

Global EV State of the Union and Outlook

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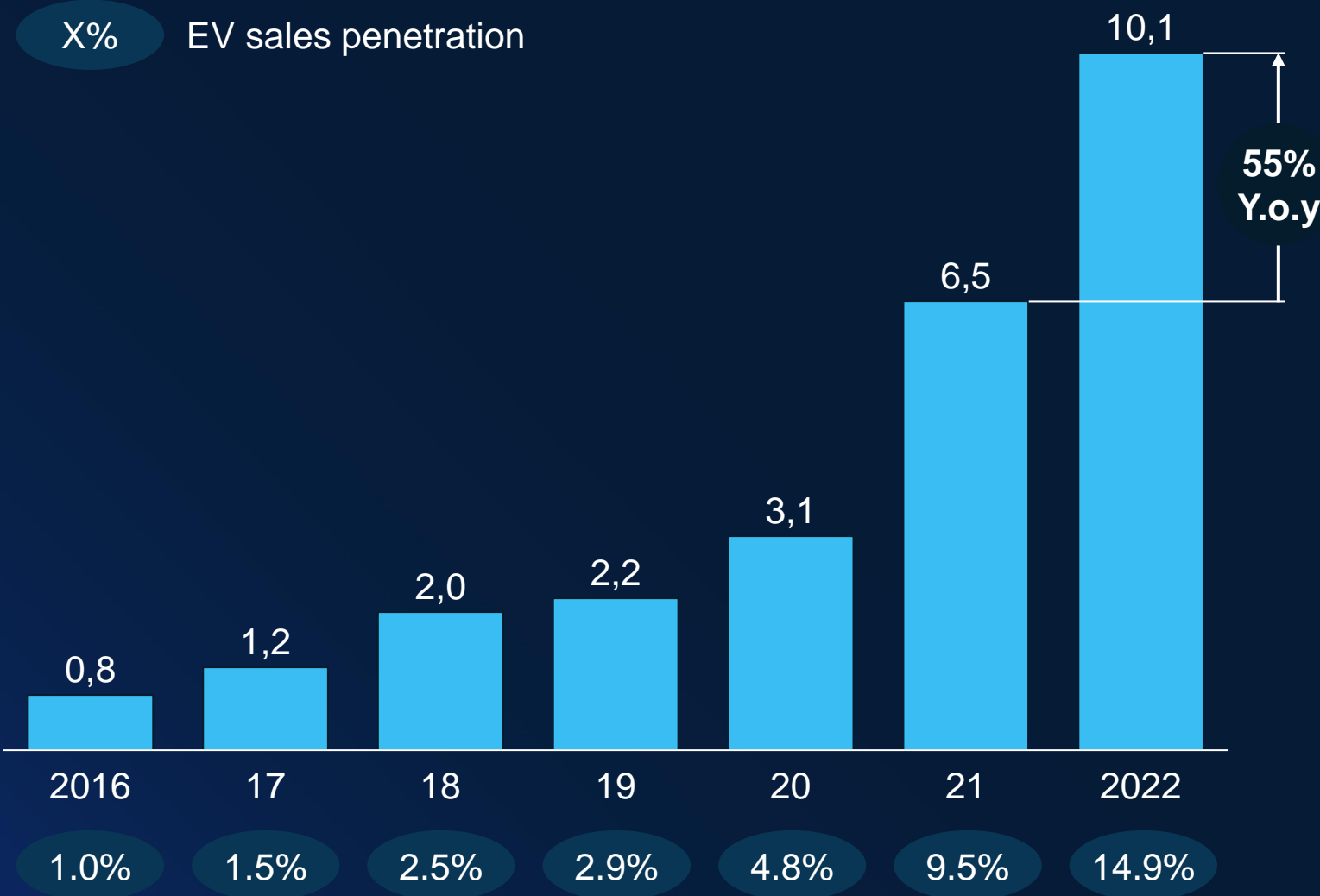
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EV sales have continued to gain momentum in 2022



Global electric¹ passenger car sales, M units



1. EV and PHEV

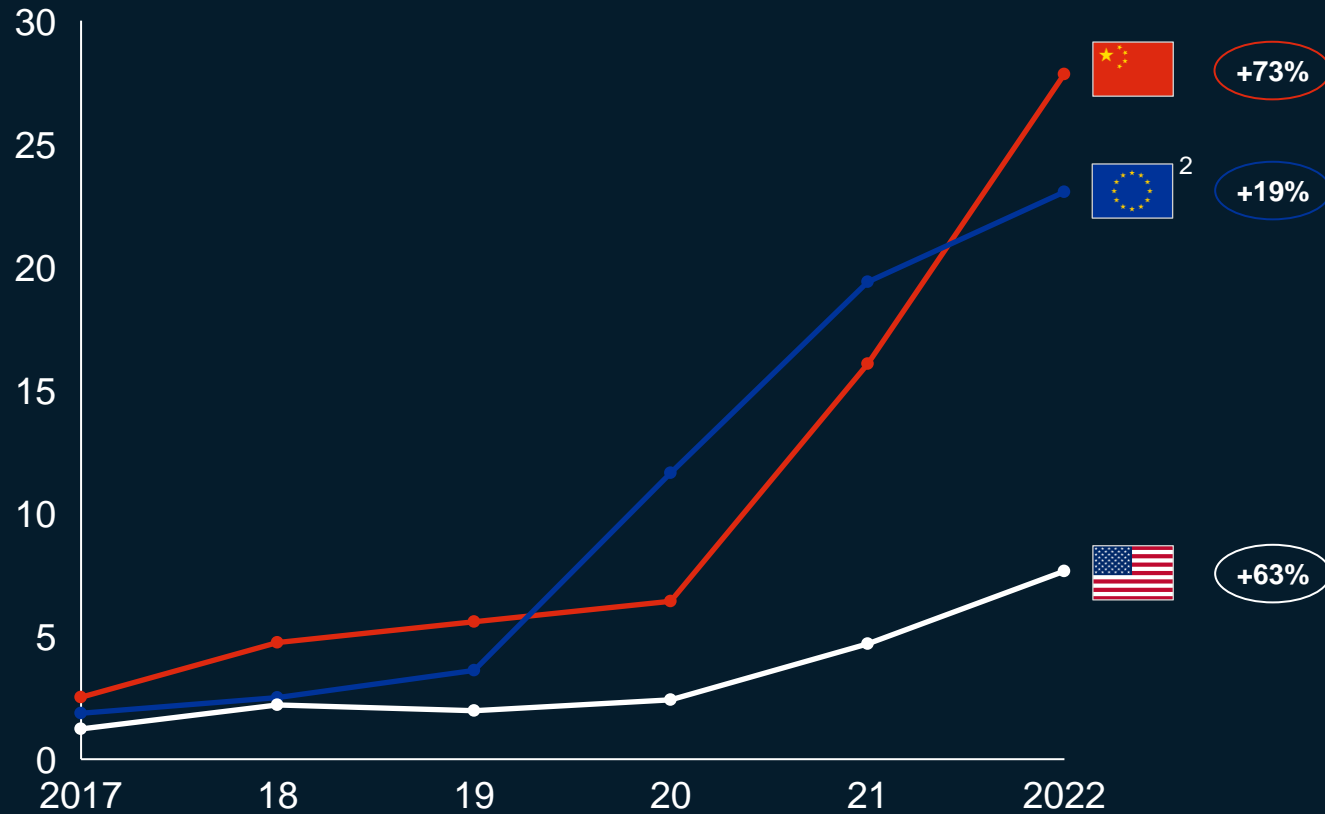
Source: EV-volumes, IHS Markit (Light Vehicle Sales Forecast October 2022), McKinsey Center for Future Mobility

China leads in EV penetration, with Europe growth slowing and the US lagging behind but accelerating

Feb 2023

X% 2021-2022 growth

EV penetration¹ by region, %



Highlights around the globe

~80% 2022 EV penetration in Norway vehicle sales

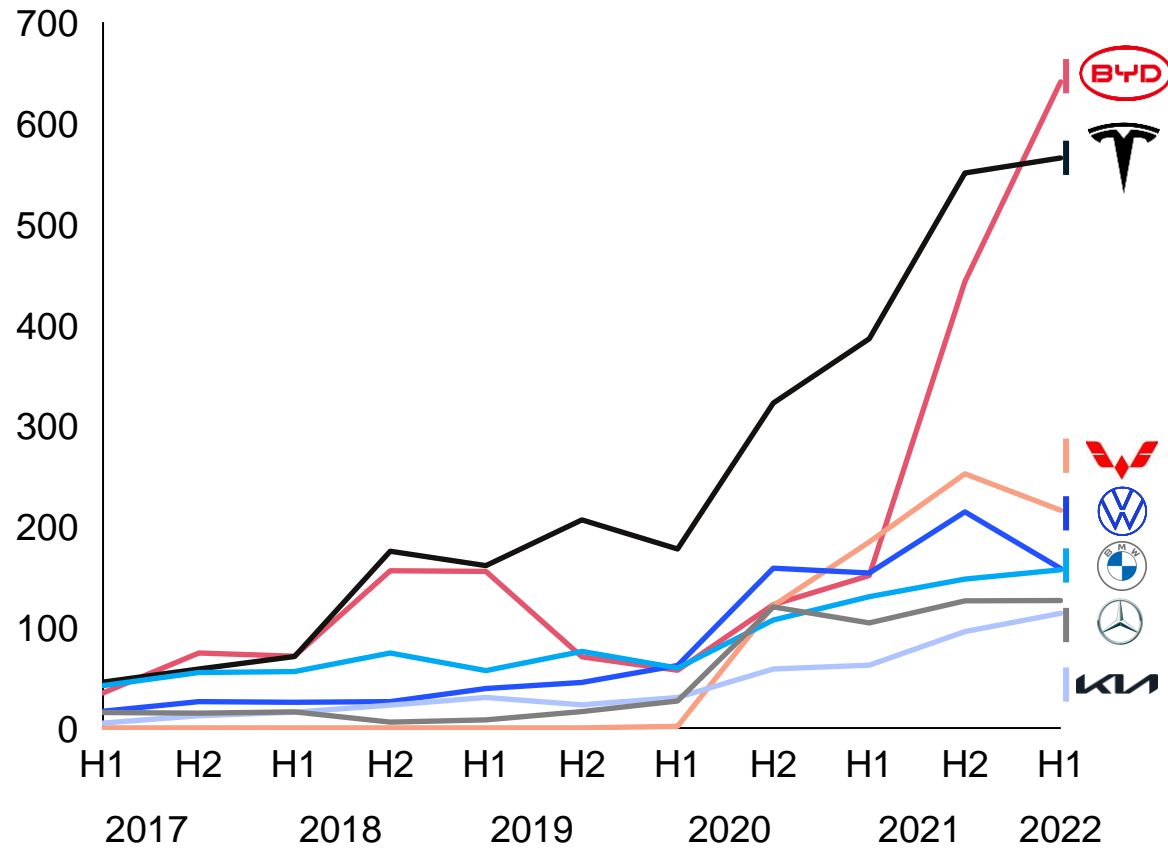
~50% Dec '22 EV penetration in Germany vehicle sales

30+% Chinese public charging volume initially driven by Didi³

1. Share of BEV and PHEV in percentage of total passenger car sales
2. EU+EFTA+UK
3. Based on Q1, 2021 data

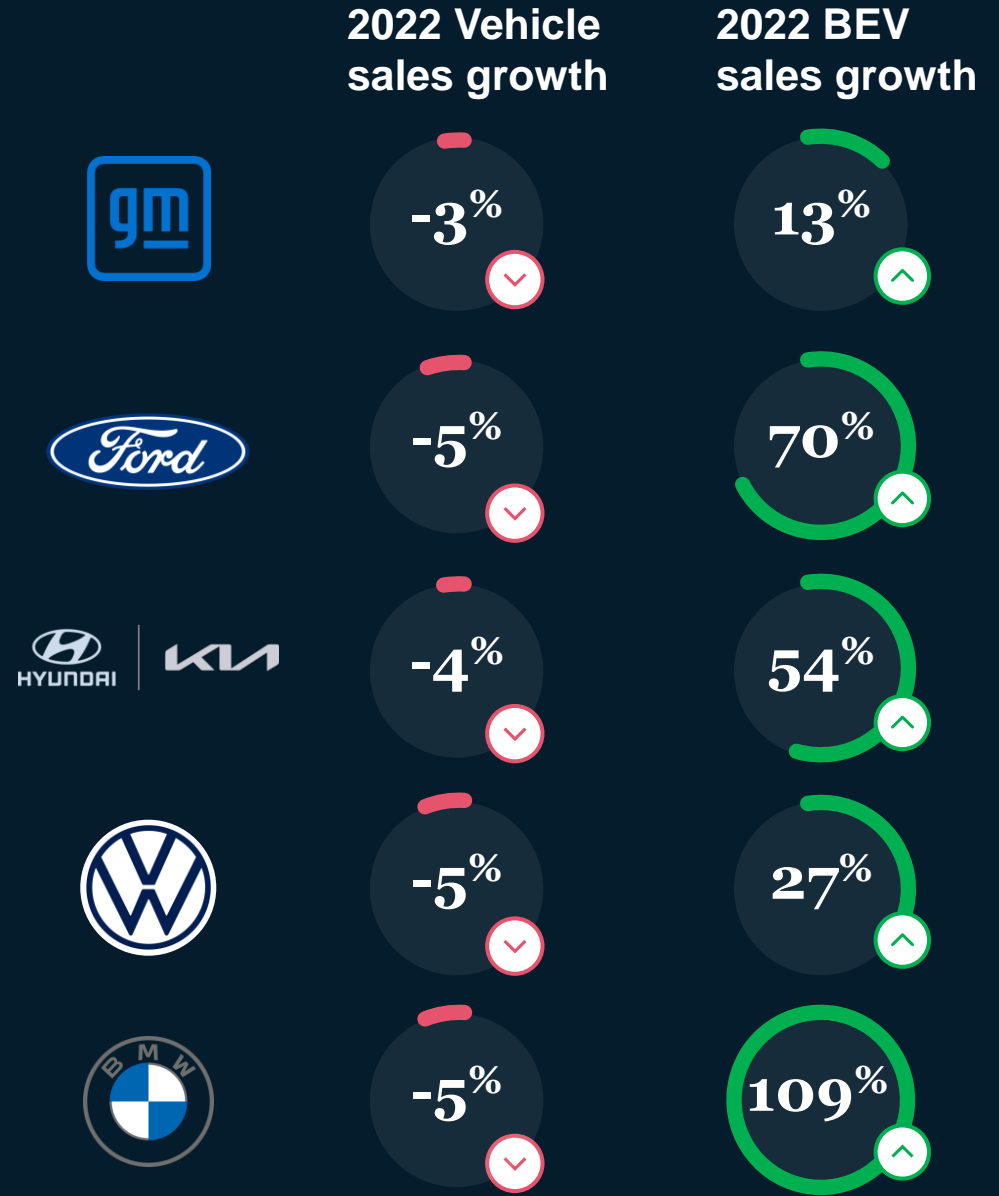
OEMs: BYD takes leading global position, BEV sales show growth vs stagnant overall vehicle sales

Electric¹ passenger car sales by brand, k units



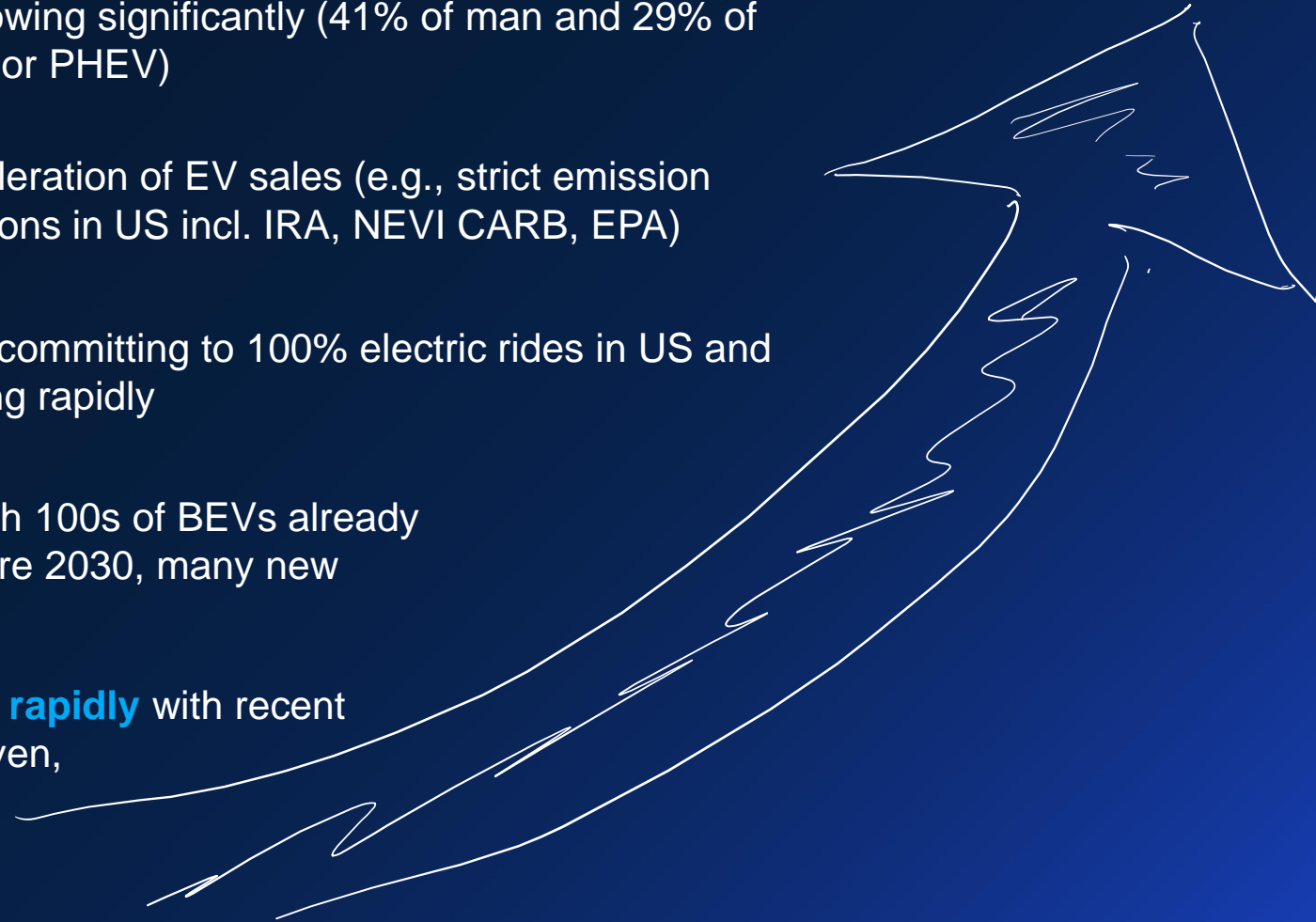
1. BEV and PHEV

Source: EV-volumes, McKinsey



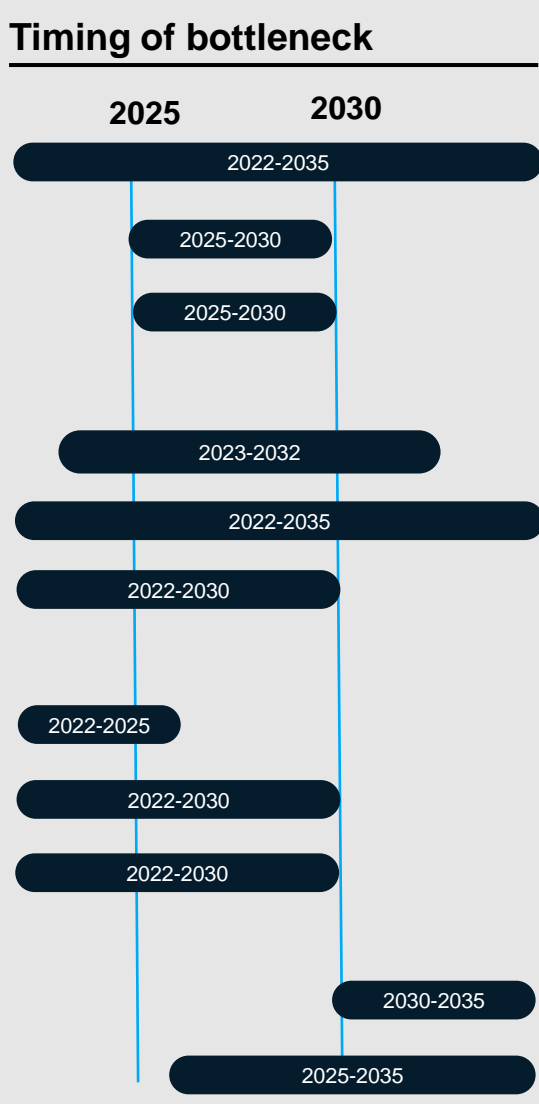
Making the case for further acceleration of EV adoption

- 1 **Customer consideration** for EVs purchases growing significantly (41% of men and 29% of women in the US say their next vehicle is a BEV or PHEV)
- 2 **Government involvement** incentivizing an acceleration of EV sales (e.g., strict emission regulations in Europe and new subsidies/regulations in US incl. IRA, NEVI CARB, EPA)
- 3 **Large fleets are decarbonizing** with e.g., Uber committing to 100% electric rides in US and Europe by 2023 and rental fleets also transitioning rapidly
- 4 **Huge lineup of BEVs** about to hit the market with 100s of BEVs already announced to be introduced into the market before 2030, many new introductions in the economy segment
- 5 **Charging infrastructure buildout accelerating rapidly** with recent announcements of most large retailers incl. 7eleven, Walmart, Ikea, Kroger, Shell, BP, etc



What could go wrong? Several risks still exist which could cause a slowdown in EV adoption

EV bottleneck	Description	Risk
Charging availability		
Public charging buildup speed	Slow build-up of public charging infrastructure due to unfavorable economics	● ● ●
Grid constraints	Certain charging use cases (i.e. highway fast charging) require grid upgrades	● ● ●
Home charging availability	As EVs go down market, fewer consumers will have access to home chargers	● ● ○
Production constraints		
Battery manufacturing capacity	Battery Gigafactory ramp-up does not meet battery demand from automotive	● ● ●
Supply chain shortages	Resource shortages on raw materials (e.g., for batteries and semicons)	● ● ●
OEM profitability	Majority of volume OEMs continue to struggle with BEV profitability	● ● ○
EV demand		
Early subsidy phaseouts	Countries are already beginning to phase out EV subsidies in the EU and China	● ● ○
Cost competitiveness	In volume segment EVs often not cost competitive with ICE	● ● ○
EV skepticism	Some consumer groups likely to continue being “EV skeptics”	● ○ ○
Regulatory uncertainty		
Implementation of targets	EV targets remain ambiguous leaving backdoors for alternative fuels/hybrids	● ○ ○
Changes in regulation	2030 emission standards can change and are not finalized in all countries (i.e. US)	● ○ ○



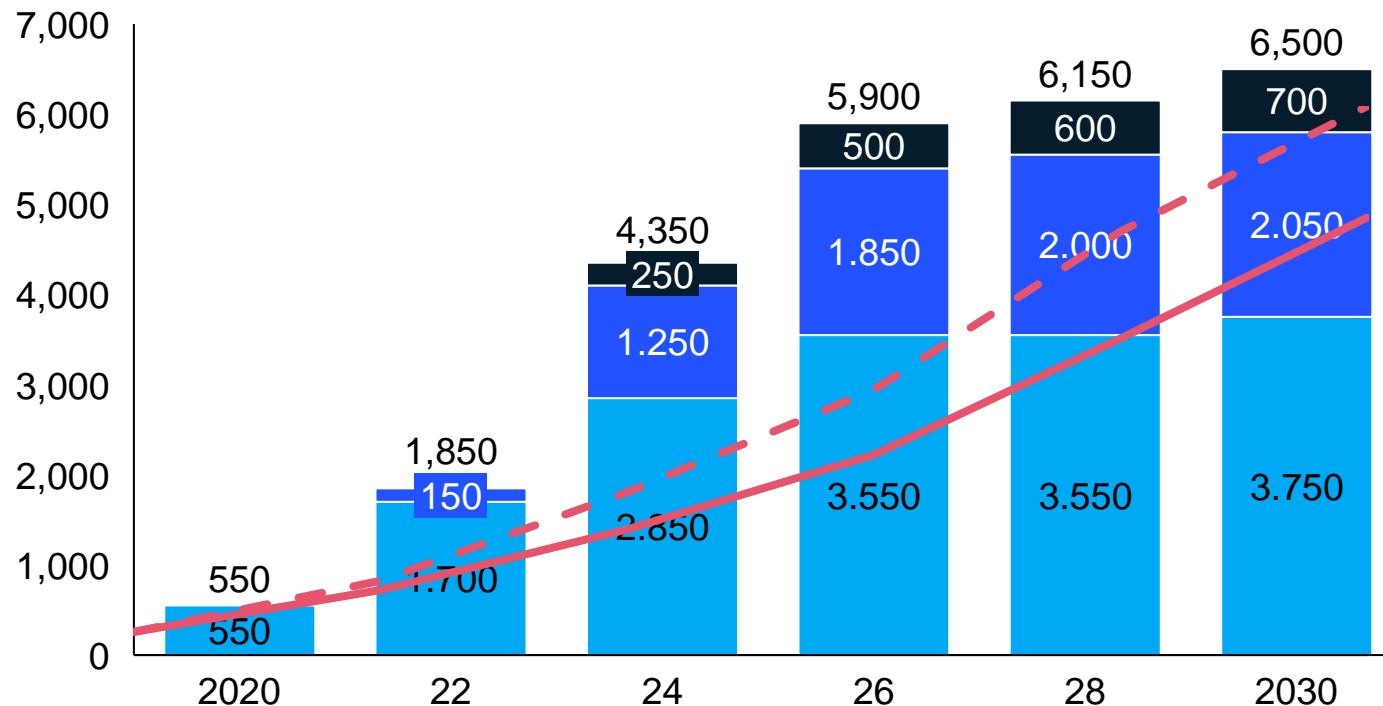
Source: McKinsey Center for Future Mobility, BNEF, IEA

Based on company claims, global supply of battery cells will exceed demand by 2030

Global LiB cell supply¹ and expected demand, GWh

Battery demand: — Base — Aggressive

■ Low Likelihood ■ High Likelihood
■ Probable



1. Battery cell production capacities based on company announcements

Source: Battery Insights, McKinsey Center for Future Mobility

Key insights

LiB demand:

- **China remains the largest market**, followed by Europe and North America
- **Mainly driven by the mobility segment**, with passenger cars representing the largest share

LiB supply:

- **Oversupply is expected** based on pure company announcement **but not by significant amount if likelihood is factored-in**
- Most new capacities are built up in Europe, followed by the US

New emissions targets in the US and EU have accelerated EV adoption

Share of new light vehicles sold, in percent

June 2023

McKinsey Current Trajectory case

ICE and MHEV HEV PHEV BEV FCEV

