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Market Update

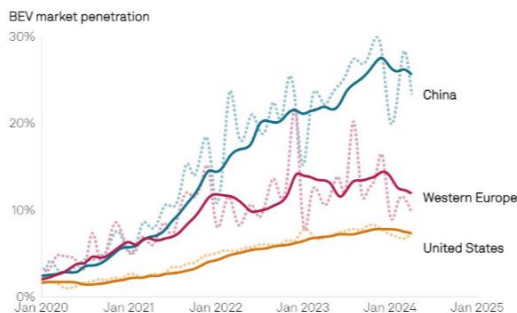
U.S. Tariffs on Chinese Imports – and retaliation

The U.S. government published [tariffs](#) on “strategic sectors such as steel and aluminum, semiconductors, electric vehicles, batteries, critical minerals, solar cells, ship-to-shore cranes, and medical products”. Specific to EVs, these include a tariff of 100% for EVs and 25% on batteries, starting this year. Graphite will face a tariff of 25% starting 2026.



As expected, China has threatened to impose tariffs of up to 25% on various imports from the U.S. and the European Union, particularly targeting vehicles with internal combustion engines.

The near-term impact of the U.S. tariffs is likely to be political more than substantial given that few Chinese EVs are sold in the U.S. Still, some luxury vehicle manufacturers with battery manufacturing footprint in China may see their costs rise. Long-term effects of these tariff wars are unclear but are unlikely to be good for either side.



Data compiled May 14, 2024.
Western Europe refers to France, Germany, Italy, Spain and the United Kingdom.
Source: S&P Global Mobility.
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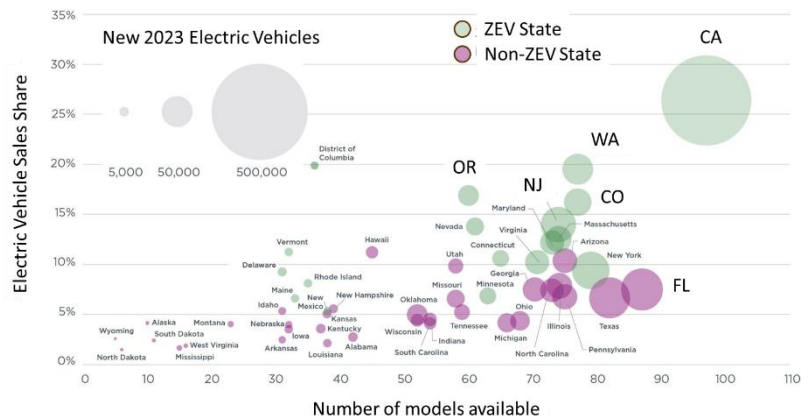
Signs of slowdown in EV market growth & battery production

S&P Global is projecting the share of electric vehicles (incl. plug-in hybrids) to be 40% in 2030, which is now 2.3 percentage points lower than the estimate last year. This is partly driven by the higher prevailing cost of EVs, which have almost reached price parity in China but cost, on average, 24% higher in Western Europe and 37% in US. Another reason for the slow down is attributed to reduced incentives in Germany and Sweden.

This has in turn, led to Volkswagen [extending](#) their timeline for battery production to reach full capacity, while Stellantis and Mercedes-Benz have [stopped](#) construction on two battery plants in Europe and are considering an option to move to cheaper LFP batteries instead.

ICCT Report on U.S. EV Market

The International Council on Clean Transportation (ICCT) has published a [report](#) showing the market share of electric vehicles across the US in 2023, highlighting the dependency on ZEV policy adoption. States with ZEV policies have generally higher EV adoption, have greater charging infrastructure deployed and a wider selection of EV models. Government policies and incentives continue to play a crucial role in EV market expansion.



CARB low NOx compliant PACCAR engine announced

PACCAR has announced the latest version of its [MX-13](#) diesel engine, which is compliant with CARB MY2024 low NOx standards. It will be available for Peterbilt Model 579, Model 567 and Model 589 trucks.

Low tailpipe emissions will be achieved using an electric heater powered by a flywheel-mounted 48-volt generator, 70% larger after-treatment system, and improved NOx sensor durability. Pistons, crankshafts and fuel injectors are also redesigned to improve fuel efficiency and emissions.



Regulations / Reports

NHTSA Fuel Economy Standards

The U.S. National Highway Traffic Safety Administration (NHTSA) has [published](#) the Corporate Average Fuel Economy (CAFE) standards for passenger cars and light trucks for model years 2027 – 2031.

Estimated Average of CAFE Levels (mpg) Required Under Final Rule

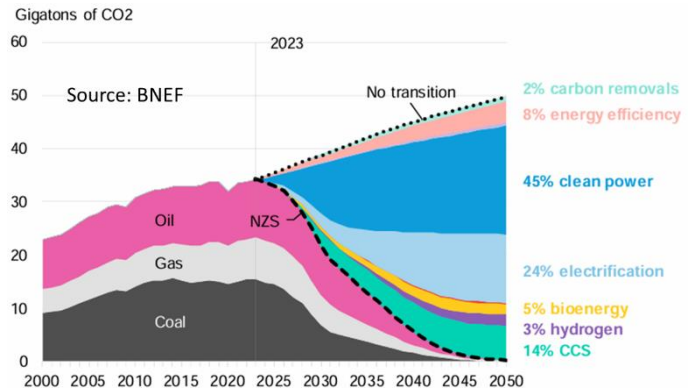
Fleet	2027	2028	2029	2030	2031
Passenger Cars	60.0	61.2	62.5	63.7	65.1
Light Trucks	42.6	42.6	43.5	44.3	45.2
Overall Fleet	47.3	47.4	48.4	49.4	50.4

The standards will require an increase in fuel economy of ~ 2% per year, and project an overall fleet-wide average of 50.4 mpg by 2031 (higher for passenger cars, lower for trucks, see table).

BloombergNEF New Energy Outlook: \$215 trillion for a fully decarbonized world by 2050, no ICE beyond 2034.

The annual new energy outlook by BNEF is [published](#).

- In the “Economic Transition Scenario” which includes adoption of economically competitive technologies, emissions fall by 27% by 2050 compared to today, and ~50% compared to a no-action scenario.
- To reach net-zero by 2050 (shown in figure), however, several additional measures are recommended including:
 - No new internal combustion engines sold beyond 2034.
 - Battery storage capacity of 4 TW, > 50X today
 - Wind and solar electricity generation reaching 31 TW by 2050, effectively 9X compared to today.
 - Carbon capture growing to 8 GtCO₂ per year, mostly from power and steel sectors.
 - Use of green H₂ via electrolysis reaching 390 Mtons per year, 4X that of natural gas based H₂ used today – and mostly used for steel, aviation (not for on-road)



The price tag is estimated at ~ \$215 trillion, with more than half of it allocated to electric vehicle sales.

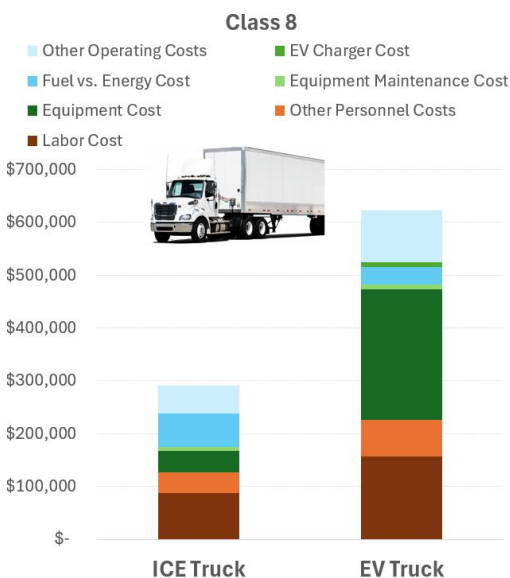
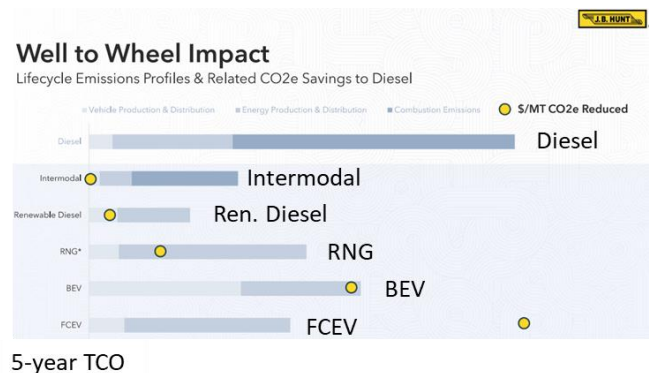
Spotlight on Heavy-Duty Decarbonization



The Advanced Clean Transportation Expo was held in Las Vegas and covered all aspects of vehicle technologies and regulations relevant to commercial vehicles. The expo boasts one of the largest exhibitions, where OEMs and suppliers showcase their latest offerings, covering a broad range of decarbonization technologies. See [here](#) for a summary in pictures.

Almost all major fleets have some form of sustainability and CO₂ reduction targets, with some targeting net-zero emissions by 2040. However, the pathway and economics to get there is not clear, such that various technologies are being pursued.

As one example, JB Hunt showed their analysis of the well-to-wheel impact of various fuels on CO₂ reduction and the associated total cost of ownership over 5 years (major fleets like to keep newer trucks). Switching to low carbon or renewable fuels was shown to deliver deeper CO₂ reductions compared to zero tailpipe emitting vehicles, and also at a lower \$/CO₂-reduced level. Switching from trucks to intermodal transport is also an option.

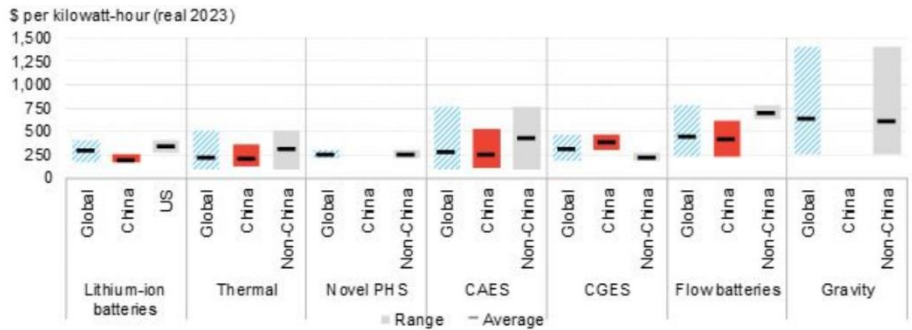


Electrification of heavy-duty vehicles is progressing, but significant challenges remain on deploying them in meaningful numbers in the short term.

Speakers mentioned that the cost of BE trucks is ~ 2.5 – 3X that of a diesel today, which is significant investment, notwithstanding the government incentives. A study recently published by Ryder, which was also discussed at ACT, concluded that the total cost of transportation for an electric truck increases over 2X compared to a diesel, from ~ \$290K to ~ \$620K for a Class 8 truck. Read [here](#) for an extended summary and link to the article.

Other barriers mentioned were the reduction in payload capacity (one cited up to 12,000 lbs.) and the biggest barrier, the lack of charging infrastructure and the long lead times for development. Portable charging – either through battery storage or generators powered by low carbon fuels – is increasingly being seen as an option to power the vehicles while infrastructure comes online.

Speaking of the need for stored energy, a [report](#) by BloombergNEF compares the cost of long-term energy storage technologies, defined as those which offer storage of at least six hours. Thermal energy storage is currently the least expensive, at \$232 per kilowatt-hour, notably lower than Li-ion batteries.



Conferences

Here are some upcoming conferences to consider attending –

CO2 Reduction for Transportation Systems Conference, June 12 – 13, Turin, Italy

[CO2 Reduction for Transportation Systems Conference - The road to decarbonization - SAE Torino \(saetorinogroup.org\)](https://www.saetorinogroup.org/)

SAE COMVEC, September 10 – 12, Schaumburg, Illinois

[COMVEC™ \(sae.org\)](https://www.sae.org/comvec/)

THIESEL 2024, September 10 – 13, Valencia, Spain

[THIESEL 2024, 10 – 13 September 2024 – EARPA](https://www.earpa.com/thiesel-2024/)

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