

Z E T A

ZERO EMISSION TRANSPORTATION ASSOCIATION

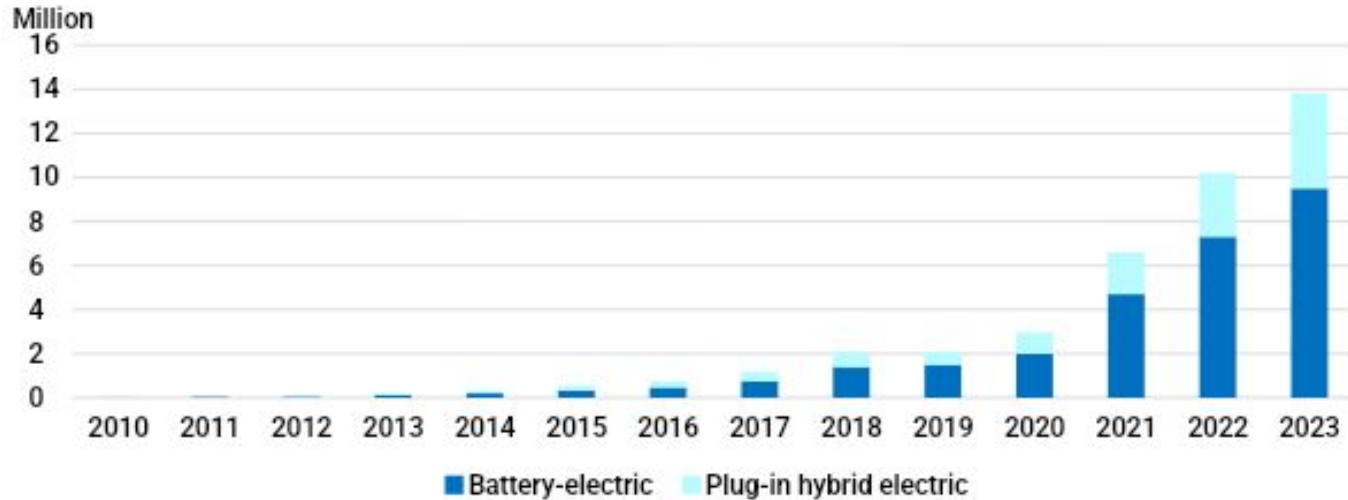
Clean Manufacturing in America Briefing Series: Congressional Climate Camp

Our Members



Global EV sales are on the rise

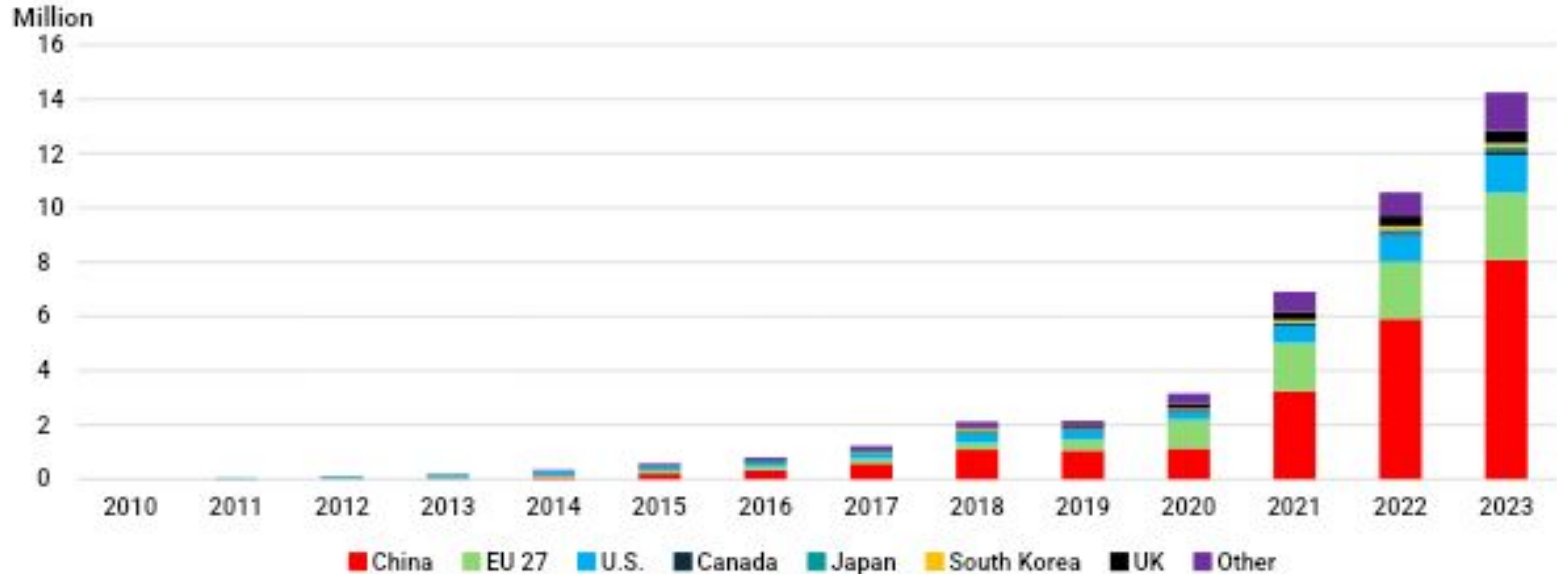
Global passenger EV sales by drivetrain



Source: IEA EV Outlook 2024.

China, Europe, and the U.S. have been the leading markets

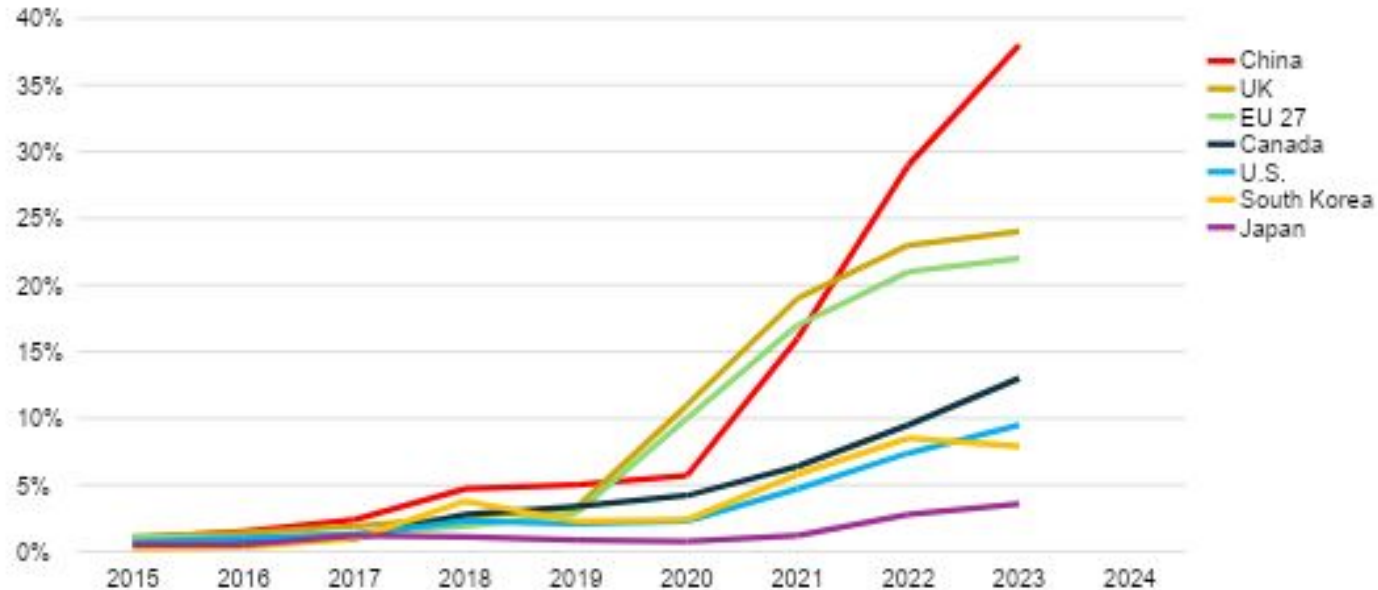
Global passenger EV sales by region



Source: IEA EV Outlook 2024. Note: includes battery-electric and plug-in hybrid electric vehicles.

... but other countries are clearly outpacing us

Passenger EV share of sales by each country



Source: IEA EV Outlook 2024. Note: includes battery-electric and plug-in hybrid electric vehicles.

The U.S. car market is unmistakably changing

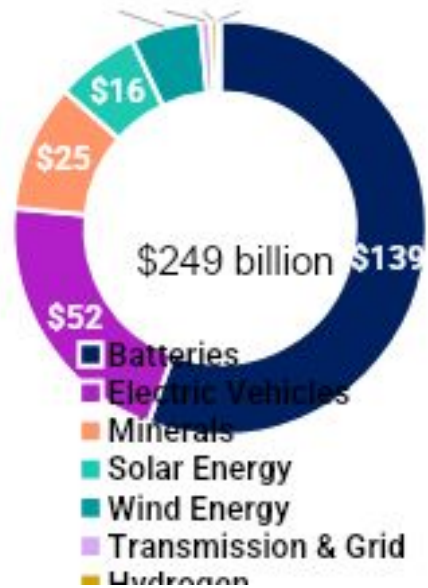
U.S. passenger car market sales (excluding ICE)

BEV CAGR: **42%**
PHEV CAGR: **42%**
HEV CAGR: **19%** (2015-2024)



Source: Edmunds. Note: CAGR is 'compound annual growth rate.'

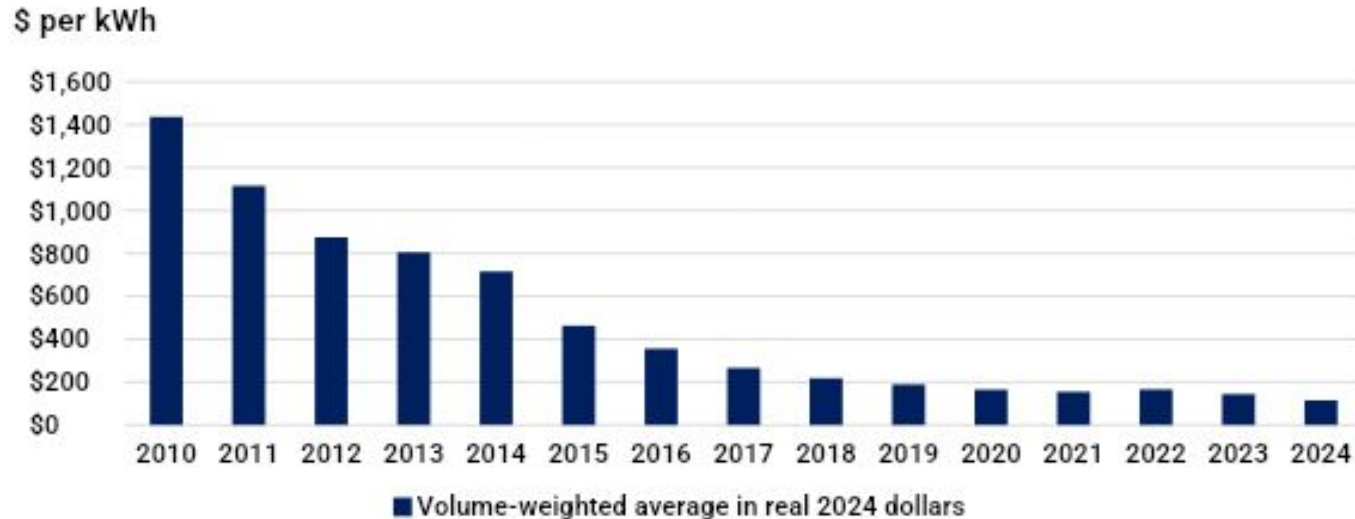
EV and battery investments make up a vast majority of US clean energy investment



Source: Atlas Public Policy.

Global battery prices have fallen to \$115 per kWh in 2024

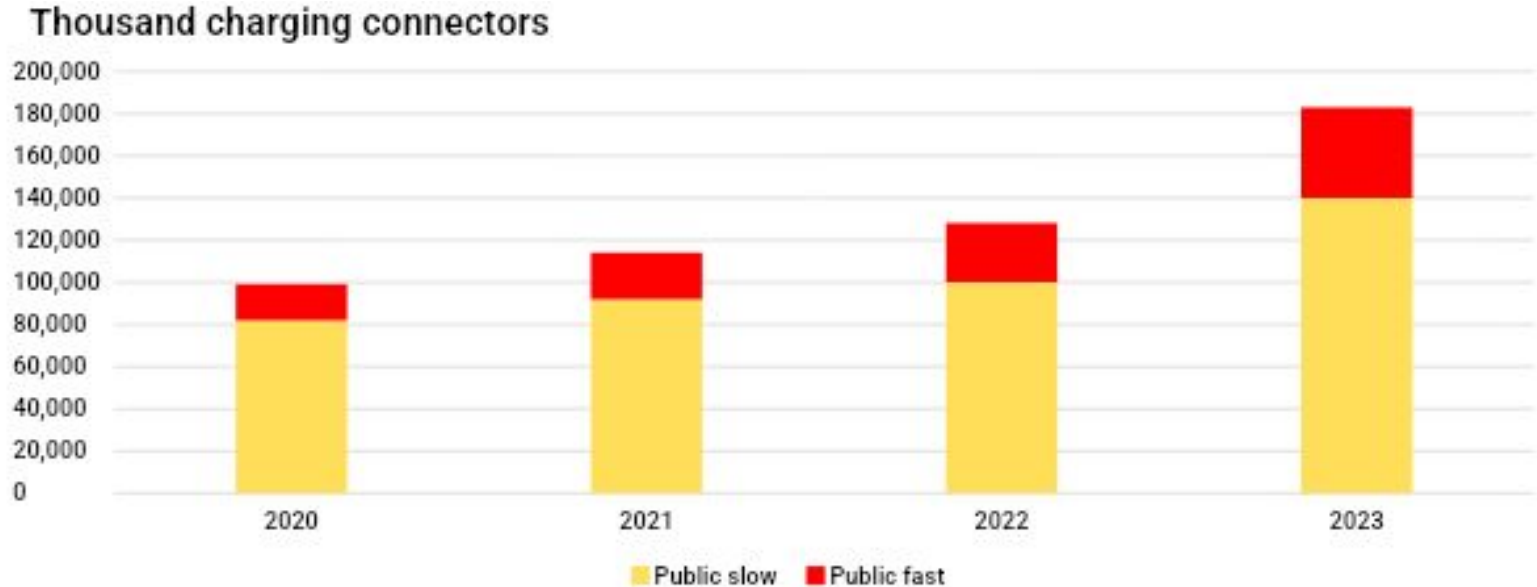
Lithium-ion battery pack prices (on a dollar per kilowatt-hour basis)



Source: BloombergNEF. Note: Prices are in real 2024 dollars.

Growth of US charging infrastructure

Public charging connectors by type in the US, historical

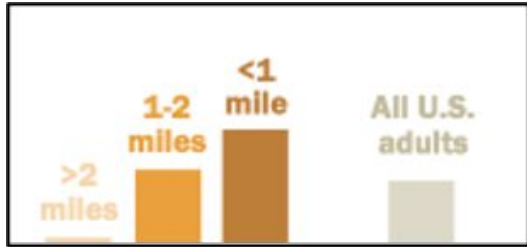


Source: IEA.

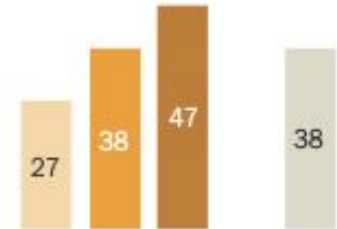
The closer you live to chargers, the more likely you are to want an EV

% of adults who lived __ from a charging station believe that they

Legend



Very/Somewhat likely to **seriously consider purchasing an electric vehicle** the next time they purchase a vehicle



Extremely/Very confident that the **U.S. will build the charging stations and infrastructure** needed to support large numbers of electric vehicles on the roads



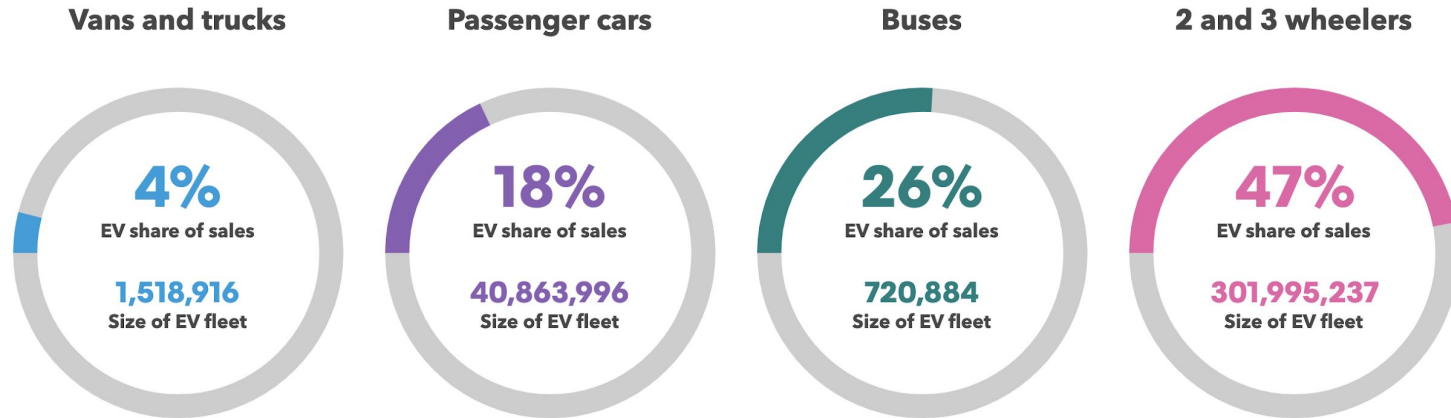
Currently own an electric or hybrid vehicle



Source: Pew Research Center. Note: Survey of US adults conducted May 30 – June 4, 2023.

The clean transportation transition is at different places in different segments

Global EV share of sales and fleet by segment at the end of 2023



Source: BloombergNEF.



THE KEY MINERALS IN AN EV BATTERY

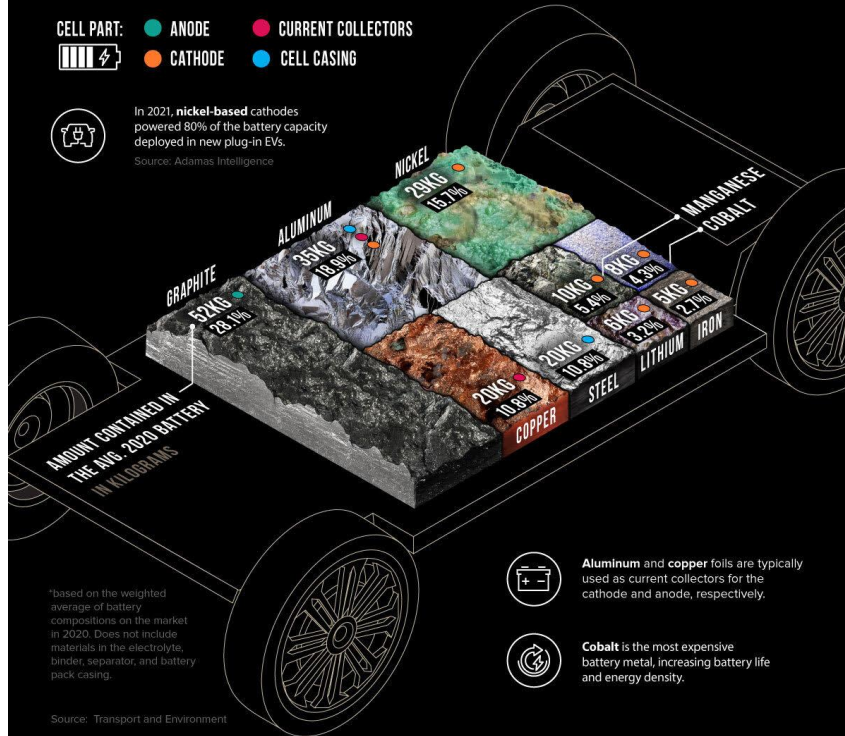
Lithium-ion batteries harness the properties of various minerals to power electric vehicles.

The cells in the average lithium-ion battery with a 60-kilowatt-hour (kWh) capacity contain around 185kg* of minerals.



In 2021, **nickel-based** cathodes powered 80% of the battery capacity deployed in new plug-in EVs.

Source: Adamas Intelligence



*based on the weighted average of battery compositions on the market in 2020. Does not include materials in the electrolyte, binder, separator, and battery pack casing.

Source: Transport and Environment



Aluminum and **copper** foils are typically used as current collectors for the cathode and anode, respectively.












Cobalt is the most expensive battery metal, increasing battery life and energy density.

Source: Visual Capitalist.

HOW BATTERY CHEMISTRIES DIFFER, BY MINERAL CONTENT FOR A 60KWH LITHIUM-ION BATTERY

The name of the battery chemistry typically indicates the composition of the cathode.

	NMC811 Nickel (80%) Manganese (10%) Cobalt (10%)	NMC523 Nickel (50%) Manganese (20%) Cobalt (30%)	NMC622 Nickel (60%) Manganese (20%) Cobalt (20%)	NCA+ Nickel Cobalt Aluminum Oxide	LFP Lithium iron phosphate
 LITHIUM	5KG	7KG	6KG	6KG	6KG
 COBALT	5KG	11KG	11KG	2KG	0KG
 NICKEL	39KG	28KG	32KG	43KG	0KG
 MANGANESE	5KG	16KG	10KG	0KG	0KG
 GRAPHITE	45KG	53KG	50KG	44KG	66KG
 ALUMINUM	30KG	35KG	33KG	30KG	44KG
 COPPER	20KG	20KG	19KG	17KG	26KG
 STEEL	20KG	20KG	19KG	17KG	26KG
 IRON	0KG	0KG	0KG	0KG	41KG

ELEMENTS 

Source: Visual Capitalist.

What does this mean for domestic supply chains?

