meet. Meeting them implies significantly increasing sales of electric vehicles.
- Automakers active in these two regions are thus strongly induced to launch new EV models, and make them attractive to consumers.

Source: BloombergNEF.

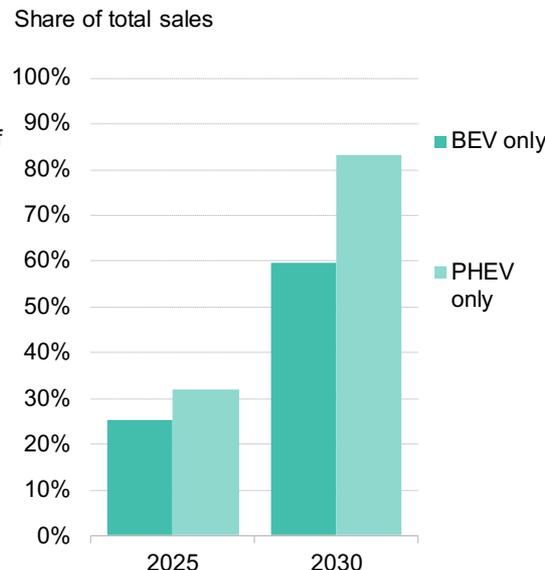


EU fuel economy targets are driving record EV adoption in the region

Historical and target average vehicle CO2 emissions in Europe



Required EV adoption to meet new EU CO2 emission targets



Europe's fuel economy targets for passenger vehicles became more stringent in 2020.

Regulations now require a 37.5% reduction of CO2 emissions by 2030, from 2021 levels. According to our analysis, this would require EV adoption to reach around 42% of passenger vehicle sales.

The European Commission proposes to tighten these targets further.

Under its proposals, the required CO2 reduction from 2021-2030 would rise from 37.5% to 55%. To comply, at least 60% of new car sales will have to be electric in 2030. This figure assumes all of the EVs are all-electric BEVs.

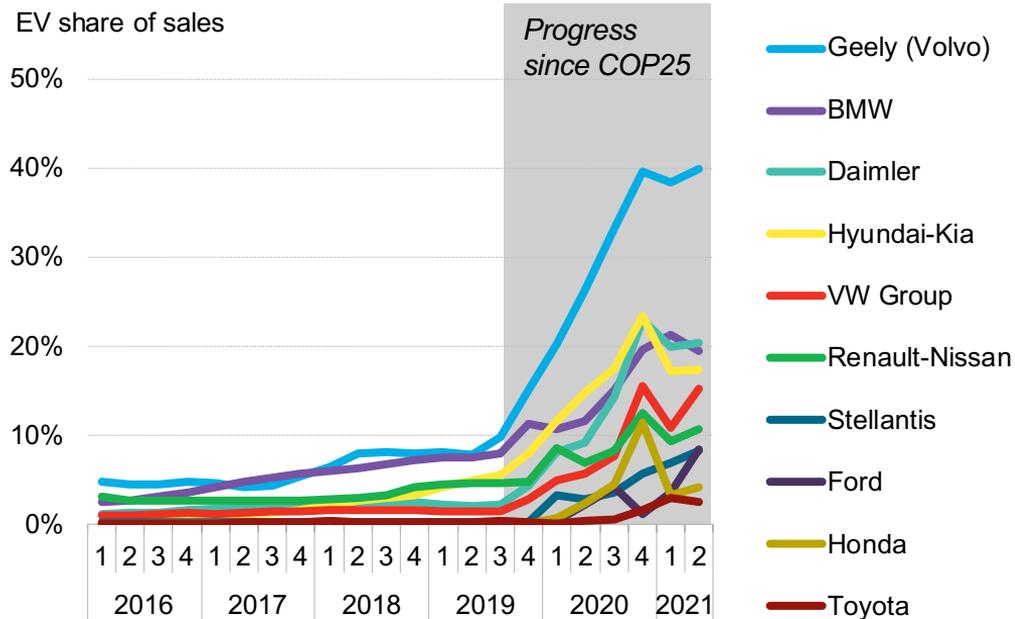
The final share will depend on the mix between BEVs and plug-in hybrids, and can exceed 80% of sales if automakers were to only use PHEVs for compliance.

The European Commission also proposes to phase out sales of ICE vehicles by 2035. This is discussed in the [Government commitments](#) section below.

Source: BloombergNEF, European Commission. Note: Targets in 2020 called for an average vehicle CO2 emissions reduction to 95gCO2/km. The 2025 target calls for CO2 emissions to be 15% lower than in 2021; the EV share depends on the BEV-PHEV mix.

Several automakers are at ~20% EV sales and above, in Europe

Automakers' EV sales share in Europe



Electric vehicles are now a major component of automakers' sales portfolios in Europe.

For most automakers in Europe, the last 3-4 quarters of sales figures have seen EVs jump to new highs.

In 2019, EVs contributed just 3.4% to major automakers' sales in Europe. This has leapt to an average of 14% in 1H 2021.

Premium brands, such as Volvo, BMW and Daimler have the highest share of EVs in their total sales among automakers with European operations, but some 70% of their combined EV sales are still PHEVs.

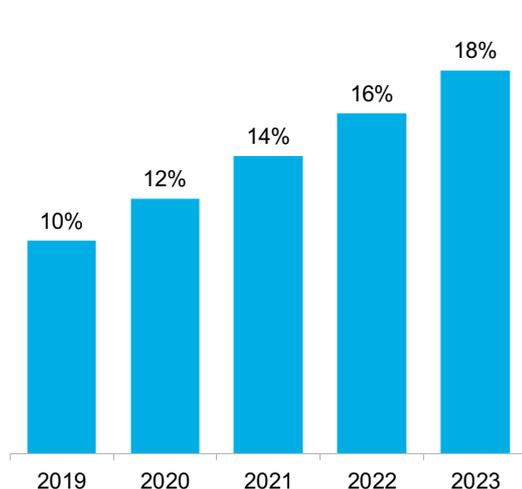
These companies achieved the highest EV sales shares in 1H 2021:

- Geely (Volvo): 39%
- BMW: 20%
- Daimler: 20%
- Hyundai-Kia: 17%

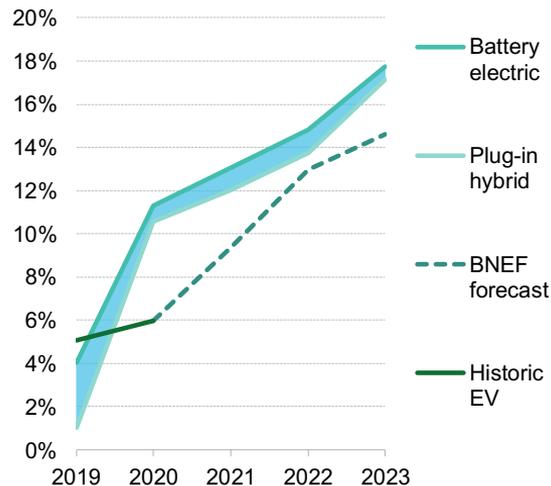
Source: BloombergNEF. Note: Includes BEV, PHEV and FCVs.

China promotes EVs through a credit mechanism and fuel economy targets

Required proportion of NEV credits to cover ICE passenger car production and imports



Estimated share of EV sales needed to meet CAFC credit targets



Since 2019, China has been promoting domestic EV sales through the **New Energy Vehicle (NEV)** credit and **Corporate Average Fuel Consumption (CAFC)** credit systems.

Under the NEV credit system, automakers are required to generate credits from the production of battery electric, plug-in hybrid and fuel cell vehicles.

To meet NEV requirements, EVs will have to be 6-11% of passenger vehicle sales in 2023, depending on the mix of BEVs and PHEVs. This is different than (but derived from) the 18% share of credits required (chart).

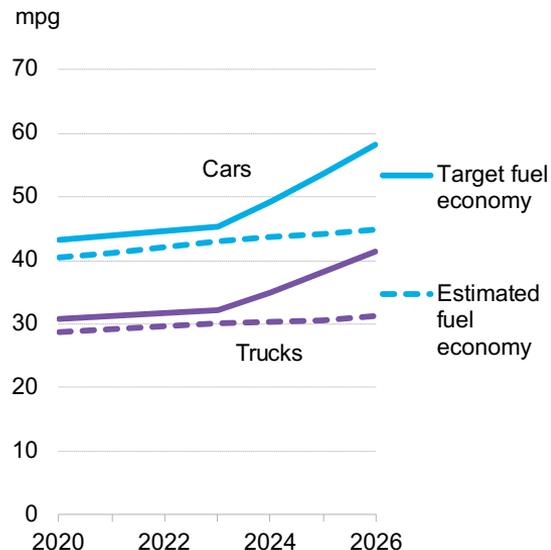
China's CAFC targets tighten towards a fleet-wide target of four litres per 100 kilometers by 2025. We estimate that 13% of vehicle sales will need to be electric in 2021 and 17% in 2023 in order to comply with the fuel economy targets in China. These targets are higher than our current forecast.

Source: BloombergNEF, Ministry of Industry and Information Technology. Note: EVs sold can generate more than one NEV credit, so the EV adoption rate is lower than the NEV credit target. Required sales to meet CAFC targets (visualized by the blue shaded area) varies depending on the mix of BEV and PHEVs sold.

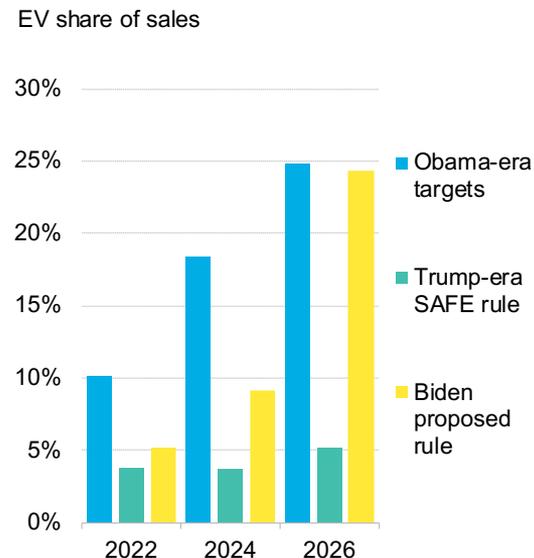


U.S. transport decarbonization policy is in catch-up mode

Estimated fuel economy targets for passenger cars and trucks under new proposed Biden rule



Required EV share of sales to meet U.S. fuel economy standards



In the U.S., the current Safer Affordable Fuel-Efficient (SAFE) rule, introduced under President Trump, does very little to incentivize EV adoption in the country.

We estimate that in order to comply with the SAFE rule, only around 5% of annual passenger vehicle sales in the country will have to be electric throughout the compliance period.

The Biden administration has proposed a new rule for fuel economy standards for model years (MY) 2024-2026

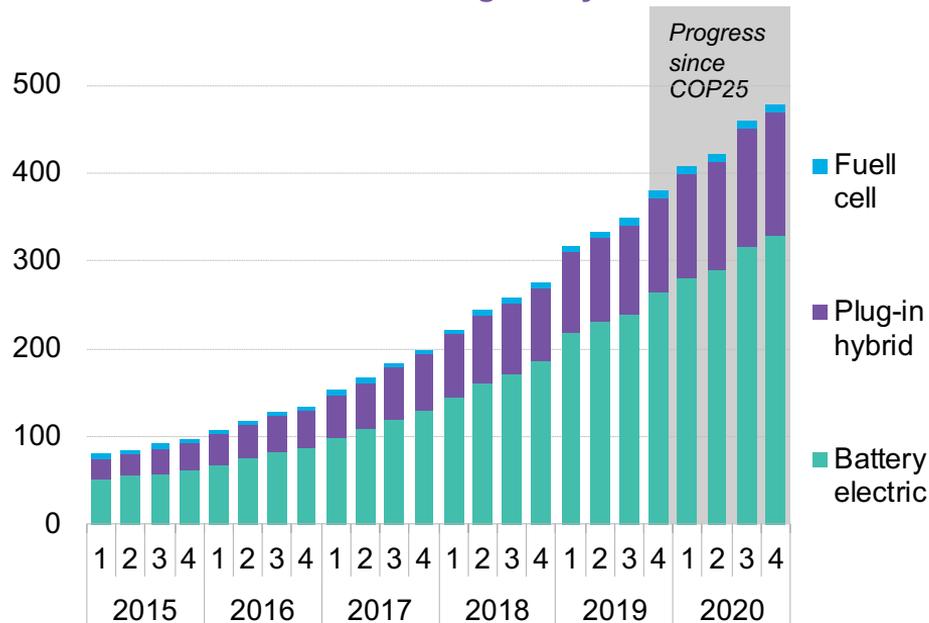
BNEF projects the EV share of passenger vehicle sales needed to hit the new Biden CAFE target would be 9% in 2024 and 24% in 2026.

The new rule is only slightly less stringent than the Obama-era targets in the last compliance year, 2026.

Source: BloombergNEF, EPA, NHTSA. Note: passenger cars include domestic and imported cars. Projected NHTSA improvements under the proposed Biden rule. Estimated fuel economy assuming 2019 vehicle sales mix.

Automakers are responding by launching many more new EV models

EV and FCV models available globally



The number of EV and FCV models available around the world has increased 37% since 2019.

While at the end of 2019 there were 264 battery electric, 109 plug-in hybrid and 7 fuel cell vehicles models available globally, by the end of 1H 2021 this has already risen to 362, 151 and 9, respectively.

China is leading in terms of model availability.

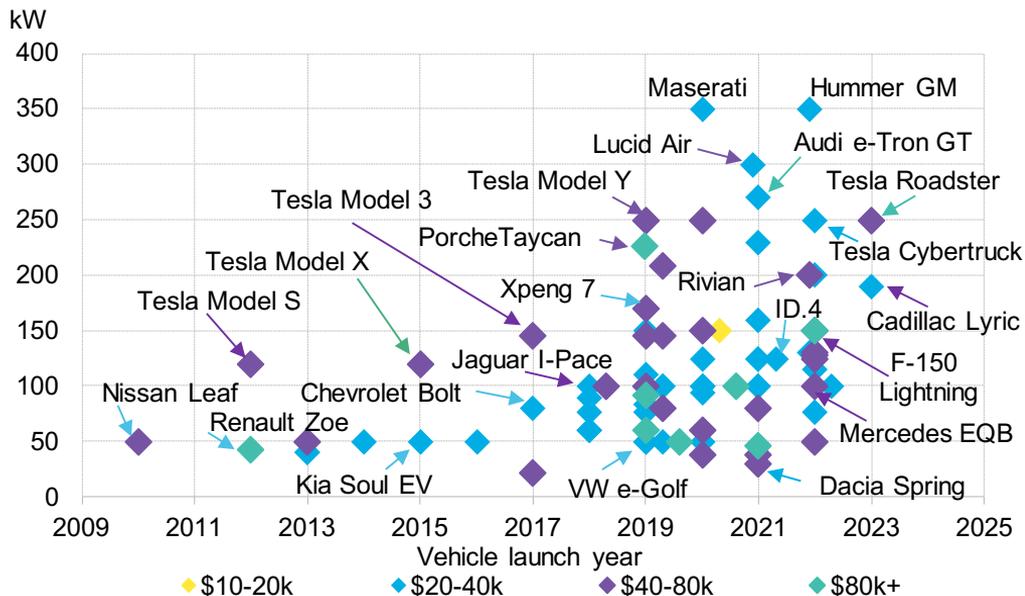
By the end of 2020 there were 355 EV and FCV models available in China, compared to 230 in Europe and just 83 in the U.S.

A lack of EV models to chose from, combined with weak fuel economy standards, are among the reasons for the U.S. lagging China and Europe in ZEV deployment.

Source: BloombergNEF.

New BEVs can charge faster than ever...

Maximum fast-charge capability of BEV models, by year of launch



Source: BloombergNEF, Company press releases.

Today the vast majority of BEVs available in the market include fast-charging capabilities in addition to the on-board charger. This feature reduces charging times, increasing convenience and helping to encourage adoption.

Historically, the dominant charging power available in the market was 50kW, with a few luxury brands offering rates over 100kW.

While the average max-charging power of a BEV launched in 2019 was 115kW, this has increased to 140kW for models launched in 2021. The share of BEVs with rates between 100 to 250kW in all BEVs introduced in 2021 increased to 53%, from 38% for models launched in 2019.

Some high-end BEV models go further, allowing for charging powers of up to 350kW.

Lately, more automakers have announced implementation of 800V architectures to achieve 350kW in future models.

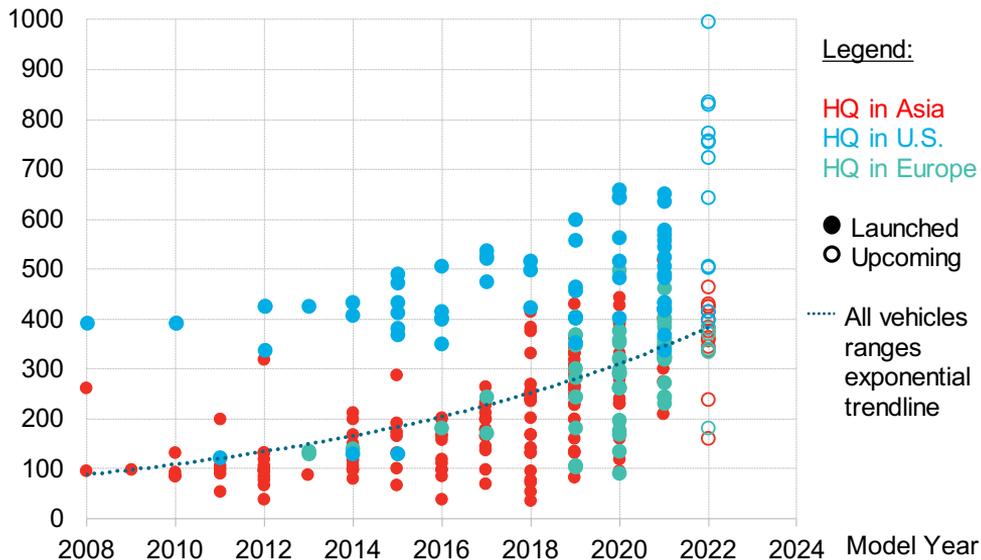
The success of fast-charging technology will require additional efforts to improve and expand fast-charging infrastructure networks.



... And drive for longer distances

Range of launched and upcoming BEV models, by launch year

EPA range in kilometers



The average range of newly launched BEV models has steadily risen over several years, reaching 400km in 2021.

Automakers have been progressively extending the range capability of their offerings. In the last three years, BEV range increased at a compound annual growth rate (CAGR) of 18%.

Models announced for 2022 are already hitting an impressive 480km average and we expect these numbers to rise further in the future.

There is a variance across regions, with the U.S. automakers offering the highest mileages.

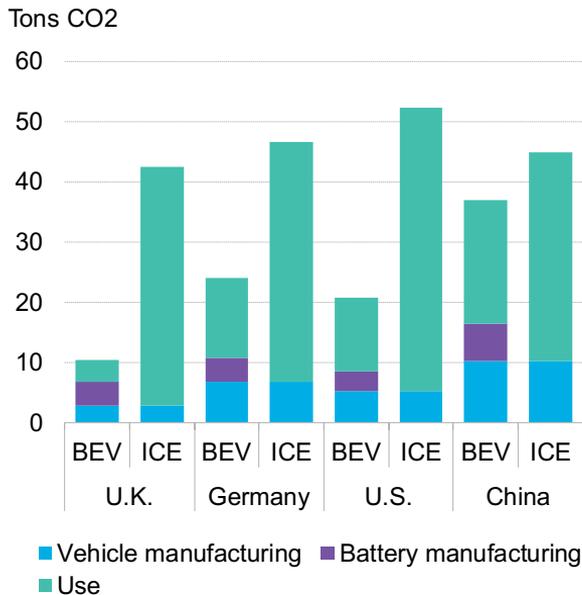
BEVs in Europe have remained stable with the bulk of the models in mid-level ranges, from 100 to 500km.

The lowest-range models are common in the Chinese market. However, even there some upcoming models will achieve up to 500km.

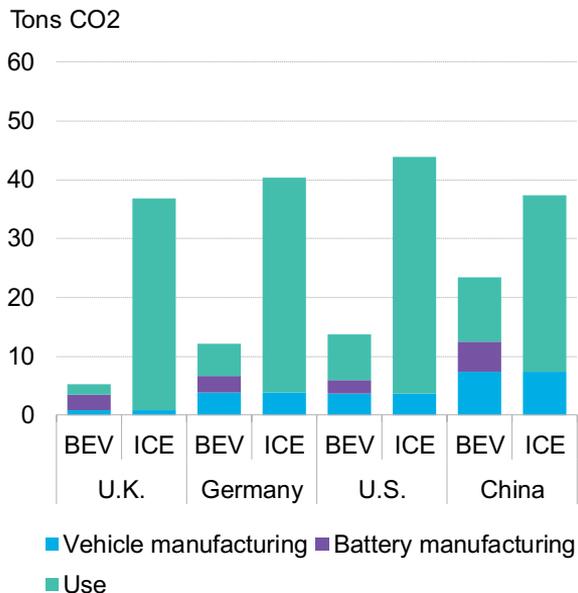
Source: BloombergNEF, EPA, Insideevs, EVCompare, Marklines, Automaker's websites. Note: In our analysis we used EPA electric range which is the testing cycle used in the U.S. for models without a verified EPA range, a value was estimated by converting from the WLTP or NEDC measurement. Regions correspond to automaker headquarters.

BEVs do have lower lifecycle emissions than internal combustion engine vehicles

BEV and ICE vehicle lifetime CO2 emissions, 2020



BEV and ICE vehicle lifetime CO2 emissions, 2030



The lifecycle CO2 emissions of battery electric cars produced in 2020 were already lower than those of combustion cars.

Lifecycle CO2 emissions of battery cars produced in 2020 and used for 250,000 km in the U.K., Germany, the U.S. and China were respectively 76%, 49%, 60% and 18% lower than those of ICE vehicles.

The growth of renewable energy in the power system means that manufacturing emissions will drop rapidly for both ICEs and BEVs between 2020 and 2030.

More importantly, cleaner electricity means cleaner-running BEVs. This means that the emissions advantage of BEVs against ICEs will only expand.

By 2030, lifecycle CO2 emissions of BEVs will be 86%, 70%, 69% and 37% lower in the U.K., Germany, the U.S. and China than for comparable ICEs.

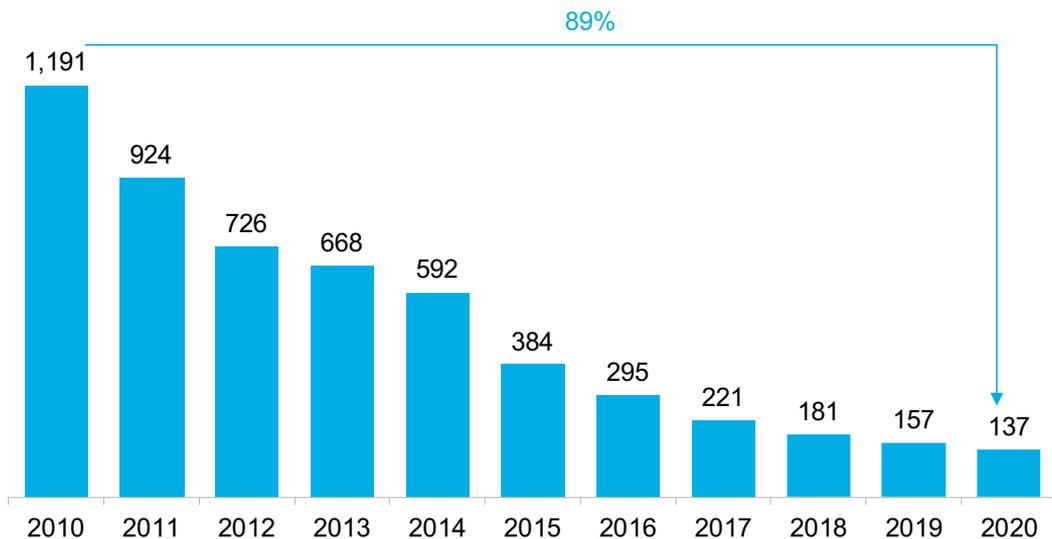
Source: BloombergNEF, ICCT. Note: for European countries we assume that the raw materials and the battery cells are manufactured in Germany and the pack in the country where the vehicle is used; for the U.S. and China the materials, cells and pack are manufactured domestically; the battery size of medium BEV is 71 kWh.



Continued battery cost reductions are a good sign for the future of EVs

Lithium-ion battery pack price

Battery pack price (real 2020 \$/kWh)



The price of large-format lithium-ion batteries used in EVs has fallen dramatically over the last decade.

The volume-weighted average battery pack price in BNEF's annual survey has decreased 89% since 2010, from \$1,191 per kWh to \$137 per kWh in 2020.

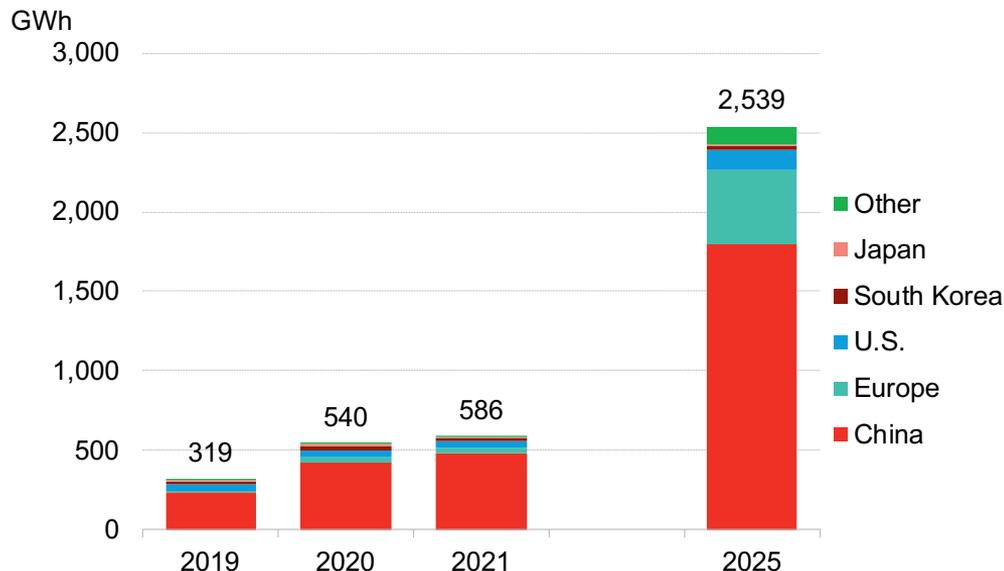
Battery prices are falling for a number of reasons, including growing global manufacturing capacity, growing order sizes from leading manufacturers, increasing energy density and introduction of new cell and pack designs.

While short-term commodity price fluctuations may slow this decline in the coming year, the long-term trend of falling battery costs will continue to improve the economics of electric vehicles.

Source: BloombergNEF.

Battery manufacturing capacity has increased 84% since 2019

Lithium-ion cell manufacturing capacity by plant location



Source: BloombergNEF. Note: 2021 includes facilities commissioned up to May 2021. 2025 Other includes capacity outside of the countries indicated. Based on current announcements. Values have been rounded.

Battery manufacturing capacity is growing steadily to meet demand from the EV market.

There is currently 586GWh/year of commissioned lithium-ion battery-manufacturing capacity globally. This is nearly twice the capacity that existed just two years ago.

Although China still dominates globally, in just two years, Europe has tripled its battery production capacity.

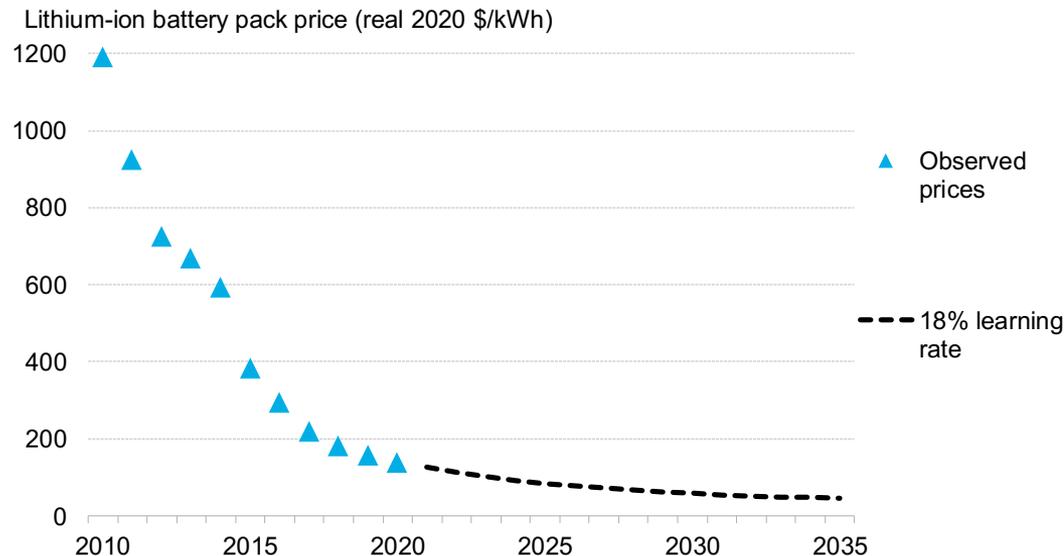
By 2025, total capacity will almost triple to 2,539GWh/year.

China will continue to be the largest lithium-ion battery manufacturer over this time horizon, but new cell manufacturing is also planned closer to demand centers in the U.S. and Europe.

Europe's share of capacity is projected to grow from just 6% today to 18% by 2025

With increased scale and improving tech, battery prices will continue to fall

Lithium-ion battery pack price outlook



Source: BloombergNEF.

Lithium-ion battery costs will continue to fall.

Based on an observed learning rate of 18%, lithium-ion battery pack prices could fall below \$100/kWh in 2024 and reach \$58/kWh in 2030.

The annual rate of price declines is slowing. This is consistent with the concept of a learning rate, which links the rate of price declines to the cumulative volume of battery packs deployed on the market.

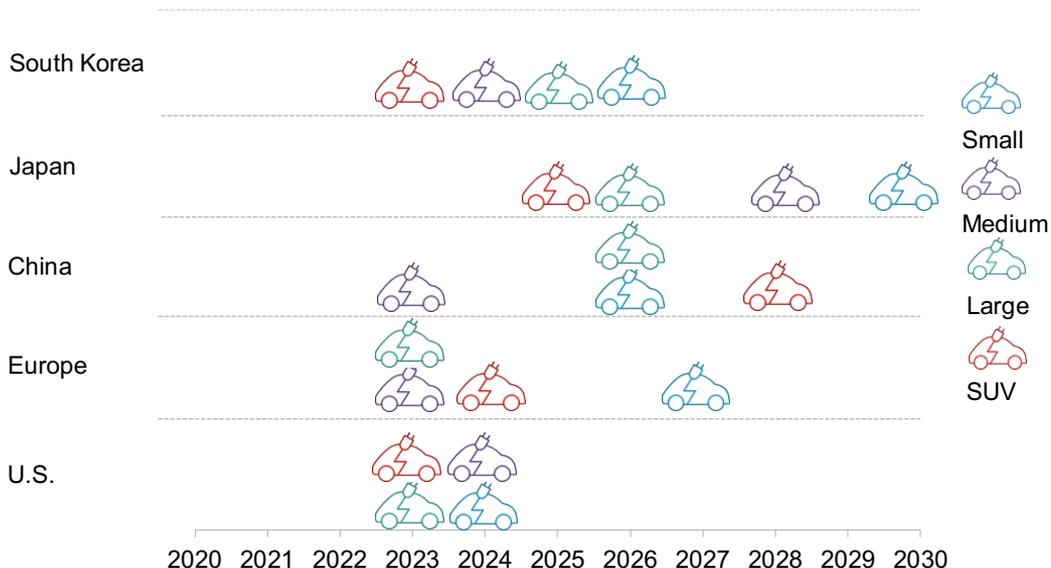
We have observed an 18% learning rate (cost reduction for every doubling of battery capacity), and use this to project forward.

By 2035, lithium-ion battery packs could achieve a volume-weighted average price of \$45/kWh.

However, this will require material substitution and further technology advancements.

BEVs will soon be cost-competitive to make and buy, on an unsubsidized basis

Year of expected upfront price parity for BEVs vs. ICEs



Falling battery prices will soon start to bring the upfront cost of BEVs to parity with equivalent ICEs.

A battery price of \$100/kWh is the point at which we expect EVs will start to reach price parity with internal combustion engine vehicles on an upfront cost basis. (EVs can already compete with ICEs on total cost of ownership in many cases.)

The exact crossover point depends on the region of sale and vehicle segment. For example, medium-sized BEVs are competitive in China and Europe as soon as 2023, while small BEVs are not competitive until 2026 and 2027 in those same regions respectively.

For all vehicle classes, we expect that BEVs can be cost-competitive with ICEs before the end of the decade.

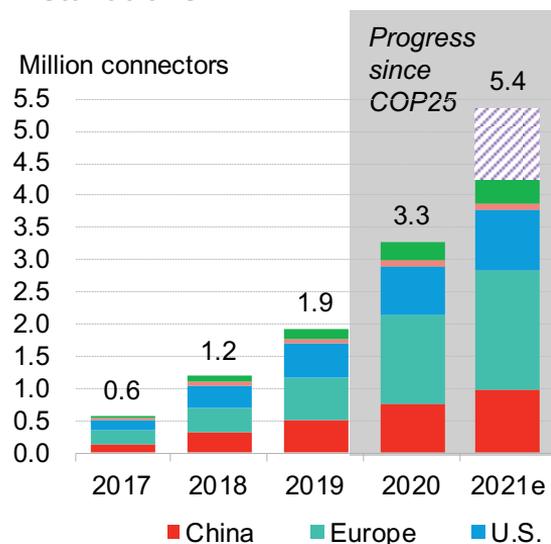
Some vehicle segments, in some countries, can reach price parity very soon.

We estimate SUVs in the U.S. can reach price parity as soon as 2023, while in Europe this won't happen until 2024. In contrast, Europe will see large cars reach parity in 2023.

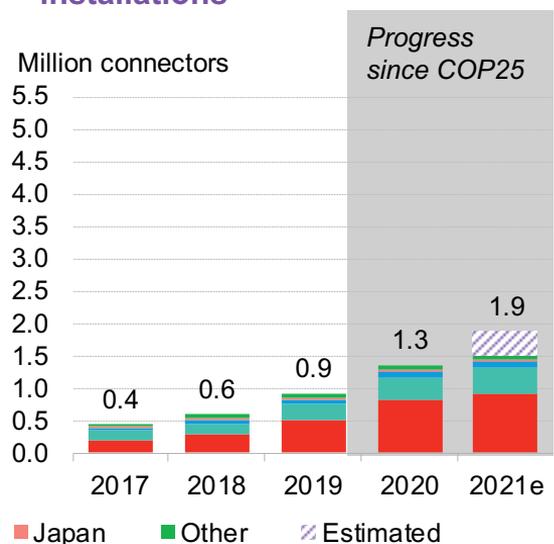
Source: BloombergNEF. Note: Includes direct manufacturing cost and additional cost. Tax not included. Might vary by country depending on local policy.

7 million EV chargers will have been installed by the end of 2021

Cumulative home charger installations



Cumulative public charger installations



BNEF estimates that there will be 5.4 million home EV chargers and 1.9 million public chargers installed cumulatively by the end of 2021.

There have been over 2 million home and 600,000 public charger installations since the end of 2019.

Home charger installations make up a higher share of total installations in Europe and the U.S. compared to China, where there is a near-even split between home and public chargers.

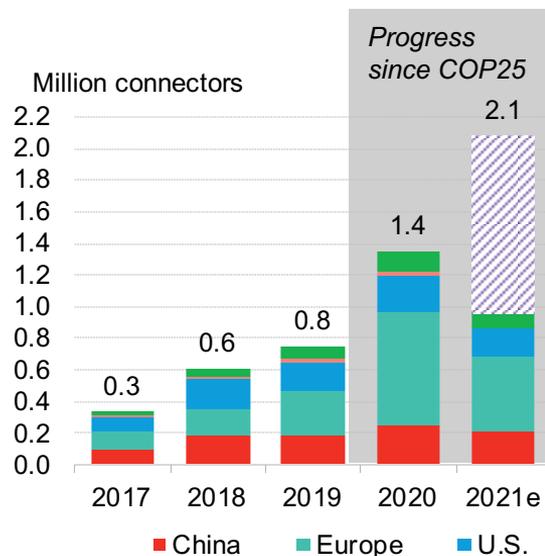
More work is required on charging deployment in countries outside of China, Europe and the U.S.

The roll-out of charging infrastructure in the rest of world and emerging economies has been slow, but slow uptake of EVs has been a factor. As EV adoption in those countries increases with improving BEV economics, charging will follow.

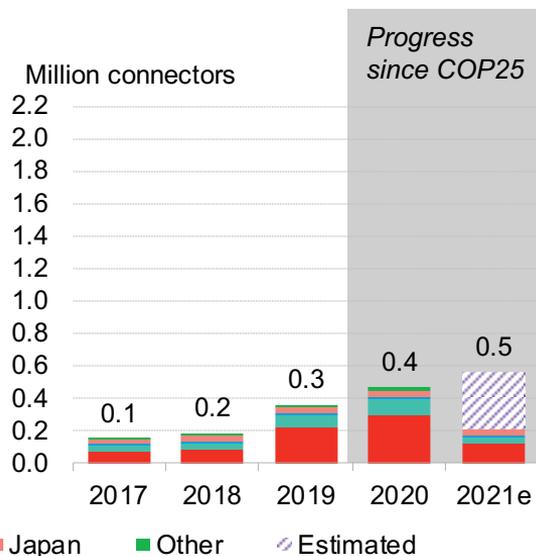
Source: BloombergNEF. Note: Home charger installations are estimated. Excludes workplace and commercial vehicle charging installations

~4 times more home chargers are being installed annually than public chargers

Annual home charger installations



Annual public charger installations



Home charger installations rates will be almost three times higher this year than in 2019.

Around four times more home chargers are being installed annually than public chargers as many EV drivers in Europe and the U.S. have the ability to install a charge point at home.

The share of drivers installing a home charger in Europe and the U.S. is expected to decrease over the next decade, as more drivers without this facility adopt an EV.

Public charger installations in 2021 will be about 60% higher than in 2019.

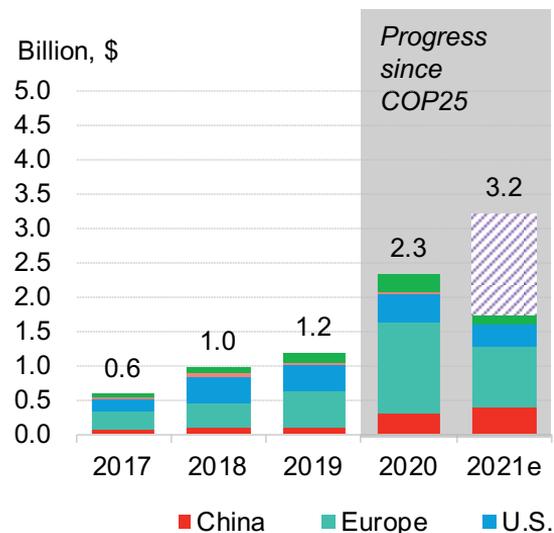
The annual rate of public installations is increasing from around 0.3 million in 2019 to 0.5 million in 2021. China installed 65% of all public chargers globally between January 2020 and June 2021. The country is expected to install around 370,000 public chargers in 2021, compared to 100,000 in Europe and 35,000 in the U.S.

Source: BloombergNEF. Note: Home charger installations are estimated.

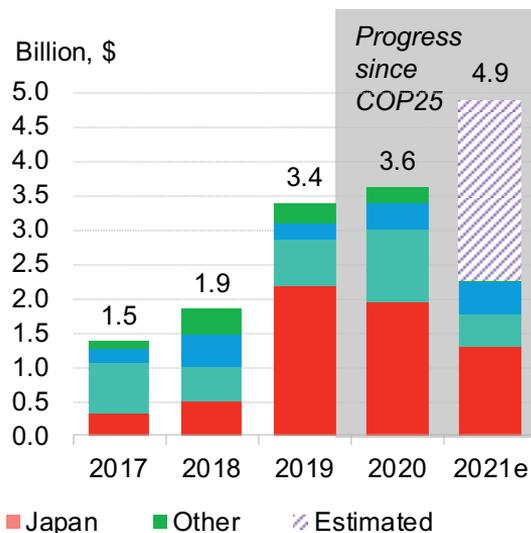


But investment in public chargers outweighs home charging

Annual home charger investment



Annual public charger investment



Total annual investment in charging infrastructure is expected to increase to over \$8 billion in 2021, up from \$4.6 billion in 2019

Public charging infrastructure accounts for a higher proportion of investment, even though there are fewer chargers. This is because of the higher unit cost of equipment and installation.

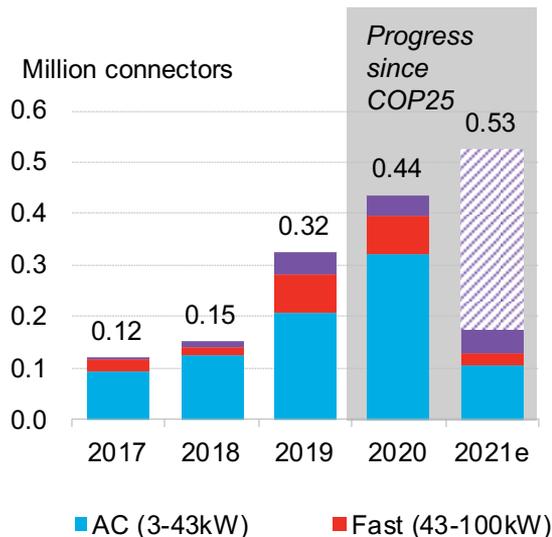
Public charging infrastructure can, however, be cheaper per electric vehicle served, once utilization increases. These charge points can serve anywhere from five to over 100 vehicles' energy needs in a year, compared to 1-2 vehicles for a home charger

Source: BloombergNEF. Note: Investment includes hardware and local installation costs. Investment numbers are estimated.

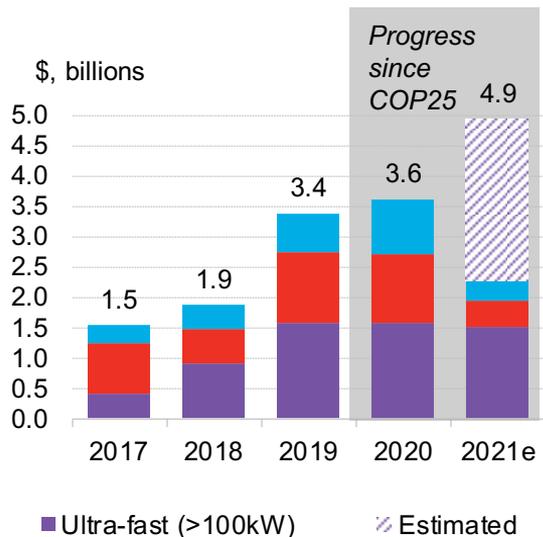


Fast chargers account for over 75% of public charging investment

Annual public charger installations by power type



Annual public charger investment by power type



Fast chargers make up 20-40% of annual public charger installations, but over 75% of annual investment

A public fast charger can cost between \$30,000 and \$180,000 to buy and install, compared to around \$1,000 for a home charger. They can serve many more vehicles and give consumers confidence to complete journeys quickly.

Ultra-fast chargers (>100kW) are taking a higher share of annual public installations.

These made up 4% of annual installations in 2017, 14% in 2019 and 27% in 1H 2021. Installations are occurring in urban locations, such as at supermarkets, as well as on highways. This infrastructure will support EV drivers who do not have the ability to charge at home.

Source: BloombergNEF



Governments have high ambitions for charging infrastructure roll-outs

Charging deployment targets for selected countries/regions

Location	Target
	100,000 public chargers by the end of 2021
	Over 1 million chargers targeted by nine provinces between 2021 and 2025
	1 million public chargers by 2025
	500,000 public chargers by 2025
	150,000 public chargers by 2030
	500,000 public connectors by 2030
	1 million public chargers by 2030

Major economies have targets to deploy over 3 million chargers globally between 2021 and 2030.

- Deployment dates differ and these figures can be for either private or public infrastructure roll-outs
- Regional and local governments are also setting targets to deploy infrastructure

Deployment targets should avoid encouraging low-quality or excessive infrastructure roll-outs.

In some countries, there have been reports of chargers being installed cheaply and in the wrong locations, contributing to low utilization. The total number of chargers required differs depending on the power of chargers installed and the make-up of the fleet.

The European Union has proposed specific measures for public chargers to counteract such issues:

- Distance-based target: A station every 60 kilometers on major roads
- Fleet-based target: 1kW of charging power per battery-electric vehicle and 0.66kW per plug-in hybrid electric vehicle in the fleet

Source: BloombergNEF, government announcements. Note: the information is not exhaustive and there will be more targets globally.

A variety of companies are targeting the charging infrastructure opportunity

Selected companies' charging infrastructure deployment targets

Company	Target
	70,000 public chargers globally by 2030
	500,000 chargers globally by 2025
	150,000 chargers by 2025
	650,000 private and public chargers by 2022
	75,000 in Europe by 2022

Many companies have set long-term charger deployment goals.

- This includes utilities, oil and gas companies and automakers
- There is more focus in Europe than other regions around the world on setting these targets

Nine charging companies have gone public, or announced the intent to go public, since 2019.

- This includes companies that manufacture hardware, operate public charging networks and provide software

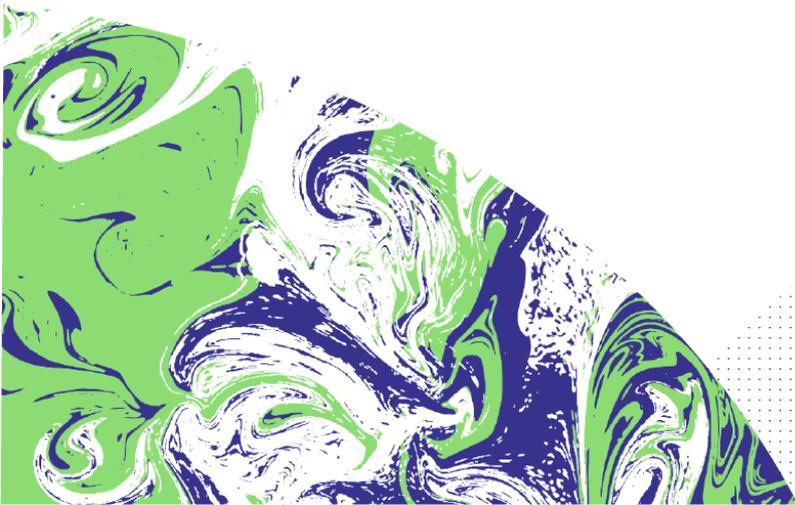
There have been a large number of investments into and acquisitions of smaller charging companies in recent years.

BNEF has tracked over 14 acquisitions in this space since the beginning of 2020, with oil and gas majors and utilities the most active acquirers.

Source: BloombergNEF, company press releases.

Corporate commitments

Ambition, targets and investments

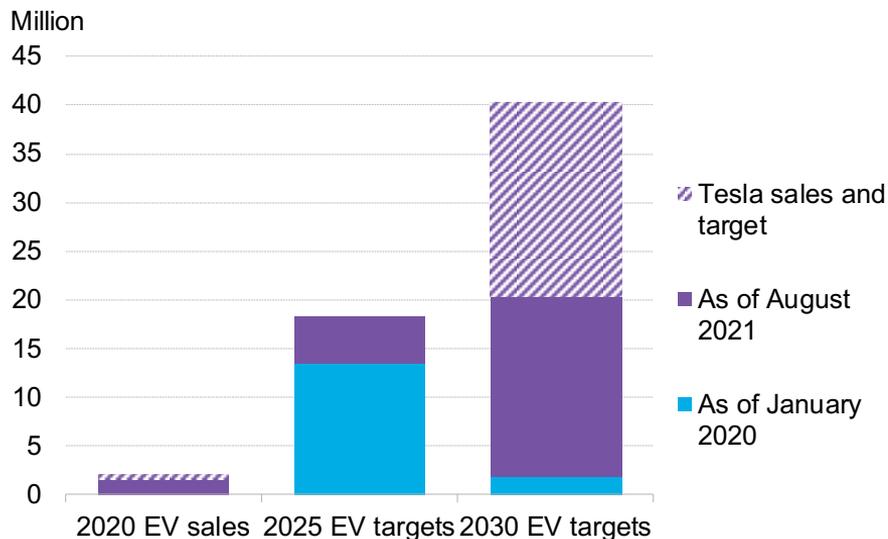


Bloomberg
Philanthropies

BloombergNEF

Automakers are now targeting more than 40 million EV sales per year by 2030

2020 actual and 2025/2030 target EV sales by selected automakers



Many automakers have announced new EV sales targets since COP25, highlighting their growing commitment to electrification.

16 automakers have set goals that could result in 19 million EV sales in 2025.

This is an increase of 44% percent since January 2020, when 11 automakers had pledged around 14 million EVs.

As for 2030, 10 automakers have pledged to achieve over 40 million in aggregate EV sales. This includes Tesla's target of selling 20 million BEVs in 2030.

This represents a major increase since early 2020, when only two automakers (Honda and Subaru) had 2030 pledges, for under 2 million EVs.

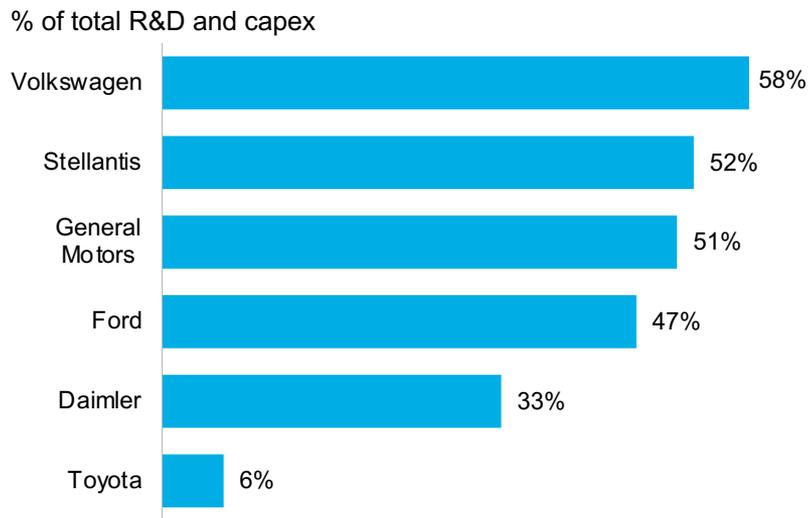
Most of the increases have come from new automakers setting targets, rather than automakers revising their goals.

However, many of these targets are based on the catch-all category of 'electric vehicles', leaving ambiguity on the role of hybrid drivetrains.

Source: BloombergNEF, various automakers. Note: EV sales estimates come from corporate statements and estimates from the BNEF EV data hub. Tesla sales and targets are in patterned purple to differentiate from vehicle makers that sell ICE models.

Major manufacturers' investment plans match their growing EV ambitions

Selected automakers' R&D and capex commitments for EVs and digital tech



Source: company press releases, BloombergNEF. Note: calculated as equal annual investment over companies' stated investment periods, divided by 2020 R&D and capex; investment plans are for five years, other than Daimler's and Toyota's which are for ten years; Toyota's plans reflect investments on battery development and production only; see "Automakers Are Investing in EVs Like They Mean It" ([web](#) | [terminal](#)).

Investment in research, development, equipment and plants for vehicle electrification is the clearest evidence of the automotive industry's rising commitment to the EV transition.

Funds deployed to develop new electric vehicles are the proof of concrete action to support long-term decarbonization goals. In particular, building EV manufacturing plants and setting up supply chains require significant capital, and demonstrate real commitment to produce and sell electric vehicles at large volumes.

Some of the largest automakers plan to commit most of their development efforts and capital spending towards electrification in the next five years.

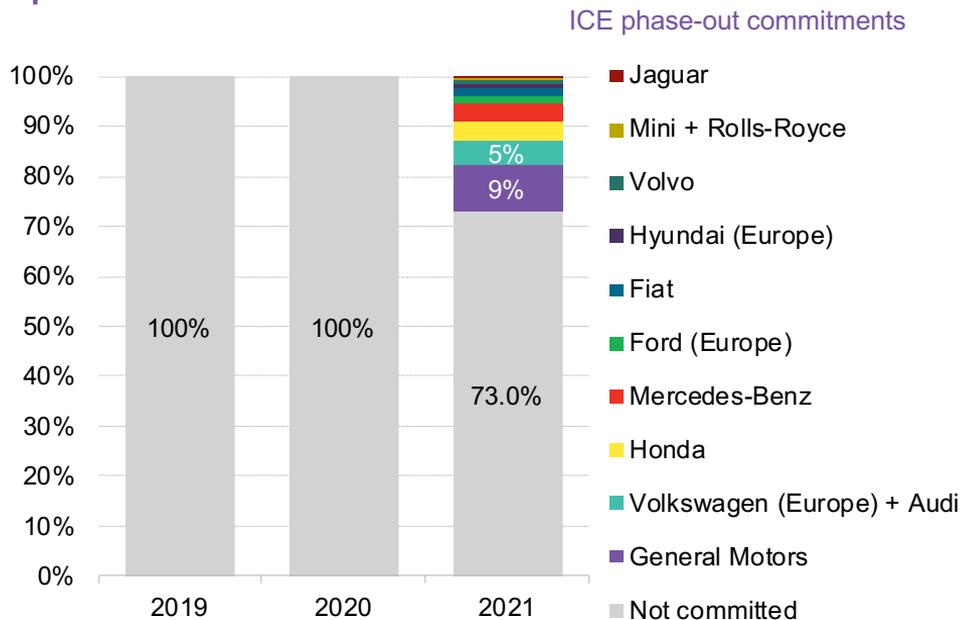
Companies have already deployed parts of those budgets and have begun bringing manufacturing capacity online. Assembly and parts-production plants (including for batteries) are now operating in Europe, North America, China and South Korea.

The automakers in the chart sold 32 million vehicles in 2020, representing about 44% of 2020 global sales (Stellantis sales via FCA and PSA).

Many other manufacturers, such as Volvo, Renault, Nissan, SAIC and BAIC also have ambitious electrification plans and already EVs at scale.

Automakers' ICE phase-out commitments now represent 27% of the global market

Share of passenger vehicles sold by automakers with an ICE phase-out announcement



2021 has seen a steady drumbeat of automakers announcing their intention to end sales of vehicles with an internal combustion engine (ICE).

12 automakers have announced global, regional or subsidiary ICE phase-out targets.

The dates of these phase-out targets range from 2030 to 2040, depending on the automaker.

Audi, Fiat, Volvo and others have chosen 2030, while GM has aspired to end ICE sales in 2035 and Mercedes-Benz by 2039. Honda has the latest target year of 2040. Other automakers like Ford, Hyundai and Volkswagen have announced regional ICE phase-outs for Europe specifically.

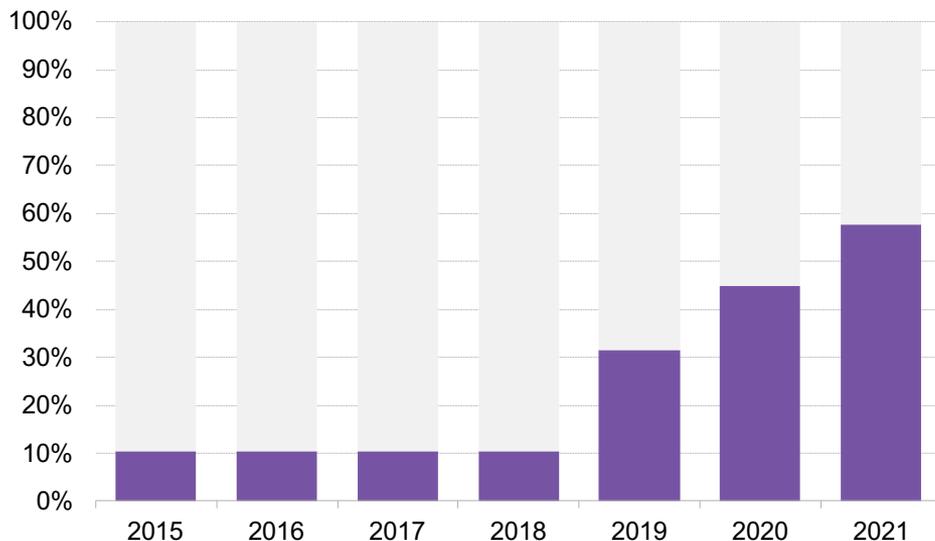
As a share of global passenger vehicle sales, these automakers represented just under 27% of all 2020 sales.

Two years ago, none of these automakers had formally made an announcement around an ICE phase-out pledge. However, around 73% of the global passenger vehicle market remains unaccounted for.

Source: BloombergNEF, Marklines, various automakers. Note: Share of 2020 passenger vehicle sales. Announcements made through September 2021.

Manufacturers covering 58% of the auto market have set some form of net-zero target

Share of global passenger vehicle sales from automakers with a net-zero target by 2050



Vehicle manufacturers have joined the global wave of companies pledging to go net-zero by 2050.

According to BNEF data, 12 automakers of various sizes have made net-zero commitments targeting 2050 or before, as of September 2021. These companies sold over 42 million vehicles in 2020, representing 58% of the global passenger vehicle market. This figure is up from just 31% in 2019.

Large automakers like Ford, Renault, Honda, GM and Nissan all made net-zero commitments in the last year-and-a-half.

Collectively, these net-zero commitments amount to a total of 1.1GtCO₂ to be reduced globally.

This is based on our estimate of the base-year CO₂ emissions covered by the net-zero targets of these automakers. Note that some of them have only committed to scope 1 and 2 emissions, and even if a company covers all 3 scopes, it can exempt certain emission types such as customer's use of a vehicle. If these 12 automakers updated their targets to cover all the emissions in their base year, that would result in closer to 2.2GtCO₂ of emissions to reduce.

Source: BloombergNEF, various automakers. Note: Based on 2020 sales shares. Net-zero data comes from BNEF's Corporate Net-Zero Assessment Tool.

Truck makers are beginning to look towards a ZEV future

Selected manufacturers' targets for zero-emission commercial vehicles

Company	ZEV R&D investment	ZEV sales		
		2025	2030	2040
	"Vast majority of total" by 2025	n/a	Up to 60%	100% (by 2039)
	n/a	n/a	>35%	"Absolute majority"
	1.6 bn euros, 2021-25	10% Scania in Europe	<ul style="list-style-type: none"> • 50% (Scania) • 60% (MAN delivery trucks) • 40% (MAN long-haul trucks) 	

The decarbonization of commercial vehicles has made less progress than the passenger car segment.

In the last two years, three major truck makers have presented plans for zero-emission medium- and heavy-duty trucks. Daimler, Volvo and Traton together averaged 1.1 million annual unit sales across 2019-2020 – roughly 23% of the global medium- and heavy-duty truck market.

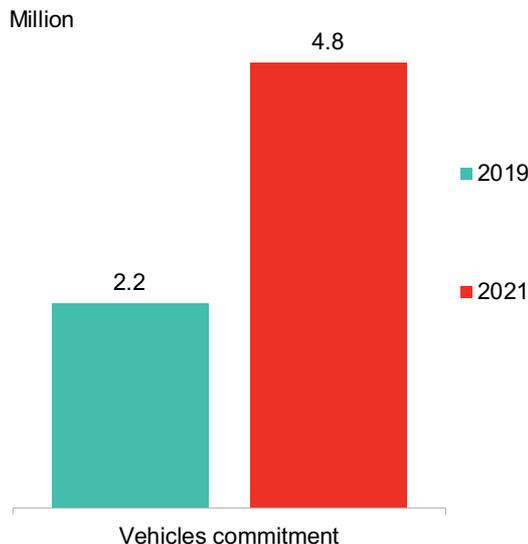
Many manufacturers expect to deploy both battery electric and fuel cell trucks to reach decarbonization targets.

However, the Traton group is relying only on battery technology, as are several startup manufacturers. The ability of truck makers to invest in several competing technologies may be limited.

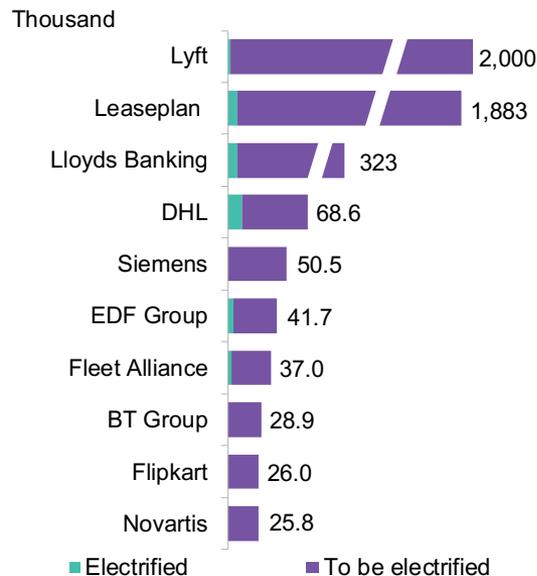
Source: BloombergNEF, company press releases. Note: ZEV is zero emission vehicle.

Corporate fleet operators have joined the race to electrify

Vehicles covered by the EV100 pledge



Top 10 EV100 members by fleet size



Corporate sustainability initiatives are driving uptake of commercial EVs.

- The number of vehicles covered by the Climate Group's EV100 fleet commitment, where members pledge to electrify all of their vehicles globally by 2030, has increased 117% since 2019.
- The number of EV100 members pledging to electrify their fleet increased from 53 in 2019 to 91 in 2021.

These commitments will underpin a strong source of EV demand in this decade.

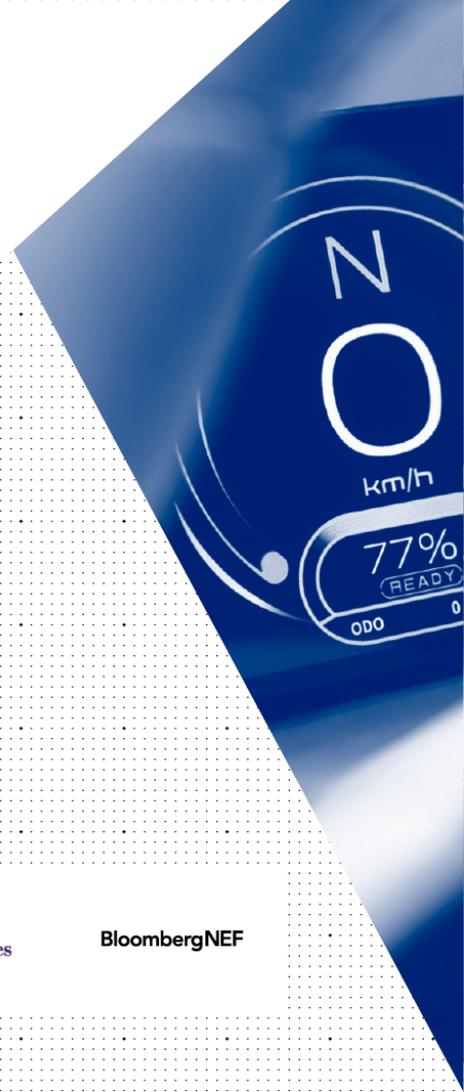
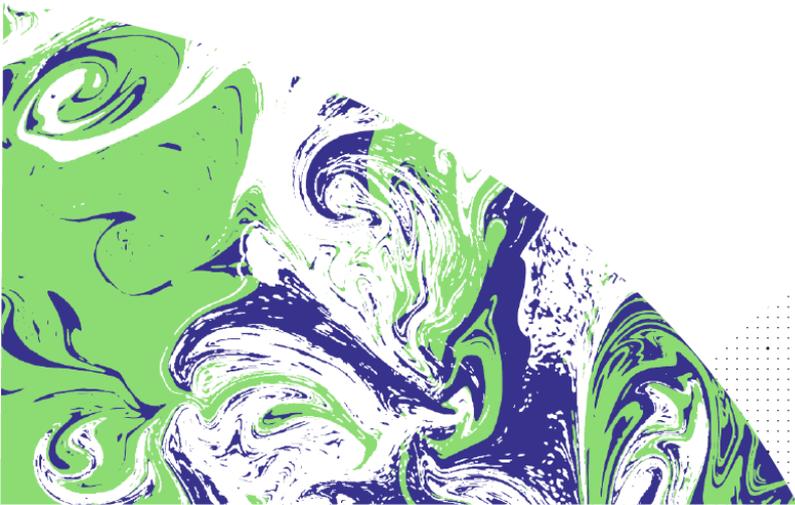
So far, EV100 members have electrified just 169,000 vehicles to date, or just 3.6% of committed vehicles*.

Source: BloombergNEF, The Climate Group. Note: Based on Climate Group's Feb 2021 report. Data on progress towards targets is from reporting in Aug-Oct 2020



Government commitments

National and regional ZEV ambition



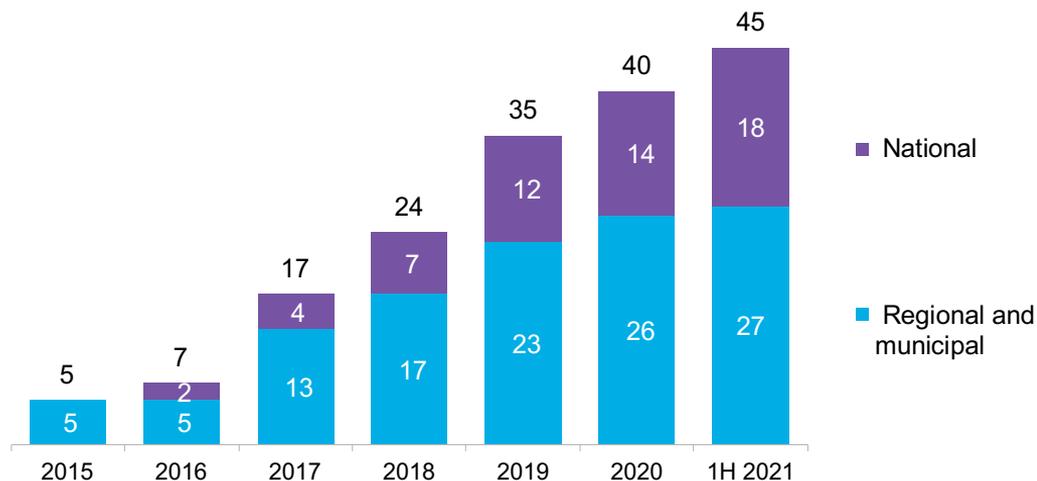
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Governments of all levels are implementing ICE phase-out targets

National and regional targets to phase out internal combustion vehicle sales

Cumulative number



Source: BloombergNEF.

There are 45 governments in total targeting a phase-out of new internal combustion vehicle (ICE) sales.

This includes 18 national governments and 27 regional and municipal authorities.

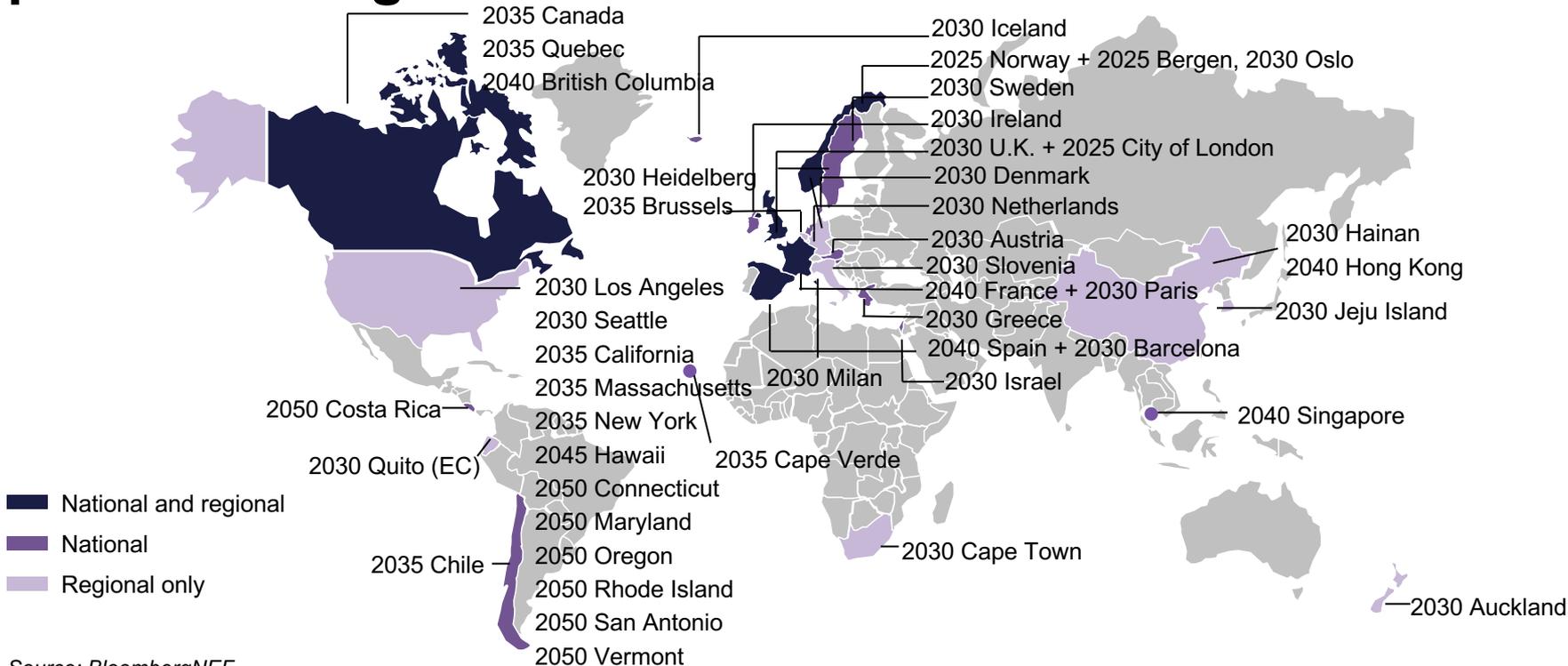
Since 2019, the year of the last COP, the list has been expanded by six countries (the U.K., Canada, Austria, Singapore, Chile and Greece), three U.S. states (California, Massachusetts and New York) and Quebec province in Canada.

Not reflected in this figure is the proposal from the European Commission to phase out sales of ICE vehicles in the EU by 2035. This would add 19 more countries to the count.

The importance of regional ICE phase-out targets should not be underestimated.

Sub-national targets can drive real impact, especially in countries where national mandates are yet to be implemented. For example, the U.S. currently has no phase-out target nationally, but state-level ICE phase-out targets already make up about 25% of passenger car sales in the country. This is discussed below.

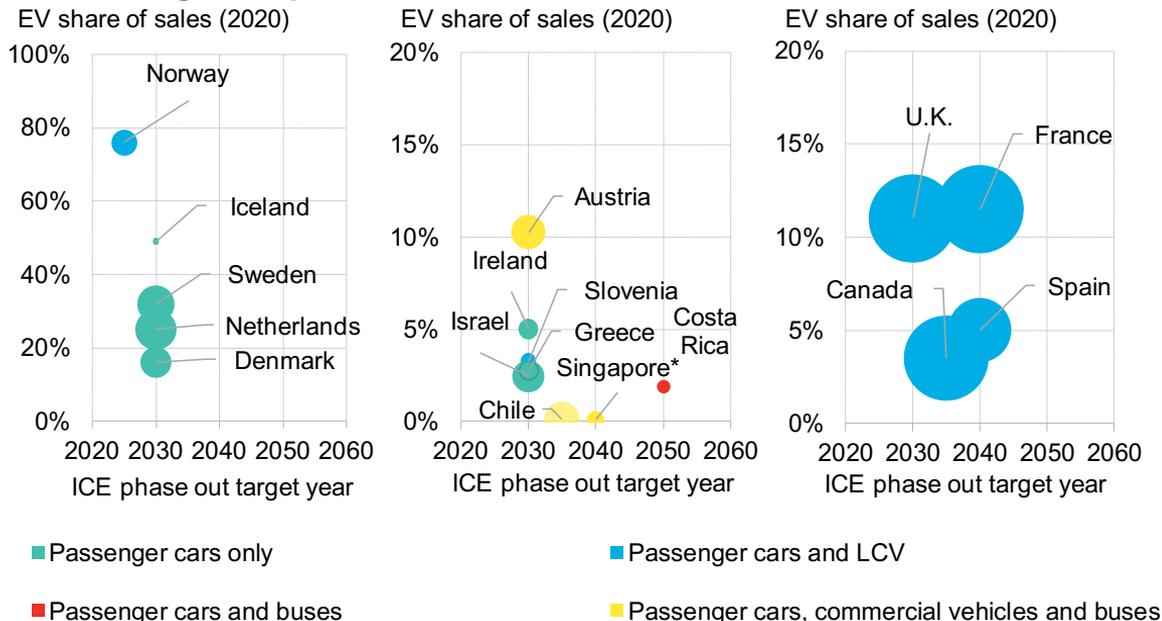
National and regional ICE vehicle phase-out targets



Source: BloombergNEF.

17 countries are targeting complete phase-outs of conventional cars

National targets to phase out internal combustion vehicle sales



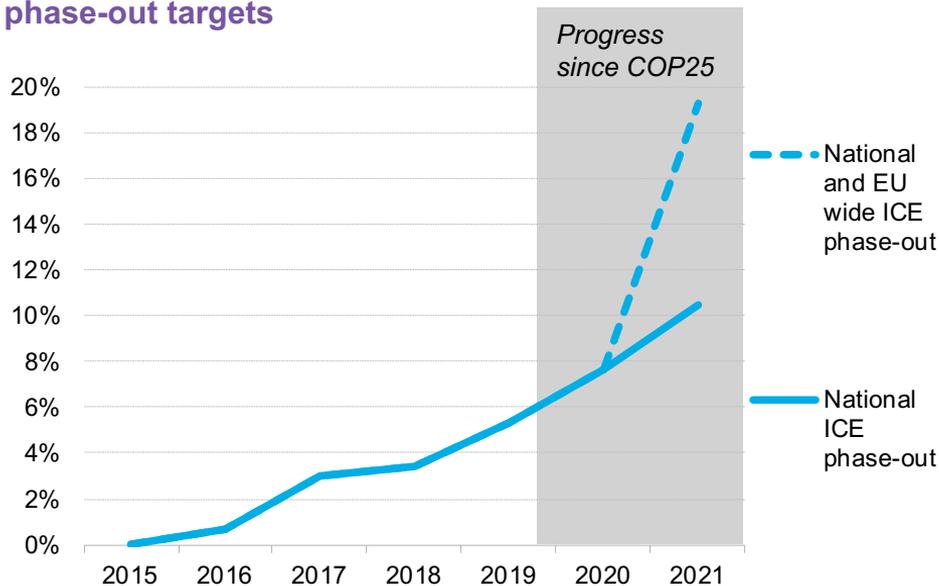
There are 18 national-level targets to phase out sales of internal combustion vehicles (ICE).

- The list is rich in European countries, but Canada, Singapore, Costa Rica and Chile have also committed to phasing out ICE sales.
- A few smaller markets – Sweden, Netherlands, Denmark and Iceland – are targeting 2030 as the phase-out date, which is earlier than others. These countries already enjoy above-average EV adoption rates.
- The U.K. has recently moved its target forward to 2030, although it will allow sales of PHEVs until 2035.
- Canada has recently set a phase-out goal for 2035, but this will require concerted action. Only 4% of passenger vehicles sold in the country in 2020 were electric.

Source: BNEF. Note: EV share of sales in these charts includes PHEVs. Size of the bubble represents the size of the overall passenger vehicles market in 2020; the color of a bubble represents vehicle segments included in the target. (*) Singapore target is a fleet target, not sales, and it allows for pure hybrid vehicles (HEV).

Countries with phase-out targets account for 19% of the passenger vehicle market

Share of global sales covered by national and EU ICE phase-out targets



19% of 2020 passenger vehicles sales were in countries that now have an internal combustion engine (ICE) phase-out date.

More countries or regions are announcing phase-outs each year, with a marked acceleration since 2019. Though some of these targets lack legislative backing, they are still a meaningful commitment towards zero-emissions road transport.

The above figure includes the proposed EU wide target for 2035. Without this, only 10% of the global car market is covered by phase-outs.

The first country with a national ICE phase-out policy was Norway in 2016. That year, less than 1% of global passenger vehicle sales were covered by these policies.

By 2019, 5% of global passenger vehicles sales occurred in countries with an ICE phase-out. This included markets like Canada, France, Spain and others.

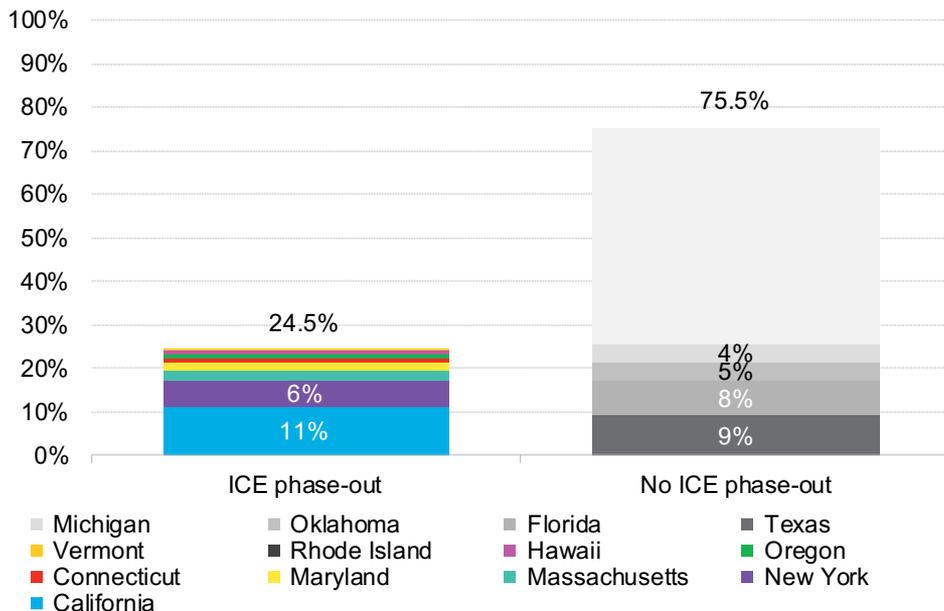
Over the past two years, nearly 14% of the global passenger vehicle market has announced new ICE phase-out targets.

The largest bloc was the EU, along with the U.K., Chile and Singapore.

Source: BloombergNEF, Marklines, Bloomberg Intelligence. Note: share of 2020 global passenger vehicle sales by announcement year of ICE sales phase-out. European Union announcement is still tentative as countries work to finalize 2035 CO2 emission regulation.

A quarter of U.S. auto sales are now under a state-level phase-out policy

Share of U.S. auto sales covered by states with and without ICE phase-out targets



Source: BloombergNEF, NADA.

Around 25% of U.S. auto sales are in states that have some form of ICE phase-out policy in place.

The U.S. had 13.7 million vehicles sold in 2020, so about 3.4 million vehicles were sold in markets with an ICE phase-out policy in place.

California, New York and Massachusetts have executive-led or legislated targets for 2035.

These three states represented just under 20% of the U.S. auto market in 2020.

Other states like Connecticut, Maryland, Oregon, Vermont and other smaller markets have currently signed on for a 2050 target.

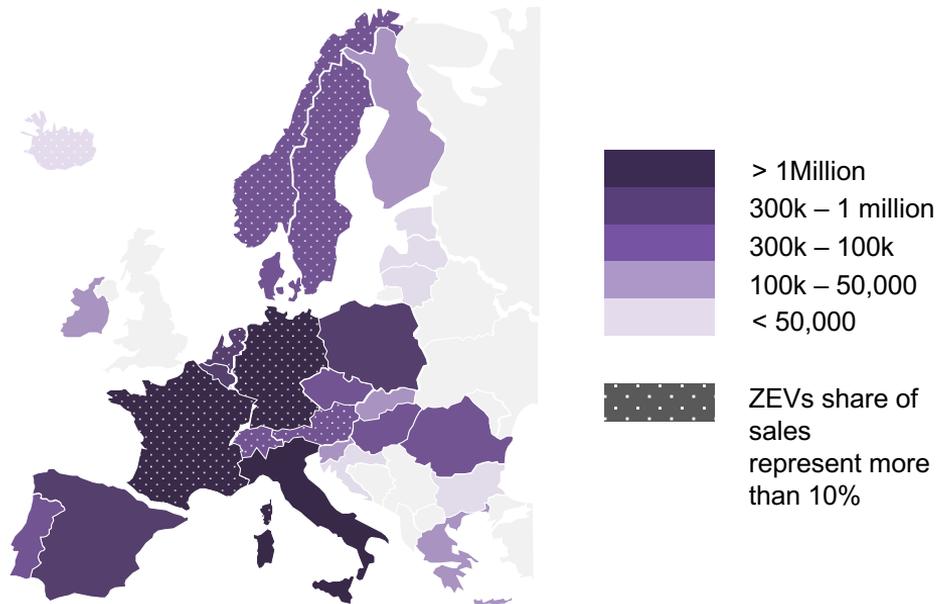
These markets only represent about 5% of the total U.S. passenger car market. It is possible that these states will follow California's lead and bring forward their target in the years ahead.

PHEVs may play a role in some of these state ICE phase-out policies.

Whether or not PHEVs will be included in any ICE phase-out policy remains to be seen. California is still allowing PHEVs in newer versions of its clean car policy as opposed to banning them. The role of PHEVs in the U.S. market will be an ongoing development in this decade.

The EU's proposed ICE phase-out covers 14% of the global auto market

European passenger vehicle sales, 2020



The European Commission has announced plans that imply a practical phase out of new ICE vehicle sales by 2035.

The initial draft aims to hit a fleetwide efficiency of 0gCO₂ per km by 2035, effectively banning PHEVs, as well as conventional vehicles. Collectively, the EU together with Norway, Switzerland and Iceland, countries that also have set ICE phase-out targets, had 10.3 million passenger vehicle sales in 2020, 14% of the global total.

The market is led by Germany, France and Italy. These three countries accounted for almost 60% of all EU passenger vehicles sales in 2020.

Some EU countries are making early strides towards the 2035 target.

In the first half of 2021, Sweden stood out with a 13% ZEV market share, followed by Austria (11.8%) and Germany (10.4%).

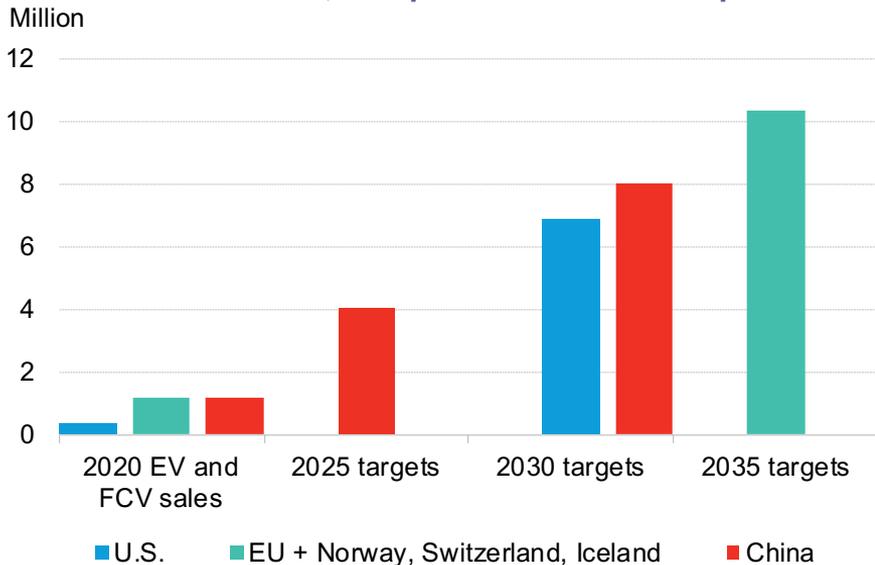
Countries under 10% ZEV share of sales saw 3.6 million passenger vehicle sales in 2021.

Italy, France, Spain and Poland are the biggest European car markets where ZEV adoption is still below the 10% mark (as of 1H 2021). Complying with the proposed ICE phase-out will be challenging for those countries.

Source: BloombergNEF. Note: The map includes data EU27 countries, Norway, Switzerland and Iceland. Data from ZEV share of sales is for the first half of 2021; total passenger vehicle sales is full year 2020.

U.S. and China have substantial EV targets, despite no phase-out policy

Estimated EV and FCV sales based on interim policy targets in China and the U.S., compared to the EU ICE phase-out



Though China and the U.S. do not have ICE phase-out targets, they do have interim targets that could play a vital role in accelerating EV adoption.

China's target is part of its NEV program, and includes three drivetrain types – BEV, PHEV and FCV. Its new interim goal calls for 40% NEV share of sales across passenger and commercial vehicles and buses by 2030. This could amount to 8 million passenger EVs and FCVs sold by 2030, 8 times higher than in 2020. China also has a 20% NEV target for 2025, which could result in 4 million passenger EVs and FCVs.

The U.S. has an interim target for 2030, set under an executive order by President Biden, calling for 50% of passenger vehicle sales to be electric.

Reaching the target would require 6.9 million EVs and FCVs to be sold in the U.S. in 2030 – a significant jump compared to 2020.

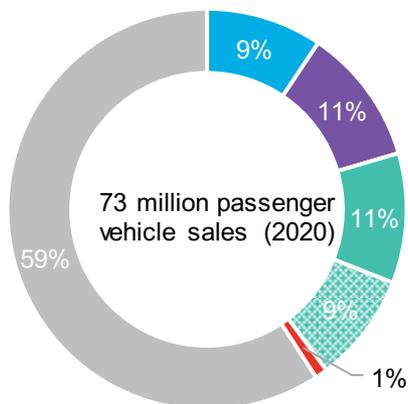
Both interim targets, if achieved, will have a significant impact on global passenger vehicle sales.

In terms of EV sales volumes, they are broadly in line with the EU's longer-term full phase-out target.

Source: BloombergNEF, various governments. Note: uses 2020 passenger vehicle sales for country to estimate impact of interim targets in the chart. The U.S. 2030 target is non-binding, and it includes PHEVs. The EU 2035 target is a full ICE phase-out, while the U.S. and China targets are interim targets.

Combined national targets reach 41% of the global passenger vehicle market

Share of 2020 passenger vehicle market covered by ICE phase-out commitments and interim / partial targets



- U.S. (2030 target)
- China (2030 target)
- ICE phase-out (in place)
- EU proposed (rest of EU)
- India (2030 target)
- Not committed

Nearly 41% of the passenger vehicle market is now covered by some type of ZEV target, either an interim sales target or ICE phase-out. This is up from just 8% in 2019.

As discussed above, ICE phase-outs represent over 19% of the global car market. Interim / partial targets – including China, the U.S. and India – add another 21%.

Combined, these targets covered about 29.8 million passenger vehicle sales in 2020.

There remains about 60% of the market not covered by any type of ZEV commitment.

Large auto markets without a current ICE phase-out policy include South Korea, Japan, Russia and Brazil – as well as remaining portions of the three large markets with interim targets (the U.S., China and India).

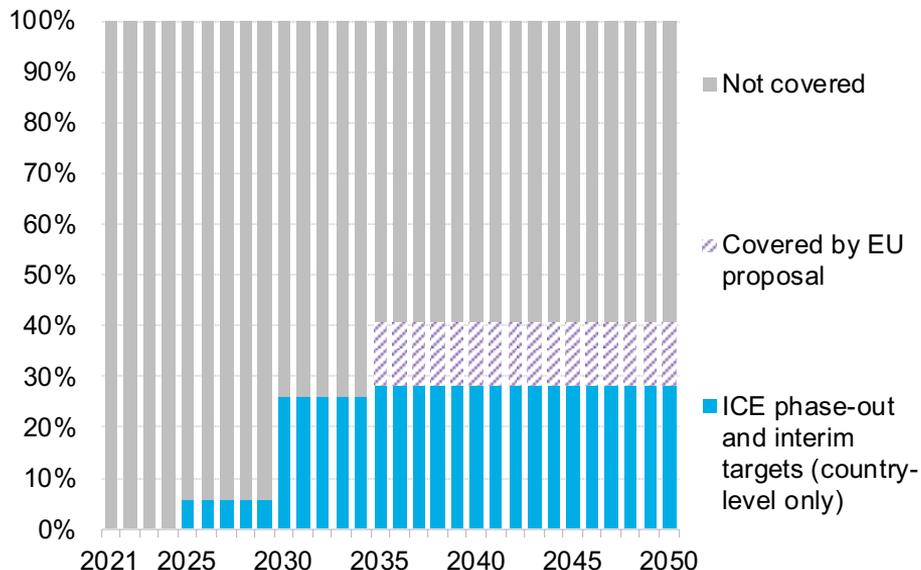
Targets are helpful, but there is still a long way to go.

2020 EV share of passenger vehicle sales was just over 2% in the U.S. and far below 1% in India. China and Europe fared better at 6% and 11% respectively.

Source: BloombergNEF, various governments. Note: uses 2020 passenger vehicle sales for country to estimate impact of interim targets in the chart. The U.S. 2030 target is non-binding, and it includes PHEVs. China's targets is for new energy vehicles. India's target includes PHEVs. ICE phase-outs vary by country/region.

That 41% level is reached in 2035, which will be a critical year

Share of 2020 passenger vehicle market covered by ICE phase-out commitments and interim / partial targets by year



According to BNEF and other projections, it will be necessary to end combustion-vehicle sales by 2035 if the road transport sector is to reach net zero by 2050.

This is because of the long service lives and slow turnover rates of vehicles, meaning that cars and vans produced in 2036 are likely still to be operating by mid-century.

Currently, national and EU targets for 2035 cover 41% of the global auto market. This figure, which includes the European Commission's proposed 2035 ICE phase-out, must rise in order to bring trajectories in line with net zero by 2050.

As soon as 2030, ZEV commitments already total 26% of the auto market. This is underpinned by interim targets in key markets such as the U.S. and China.

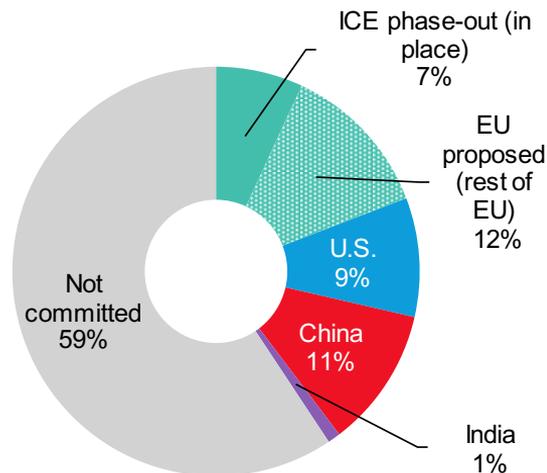
Countries with ICE phase-out targets after 2035 do not significantly add to the total.

These countries include small car markets such as Singapore and Costa Rica with ICE phase-out targets set at 2040 and 2050, respectively, as well as European countries such as France and Spain which we have included in the proposed EU target.

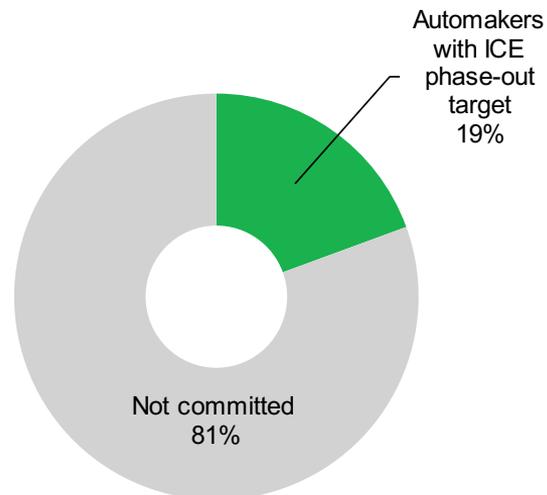
Source: BloombergNEF, various governments. Note: uses 2020 passenger vehicle sales for country to estimate impact of interim targets in the chart. The U.S. 2030 target is non-binding, and it includes PHEVs. China's targets is for new energy vehicles. India's target includes PHEVs. ICE phase-outs vary by country/region.

Automakers' 2035 ambitions do not yet match up to country targets

Country ICE phase-out targets and interim / partial ZEV targets by 2035



Automakers' ICE phase-out targets by 2035



Automotive manufacturers' ICE phase-out targets by 2035 are currently less ambitious than the targets set by governments.

Automakers accounting for 19% of the global passenger vehicle market have stated their intentions to stop selling internal combustion engine vehicles by 2035. This is considerably less than the 41% of the global market covered by national and EU targets, as shown on the previous two slides.

Most corporate and country targets are for 2035, with only a handful for 2040 and beyond.

Honda has set a 2040 ICE phase-out target, while Mercedes-Benz targets 2039. With those targets included, automakers accounting for 27% of vehicles sold in 2020 would only sell electric cars by 2040 (see slide 45).

Source: BloombergNEF.

Source: BloombergNEF.



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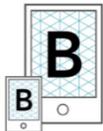
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