# 5-Min Monthly Read - August 2023

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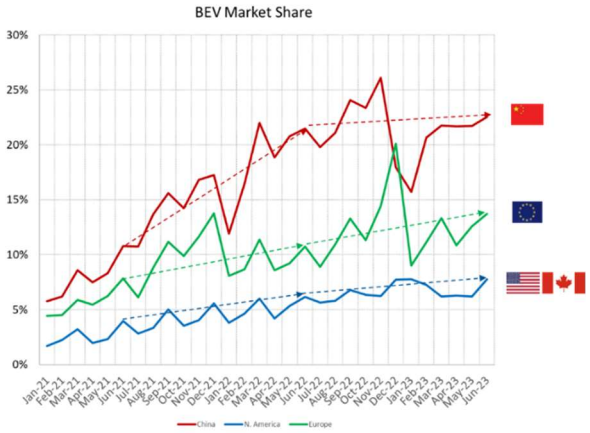
## Market Update

### Passenger car BEV market share facing headwinds

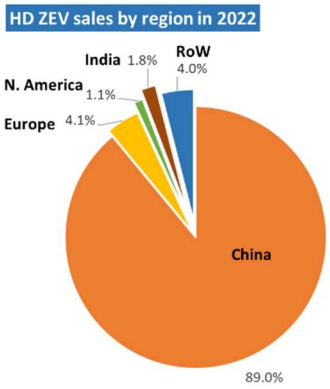



In the last newsletter, we have pointed to the relatively slower pace of electrification in the past few months. That narrative continues: growth in EV sales is much smaller compared to last year, especially in China which grew 1.1 percentage points (June 2022 → June 2023 compared to 10.7 percentage points over the same period a year ago.

Hybrids, on the other hand, are increasing market share: in Europe, one in every four cars sold was a hybrid each month this year. Hybrid share in China is 17% year-to-date, and 13% in N. America. S&P Global Mobility estimates that hybrids will account for 24% of U.S. new sales in 2028.

Data source: EV-Volumes

### Heavy-Duty - In 2022, 89% of heavy-duty ZEVs were sold in China

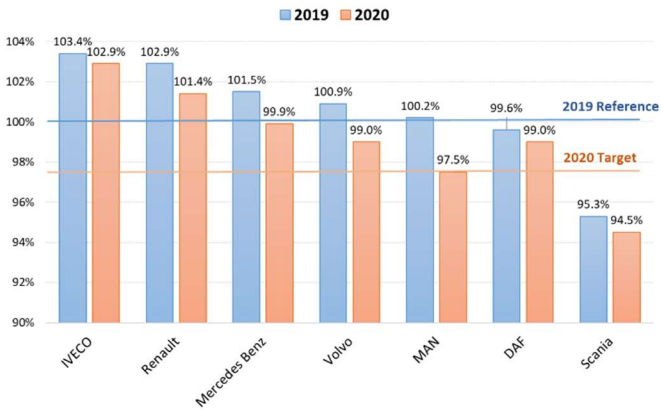



The International Council on Clean Transportation (ICCT) has published a market report for heavy-duty ZEV vehicles. China accounted for 89% of HD ZEVs sold in 2022, followed by Europe at a distant 4%.

The report is focused on Europe, where the ZEVs accounted for 1.6% of total HD sales in 2022. Electric buses are the major component (13% of buses sold were ZEVs), while heavy trucks accounted for only 0.3% (800 trucks) of the respective total sales.

### European heavy-duty $CO_2$ emissions NOT on track

According to another report by the ICCT, European trucks reduced $CO_2$ emissions on average by 1% from 2019 to 2020. This falls short of the 2.5% reduction required each year to meet the 15% overall target by 2025, relative to 2019 baseline. Some OEMs such as Scania are ahead and are generating credits, while others are emitting well above the targets.




EU regulations impose a fine of €4,250 per g-CO2/ton-km exceedance per truck in 2025. The industry average CO2 emissions were 52.5 g-$CO_2$/t.km. An extrapolation of only 1% reduction in $CO_2$ emissions each year will result in average fines of €20,000 per truck in 2025! Clearly, ZEV sales will help offset some of these fines (simple math

shows ~ 9.5% ZEVs required by 2025 for only 1% reduction in $CO_2$ each year). The report notes that the best-in-class diesel engines are at ~ 43% BTE on the WHTC.

## Regulations / Reports

**California proposing to amend the MY 2024 low NOx standards**

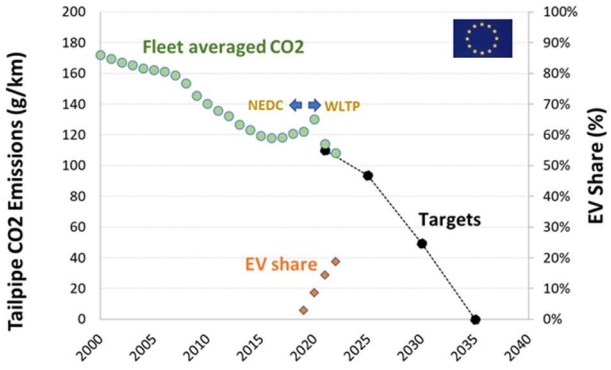
California Air Resources Board (CARB) is proposing to amend some of the low NOx Omnibus requirements to provide more flexibility to OEMs to comply with the MY 2024 – 2026 standards. The original proposal allows a certain fraction of heavy HD diesel engines to comply with the current standard of 0.2 g/bhp-hr – so called "legacy engines" – for MY 2024 and 2025, as long as the additional emissions are offset by ZEVs. However, considering the lack of new engine introductions in California for these upcoming standards, these requirements are being modified.

Two options are on the table:
(1) allowing legacy engine sales into MY2026 with a 10% CA sales limit; and
(2) extend the legacy provisions to manufacturers producing medium HD diesels, limiting MHDD legacy engines to 60% in MY 2024 and 2025
Other than offsetting legacy emissions using ZEVs, the proposal also introduces a pathway through projects in disadvantaged communities.

**European light-duty $CO_2$ emissions on track to meet tailpipe standards**

The European Environment Agency has published provisional data which shows that in 2022, average CO2 emissions from passenger cars in Europe were 108.2 g/km on the WLTP.

The ~ 5% reduction compared to 2021 is driven mostly through an increase in EV sales which increased share from 15% in 2021 to ~ 19% in 2022.




**Urban low emission zones & congestion pricing – good ideas?**


Restricting access of older, polluting vehicles to city centers is increasingly seen as a way to reduce pollution levels, ease congestion and improve road safety.

There are 320 low emission zones (LEZs) across Europe in 2022. London is expanding the "ultra-low emission zone (ULEZ)" across all boroughs by the end of this month, backed by a scrappage scheme to offset costs for affected vehicles. The website cites a 46% reduction in central London already. However, to qualify for ULEZ, petrol (gasoline) vehicles must be Euro 4 or newer and diesels must be Euro 6 compliant. Considering that Euro 4 petrol were exempt from the use of filters, the benefits for

particulates are questionable. Drivers have to pay a fee of £12.50 per day if they choose to drive a non-compliant vehicle. This is controversial, to say the least.

Across the pond, Manhattan (NY) is proposing a congestion pricing plan, where commuters will have to pay an additional toll to drive below 60th street.

A new study in Lancet reviewed the health effects of the above tools and found some benefit with respect to lower cardiovascular disease – e.g. 11% reduction in cardiovascular deaths in Japan – but the results were mixed and the authors call for more work in this area.
This is raising much controversy whether these tools are effective, but it is clear that they do little to eliminate new vehicles with tampered emissions control and will require a careful evaluation of the environmental justice impacts.

## Electrification

**On-road testing of long-haul electric trucks**


US: Tesla Semi / Pepsi

A new video from the North American Council for Freight Efficiency (NACFE) gives an inside look at in-use performance of the 21 Tesla.

- The facility required a new 3 MW service from the local utility
- Batteries are charged from 0 to 80% in 45 mins using 750 kW chargers
- The trucks are using 1.7 kWh/mile, with regenerative braking and tandem axles playing an important role.

Europe: Mercedes-Benz eActros 600

Daimler Truck has announced world premiere of its long-haul truck, the eActros 600, on October 10th. Series production is slated to begin in 2024. The truck carried 600 kWh of LFP batteries (hence the name), expected to deliver ~ 500 km range and is megawatt charging capable to allow recharging from 20% – 80% in under 30 mins. Recently, the truck completed an on-road test covering 2,000 kms at summer temperatures touching 44 °C in Spain.

## $H_2$ and alternate fuels

**Engines increasingly certified for alternative fuels**

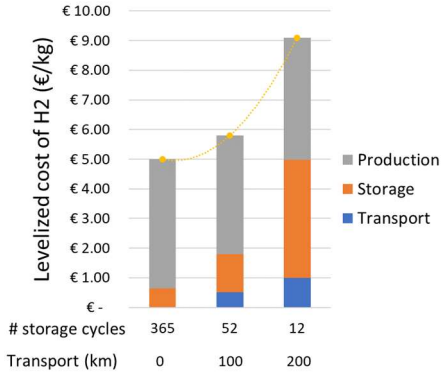
Hydrotreated vegetable oil (HVO) is a drop-in replacement for diesel, made from waste oil and fats, and providing a well-to-wheel reduction in $CO_2$ emissions. It also provides reduced criteria pollutant emissions and has very low sulfur content, important for SCR deactivation. Increasingly, engine manufacturers are certifying their engines for use with these fuels:

- DAF has approved all its next generation trucks to run with hydrotreated vegetable oil (HVO), the use of which it estimates will lead to a 90% well-to-wheel $CO_2$ reduction.
- Cummins has approved the use of HVO for all its high horsepower engines (19L-95L) across a variety of industries, such as mining, marine, rail, defense and oil & gas. Other than 90% reduction in $CO_2$, the use

of these drop-in fuels is also expected to reduce particulates by 50%. Previously, Cummins has approved the use of HVO in all their 3.8 to 15L off-highway engines and diesel generator sets.

- In the past, Audi (light-duty), Kohler, MAN and others have also announced the use of their select engines with HVO.

**Wärstilä report on cost of e-fuels**




An analysis done by Wärstilä compares the cost of various e-fuels (that is starting with solar power for splitting water to make hydrogen, and combining with $N_2$ or captured $CO_2$): $H_2$, ammonia, methane, and methanol. While this report looks at the application of power generation, the learnings are instructive for transport as well. Three scenarios are evaluated, one with local $H_2$ production and other two with transport over 100 and 200 kms. The storage requirements are also different depending on number of storage cycles for meeting the power requirements. The study shows that when transporting and storage requirements are high, $H_2$ is more expensive than other fuels.

## Conference Summaries

**2023 Sustainable Fleet Technology Conference, Aug 15 – 16th, 2023**

See here for some notes from some keynote talks and panel discussions at this conference on fleet decarbonization. A key takeaway from the conference was a repeated call by utilities for fleets to "talk to us early" as they prepare for electrification – it takes time to install upstream electrical infrastructure. Of course, there is much more, check out the notes.

## Upcoming Conferences

**SAE On-Board Diagnostics Symposium, September 12th – 14th, 2023, Indianapolis, USA**
https://www.sae.org/attend/obd-na/

**The Battery Show, September 12th – 14th, 2023, Novi, MI, USA**
https://www.thebatteryshow.com/en/home.html

**SAE COMVEC, September 19h – 21st, Schaumburg, IL**
https://www.sae.org/attend/comvec

**North American International Powertrain Conference, September 27th – 29th, Chicago**
https://www.sae.org/attend/naipc

**Aachen Colloquium on Sustainable Mobility, October 9th – 11th, Aachen**
https://www.aachener-kolloquium.de/en/

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### EV Volumes.com

Database of sales statistics, charging infrastructure, batteries, car models, and sales forecasts for plug-in cars

### Sensors Inc.

Innovative Gas Measurement Solutions

### Emissions Analytics

Leading independent global testing and data specialist for the scientific measurement of real-world emissions

### Diesel Technology Forum

Learn more about advanced diesel technology and how, where, and why it fits into the future

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