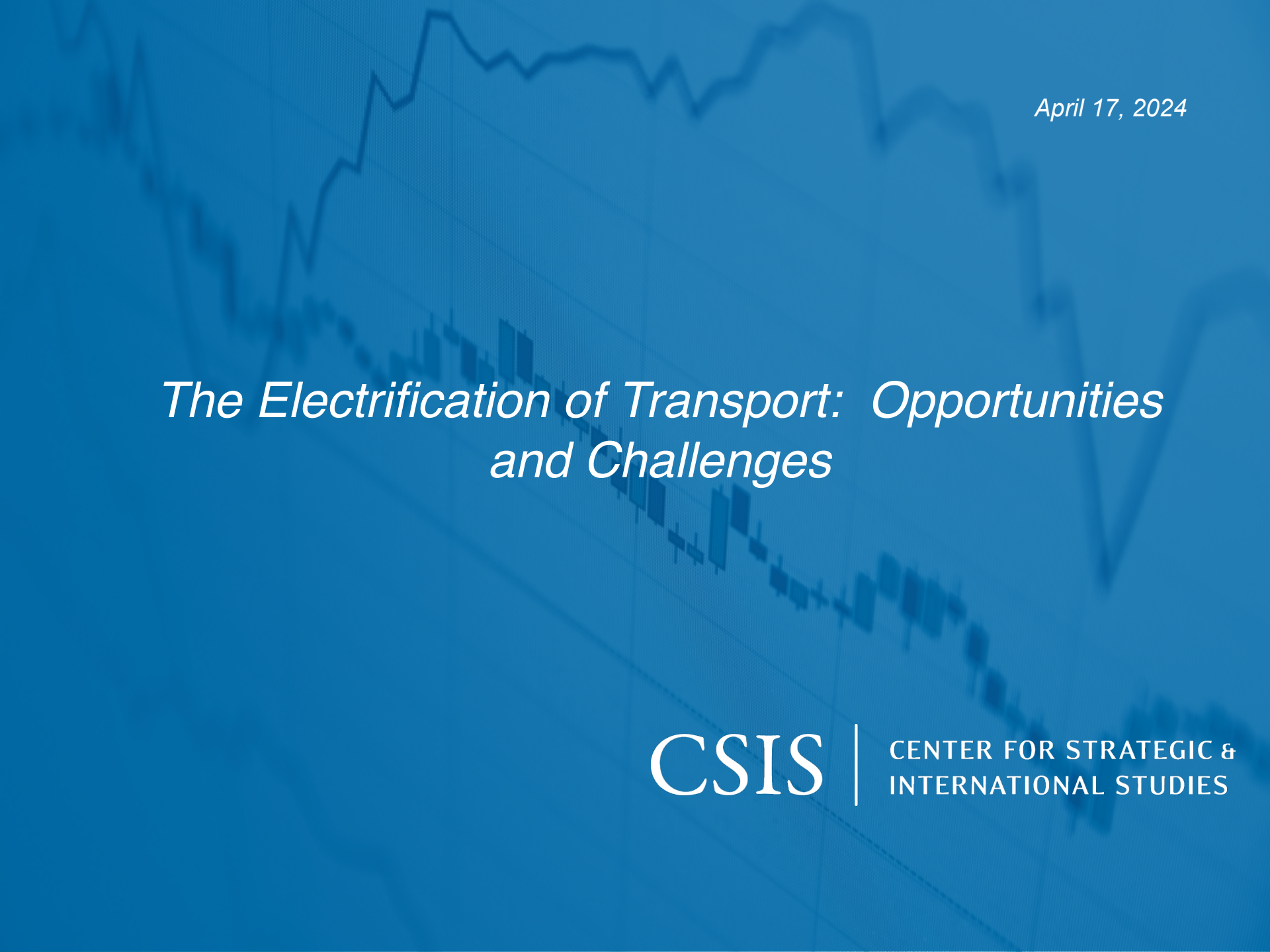




April 17, 2024

The Electrification of Transport: Opportunities and Challenges

CSIS

CENTER FOR STRATEGIC &
INTERNATIONAL STUDIES

Outline

*U.S. and Global EV
Outlooks*

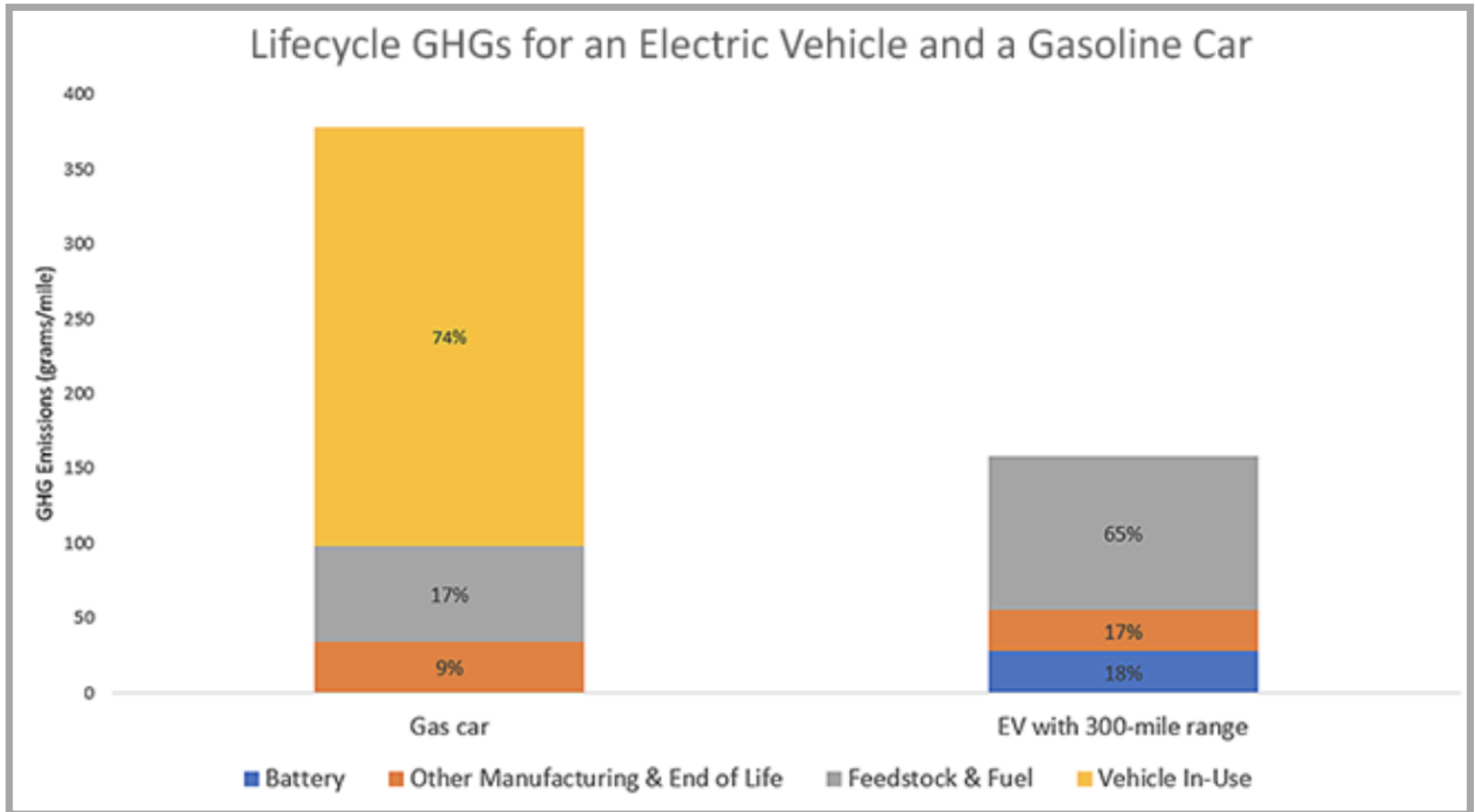
Consumer Preferences

*Availability of EV Battery
Materials*

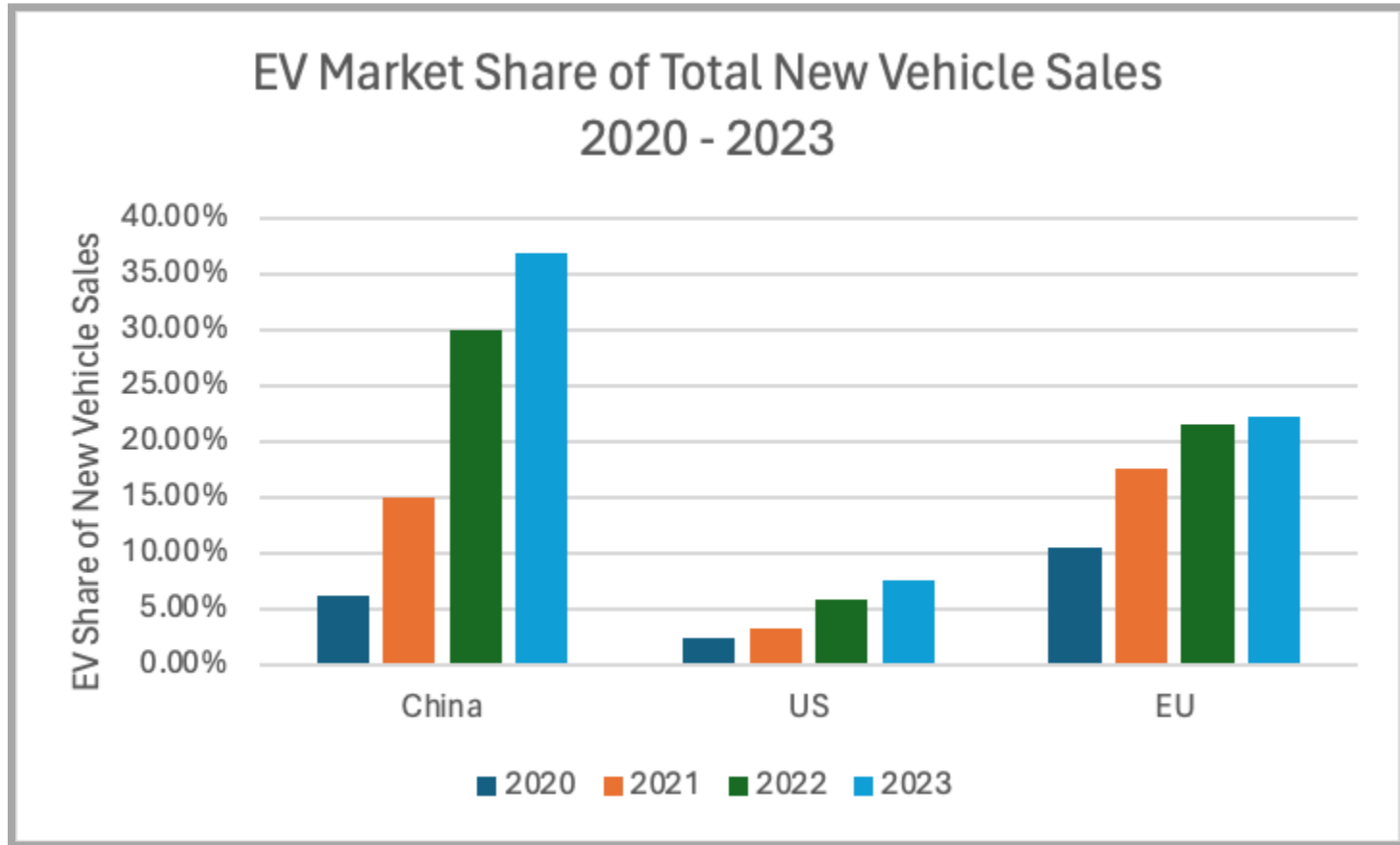
*Concentration in EV and EV
battery supply chains.*

Conclusions

Emissions Motivation

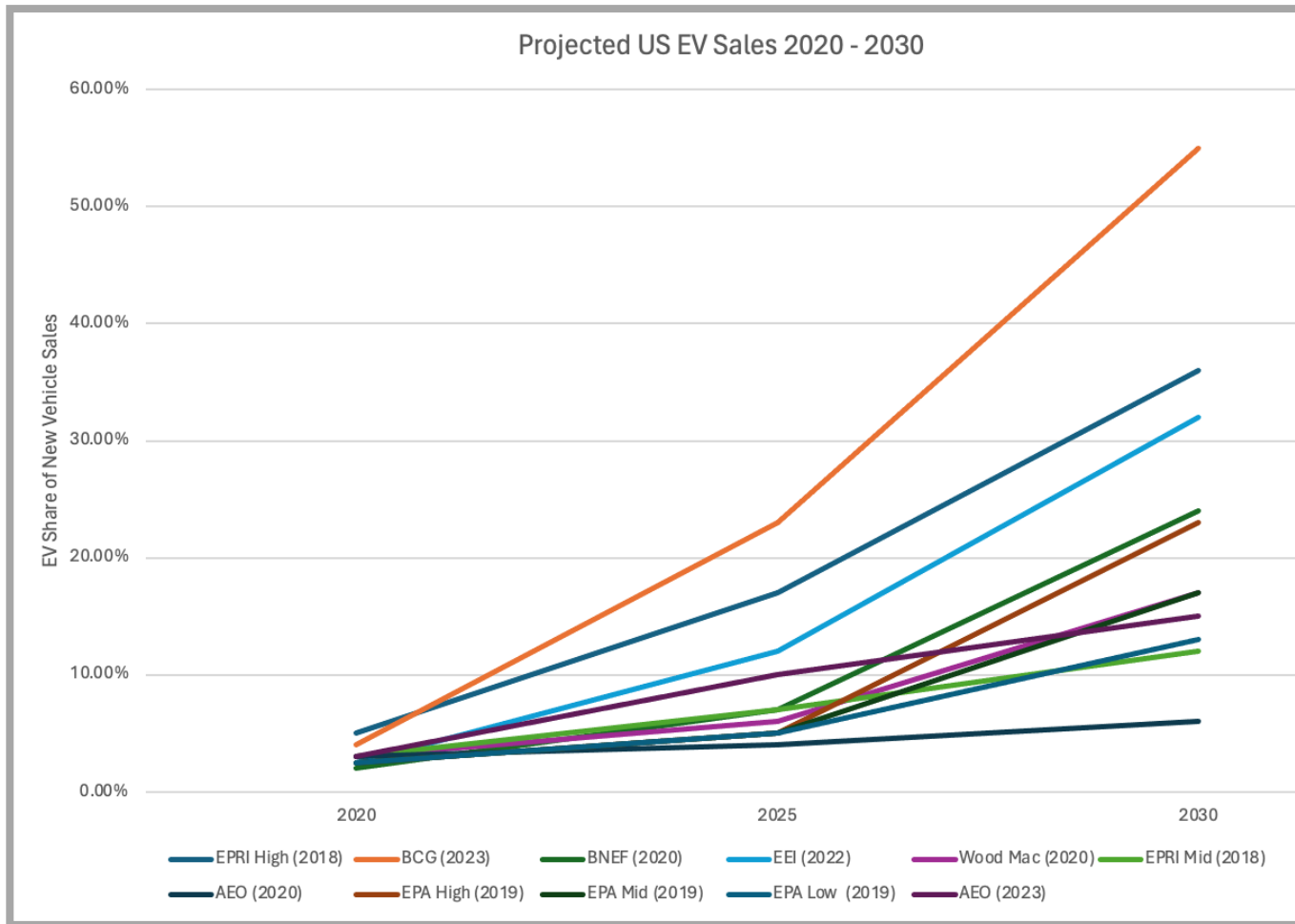


What we know so far



ACEA, EEA, Clean Technica

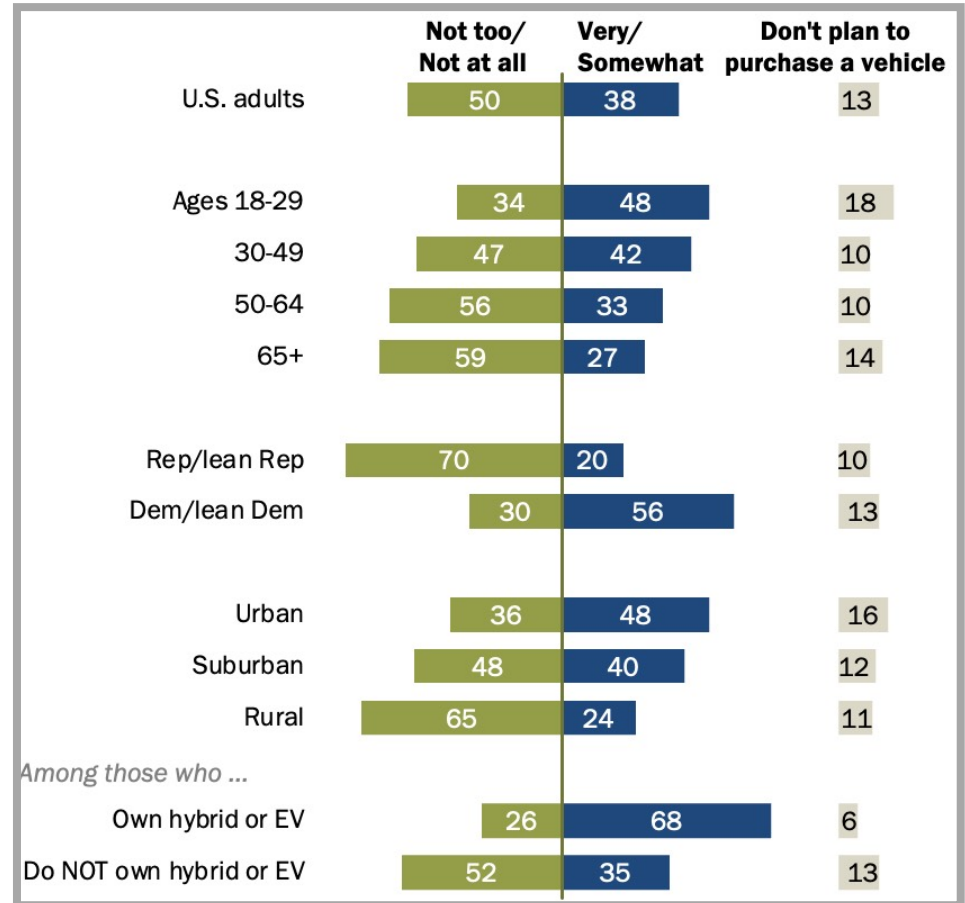
Forecasts are highly uncertain



The Brattle Group, [EEI](#), [BCG](#), [AEO](#)

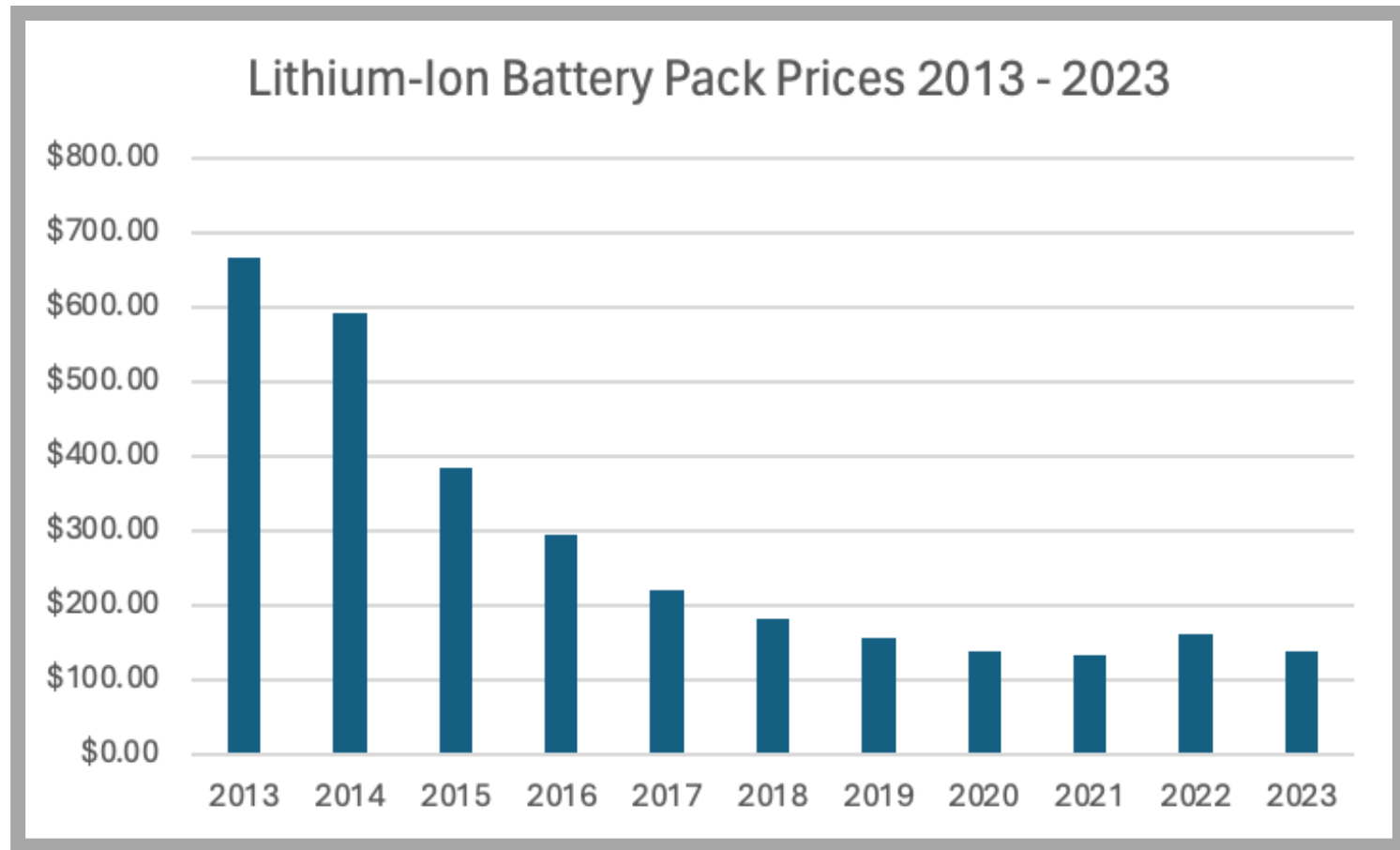
U.S. Consumer Preference

- Polling shows EVs are more popular with urban, young, and politically liberal people.
- More popular with people who already own one.



Pew Charitable Trust

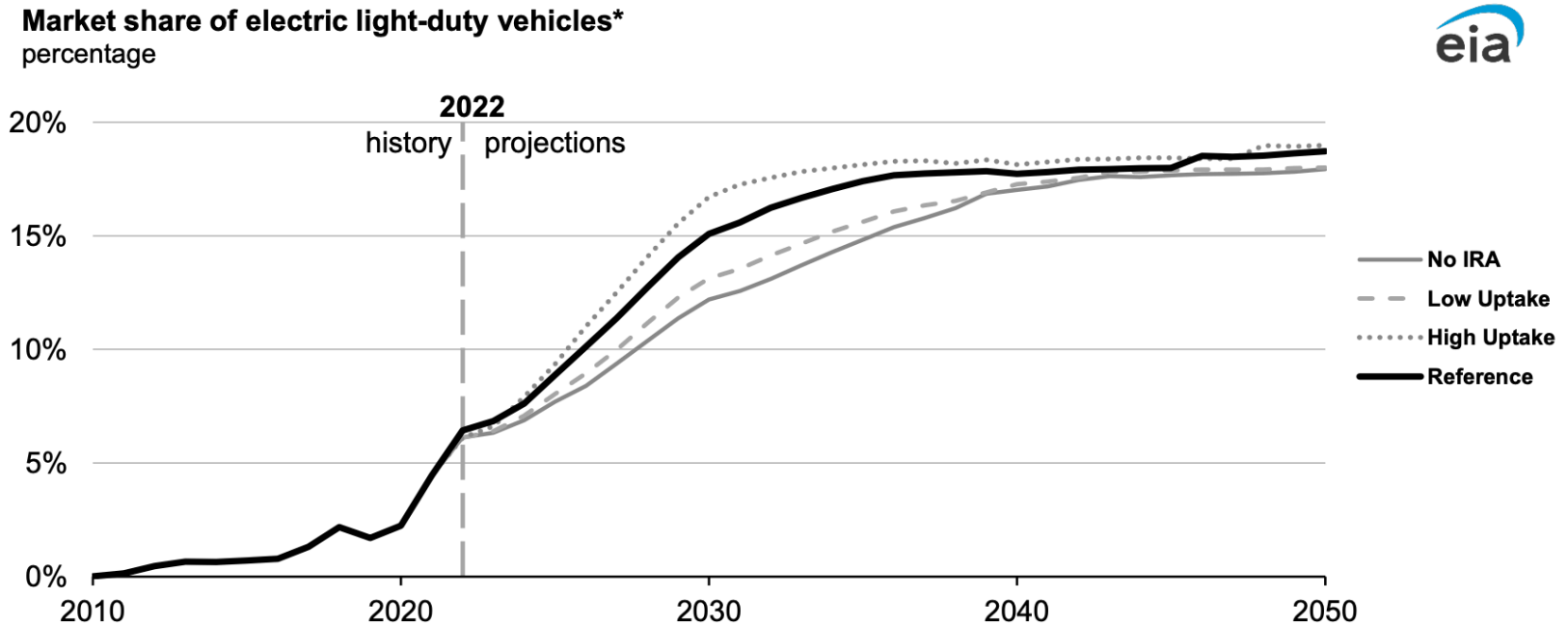
Battery Costs Are Falling



BNEF [Dec. 2020](#), [Nov. 2021](#), [Nov. 2023](#)

Subsidy Speeds Deployment

IRA incentives speed growth in sales of electric vehicles



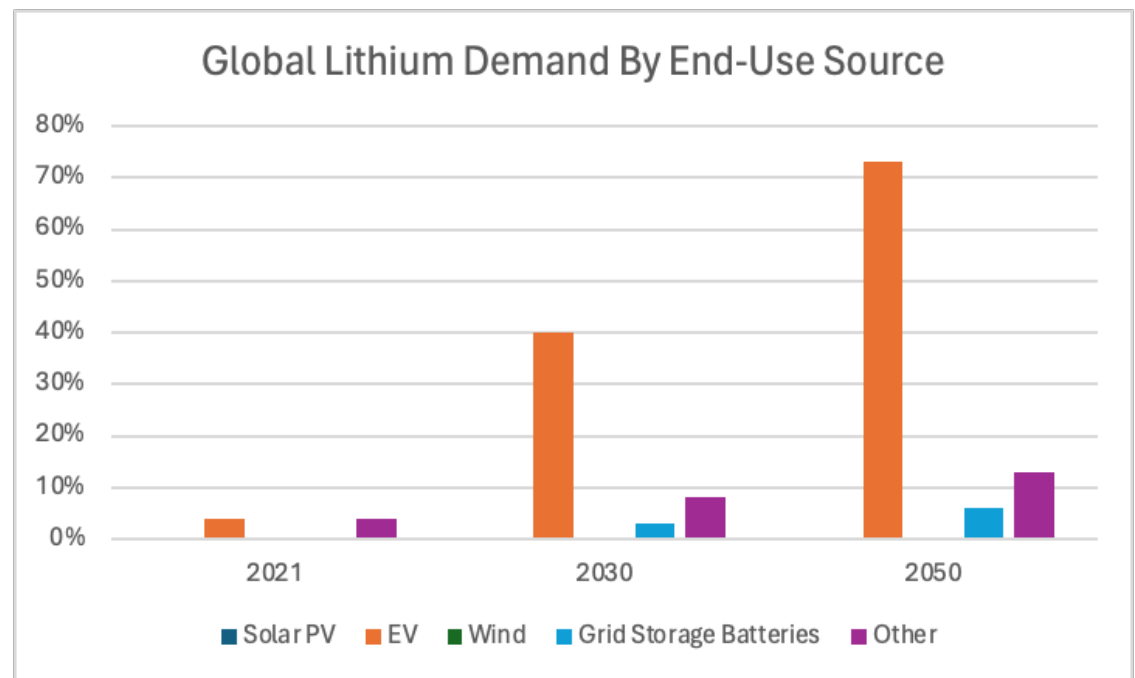
Data source: U.S. Energy Information Administration, *Annual Energy Outlook 2023* (AEO2023)

Note: *Includes battery electric and plug-in hybrid electric vehicles. IRA=Inflation Reduction Act

[EIA](#)

Minerals Access

- Vehicle electrification is maybe largest component of the critical minerals challenge.
- IEA: Supply outlook for 2030 seems consistent with APS scenario, but not NZE.

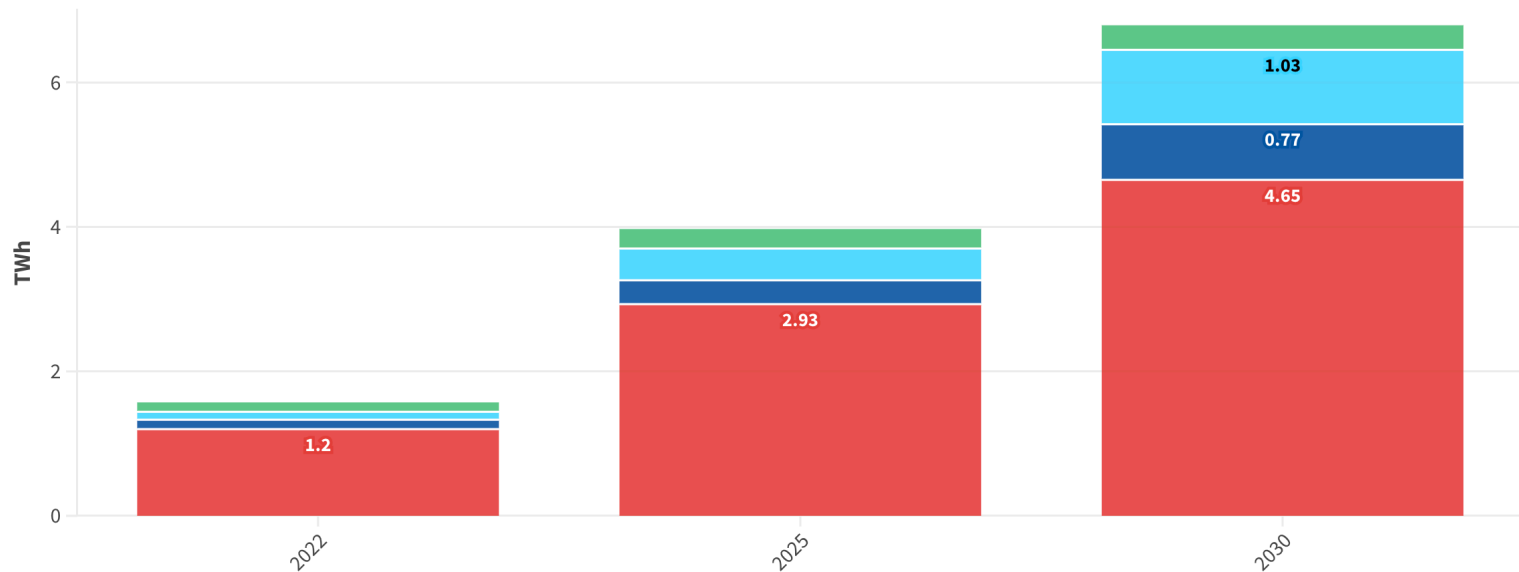


IEA July 2023

Manufacturing Concentration

Figure 2. Lithium-Ion Battery Manufacturing Capacity, 2022–2030
TWh

China Europe United States Rest of World

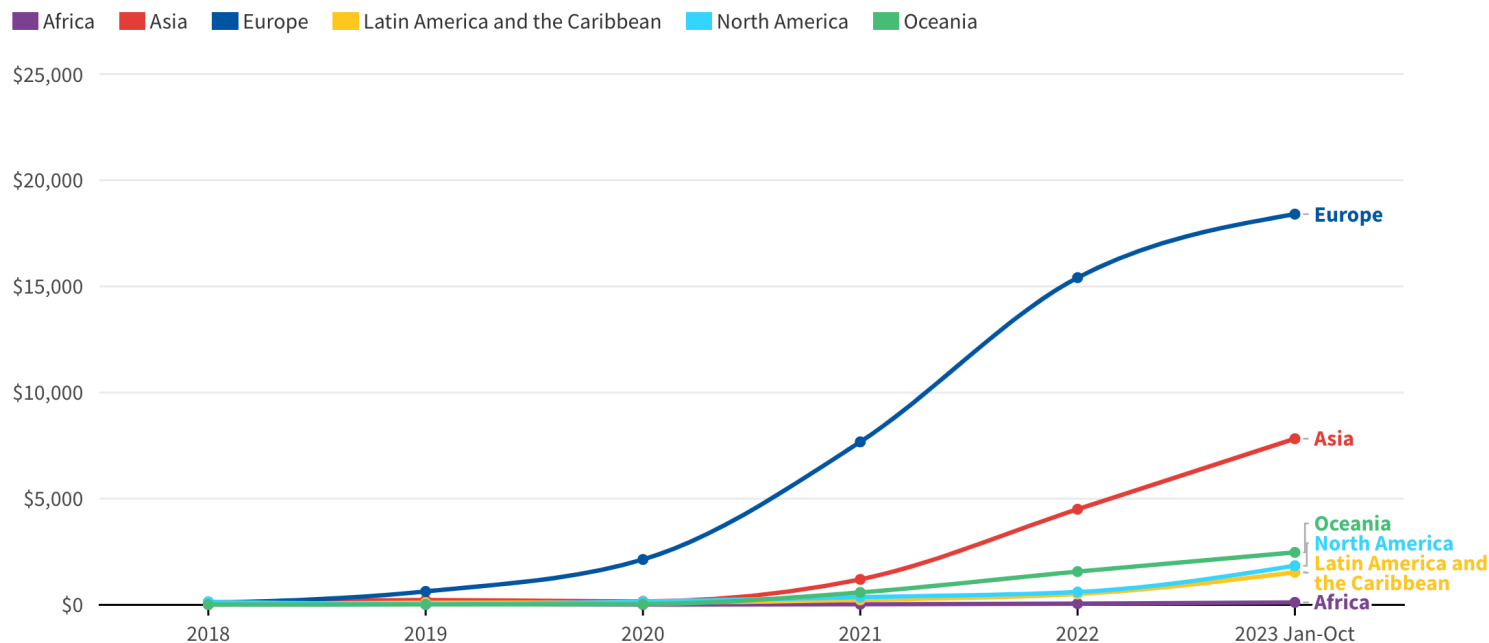


Source: [International Energy Agency](#).

Geopolitics and Trade Tensions

Figure 3: Electric Vehicle Exports from China by Region, 2018–October 2023

USD, Millions



Note: EVs include plug-in hybrid and battery electric vehicles. The HS codes used to look up and calculate EV exports are 870360, 870370, and 870380. Please reference the interactive web version for specific values.

Source: [General Administration of Customs of the People's Republic of China](#).

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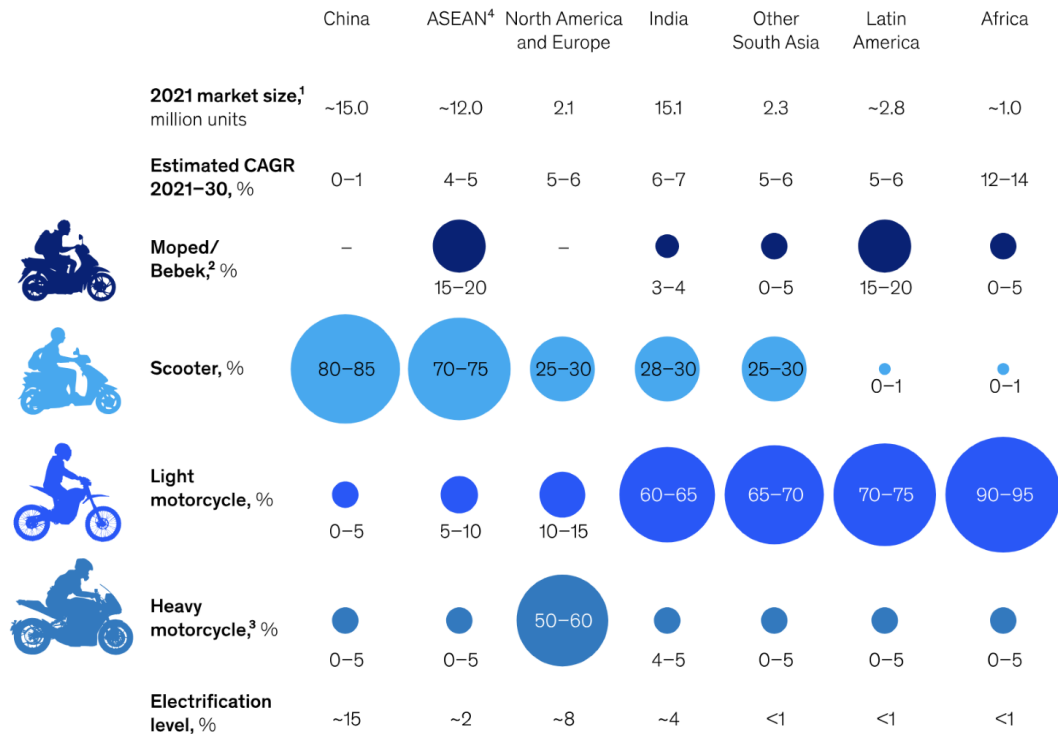
TRUSTEE CHAIR IN
CHINESE BUSINESS & ECONOMICS

Potential Surprises

- Account for more than 50 percent of CO2 reduction from electrification
- Positive outlook in India, China, and Southeast Asia
- Lower operational and maintenance costs than ICE alternatives

Developed geographies and China are already moving to electric two-wheelers.

Electric-2-wheeler facts and product mix, by geography¹



¹The e-bike market (maximum speed of <25 kilometers per hour) has been excluded from the scope, due to the dominance of Chinese players in this segment playing at low cost.

²A bebek is a small-capacity two-wheeler popular in Indonesia

Challenges

Consumer Preference

Mineral and Component
Supply

Geopolitics and Trade tensions

Opportunities

Improved technology and
experience

New Product Categories

Emissions Goals