Electric Vehicle Outlook 2019

May 15, 2019

BloombergNEF

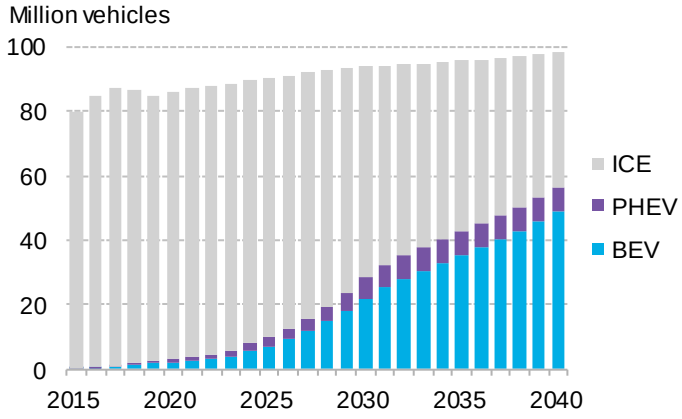
Section 1. Executive summary

This is BloombergNEF's fourth annual Long-Term Electric Vehicle Outlook (EVO). In the last year, over 2 million electric vehicles were added to the global vehicle fleet, and there are now over 5 million EVs on the road globally. Battery prices have continued to fall, policymakers continue to push toward lower carbon transport, and automakers are increasing their commitments to electrification. Consumer interest in EVs is also rising as more compelling models hit the market. Meanwhile, shared mobility trends are gathering pace as ride hailing and car sharing grow.

This report updates our view of EV adoption in passenger vehicles, commercial vans and trucks, and buses globally, and the associated impacts on electricity, oil and battery materials markets.

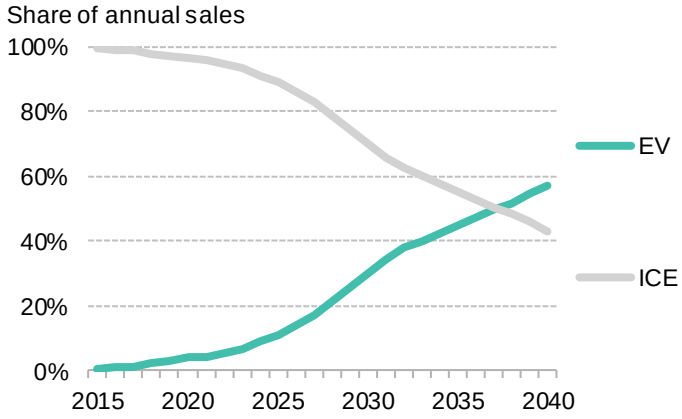
- By 2040 we expect 57% of all passenger vehicles sales and just over 30% of the global passenger vehicle fleet will be electric. As in our previous forecasts, we expect price parity between EVs and internal combustion vehicles by the mid-2020s in most segments, though the first segment crosses by 2022 and there is a wide variation between geographies and vehicle segments. Until this is reached, policy support will be required in most markets.
- There are two main inflection points for passenger EV adoption: EV price parity and infrastructure growth slowdown. EV adoption accelerates from 2024 onwards before slowing down in the 2030s as charging infrastructure availability holds back the market. Buyers with access to home charging will go electric at a much faster rate than those without. Each country hits these points at different times, leading to a highly varied global auto market.

Figure 1: Global long-term passenger vehicle sales by drivetrain



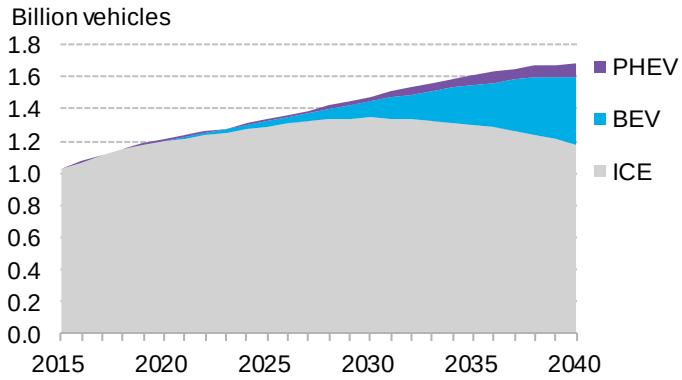
Source: BloombergNEF

Figure 2: Global EV and ICE share of long-term passenger vehicles sales



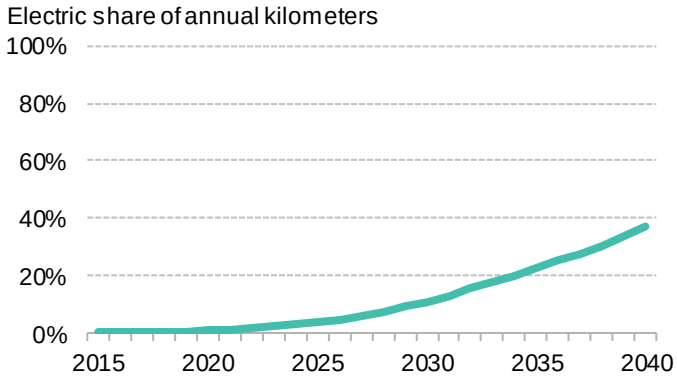
Source: BloombergNEF

Figure 3: Global long-term passenger vehicle fleet by drivetrain



Source: BloombergNEF

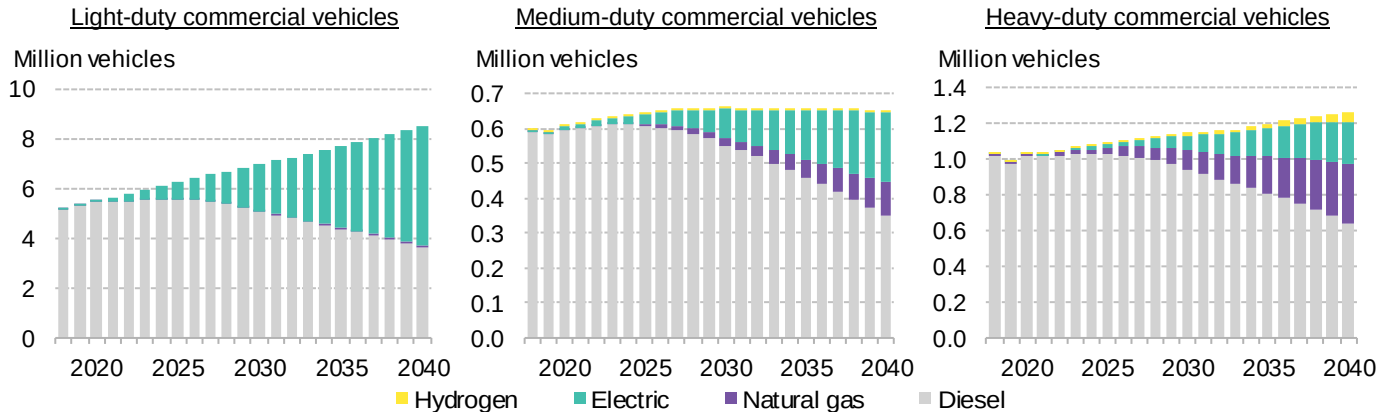
Figure 4: Global long-term passenger kilometers traveled by electric vehicles



Source: BloombergNEF

- Passenger EV sales rise from 2 million in 2018 to 10 million in 2025, 28 million in 2030 and 56 million by 2040. Sales of internal combustion passenger vehicles have already peaked, and may never recover unless EV growth falters, or major economies such as China invest in significant stimulus programs.
- The total passenger fleet size continues to rise to 1.68 billion vehicles in 2040, driven mostly by demand in emerging economies. This is lower than many other forecasters, as we see ride hailing, car sharing, urbanization, demographics and – eventually – autonomy, cut into vehicle demand growth, particularly in the 2030s. We expect 500 million of these to be EVs.
- Today, shared mobility services – taxis, ride hailing and car sharing – account for less than 5% of total distance traveled annually by passenger vehicles. By 2040, we expect the contribution from shared mobility services to rise to 19% of total kilometers traveled by passenger vehicles. Shared, autonomous vehicles ('robotaxis') account for 37% of the distance traveled by shared mobility services in 2040. EV adoption by shared mobility services will be faster than privately-owned vehicles due to economics. Today, EVs account for 1.8% of the shared mobility fleet. By 2040, we expect EVs to account for 80% of the shared mobility fleet.
- The internal combustion (ICE) vehicle fleet peaks in 2030 and then begins to decline. Average passenger ICE fleet efficiency rises by 25% between today and 2040. The share of total passenger kilometers driven goes electric faster than the fleet due to high utilization vehicles in shared applications switching to electric faster than private vehicles.
- Buses go electric faster than any other major vehicle segment. The total cost of ownership of municipal e-buses is now competitive with comparable diesel buses. China is far ahead of other countries, with 425,000 e-buses already deployed, but sales are rising quickly in Europe and North America and new policy targets are pushing the market forward. By 2030, 46% of the global municipal bus fleet is electrified, rising to 67% by 2040.
- The recent rapid growth in global demand for freight slows over the next 20 years due to structural changes to economies and increased population density. The share of road freight moved in small trucks and delivery vans doubles between 2020 and 2040 as urbanization continues its steady march, more cities impose more restrictions on heavy vehicles, and the economics of lighter trucks improve due to electrification. E-commerce also contributes to this trend and reduces the relative use of larger trucks.

Figure 5: Commercial vehicle sales forecast by segment in the U.S., China and Europe



Source: BloombergNEF. Note: Rest of World sales are not included in these numbers; natural gas includes LNG and CNG; electric includes BEV, PHEV and range-extended EVs.

- Commercial vehicles start to electrify in the 2020s, but progress is highly varied by weight class and duty cycle. We expect 56% of light commercial vehicle sales and 31% of medium commercial vehicle sales in China, the U.S. and Europe combined to be electric by 2040. Electrification will also make inroads into heavy-duty trucks, but mostly for urban applications. Long-haul applications are harder to electrify due to weight and range constraints, so natural gas and hydrogen fuel cells will play a role. We expect 19% of heavy truck sales to be electric by 2040.
- The commercial vehicle fleet gets more efficient over this period, with fuel economy increasing by 27% due to recently passed legislation and new technologies. Digitization, increased data on fleet operations and optimized routing improve the efficiency of the commercial vehicle fleet between now and 2040.

Figure 6: EV share of global new vehicle sales by segment

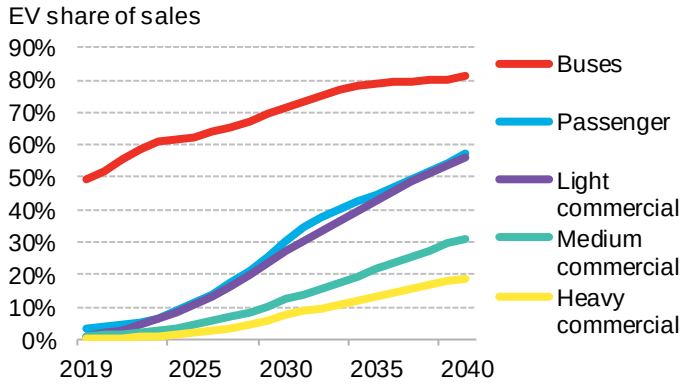
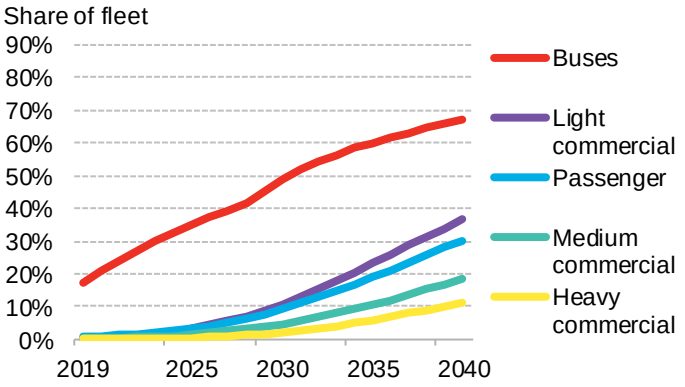


Figure 7: EV share of global vehicle fleet by segment



Source: BloombergNEF. Note: Commercial vehicle adoption figures include the main markets of China, Europe and the U.S.

- China continues to lead on EVs in all segments. China accounts for 48% of the passenger EV sales market in 2025, 34% in 2030 and 26% in 2040. Europe quickly pulls ahead of the U.S. as the number two EV market in the 2020s, driven by tightening fuel economy regulations and growing commitments from domestic automakers.

- Direct EV purchase subsidies will be gone in most countries by 2022. Phase out of subsidies in China as well as automakers reaching the limits of tax credits in the U.S. is expected to slow down EV sales growth in both of those markets in 2019-20. However stringent regulations in China and Europe is driving automakers to make more EV models post 2020, which in turn will result in continued growth in EV sales globally.
- India and other emerging economies go electric much more slowly. In these countries, lower average vehicle purchase prices mean that EV price parity takes longer to achieve. Other barriers include a lack of stringent fuel economy regulations, lower availability of public charging infrastructure and grid constraints. Segments like buses and two/three-wheelers are more promising for electrification in these countries over the next 10 years. Two- and three-wheelers are not included in this forecast.

Figure 8: Global short-term passenger EV adoption by region

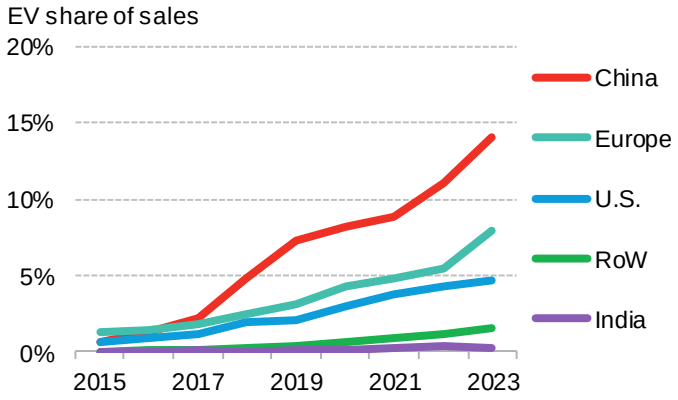
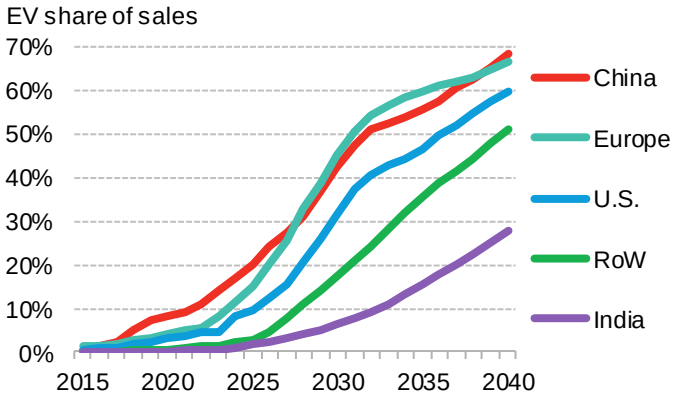


Figure 9: Global long-term passenger EV adoption by region



Source: BloombergNEF. Note: Europe includes EU + EEA + Switzerland.

- Japan, South Korea and Australia all see significant adoption of EVs by 2040 with EVs representing 63%, 52%, and 61% of passenger vehicle sales, respectively. Japan and Australia start slower than other countries, while a new policy push in South Korea helps accelerate short-term adoption.

Figure 10: Annual passenger EV sales by region

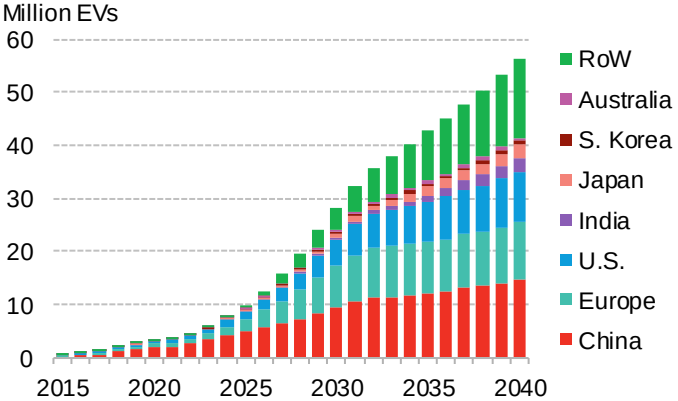
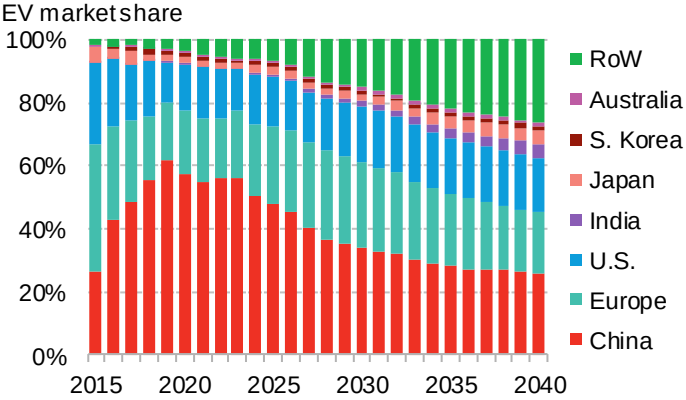


Figure 11: Regional shares of annual passenger EV sales



Source: BloombergNEF. Note: Europe includes EU + EEA + Switzerland. South Korean EV sales prior to 2016 have not been included. The excluded data does not have a material impact on the results.

- Electricity demand from all types of EVs rises from 74TWh in 2019 to 2,333TWh in 2040. Despite this rapid rise, EVs only add 6.8% to total global electricity consumption in 2040. Some countries will be much higher. EVs add 14% to electricity demand in Germany 2040, 11% in the U.S and 7.5% in China. Co-ordinated charging and time of use pricing will be needed to prevent localized grid capacity constraints, but overall the power market can integrate this additional demand.
- Privately owned passenger EVs, shared EVs, electric commercial vehicles and e-buses displace a combined 13.7MMbpd of oil by 2040. This is up significantly from our 2018 forecast due to higher expected miles traveled, lower assumed ICE efficiency, a growing role of shared mobility and the inclusion of commercial vehicles in our forecast. Passenger vehicle oil demand peaks in 2028 and commercial vehicle oil demand peaks in 2035.

Figure 12: Passenger vehicle fuel demand forecast

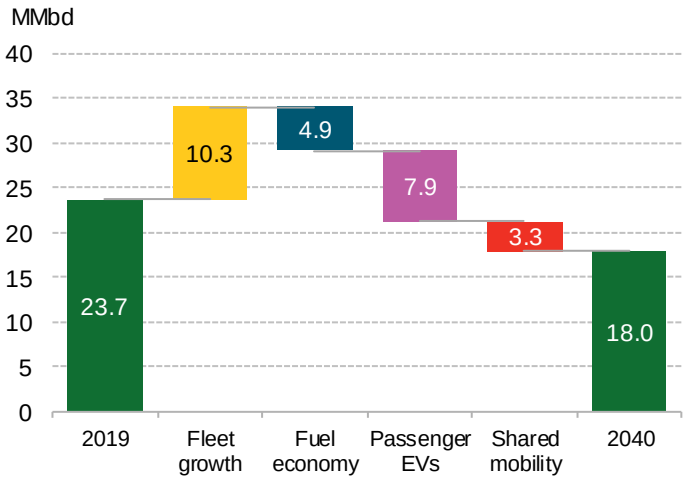
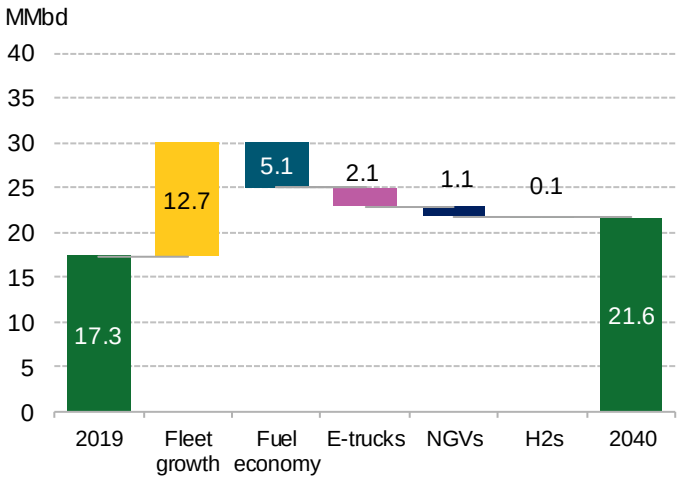


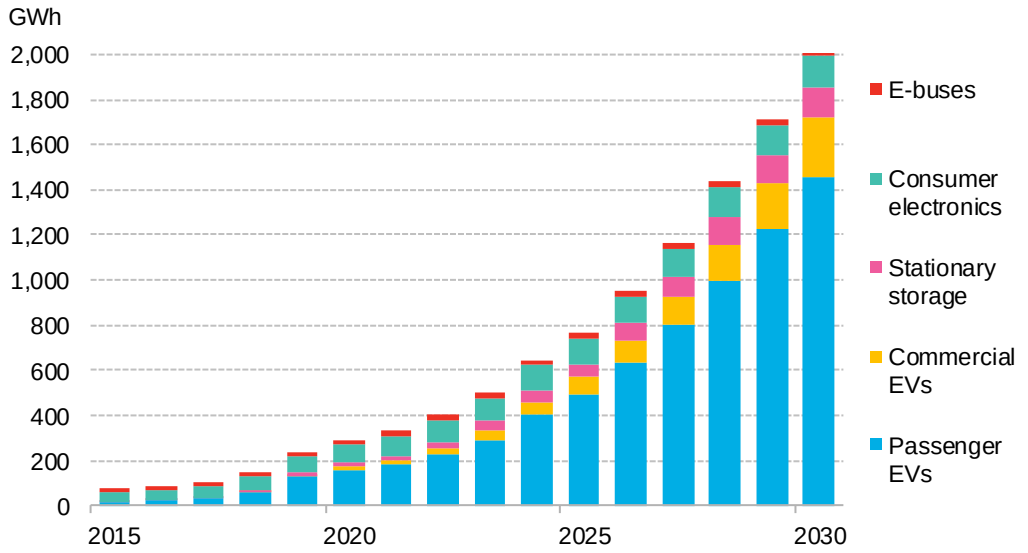
Figure 13: Commercial vehicle fuel demand forecast



Source: IEA, BloombergNEF. Note: NGV = natural gas vehicles, H2 = hydrogen powered vehicles. Biofuels such as ethanol and biodiesel are not broken out in this analysis. Excludes e-buses.

- Demand for lithium-ion batteries used in EVs soars, from 151GWh in 2018 to 1,748GWh by 2030. Average battery pack prices reach $87/kWh in 2025 and $62/kWh in 2030.
- High-nickel battery chemistries take a growing share of the market over the next 10 years. Lithium supply looks sufficient out until at least the mid-2020s, but new cobalt mining capacity will need to come online to avoid a supply crunch. We do not expect any long-term shortage of these materials to persist.
- Solid-state batteries are still a decade away from use in mass-produced vehicles, but steady advances in the current family of lithium-ion batteries will bring continued improvements in energy density.
- Fuel cell vehicles play a role in the commercial vehicle segment, but not passenger vehicles. China may lead the trend toward commercial fuel cell vehicles, if the central government changes regulations limiting buildout of hydrogen refueling infrastructure. The government already provides generous subsidies to automakers selling FCVs. China's Society of Auto Engineers has also set an informal target of 1 million FCVs (all types) on the road by 2030.

Figure 14: Annual lithium-ion battery demand



Source: BloombergNEF, Avicenne.

- PHEVs account for 26% of global passenger EV sales in 2025 and 22% in 2030, but their share drops in the 2030s as BEVs become cheaper. They play a larger role in the short-term in Europe to meet fuel economy regulations, and Japan because of the drivetrain choices of domestic automakers.
- A total of 14 countries have now announced targets for phasing out sales of new internal combustion vehicles, mostly by 2030 or 2040. This number is growing quickly, with three new targets announced in 2018. Most of these are not yet backed by firm legislation and our forecast does not assume that any of them are achieved. Still, they are providing clear guidance for automakers on the long-term direction of travel. If these phase-out targets were implemented and enforced, and the gap filled with EVs, then the EV share of global sales would rise three percentage points to 60% in 2040.
- Charging infrastructure remains a challenge. There are already 630,000 public charging points installed globally, but many more will be needed to serve the growing EV fleet. A patchwork of solutions is emerging to improve the public charging experience – roaming agreements, ultra-fast chargers, converted lampposts, wireless charging, battery swapping, and more – but none yet make EVs fully competitive with ICE vehicles for consumers without access to home or workplace charging. If, through technology innovation and government policy, EV charging barriers are significantly lowered, adoption could be faster in the 2030s.
- Despite the rapid uptake of electric vehicles across many different vehicle segments, direct CO2 emissions from road transport continue rising for the next 10 years before peaking in 2030, mainly due to a growing ICE fleet. By 2040, direct emissions from passenger cars, commercial vehicles and buses have returned to similar levels as in 2018. If additional power sector emissions from generation are added, the peak is 2-3 years later. Road CO2 emissions per capita and per unit of GDP improve significantly over the next 20 years and total emissions are on a downward trajectory at the end of the forecast period[1].

[1] Emissions figures refer to CO2 from passenger cars, commercial vehicles and buses. They do not include two- and three-wheeled vehicles.

About us

Contact details

Client enquiries:

- Bloomberg Terminal: press <Help> key twice
- Email: support.bnef@bloomberg.net

Colin McKerracher	Head of transport analysis
Ali Izadi-Najafabadi	Head of Intelligent Mobility
Richard Chatterton	Head of Oil Demand
Nannan Kou	Head of China analysis
Nicholas Albanese	Associate, Electric Vehicles
Nikolaos Soulopoulos	Senior Associate, Electric Vehicles
David Doherty	Specialist, Oil Demand
James Frith	Associate, Energy Storage
Andrew Grant	Analyst, Intelligent Mobility
Ian Berryman	Modelling
Siyi Mi	Analyst, Electric Vehicles
Ali Asghar	Senior Associate, Australia
Allen Tom Abraham	Associate, India
Milo Boers	Analyst, Intelligent Mobility
Justin Commerford	Data Researcher
Alejandro Zamorano-Cadavid	Specialist, Intelligent Mobility
Ryan Fisher	Associate, Electric Vehicles

Copyright

Disclaimer

The Bloomberg NEF ("BNEF"), service/information is derived from selected public sources. Bloomberg Finance L.P. and its affiliates, in providing the service/information, believe that the information it uses comes from reliable sources, but do not guarantee the accuracy or completeness of this information, which is subject to change without notice, and nothing in this document shall be construed as such a guarantee. The statements in this service/document reflect the current judgment of the authors of the relevant articles or features, and do not necessarily reflect the opinion of Bloomberg Finance L.P., Bloomberg L.P. or any of their affiliates ("Bloomberg"). Bloomberg disclaims any liability arising from use of this document, its contents and/or this service. Nothing herein shall constitute or be construed as an offering of financial instruments or as investment advice or recommendations by Bloomberg of an investment or other strategy (e.g., whether or not to "buy", "sell", or "hold" an investment). The information available through this service is not based on consideration of a subscriber's individual circumstances and should not be considered as information sufficient upon which to base an investment decision. You should determine on your own whether you agree with the content. This service should not be construed as tax or accounting advice or as a service designed to facilitate any subscriber's compliance with its tax, accounting or other legal obligations. Employees involved in this service may hold positions in the companies mentioned in the services/information.

The data included in these materials are for illustrative purposes only. The BLOOMBERG TERMINAL service and Bloomberg data products (the "Services") are owned and distributed by Bloomberg Finance L.P. ("BFLP") except that Bloomberg L.P. and its subsidiaries ("BLP") distribute these products in Argentina, Australia and certain jurisdictions in the Pacific islands, Bermuda, China, India, Japan, Korea and New Zealand. BLP provides BFLP with global marketing and operational support. Certain features, functions, products and services are available only to sophisticated investors and only where permitted. BFLP, BLP and their affiliates do not guarantee the accuracy of prices or other information in the Services. Nothing in the Services shall constitute or be construed as an offering of financial instruments by BFLP, BLP or their affiliates, or as investment advice or recommendations by BFLP, BLP or their affiliates of an investment strategy or whether or not to "buy", "sell" or "hold" an investment. Information available via the Services should not be considered as information sufficient upon which to base an investment decision. The following are trademarks and service marks of BFLP, a Delaware limited partnership, or its subsidiaries: BLOOMBERG, BLOOMBERG ANYWHERE, BLOOMBERG MARKETS, BLOOMBERG NEWS, BLOOMBERG PROFESSIONAL, BLOOMBERG TERMINAL and BLOOMBERG.COM. Absence of any trademark or service mark from this list does not waive Bloomberg's intellectual property rights in that that name, mark or logo. All rights reserved.