

DOCKETED

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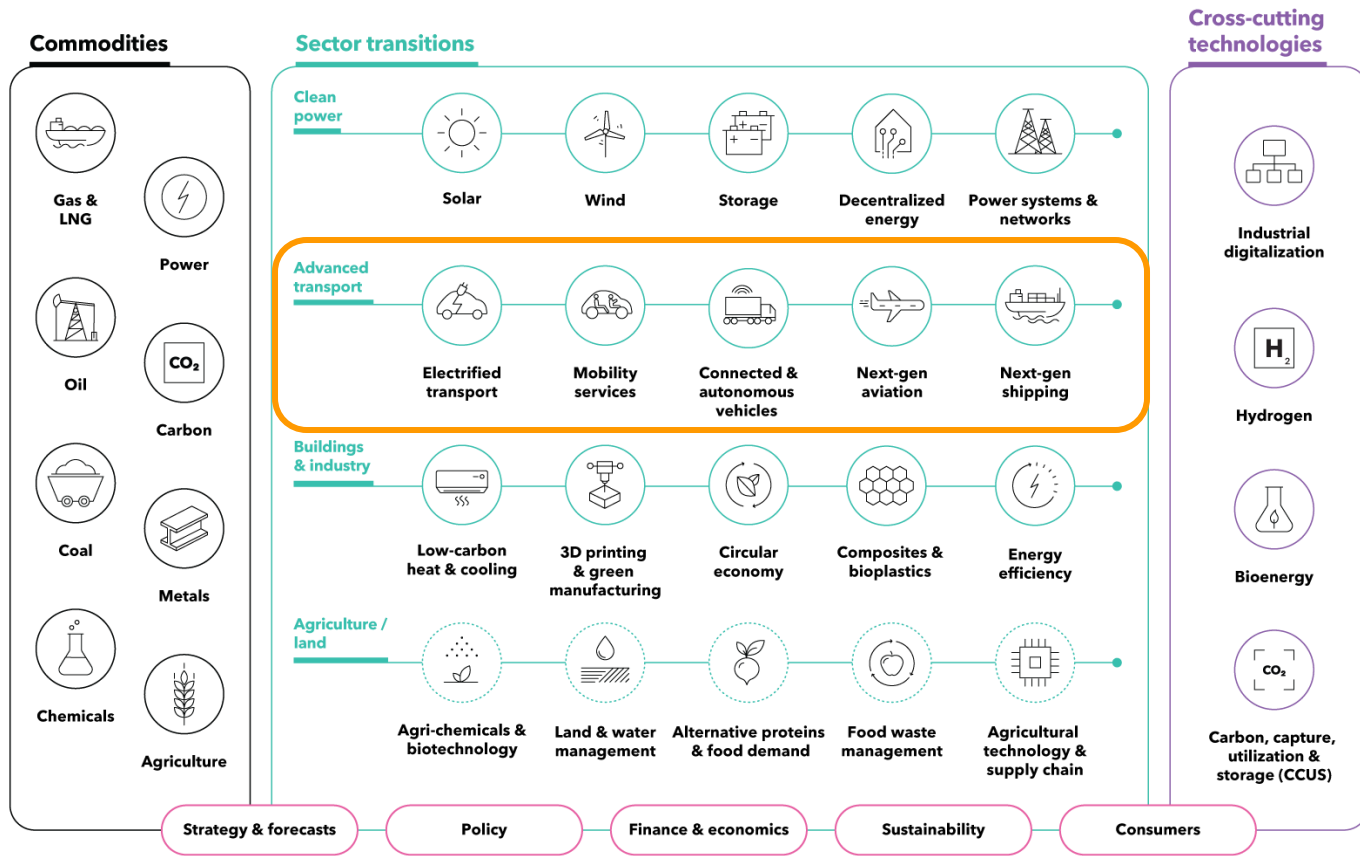
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Source: BloombergNEF.

BNEF coverage

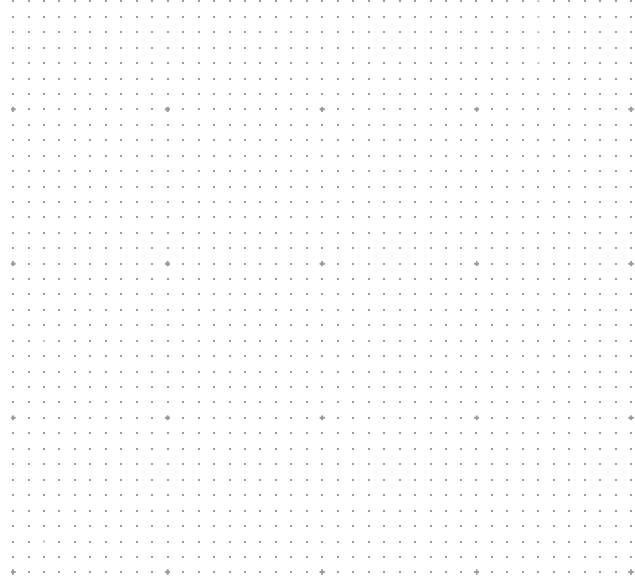
Strategies for a cleaner, more competitive future



Source: BloombergNEF.

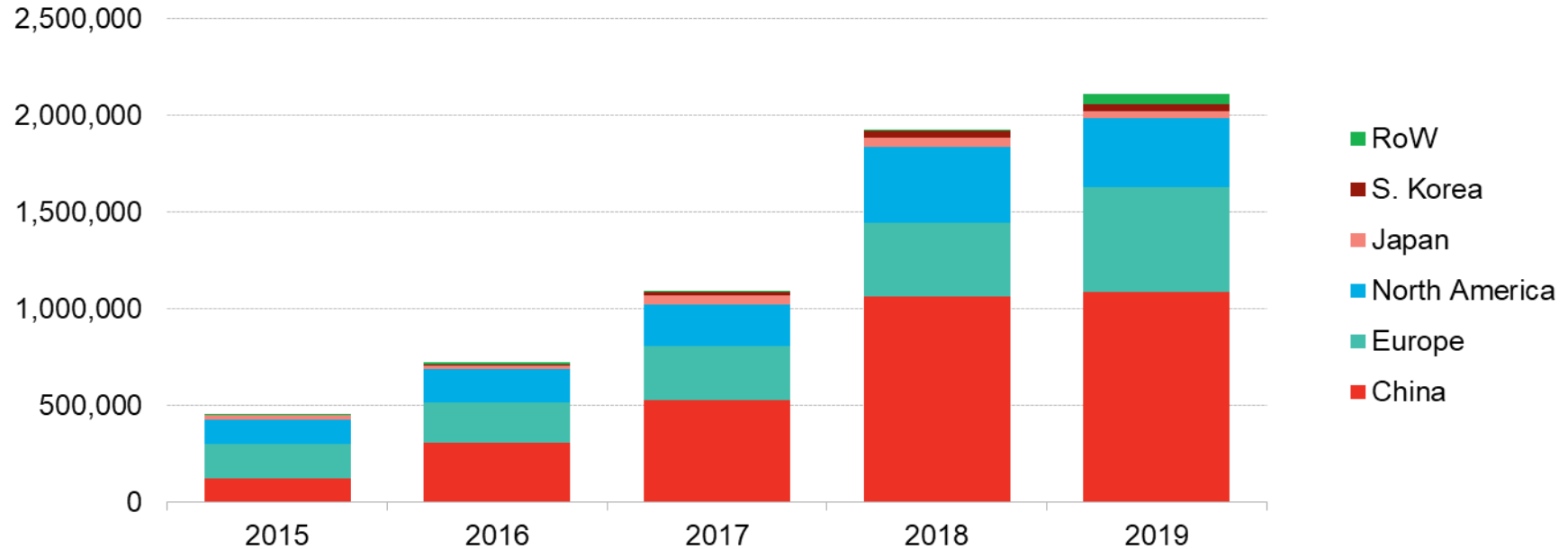
Current market

EVs to date



Passenger EV sales have grown quickly

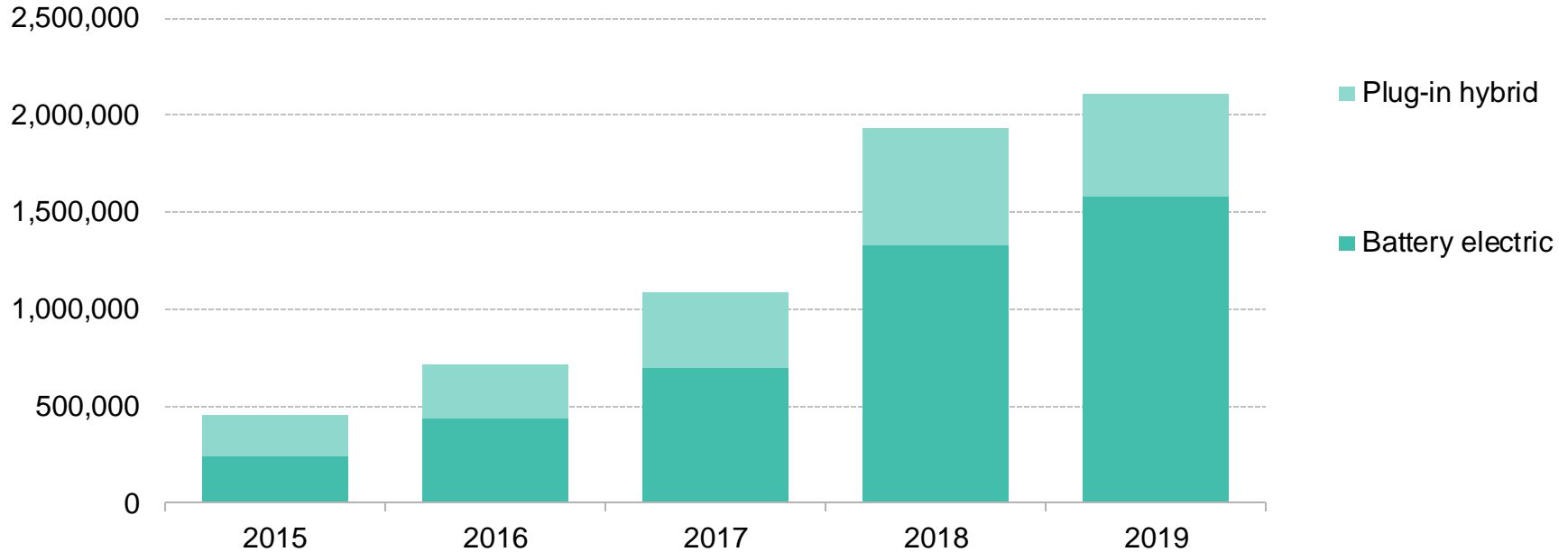
Annual BEV + PHEV sales by market



Source: BloombergNEF.

Passenger EV sales have grown quickly

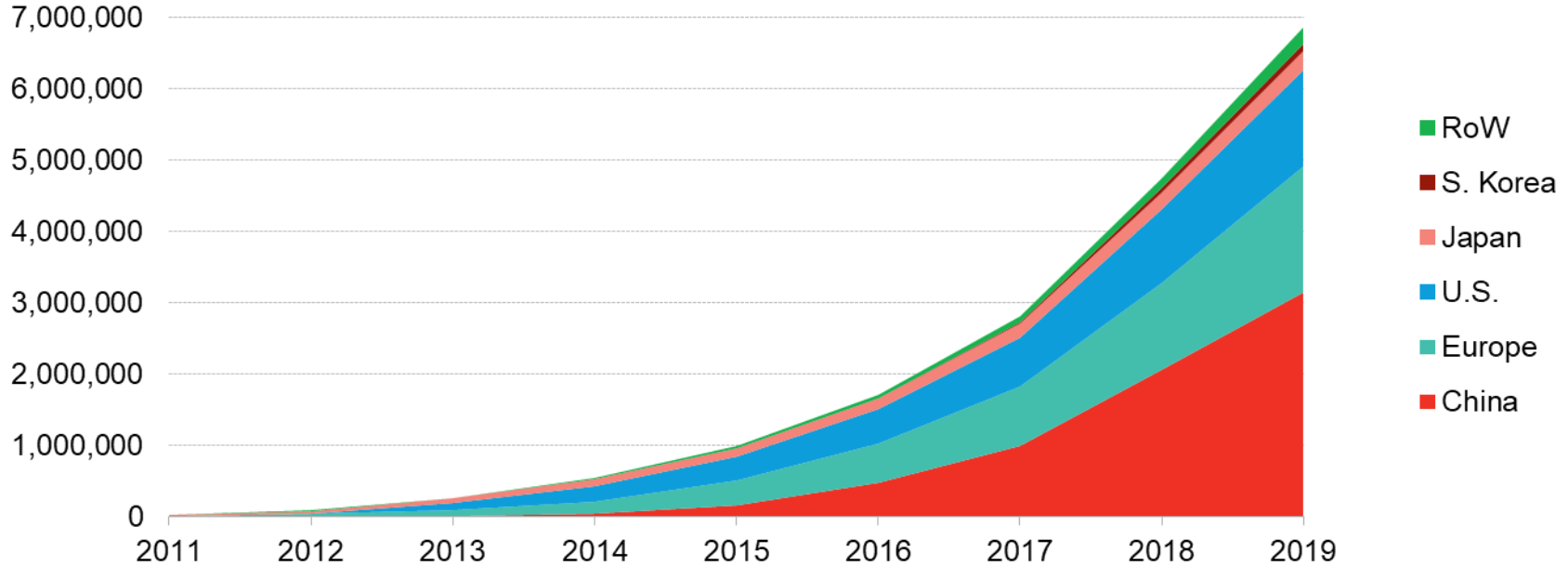
Annual BEV + PHEV sales by drivetrain



Source: BloombergNEF.

The global passenger EV fleet more than doubled in two years

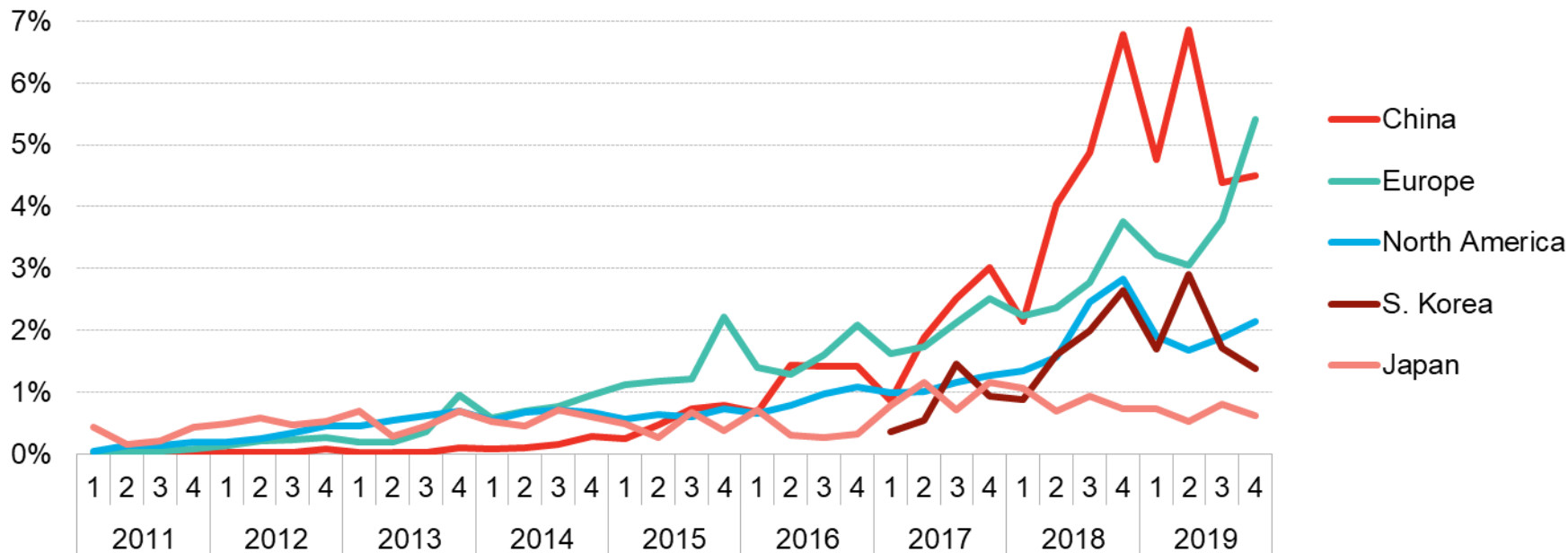
Cumulative BEV + PHEV sales by market



Source: BloombergNEF.

Passenger EVs are just 2-5% of annual sales in most major auto markets

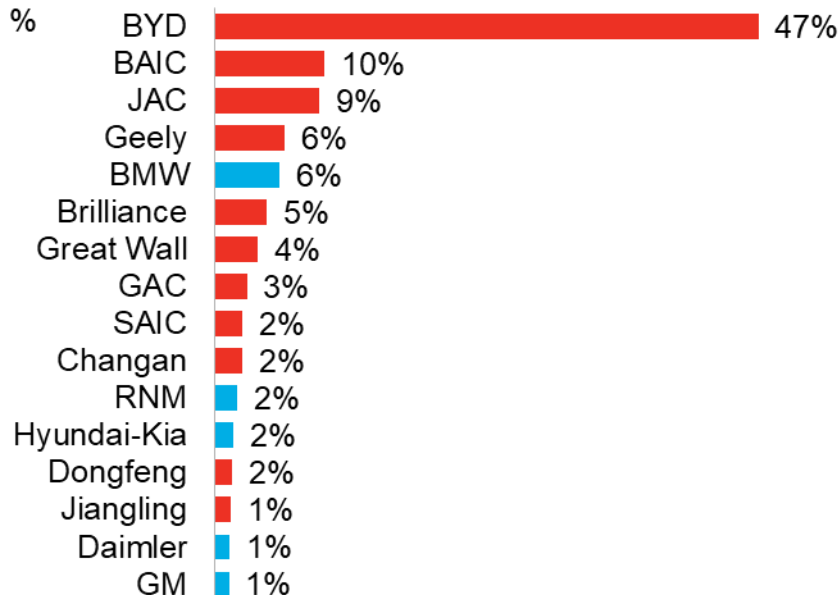
Quarterly EV sales penetration by market



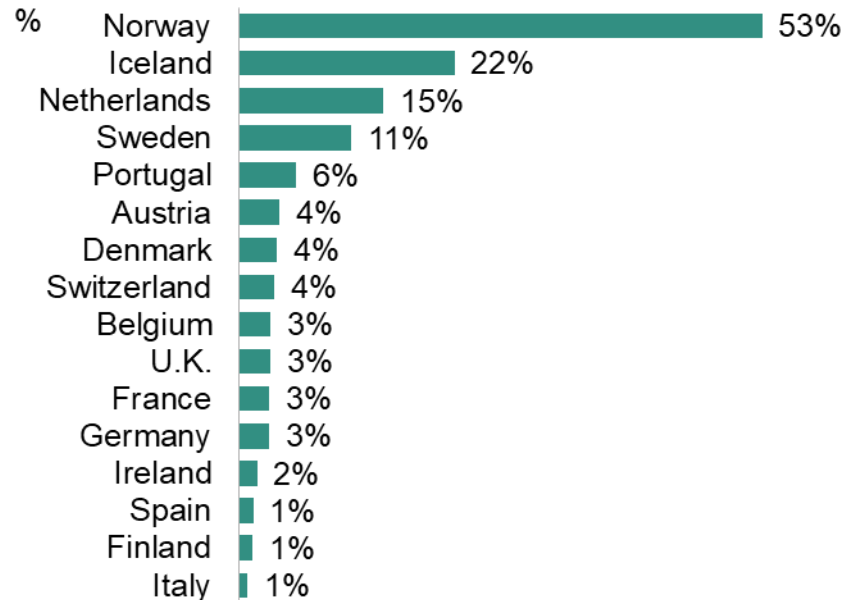
Source: BloombergNEF.

Some companies and countries are further ahead

EV share of total sales of selected automakers



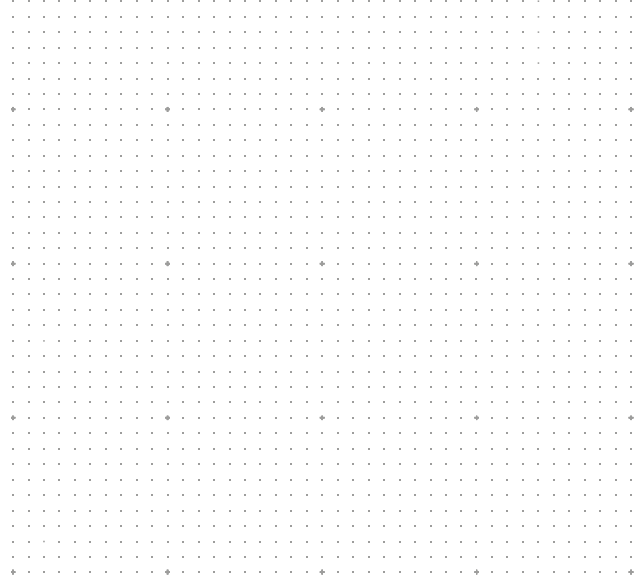
EV share of total sales in European countries



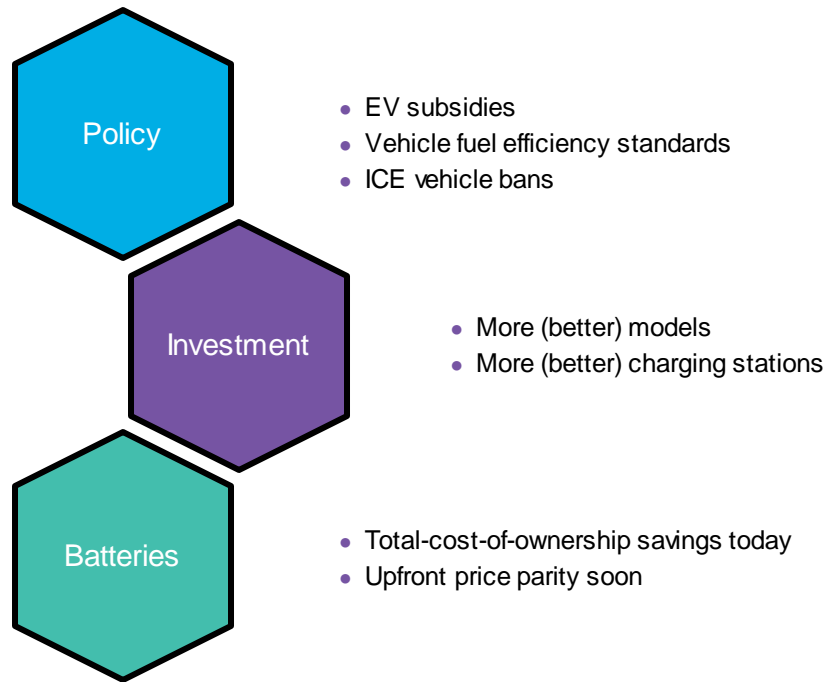
Source: BloombergNEF, Marklines. Note: RNM is the Renault-Nissan-Mitsubishi Alliance; Geely includes Volvo; commercial vehicles included in manufacturers' totals; EV sales from Chinese JVs attributed to both partners in full; excludes Tesla and other pure EV automakers; red companies are based in China.

Key drivers

Policy, investment and batteries



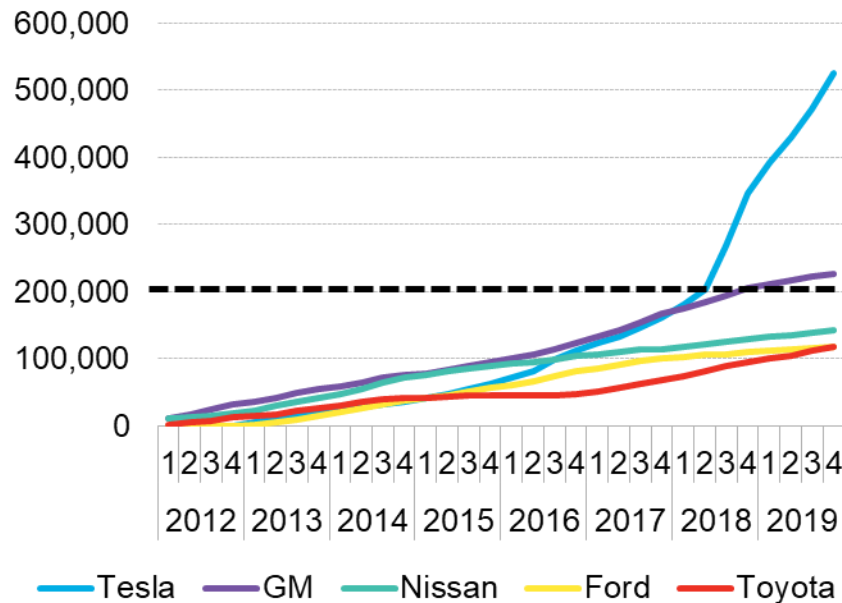
The U.S. (and other markets) will catch up with Norway



Source: BloombergNEF.

The U.S. is an outlier among major auto markets

Cumulative U.S. EV sales by automaker



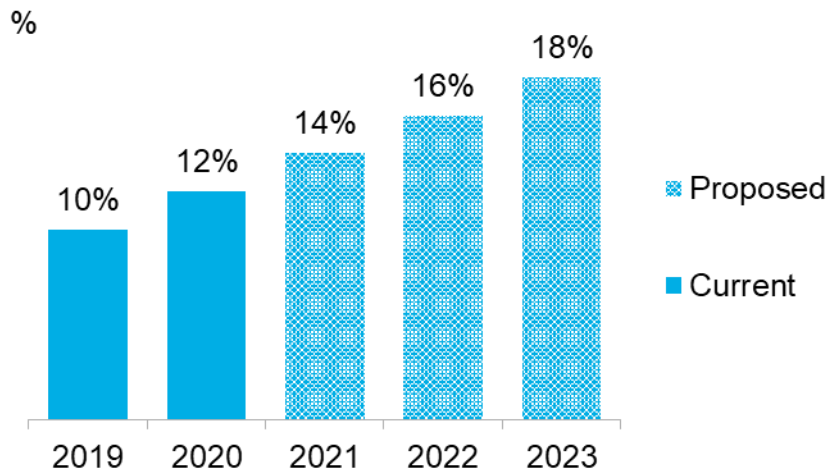
State-level BEV purchase incentives

State	Max amount
New Jersey	\$5,000
Colorado	\$4,000
Oregon, Maryland	\$3,000
Delaware, Massachusetts	\$2,500
California, Maine, New York	\$2,000
Connecticut	\$1,500

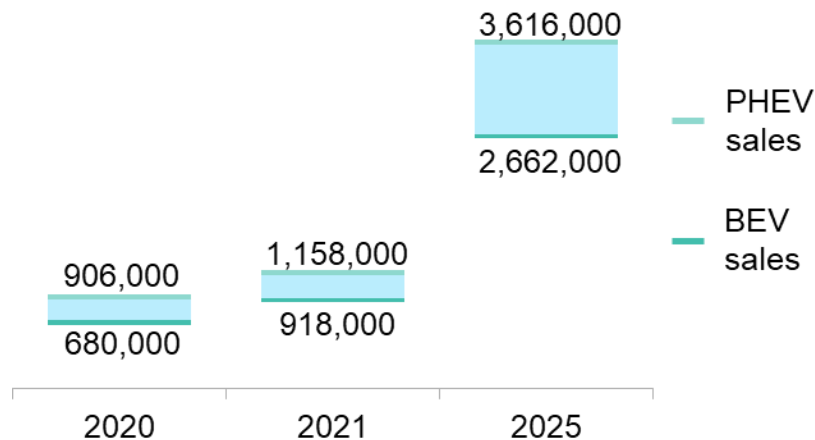
Source: BloombergNEF. Note: Includes direct and fixed purchase incentives, such as purchase subsidies, scrappage schemes and income tax credits.

China and the EU are pushing hard for electrification

China: Proportion of required NEV credits to ICE passenger car production and imports



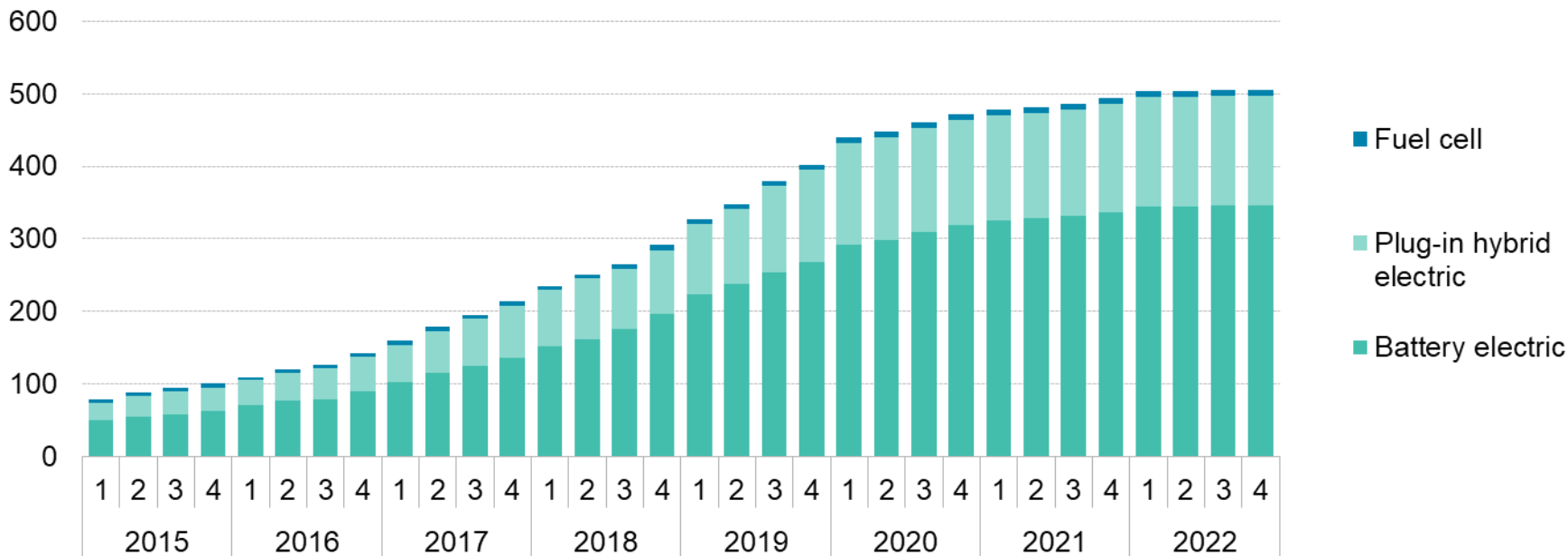
EU: EV sales needed in Europe to meet EU emissions targets, pre Covid-19



Source: BloombergNEF. Note: The light and dark green lines denote the upper and lower sales numbers needed to hit the targets. The boundaries shown are calculated if all sales were BEVs or PHEVs. The fleet will be a mix of BEVs and PHEVs and therefore the true figure will sit between these boundaries. The limits shown are extrapolated from an analysis of the top automakers that represented 85% of all sales in the region in 2019.

Passenger EV model availability is increasing

Current and upcoming passenger EV/FCV models



Source: BloombergNEF, Marklines. Note: Based on automakers stated vehicle launch plans.

Passenger EV driving range is rising

Range of launched and upcoming BEV models

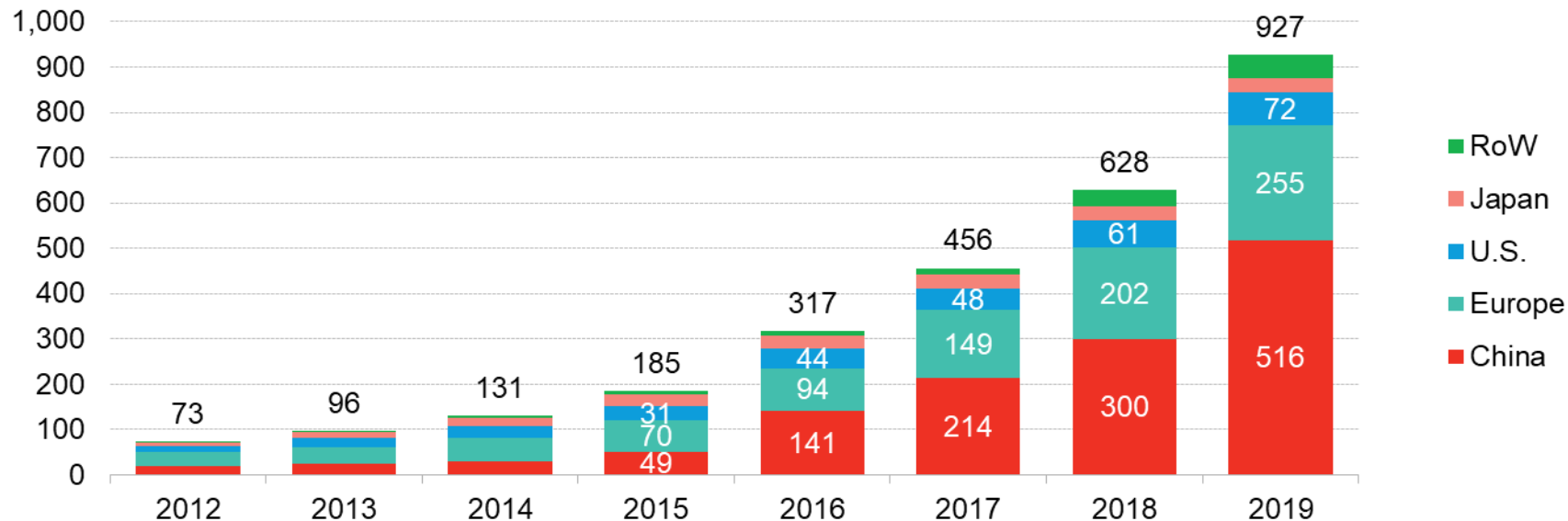


Source: BloombergNEF, EPA, ELTP, EVCompare, MarkLines. Note: Shaded circles represent launched models; empty circles represent upcoming models.

The public charging infrastructure stock rose by 47% in 2019

Cumulative public charging connectors

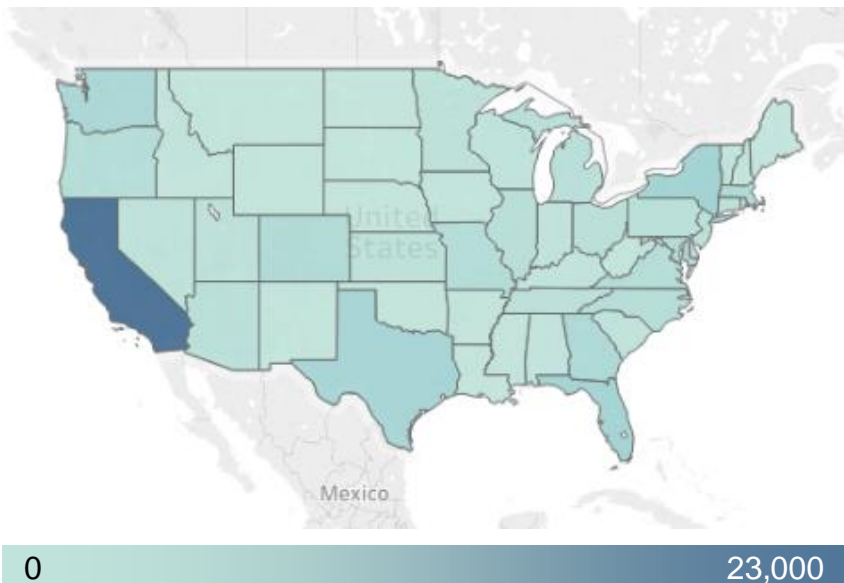
Thousand



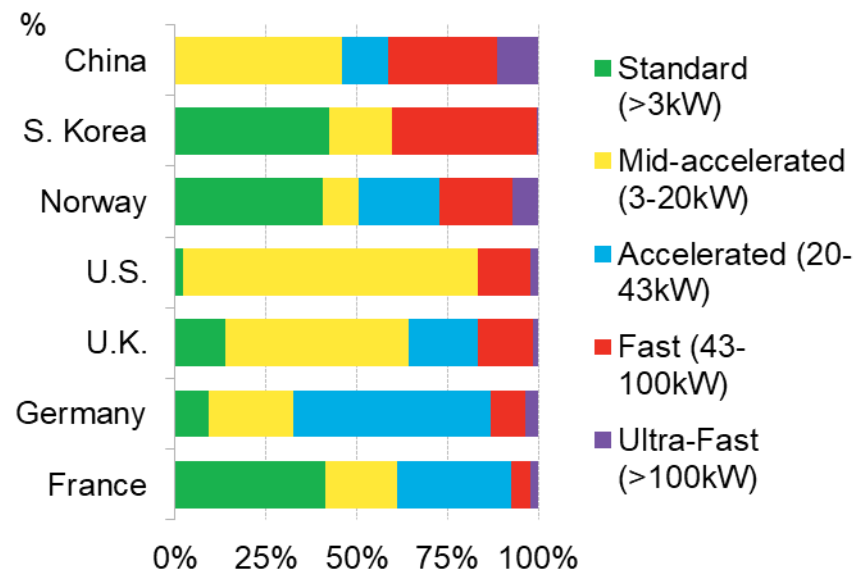
Source: BloombergNEF. Note: Includes Tesla destination and supercharger networks even though these are semi-private.

Challenges remain

U.S. public charging connectors by state



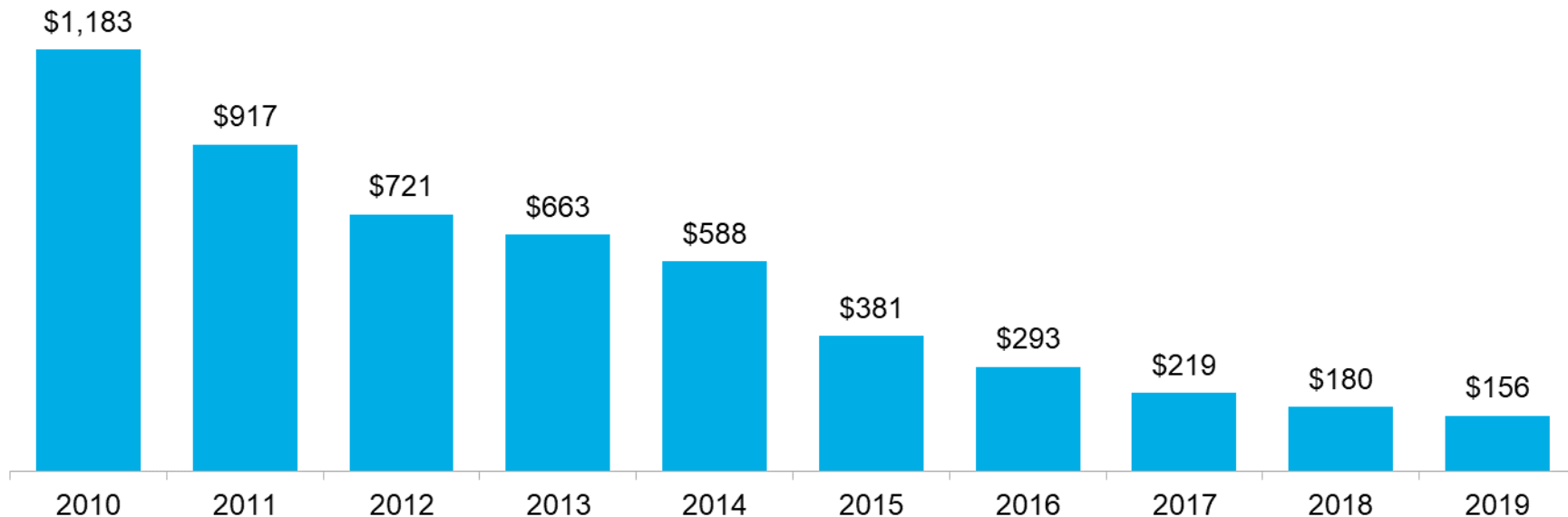
Public charging connectors by speed



Source: BloombergNEF, U.S. Department of Energy, various public- and private-sector sources.

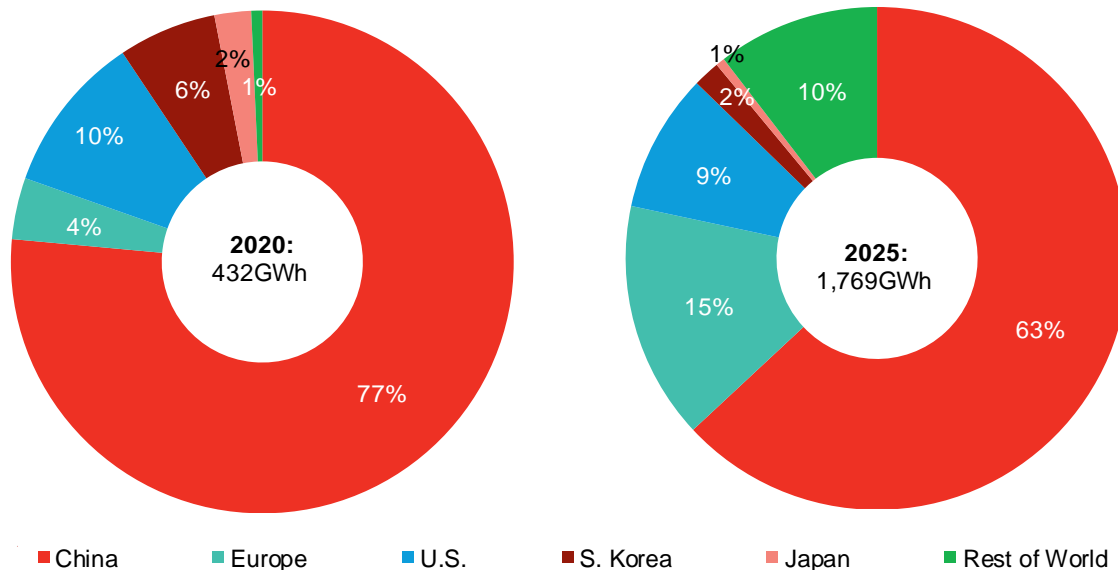
Volume-weighted lithium-ion battery pack prices have fallen 87%

Lithium-ion battery pack price (real 2019 \$/kWh)



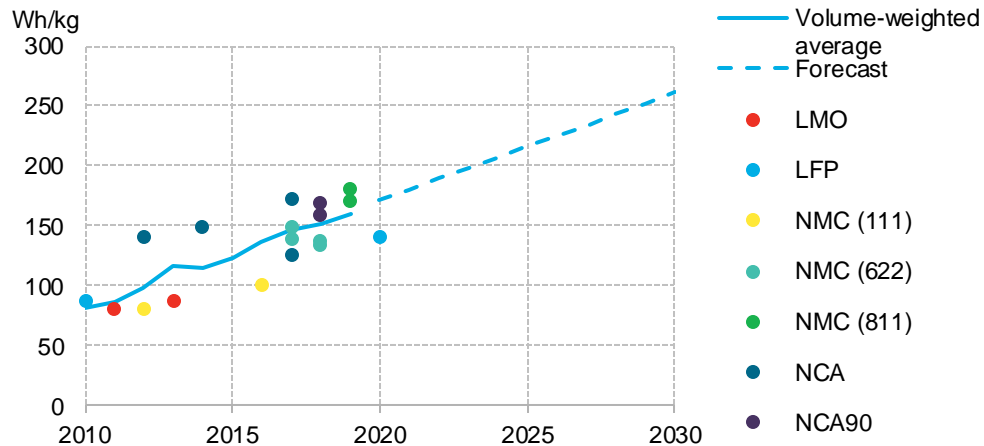
Source: BloombergNEF.

Lithium-cell manufacturing capacity is set to quadruple by 2025



Source: BloombergNEF. 2025 Rest of World includes capacity outside of the countries indicated and 71.4GWh of capacity with an undisclosed location. This is where a company has announced capacity expansions but has not specified where all the capacity will be located. Values have been rounded.

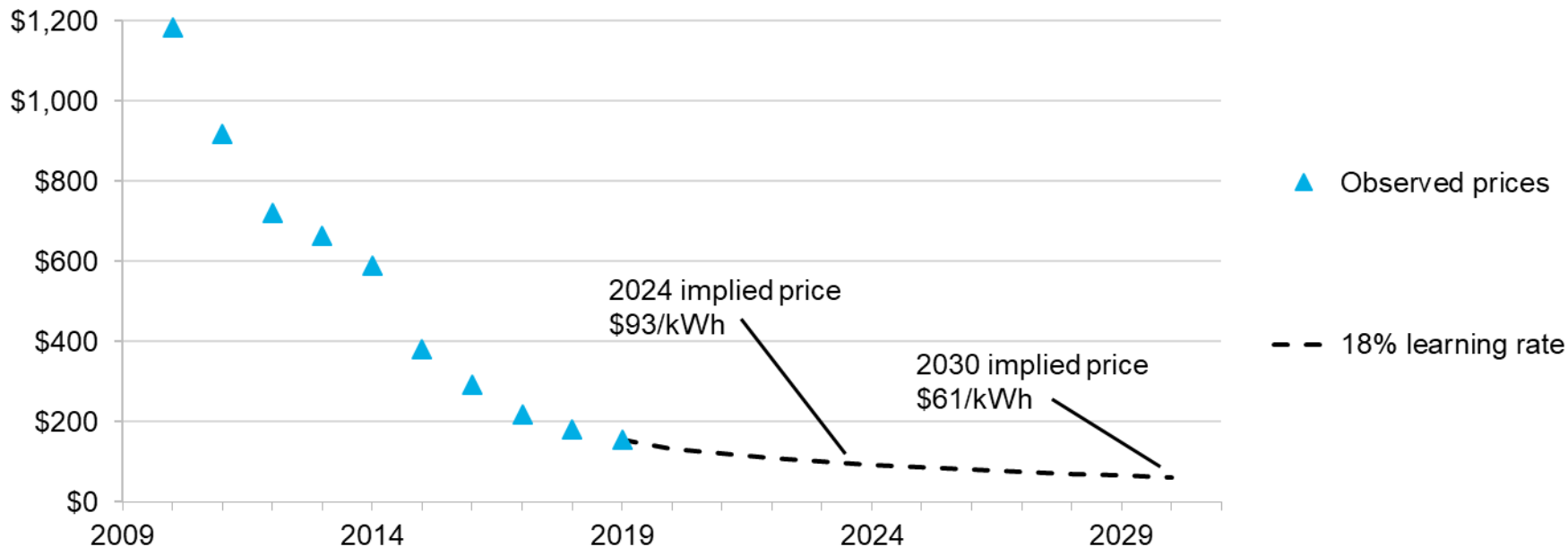
Historic and forecasted changes to battery-pack energy density



Source: BloombergNEF.

Lithium-ion battery pack prices will keep falling

Lithium-ion battery pack price (real 2019 \$/kWh)



Source: BloombergNEF. Note: The data in this chart has been adjusted to be in real 2019 dollars.

Delivering upfront passenger EV price parity in the mid-2020s

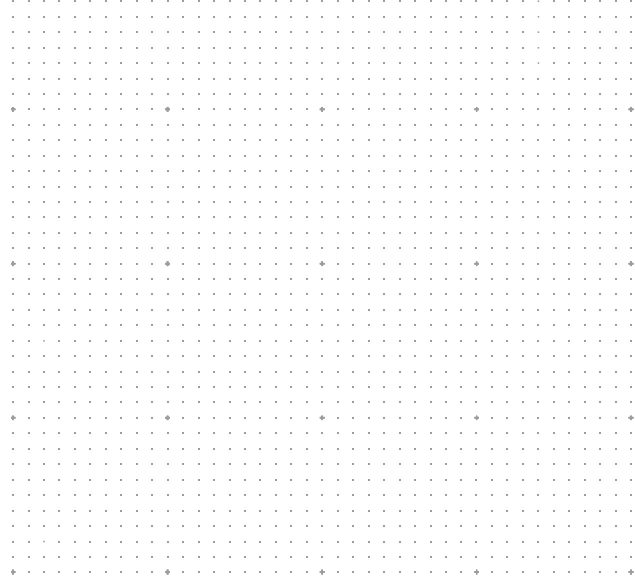
BEV price parity with ICE vehicles

Segment	U.S.	Europe	China	Japan	S. Korea	Australia
Small	2024	2027	2026	N/A	2026	2024
Medium	2024	2023	2023	2029	2024	2024
Large	2022	2022	2027	2027	2026	2022
SUV	2022	2024	2029	2025	2023	2022

Source: BloombergNEF, EPA, ICCT, FEV, ONRL, IDL. Note: Refers to the price parity years, with no additional home charger costs; N/A means that we do not predict price parity within the forecast period.

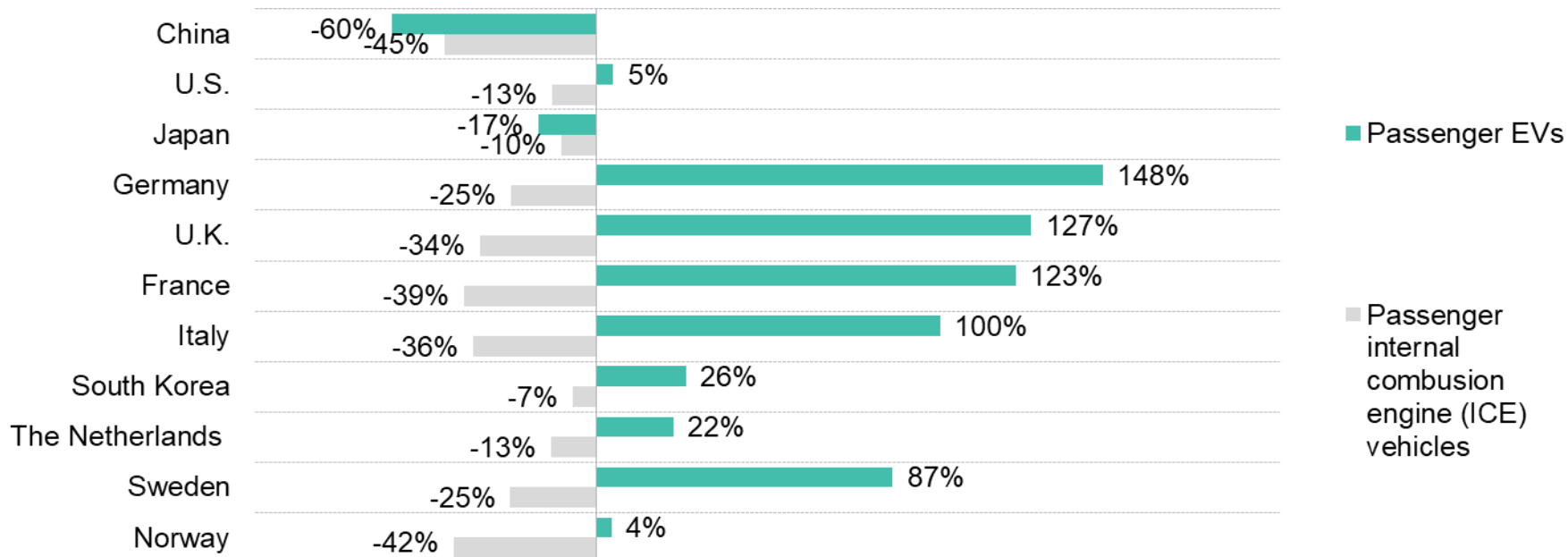
BNEF outlook

EVs through 2040



Short-term pain

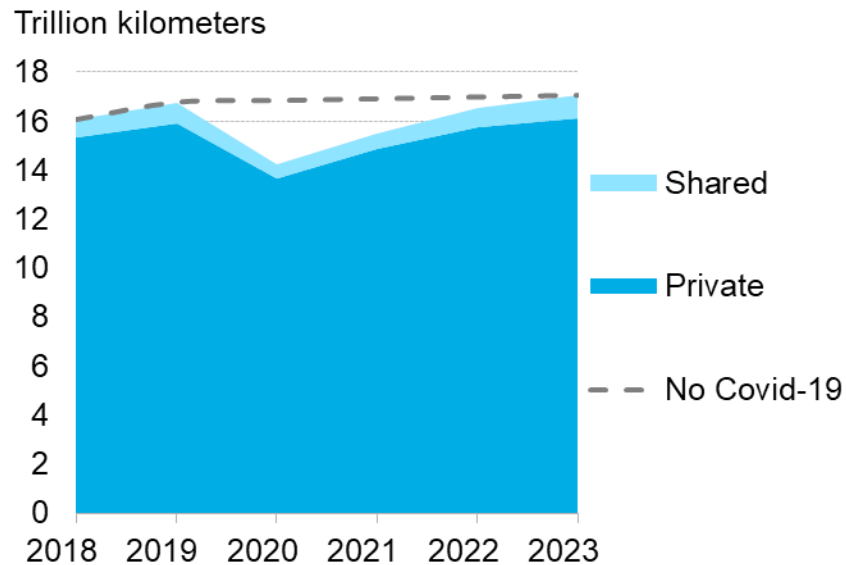
Impact of Covid-19 on passenger vehicle sales, 1Q 2020



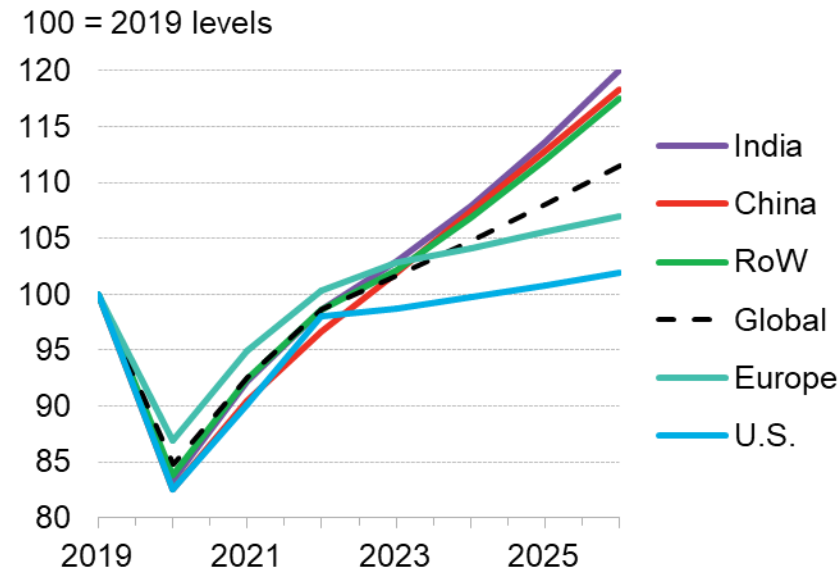
Source: BloombergNEF.

Short-term pain

Impact of Covid-19 on passenger kilometers traveled by type



Impact of Covid-19 on passenger kilometers traveled by market



Source: BloombergNEF.

BNEF Covid-19 scenarios

BNEF pandemic scenarios

Scenario 1: single-wave pandemic

- Most countries endure a three-month severe lockdown, followed by a gradual return from isolation
- Most countries return to growth by **4Q 2020**

Scenario 2: multiple-wave pandemic

- Virus proves resilient and efforts to re-open economies falter. Two-three waves of distancing are required over the course of a year.
- Global growth returns in **2Q 2021**

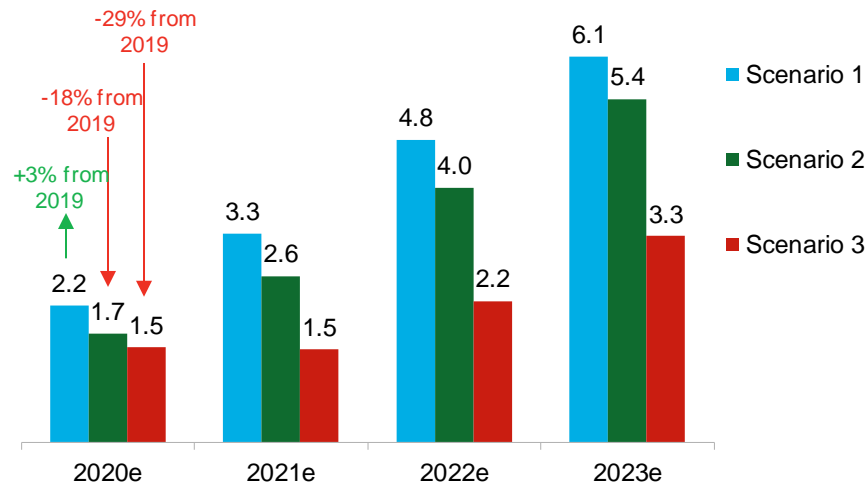
Scenario 3: enduring pandemic

- Virus proves resilient and repeated distancing measures are required until a vaccine or treatment is scaled up.
- Global growth returns in **4Q 2021**

Source: BloombergNEF.

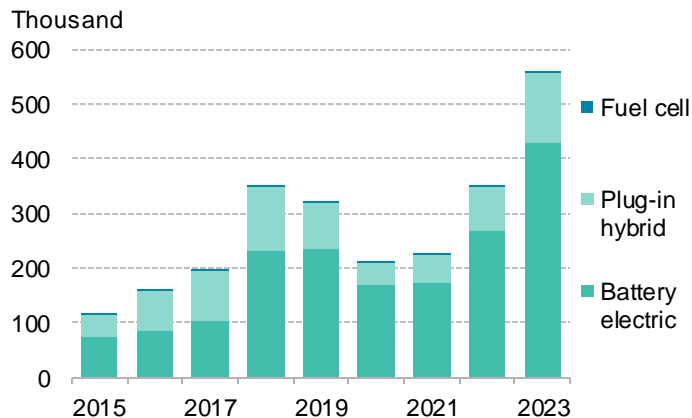
Global Covid-19 EV sales forecast

Million

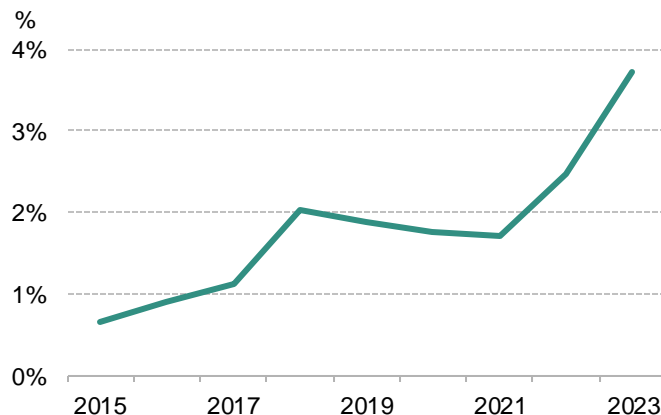


Base case: U.S. passenger EV sales

U.S. short-term annual passenger vehicle sales by drivetrain



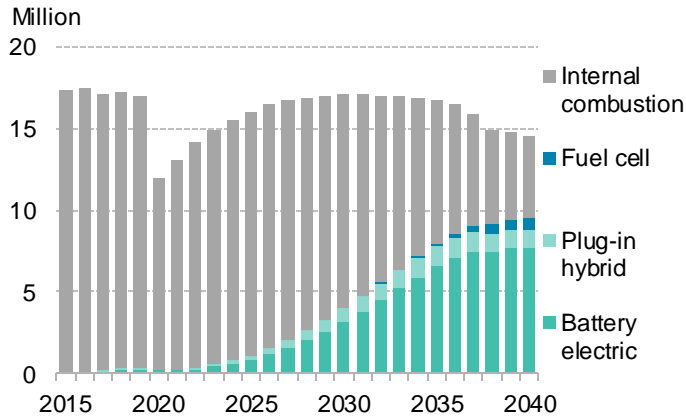
U.S. short-term EV share of total annual passenger vehicle sales



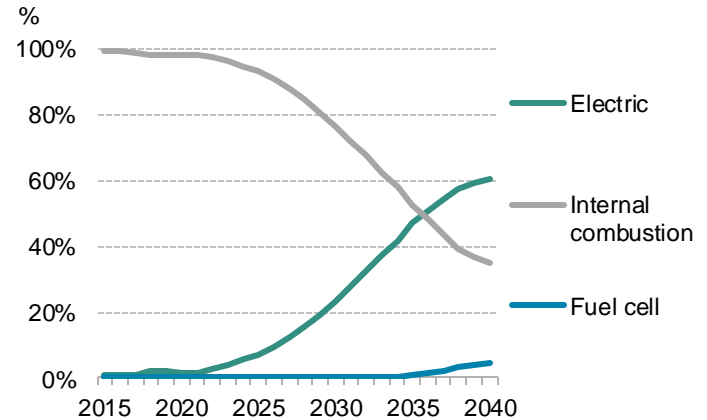
Source: BloombergNEF.

Base case: U.S. passenger EV sales

U.S. annual passenger vehicle sales by drivetrain



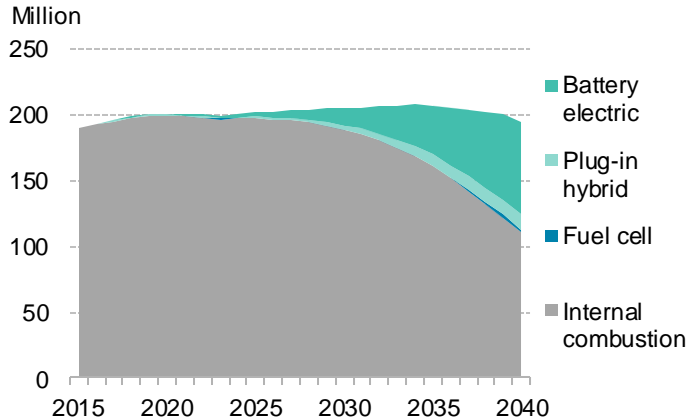
U.S. share of total annual passenger vehicle sales by drivetrain



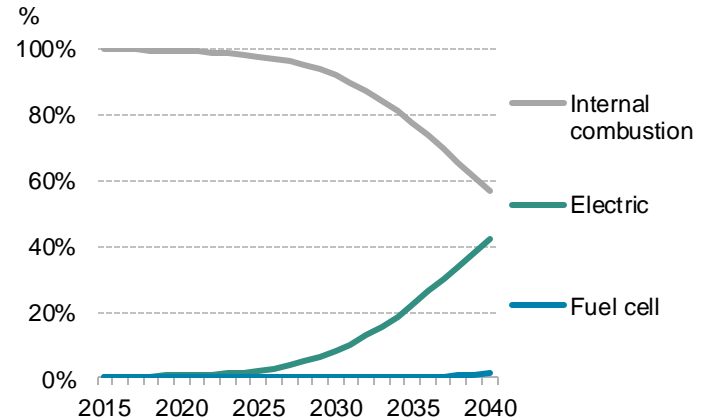
Source: BloombergNEF. Note: Electric contains battery electric and plug-in hybrid.

Base case: U.S. passenger EV fleet

U.S. passenger vehicle fleet by drivetrain



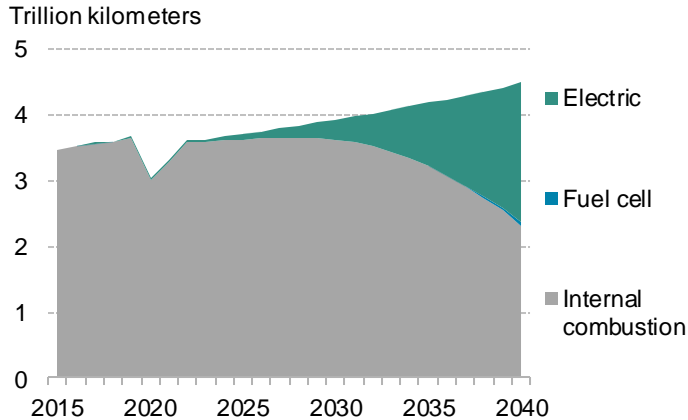
U.S. share of total passenger vehicle fleet by drivetrain



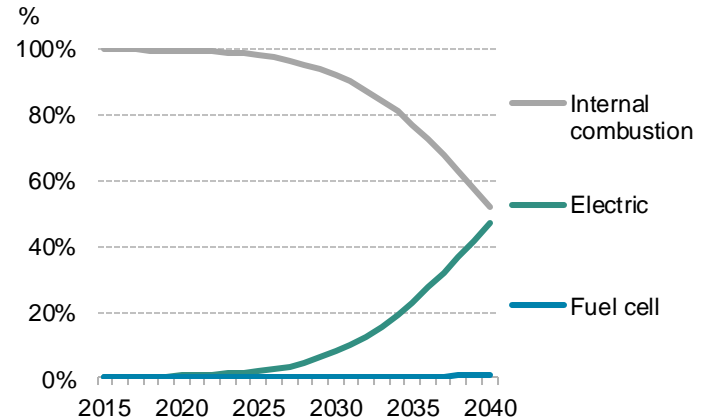
Source: BloombergNEF. Note: Electric contains battery electric and plug-in hybrid.

Base case: U.S. passenger EV kilometers traveled

U.S. total annual passenger vehicle distance traveled by drivetrain



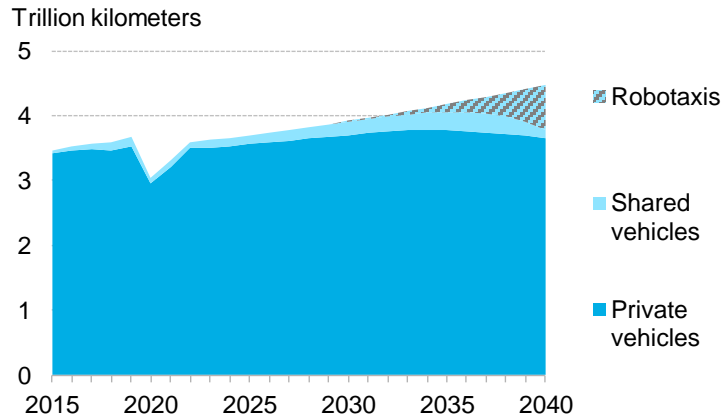
U.S. share of annual passenger vehicle distance traveled by drivetrain



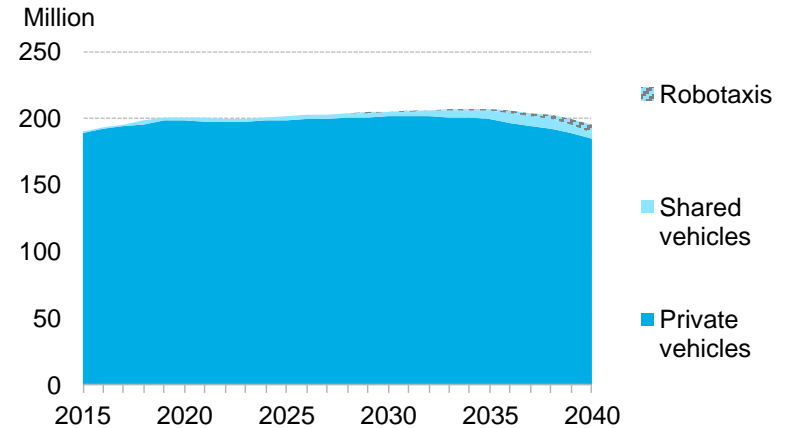
Source: BloombergNEF. Note: Electric contains battery electric kilometers and electric-driven share of plug-in hybrids. Internal combustion contains conventional internal combustion and internal combustion share of kilometers by plug-in hybrids.

Base case: U.S. shared-mobility adoption

Annual distance traveled by the U.S. passenger vehicle fleet by type



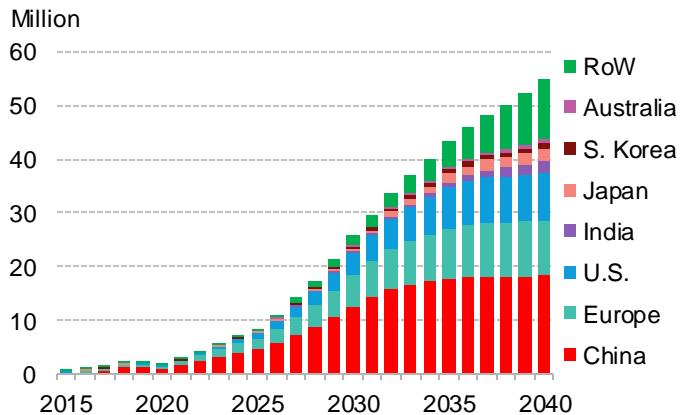
U.S. passenger vehicle fleet by type



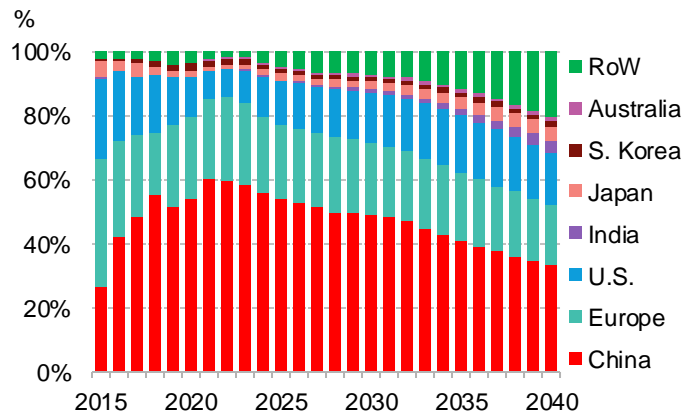
Source: BloombergNEF.

Base case: Global passenger EV sales

Annual passenger EV sales by region



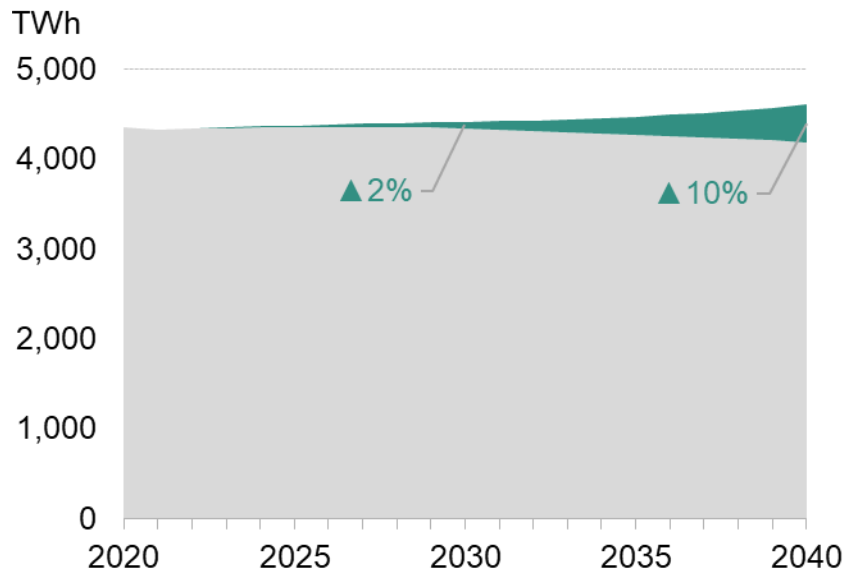
Regional shares of annual passenger EV sales



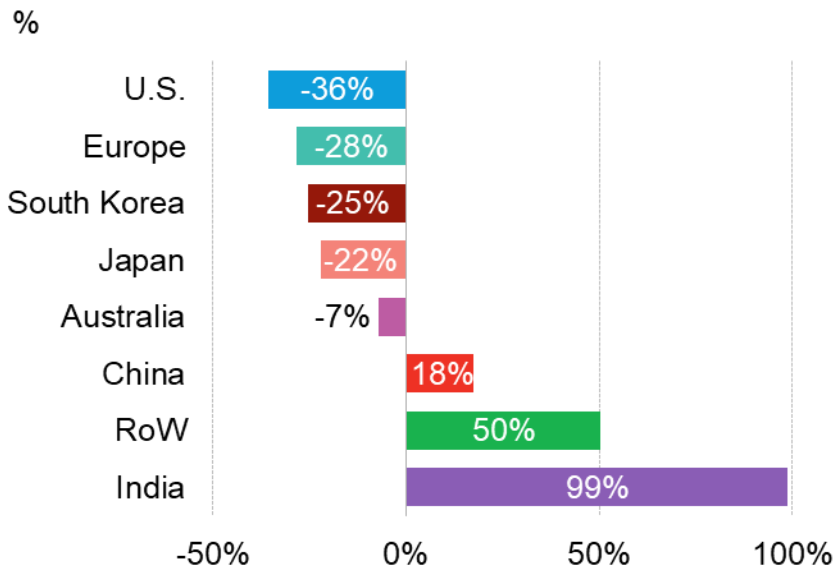
Source: BloombergNEF. Note: Europe includes EU, U.K. and EFTA.

Impacts on the grid and climate

U.S. electricity demand outlook by segment



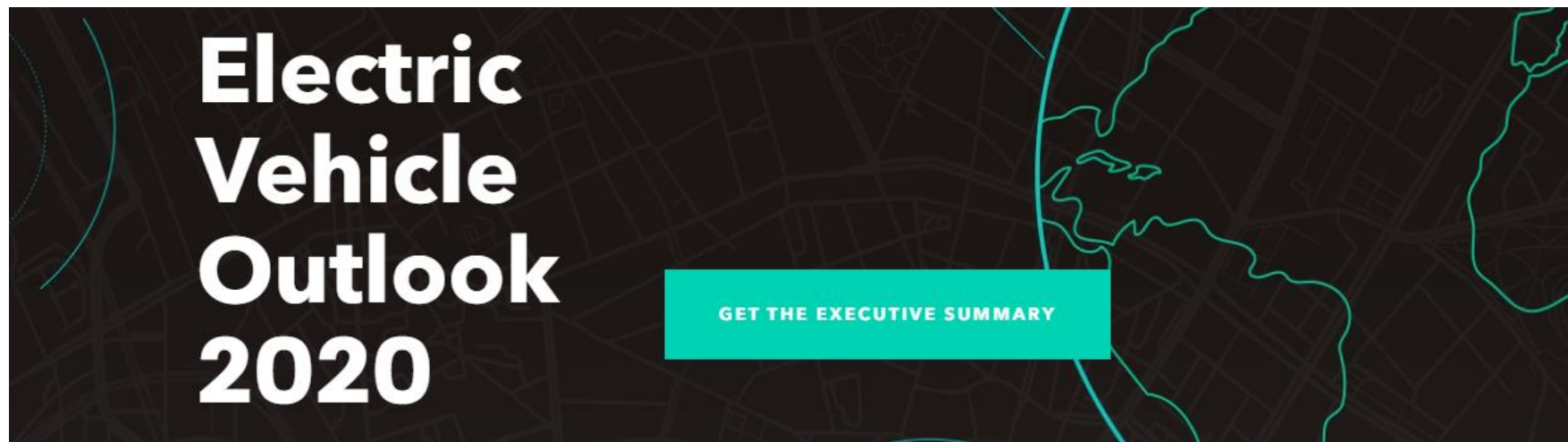
Growth in road-transport GHG emissions by market, 2018-2040



Source: BloombergNEF. Note: Uses general and air conditioning electricity demand projections from BNEF's June 24, 2019 "New Energy Outlook 2019" research note. Percentages refer to the extra electricity demand generated by EVs in 2030 and 2040. The green shaded area in the chart on the left is demand from EVs.

Thank you

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Source: BloombergNEF.

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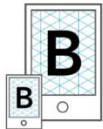
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