



**Asia-Pacific
Economic Cooperation**

2023/AD2/006
Agenda Item: 2

Global Electric Vehicle Outlook

Purpose: Information
Submitted by: BloombergNEF



38th Automotive Dialogue
18-19 October 2023



Asia-Pacific
Economic Cooperation

Global Electric Vehicle Outlook

Siyi Mi

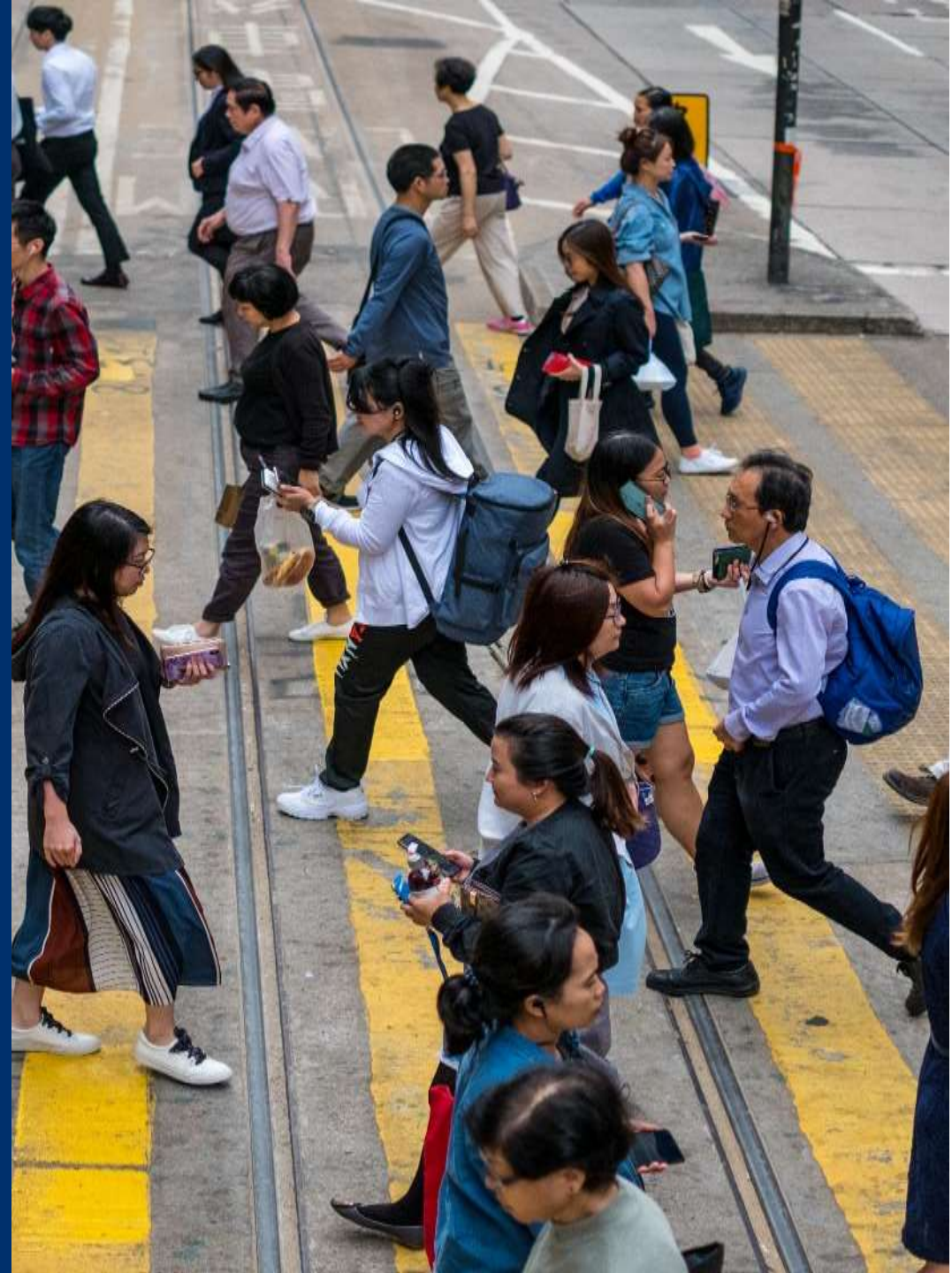
Senior Transport Analyst, BloombergNEF

Automotive Dialogue 38

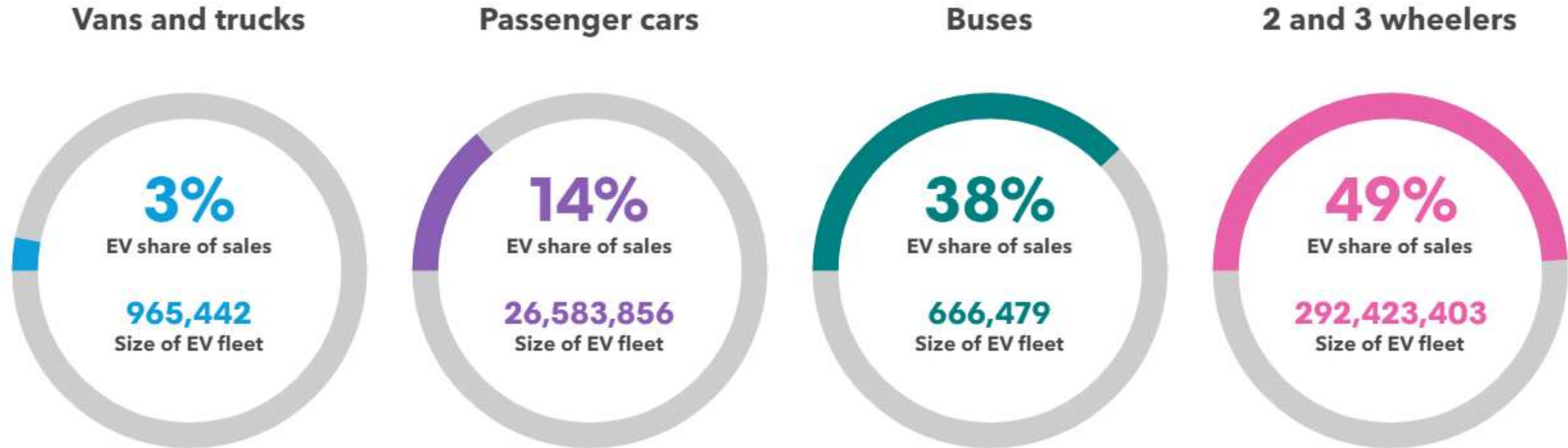
October 18, 2023

Advancing Free Trade
for Asia-Pacific Prosperity

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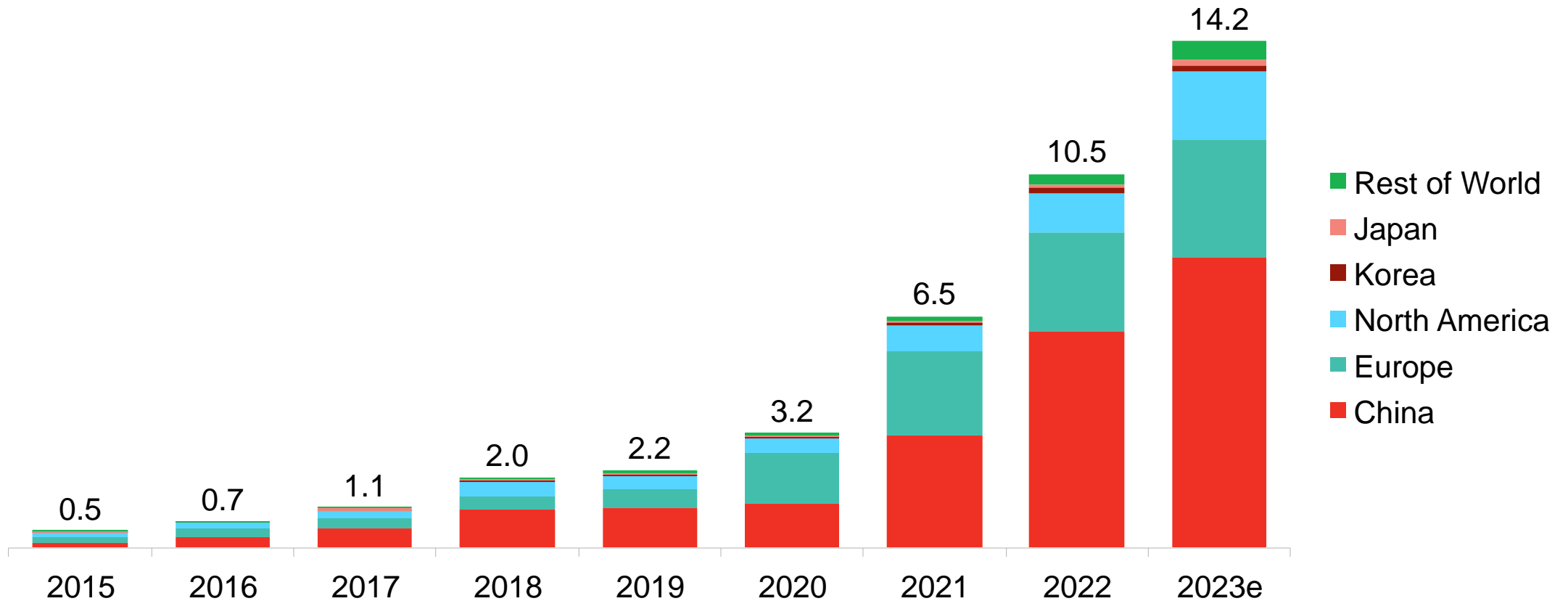
Electrification is spreading quickly to all areas of road transport



Passenger electric vehicle sales to hit 14 million in 2023

Annual passenger EV sales by economy

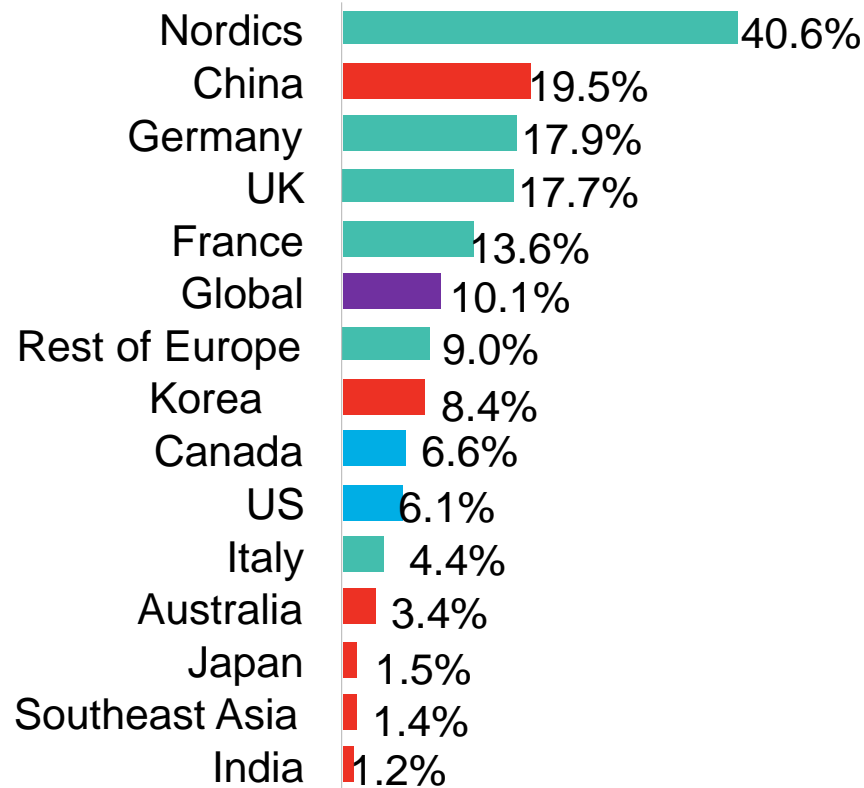
Million



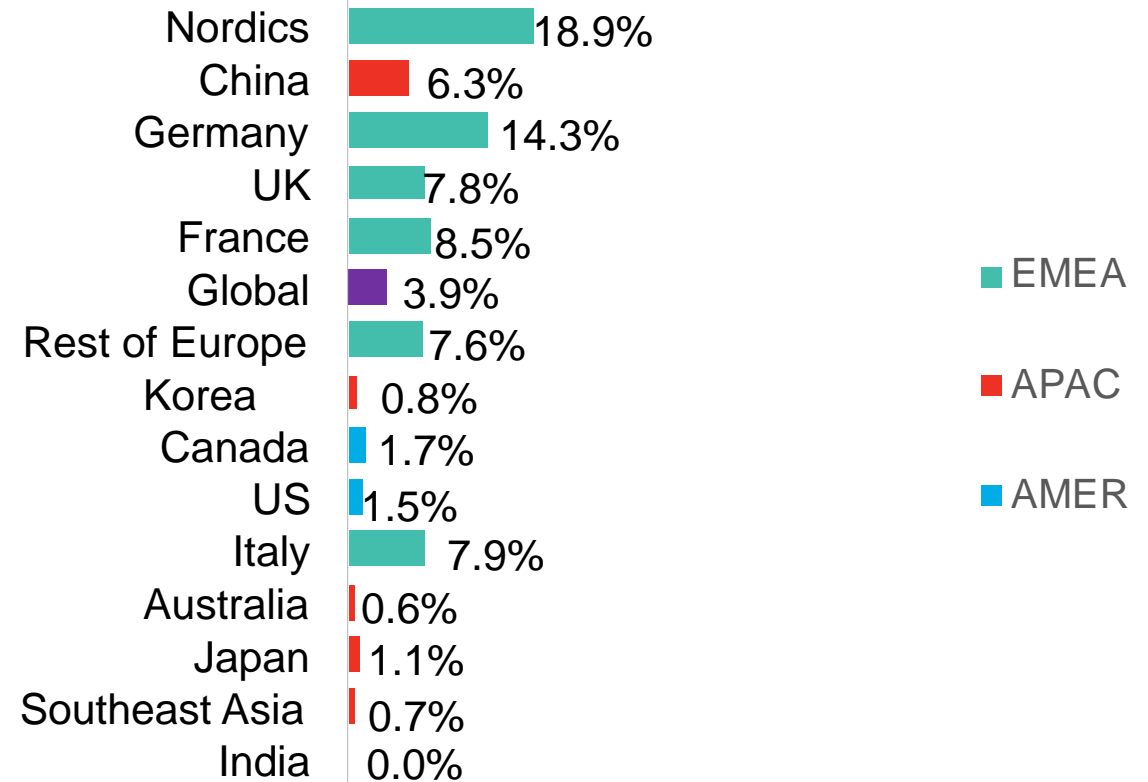
Global growth masks significant regional variation

Passenger EV share of sales in selected economies, 2022

Battery electric vehicles



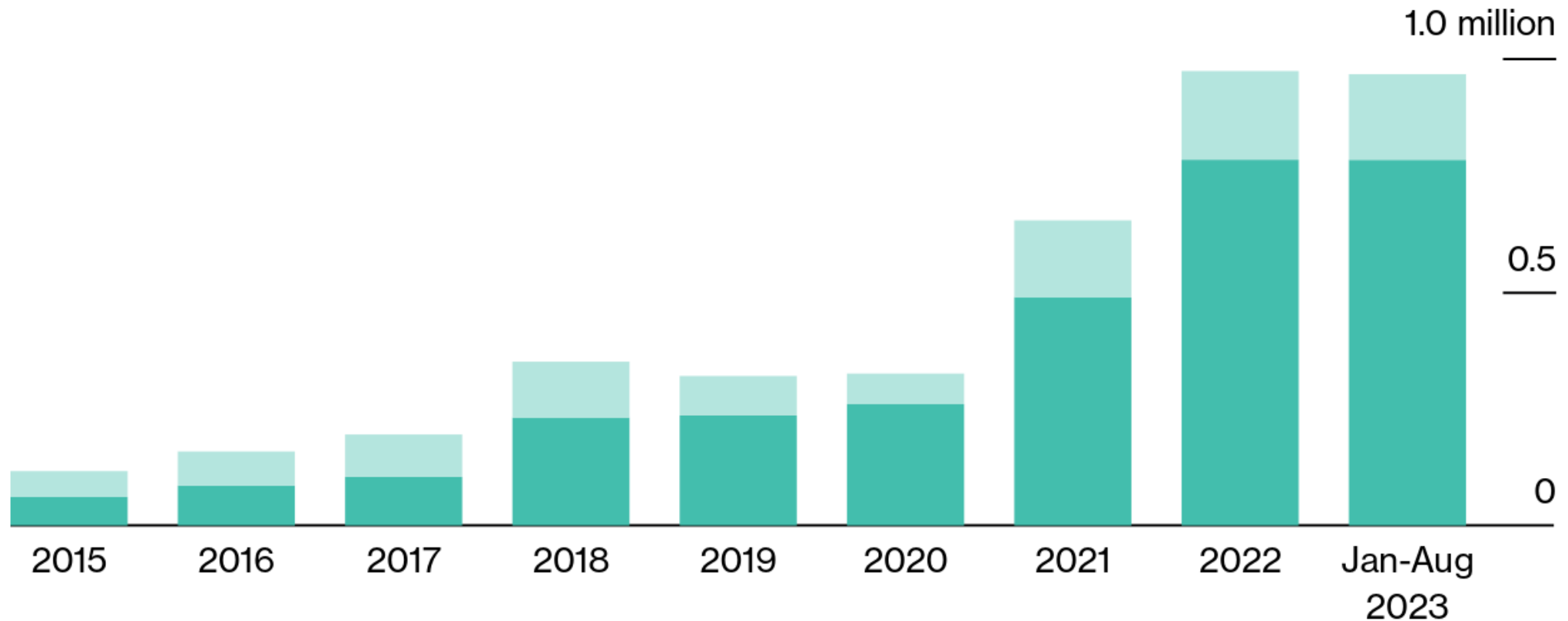
Plug-in hybrid electric vehicles



Brighter US EV sales outlook on IRA and new subsidies

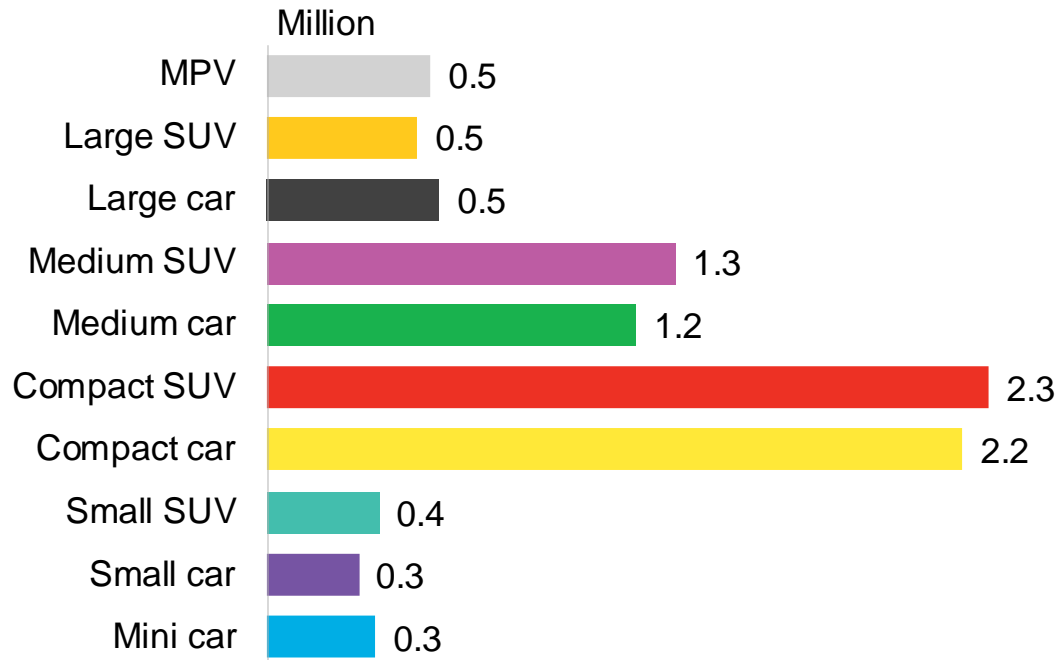
US passenger EV sales by drivetrain

■ Battery electric ■ Plug-in hybrid electric

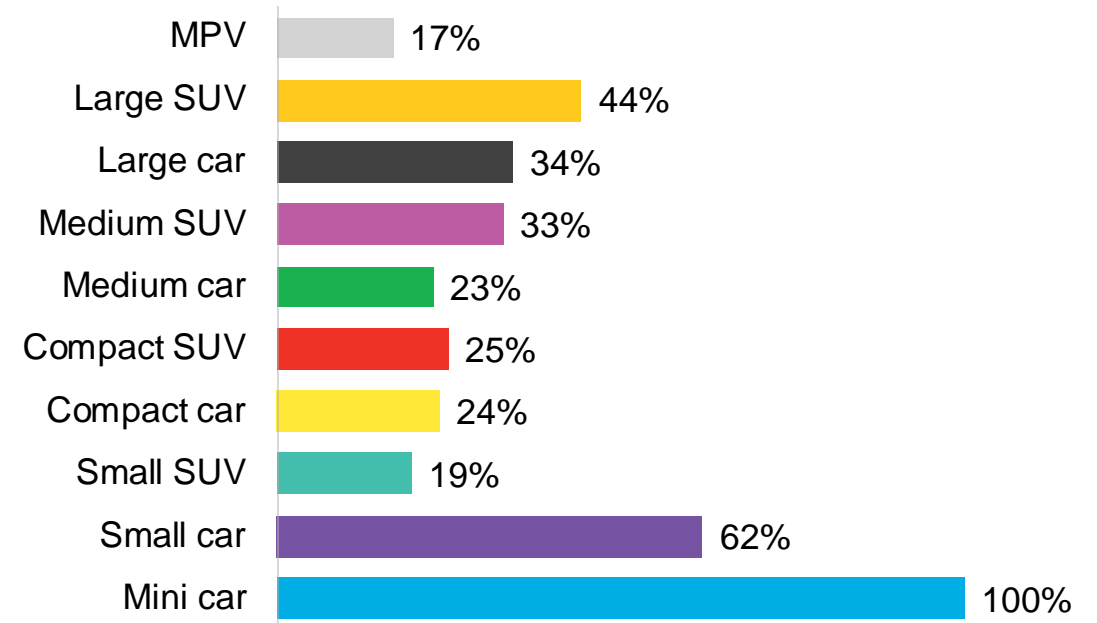


Consumer purchasing patterns diverge in China's EV market

China passenger vehicle sales by segment, 1H 2023

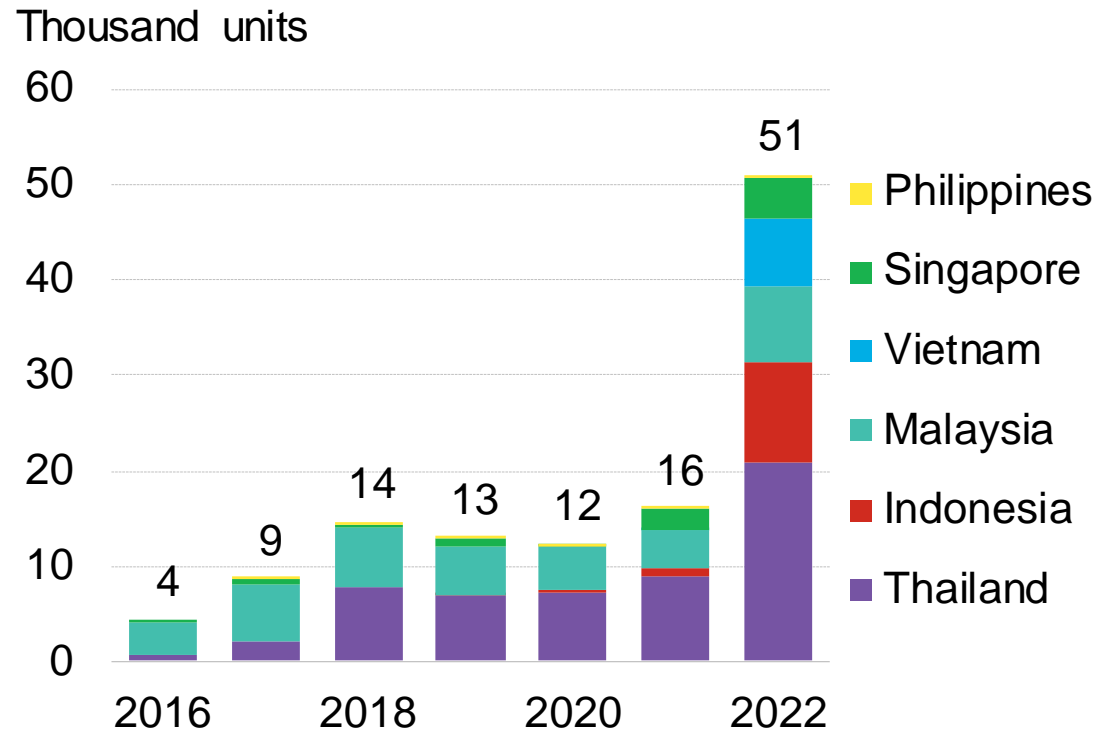


China passenger EV share of sales by segment, 1H 2023

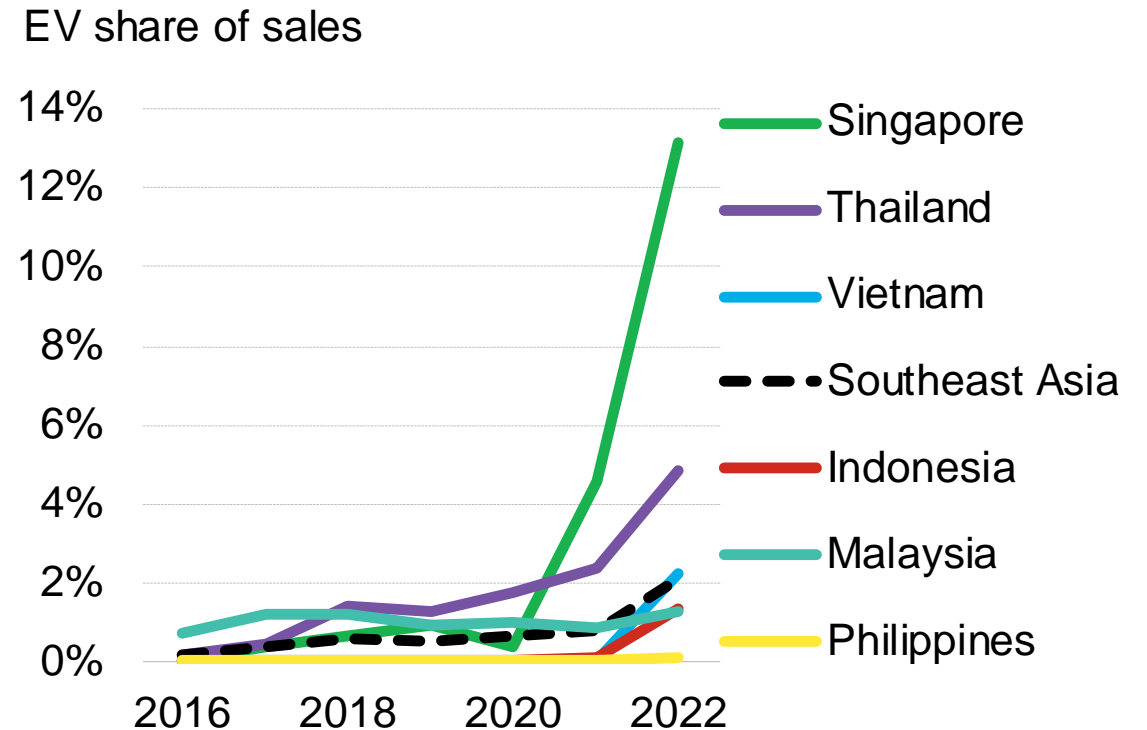


EV adoption starts to grow across most ASEAN economies

Southeast Asia annual passenger electric vehicle sales by economy



EV share of annual passenger vehicle sales by economy in Southeast Asia



Source: BloombergNEF, Marklines, Gaikindo (Indonesia), Thailand Department of Land Transport, Malaysia Automotive Association, Philippines Land Transportation Office, Vietnam Automobile Manufacturers' Association, Singapore Land Transport Authority. Note: Plug-in hybrid sales in Malaysia and total EV sales in the Philippines are estimates based on automaker and auto-industry organization announcements.

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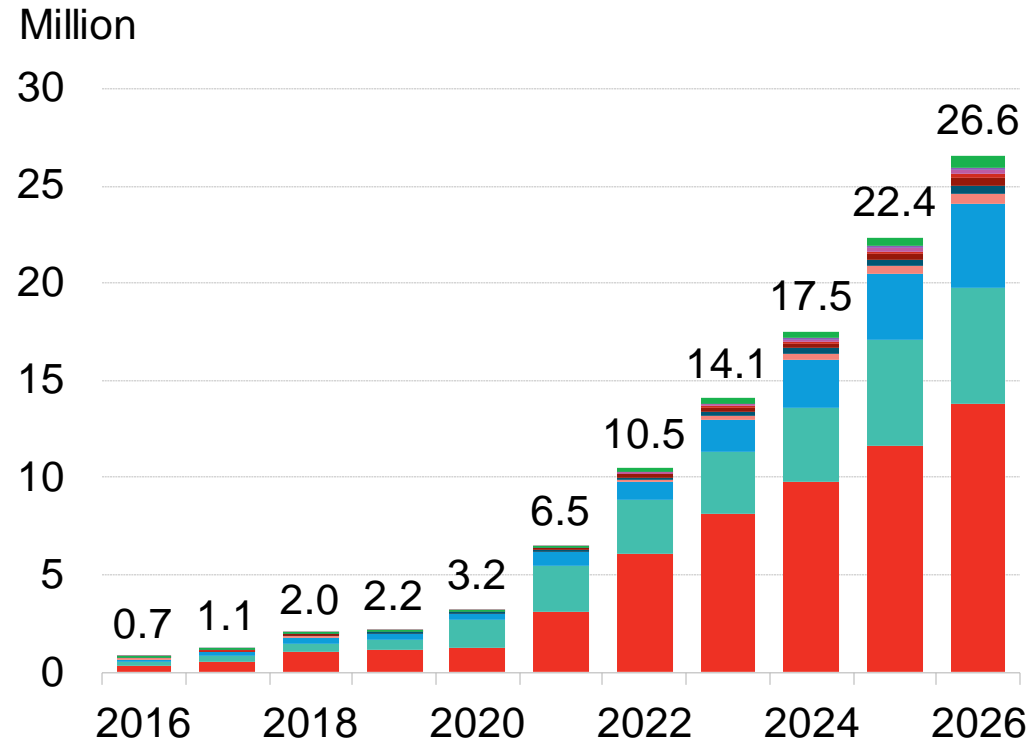
Electric Vehicle Outlook 2023

BloombergNEF

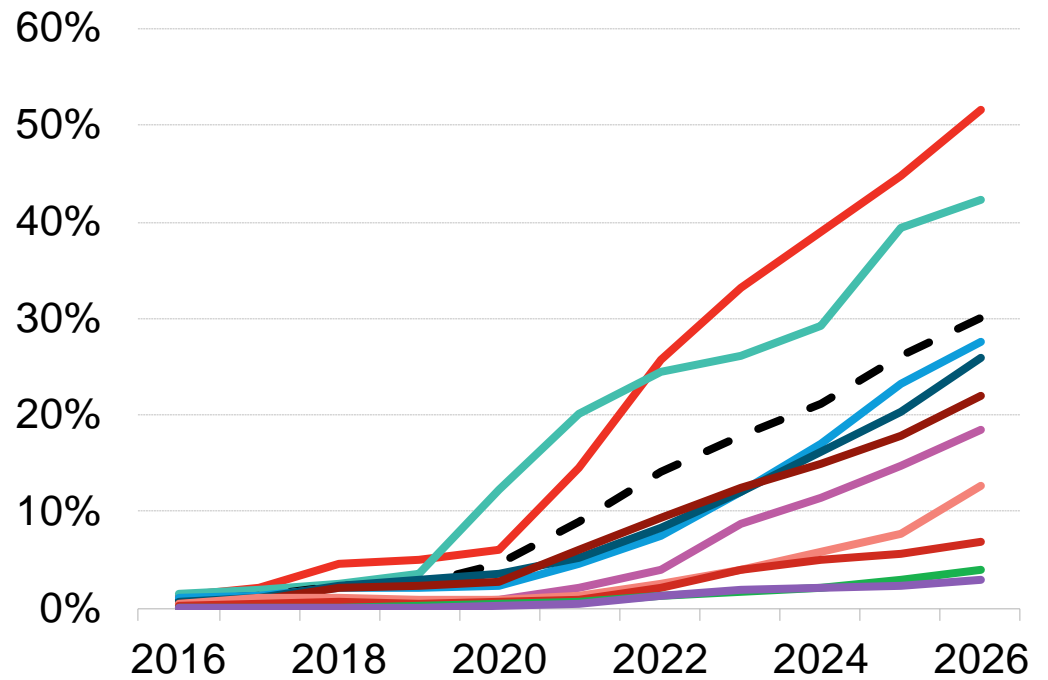


EV sales set to continue rising, led by China and Europe

Global near-term passenger EV sales by economy



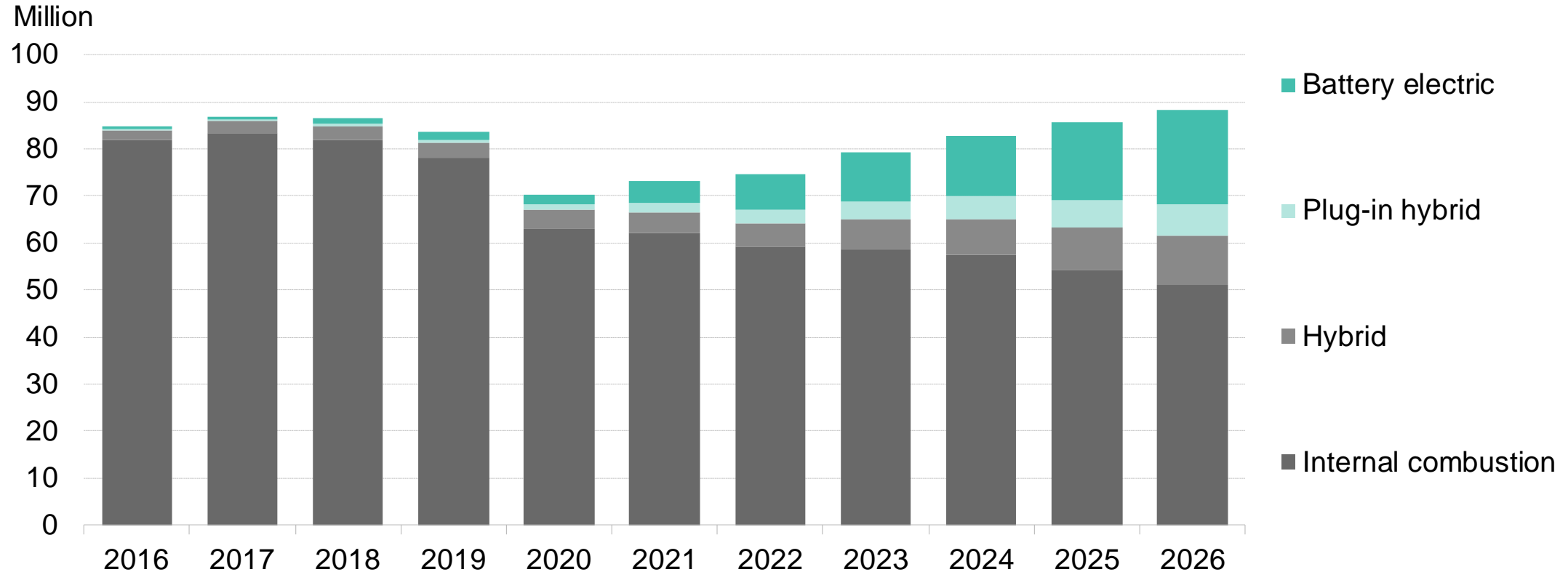
Global near-term EV share of passenger vehicle sales by economy



■ China
 ■ Europe
 ■ US
 ■ Japan
 ■ Canada
 ■ Korea
 ■ Southeast Asia
 ■ Australia
 ■ India
 ■ Rest of World
 ■ Global

Combustion engine vehicle sales have already peaked

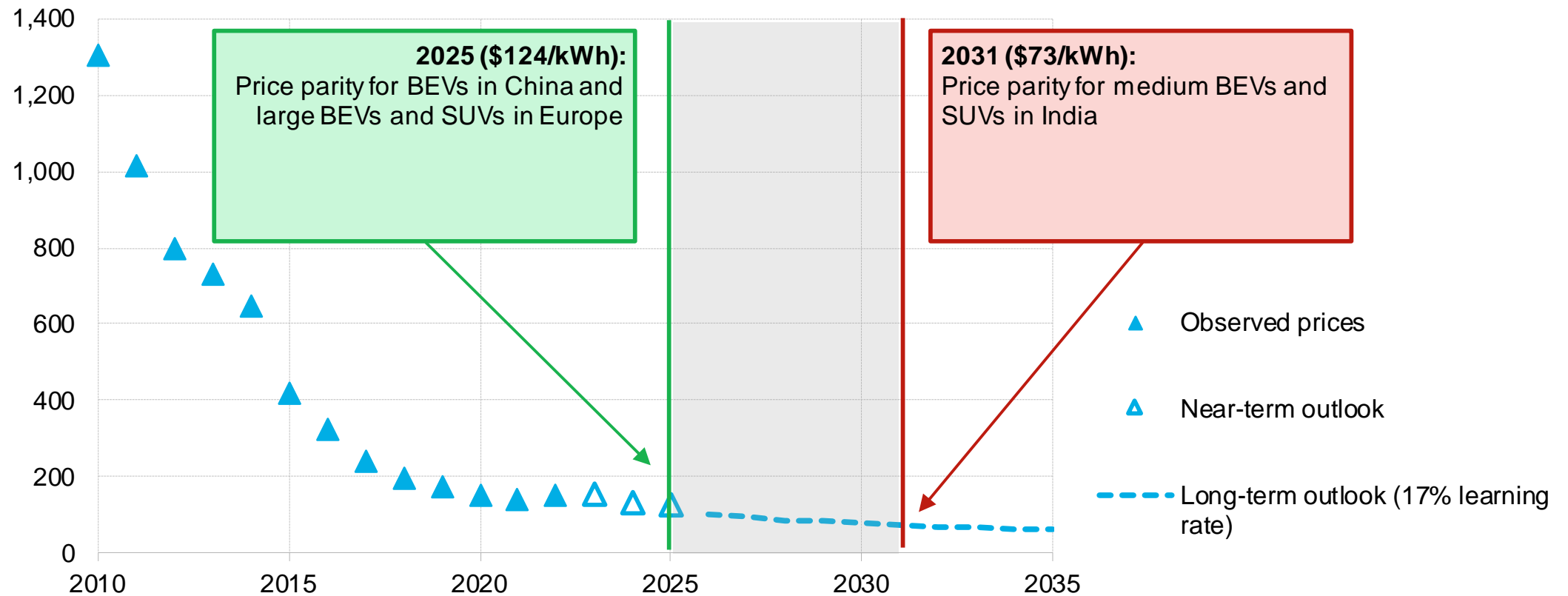
Global passenger vehicle sales by drivetrain



Falling battery prices become a major driver of EV adoption

EV share of passenger vehicle sales in selected economies – Economic Transition Scenario and Net Zero Scenario

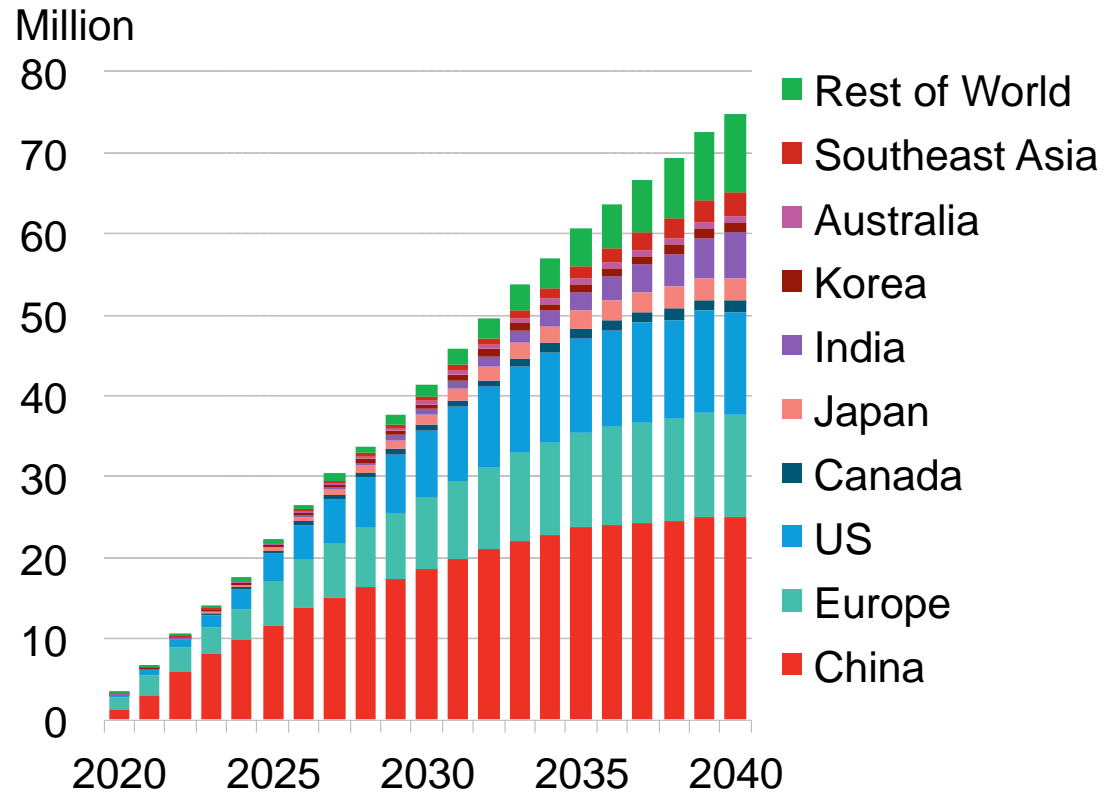
Real 2022 \$/kWh



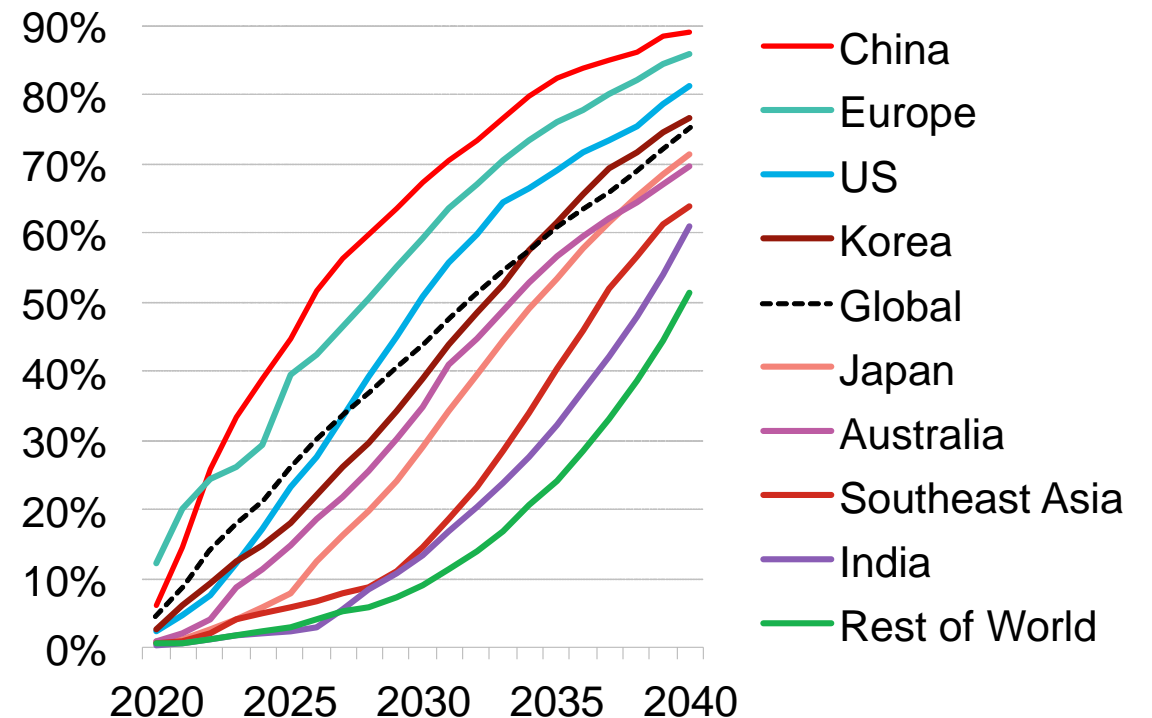
Source: BloombergNEF. Note: Shaded range represents battery pack prices that correspond to price parity for different regions and segments for the base case.

By 2030, EV sales accelerate across the globe

Global passenger EV sales by economy – Economic Transition Scenario

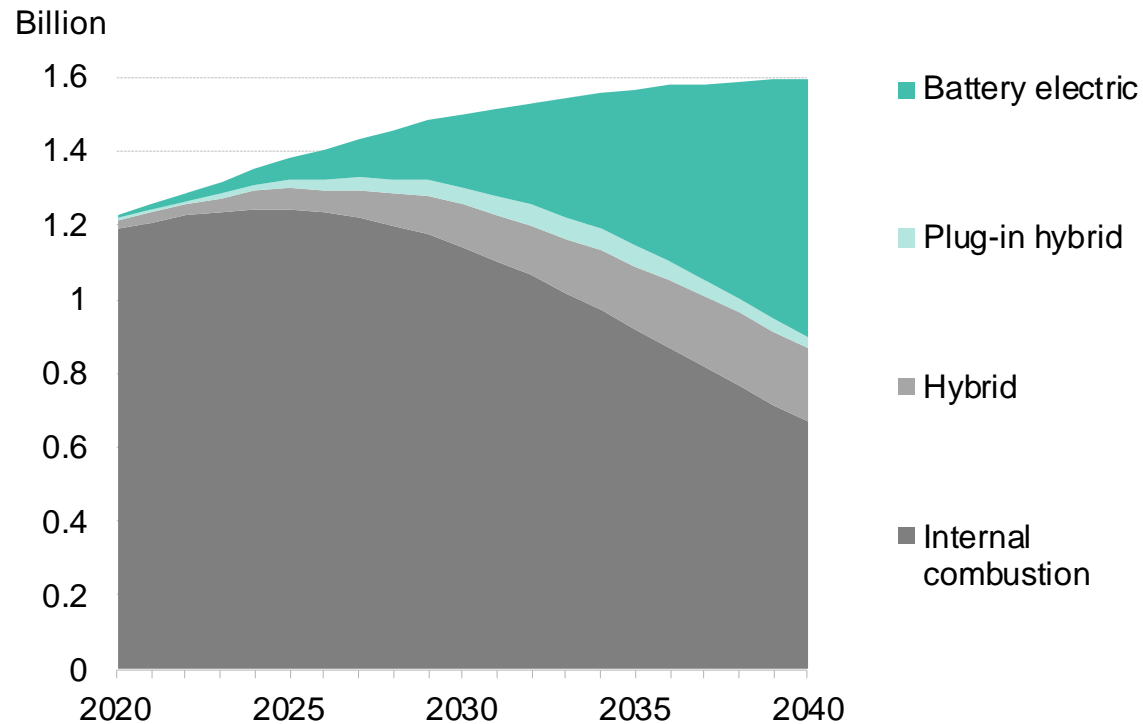


EV share of passenger vehicle sales by economy – Economic Transition Scenario

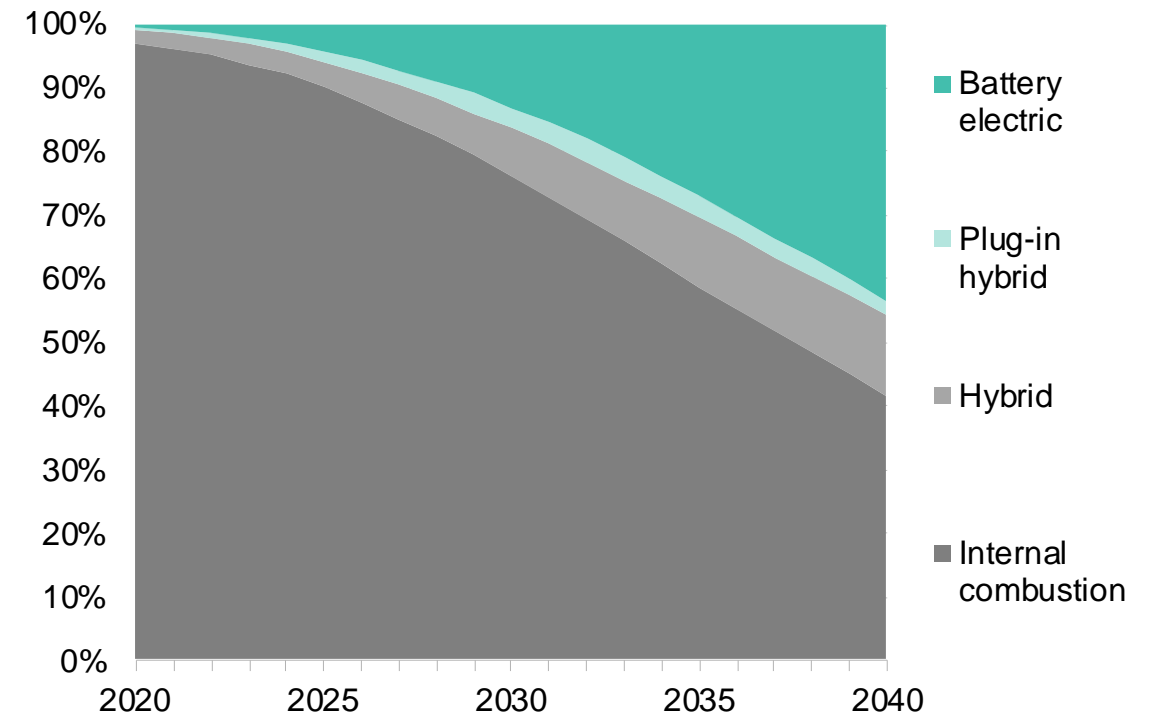


Fleet turnover takes a long time

Global passenger vehicle fleet by drivetrain – Economic Transition Scenario



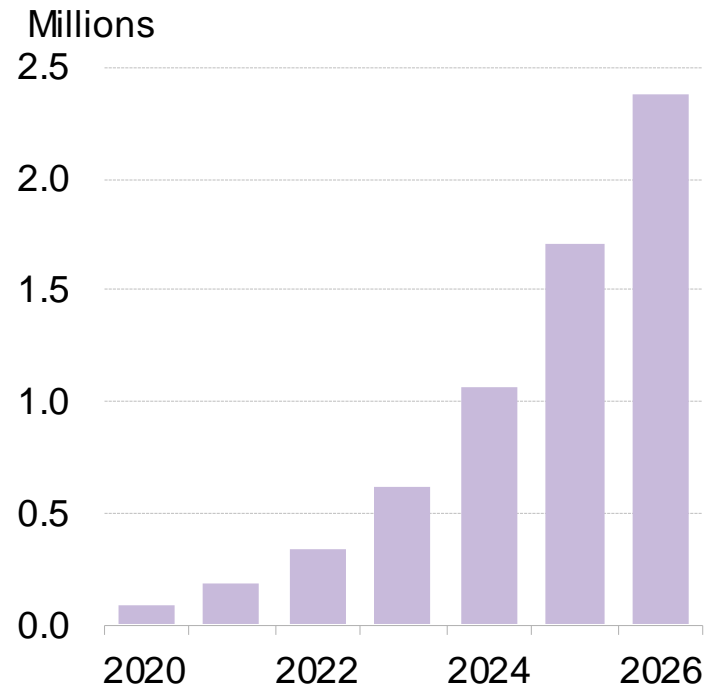
Global passenger vehicle share of fleet by drivetrain – Economic Transition Scenario



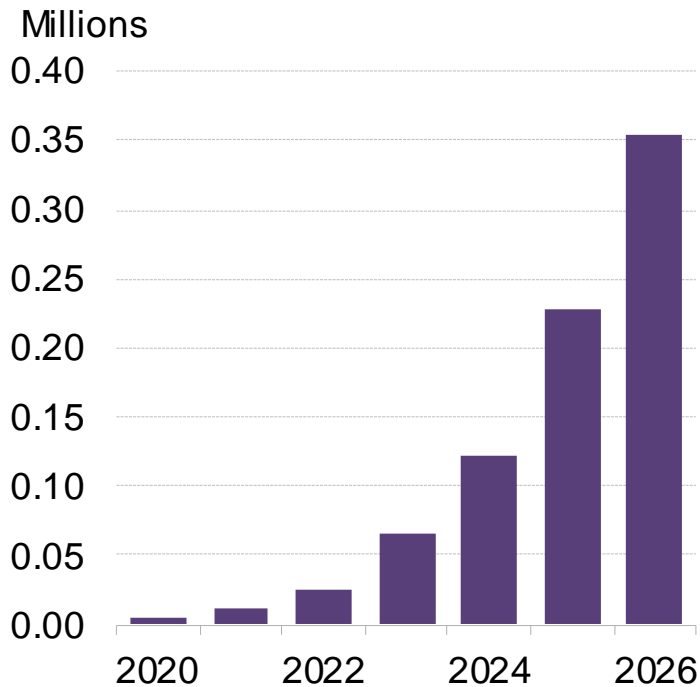
Sales of commercial EVs start to take off

Global electric and fuel cell commercial van, truck, and buses near-term sales outlook

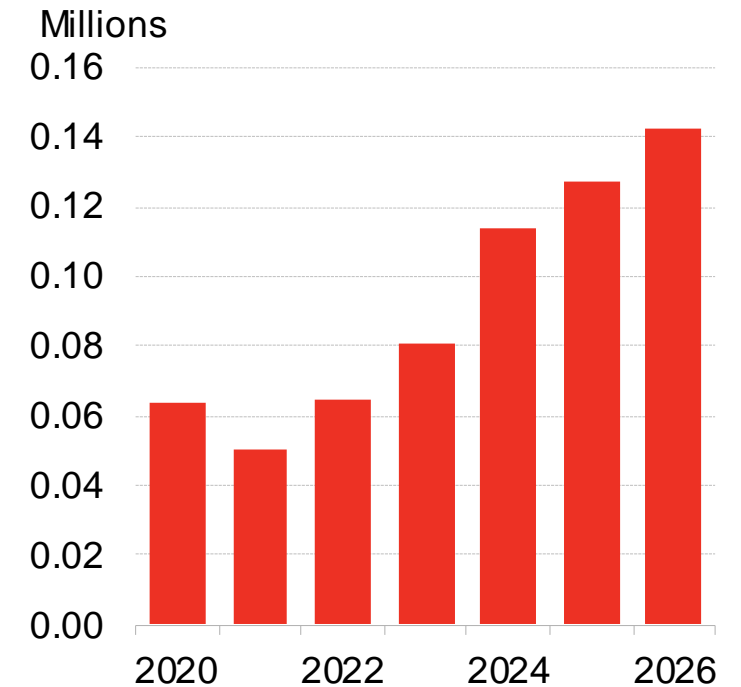
Light-duty



Medium- and heavy-duty

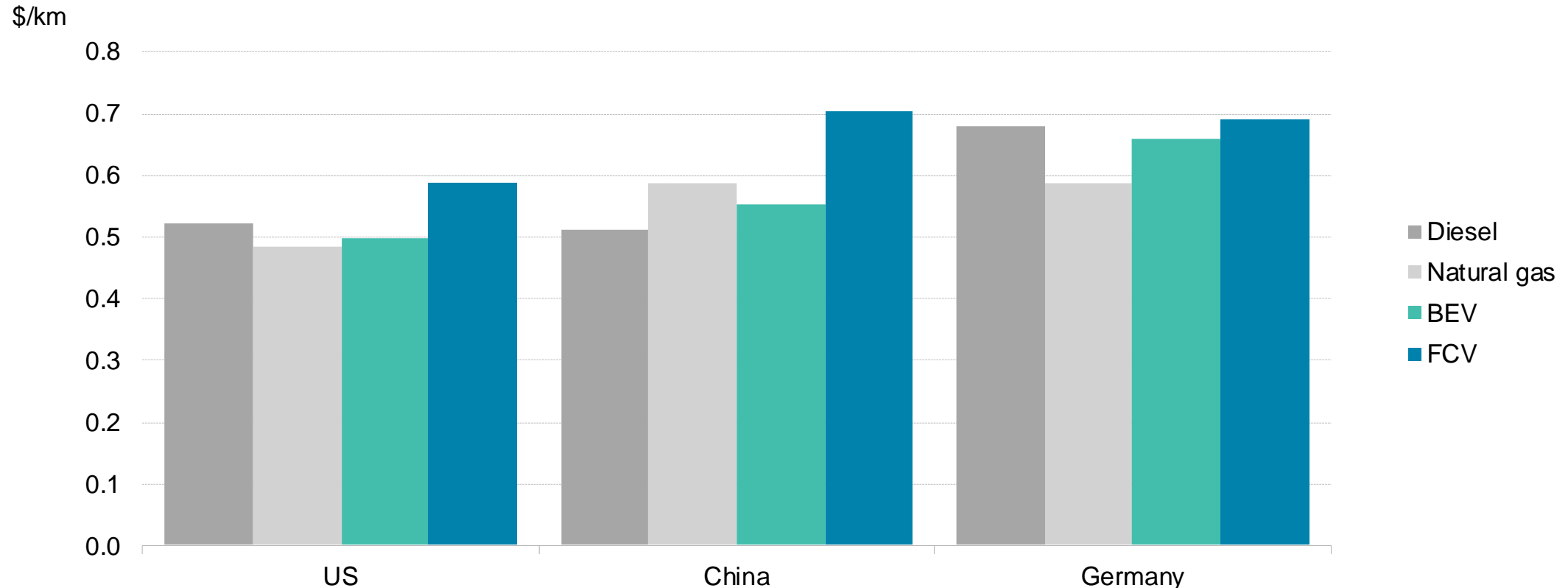


Bus



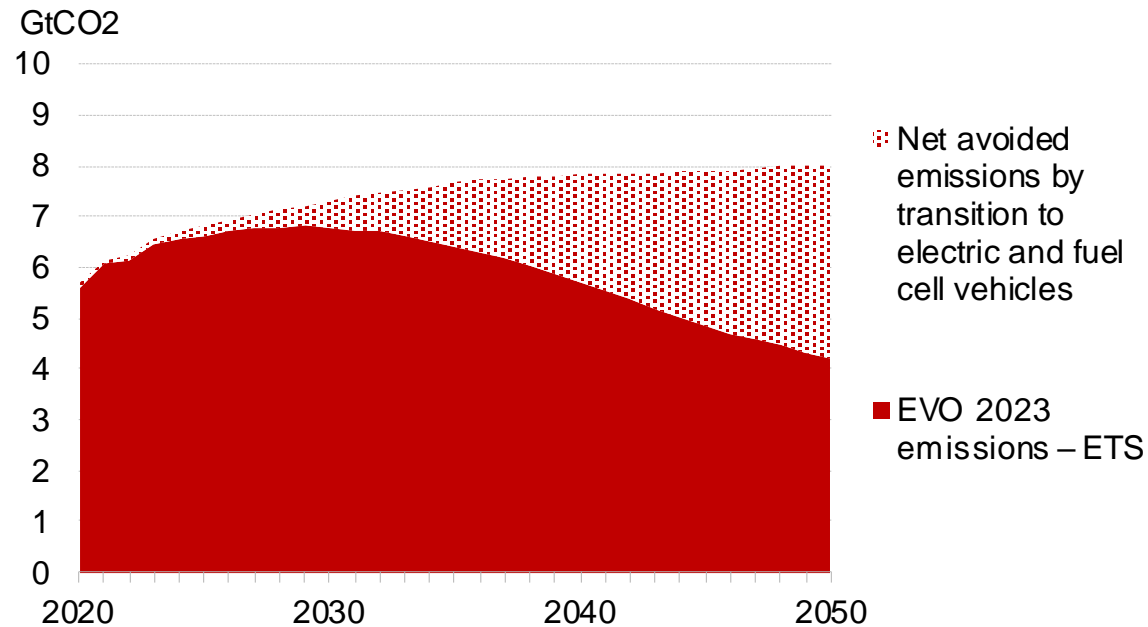
Heavy-duty long-haul electric trucks become cost competitive by 2030

Total cost of ownership of heavy-duty truck in long-haul duty cycle in 2030

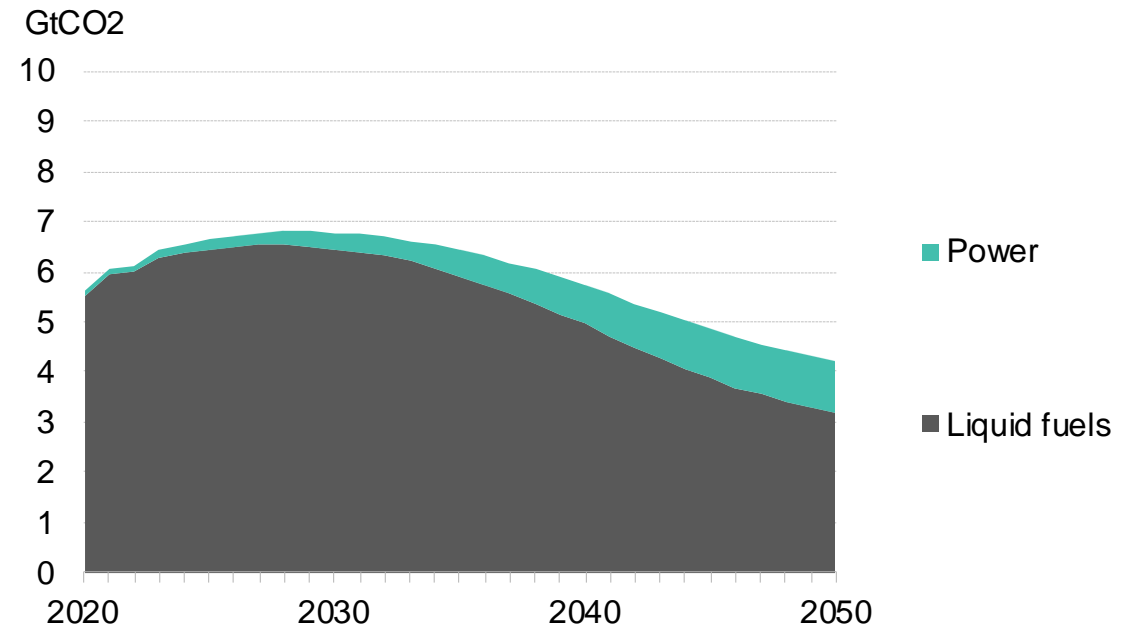


Road transport emission fall, but not enough for Net Zero

Road transport emissions avoided by the penetration of electric and fuel cell vehicles – Economic Transition Scenario



Total global CO2 emissions from road transportation by energy source – Economic Transition Scenario

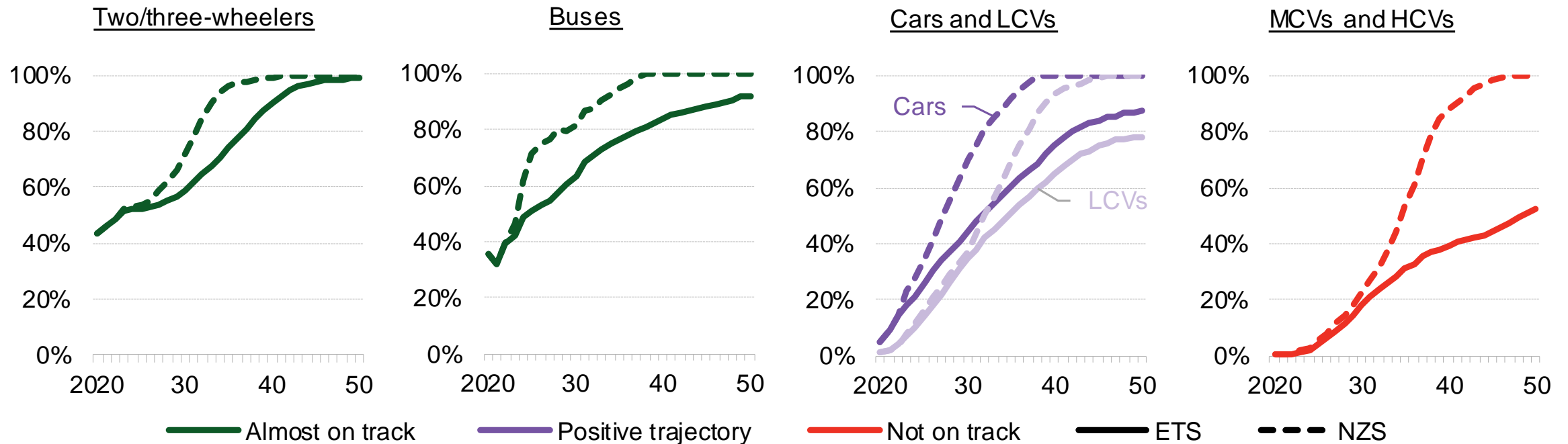


Road transport segment progress toward a Net Zero Scenario

Segment	Current share of road transport CO2 emissions	Current global fleet size	EV share of fleet - 2022	Zero-emission vehicle (ZEV) fleet share in 2050 – Economic Transition Scenario	Level of policy intervention needed to hit Net Zero Scenario (100% ZEV share) by 2050
Three-wheeled vehicles	<1%	119 million	70%	95%	On track
Two-wheeled vehicles	5%	1 billion	21%	78%	Almost on track: minor additional measures needed
Municipal buses	1%	3.5 million	19%	87%	Almost on track: minor additional measures needed
Passenger vehicles	53%	1.3 billion	2%	70%	Positive trajectory: moderate additional measures needed
Light commercial vehicles	11%	165 million	0.6%	76%	Positive trajectory: moderate additional measures needed
Medium + heavy commercial vehicles	30%	82 million	0.1%	32%	Not on track: strong additional measures needed urgently

Two- and three-wheelers are quickest to electrify

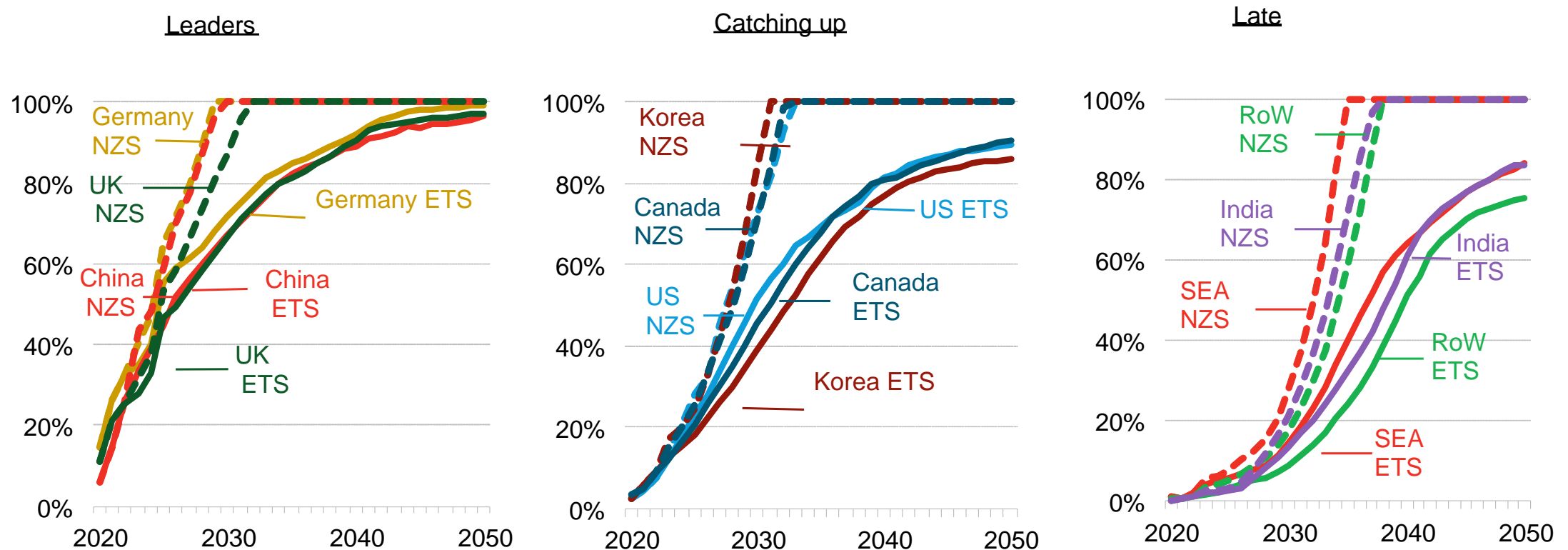
Global zero-emission vehicle sales share outlook – Economic Transition Scenario and Net Zero Scenario



Source: BloombergNEF. Note: 'ETS' stands for Economic Transition Scenario and 'NZS' stands for Net Zero Scenario. 'LCVs, MCVs and HCVs' are light-, medium- and heavy-duty commercial vehicles. 'Zero-emission' includes battery-electric, plug-in hybrid electric and fuel cell vehicles, depending on the vehicle segment. Some values rounded.

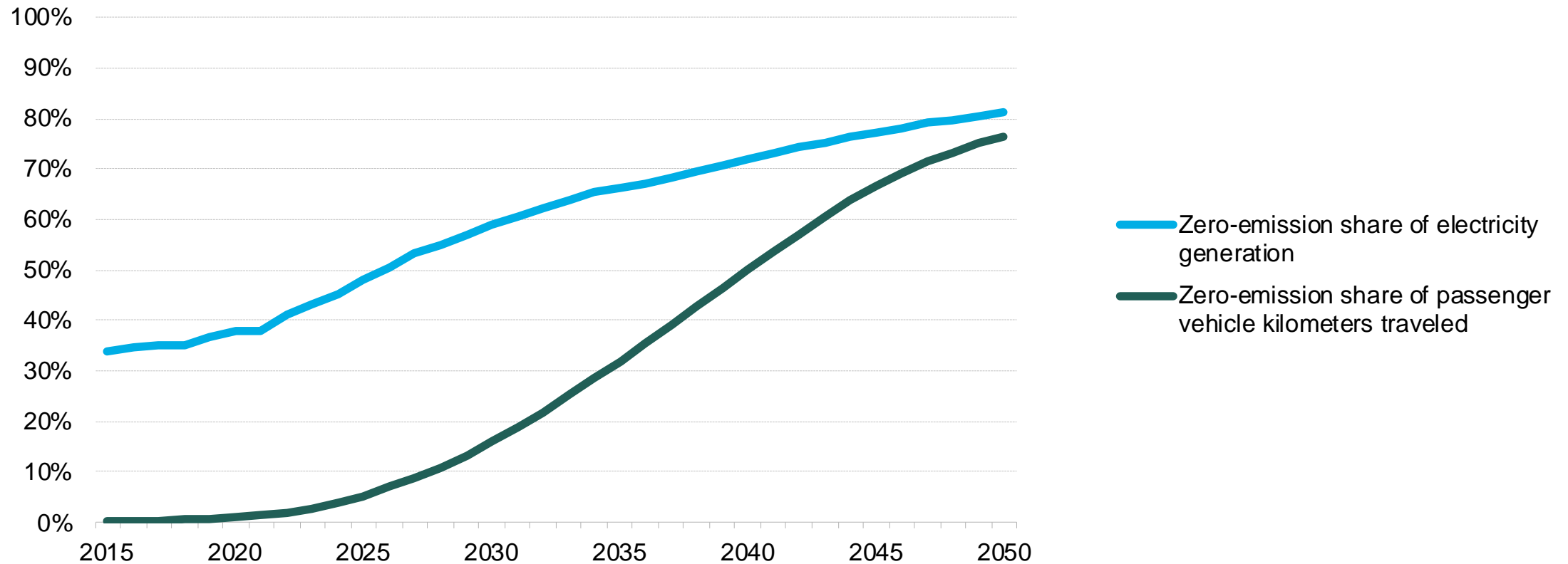
Staying on track for Net Zero means phasing out ICE sales by early 2030s

EV share of passenger vehicle sales in selected economies – Economic Transition Scenario and Net Zero Scenario



Power sector if further along the journey

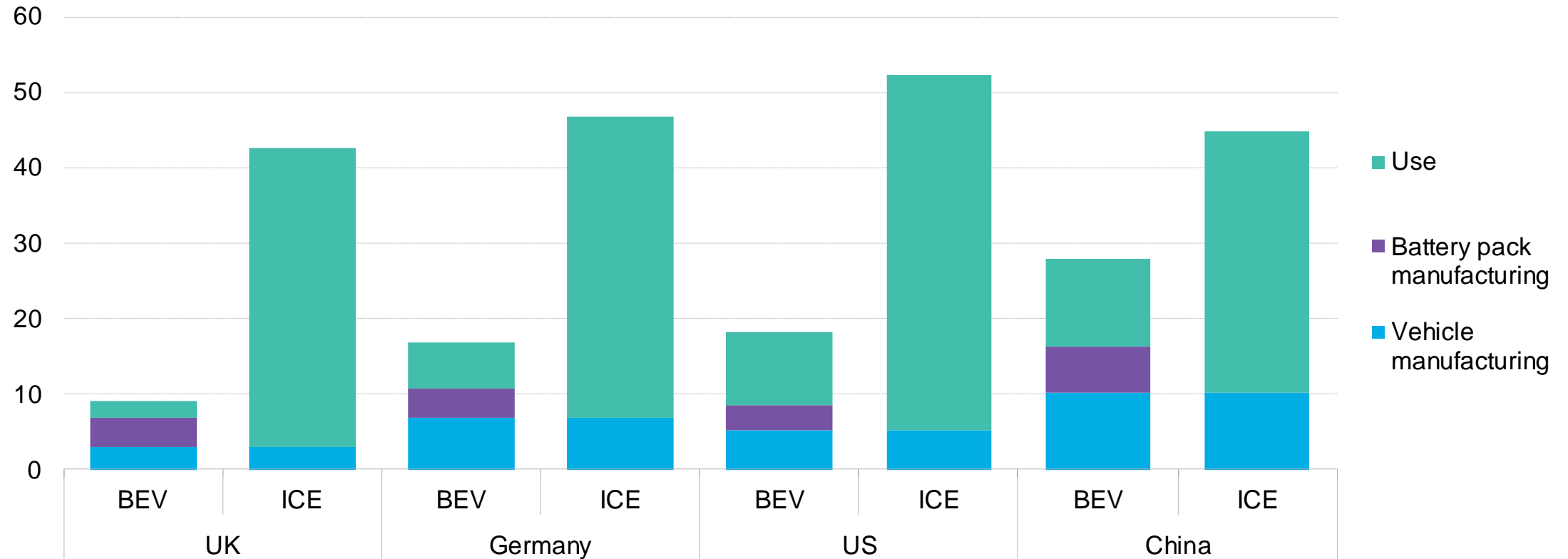
Share of global power generation from zero-emission sources and share of passenger kilometers traveled in zero-emission vehicles – Economic Transition Scenario



EVs have lower life cycle emissions

Total tons of CO2 emissions of medium ICE and BEV produced in 2020 and used for 250,000 kilometers

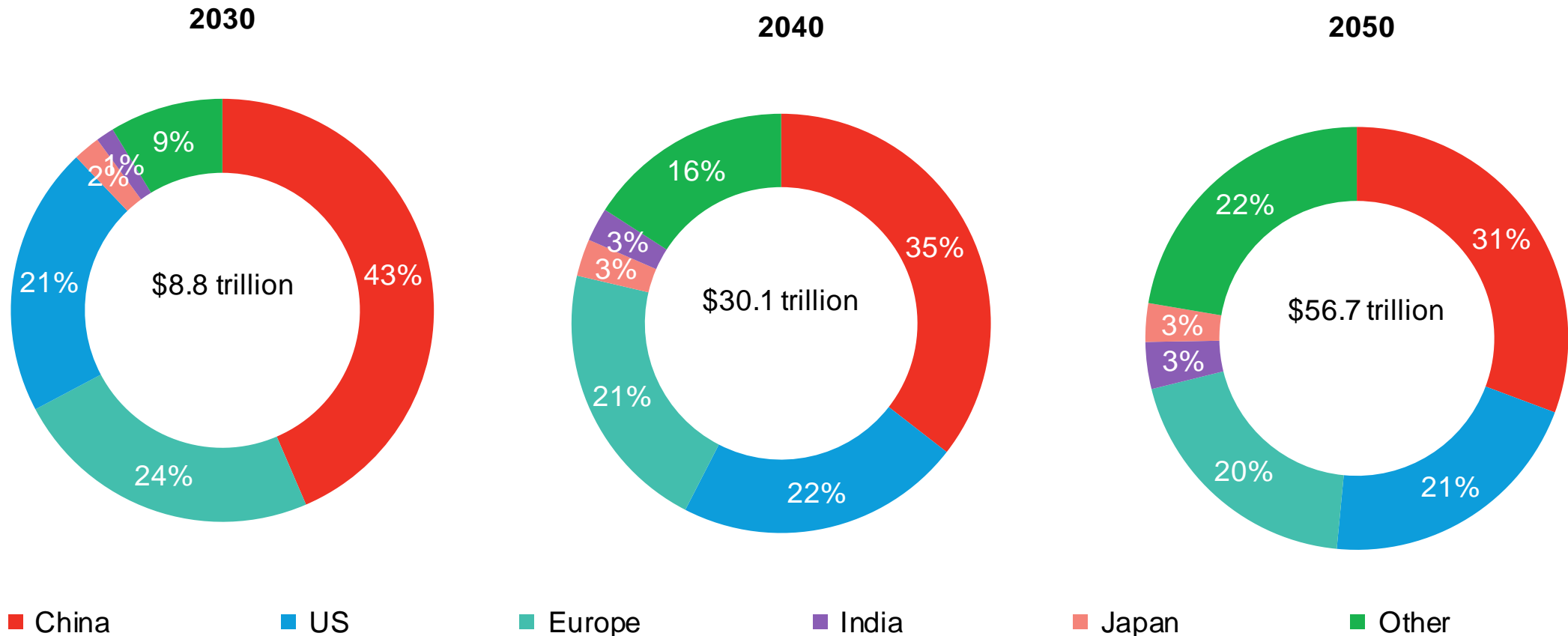
Tons CO2



Source: BloombergNEF, ICCT. Note: the annual distance driven differs between countries, so the vehicle lifetime in years is also different and we take into account the changing grid emissions over that period; 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 US and China the materials, cells and pack are manufactured domestically; the battery size of medium BEV is 71 kWh; the vehicles are produced in the country of use. 2020 data.

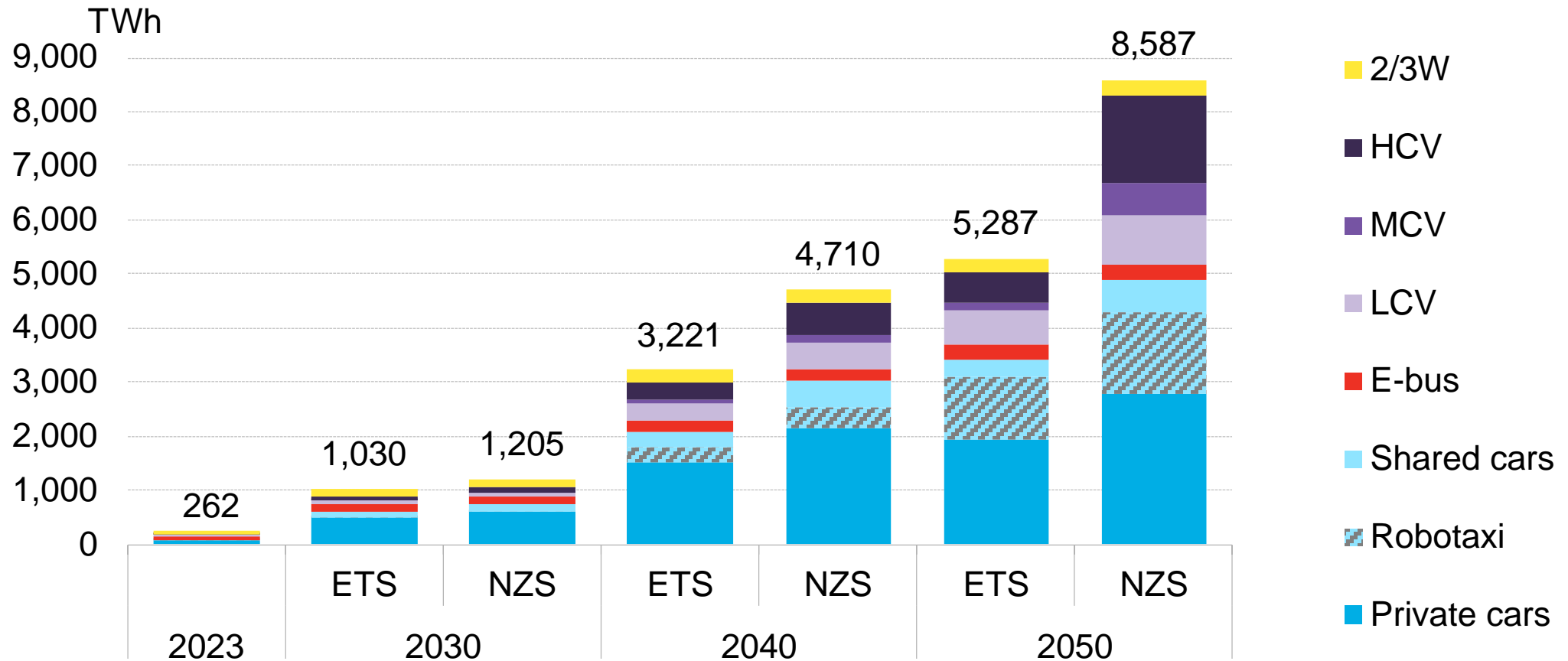
EV sales value hits \$9 trillion by 2030

Cumulative global EV market opportunity by economy – Economic Transition Scenario



A fully electric fleet requires 9,000TWh by 2050

Global electricity demand outlook by electric vehicle segment and scenario



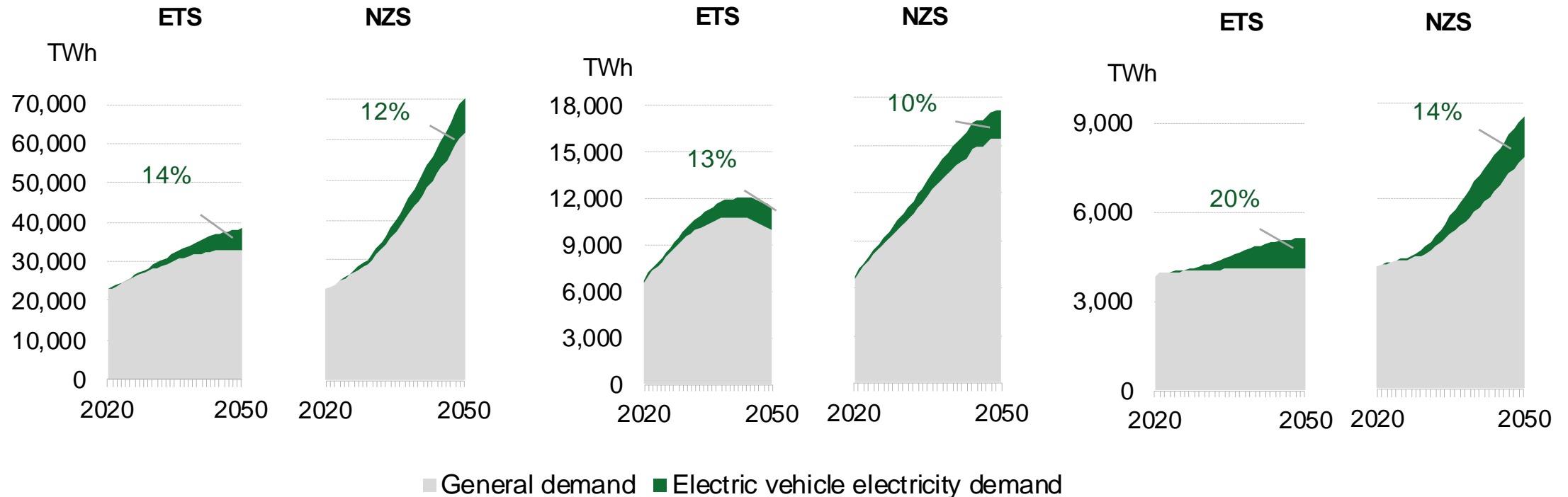
Electrifying road transport adds 12-14% to global electricity demand

Electricity demand outlook for selected economies by scenario

Global

China

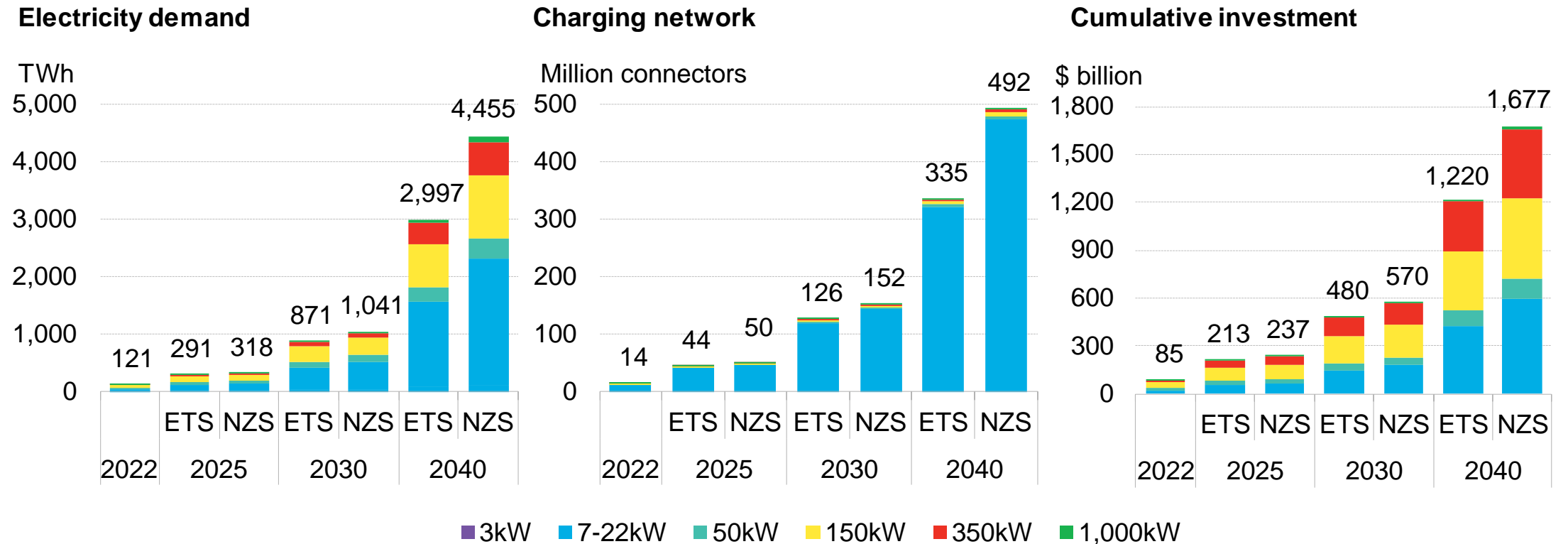
US



Source: BloombergNEF. Note: Uses general electricity demand projections from BloombergNEF's New Energy Outlook 2022. This is the final energy consumption and excludes any losses in transmission. EV electricity demand includes demand from passenger EVs, commercial EVs, e-buses and electric two- and three-wheelers. Percentages refer to percentage of EV electricity demand of total in 2050. Net Zero Scenario includes additional demand from electrification of heating, industry, electrolyzer use for hydrogen production.

Charging infrastructure is a trillion-dollar opportunity / challenge

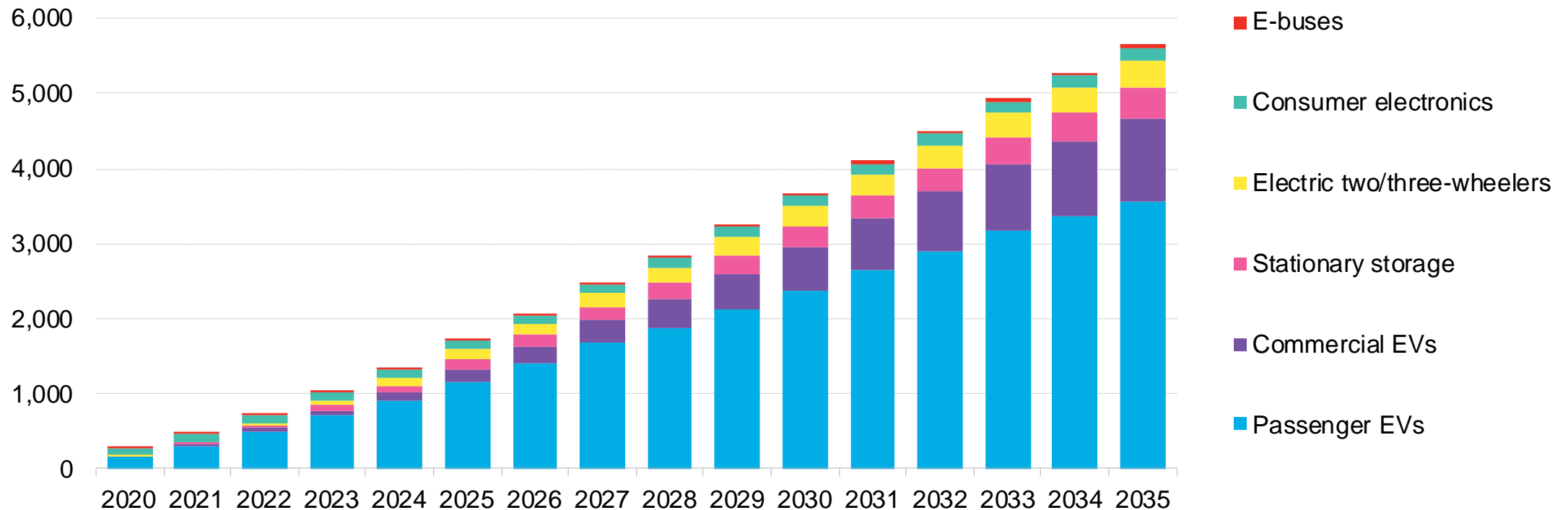
Global electricity demand, charging network and charging investment outlook by scenario



Battery demand exceeds 1TWh in 2023 and 5.5TWh in 2035

Global annual battery demand outlook under BNEF's Economic Transition Scenario and Net Zero Scenario

GWh/year

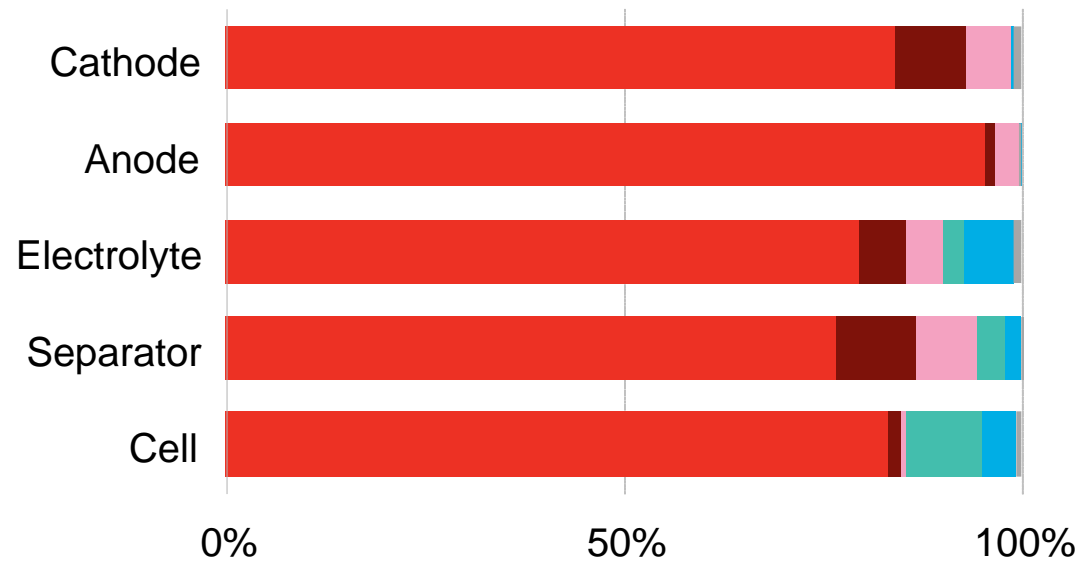


Source: BloombergNEF. Note: Consumer electronics and stationary storage demand are assumed to be the same under both scenarios. ETS is the Economic Transition Scenario, where EV adoption is primarily driven by techno-economic trends and market forces. NZS is the Net Zero Scenario, a pathway to net-zero emissions in the road transport sector by 2050. TWh = terawatt-hour.

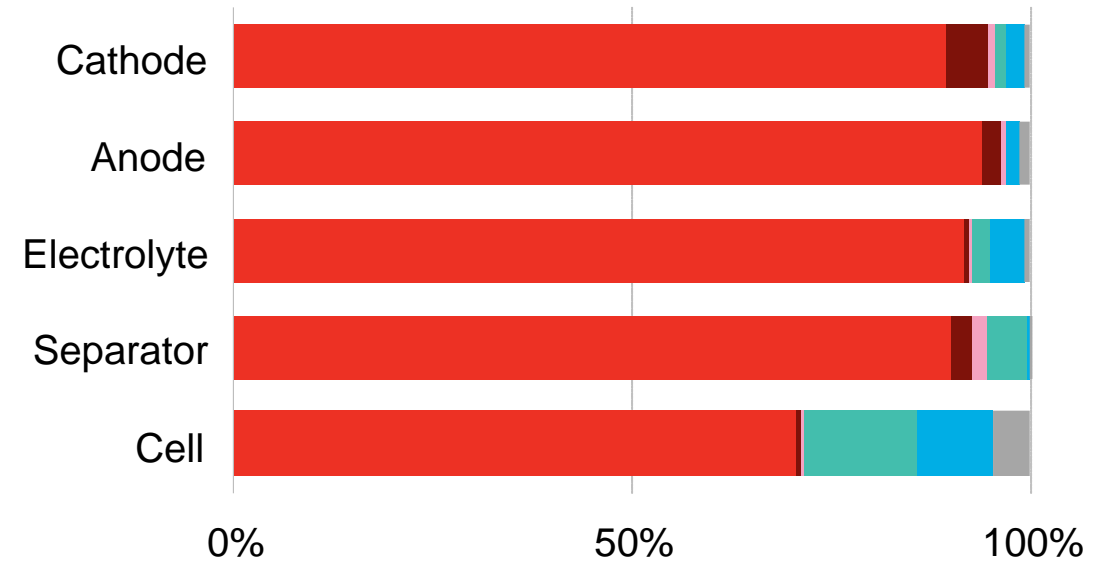
China continues to dominate the lithium-ion battery supply chain, but the race to localize battery supply chain gets heated

Global lithium-ion battery cell and component production capacity by economy

2023



2030



China Korea Japan Europe North America RoW

China Korea Japan Europe North America RoW

Some recommendations for Net Zero

Sector	Measures
Vehicles	<ol style="list-style-type: none"><li data-bbox="529 401 2257 558">1. Governments with climate targets should <u>set a phase-out date for sales of new internal combustion vehicles</u> no later than 2035, backed by legislation and supported by concrete policy measures with interim targets.<li data-bbox="529 572 2232 672">2. <u>Fuel economy standards and/or tailpipe CO2 emissions standards</u> need to be made stricter and stretch further in time than current rules.<li data-bbox="529 686 2308 786">3. Governments should consider <u>mandates for the electrification of government and commercial fleets</u> and consider incentives to push freight into smaller trucks.<li data-bbox="529 801 2333 958">4. Additional <u>consumer subsidies targeting low-priced EVs</u> with smaller batteries may be needed to help access the full range of buyers and targeting the purchase of second-hand EVs.<li data-bbox="529 972 2346 1129">5. Policy makers should consider <u>enforcing a stronger regulatory environment around battery warranties and repairs</u>. Support and investment in building out after-sales services, and skilled labor training are also crucial.

Some recommendations for Net Zero

Sector	Measures
Batteries	<ol style="list-style-type: none">1. Governments should <u>set requirements and standards for the recycling of EV batteries</u> and continue to <u>support research into next-generation battery technologies</u>. Funding and streamlined permitting process can help encourage new supply of raw materials.2. Governments should also look at ways to <u>support domestic development and commercialization of battery supplies</u> and continue to support R&D into emerging battery technologies that reduce dependence on critical raw materials.
Charging infrastructure	<ol style="list-style-type: none">1. Support for charging infrastructure needs to be expanded dramatically, including for remote and otherwise under-served locations. Governments should also <u>review cost recovery mechanisms for grid upgrades and grid connections</u> to enable more charging points and consider if these can be included in the rate base of relevant grid operators in a given area.2. Extensive investments will be needed in high powered charging for trucking fleets, including local grid network reinforcements. Governments should <u>fast track grid connection and permitting processes</u> for these facilities wherever possible.

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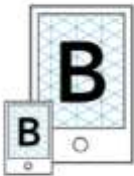
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