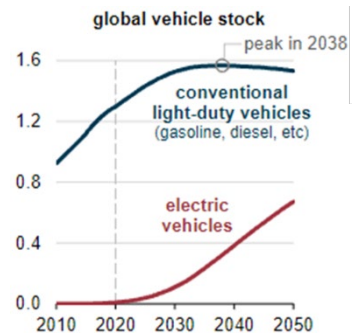


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Around Halloween, the Sacramento Metropolitan Air Quality Management District [published](#) a review of the health impact of fine particles emitted from vehicular tailpipes and brakes and tires. These particles can cross biological barriers to reach the brain and “directly alter brain proteins”, and are associated with elevated risk for a range of neurological and psychiatric disorders, including Alzheimer’s, Parkinson’s, cerebrovascular disease, stroke, dementia, mood disorders and suicidal tendencies - to name a few. The authors state that “*given the slow transition towards electric, zero tailpipe emission mobility, there will still be significant human exposure to traffic-related combustion and non-tailpipe vehicle emissions for decades*”.

The US Energy Information Administration (EIA) has put out an [estimate](#) that global light-duty vehicle fleet will grow from 1.31 billion in 2020 to 2.21 billion by 2050. Internal combustion engines will peak in 2038 but even in 2050, will power 69% of the overall fleet. This is a reminder for policy makers to not overlook continued development and adoption of best available technologies for internal combustion engines which will be around for decades.



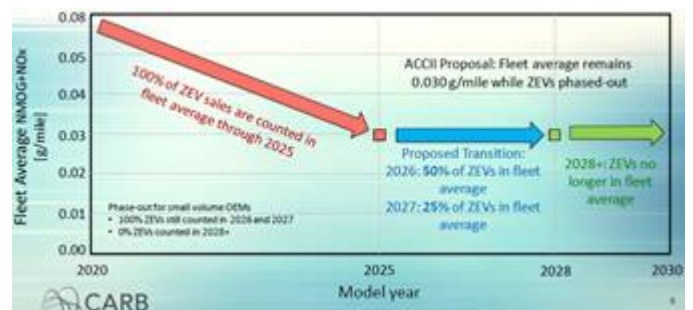
## Regulatory Update

### CARB Advanced Clean Cars II

On Oct 13<sup>th</sup>, CARB held another [workshop](#) to discuss their latest thinking on the next regulation for reducing NOx and particulates from light-duty vehicles (ACC II). Some of the new and key elements proposed:

#### NOx

- SULEV30 NMOG+NOx for ICE only fleet. Transition of ZEV phase-out when calculating emissions proposed: 50% of ZEVs can be used in 2026, 25% in 2027 and 0% starting 2028 when calculating the fleet average.
- LEV160 and ULEV125 to be eliminated, new bins added down to SULEV15
- Separate FTP, US06 & SCO3 certification (no combined SFTP allowed). US06 standard identical as FTP.



#### Cold-start emissions

- Additional limits proposed for intermediate cold soaks, to be phased in over 2026 - 2028
- An additional test with reduced idling time of 8 sec over the FTP test. Adjusted limits (e.g. 42 mg/mi for SULEV30)
- Limits for plug-in hybrid high powered cold start emissions on US06, to be phased in over 2026 – 2028.
  - Limits depend on certification bins e.g. 100 mg/mi NMOG + NOx for SULEV30
  - PHEVs with all-electric range sufficient to cover US06 are exempt from this requirement

#### Particulates

US06 limit tightens from 6 to 3 mg/mi, to be phased-in from 2027 – 2030. No change to FTP limit being considered.

Class 2b-3 medium-duty vehicles

- NOx phase-in over MY 2026-2029: Class 2b phases in to SULEV150 and Class 3 phases in to SULEV175
- Particulate limits not discussed yet

ZEVs / Batteries

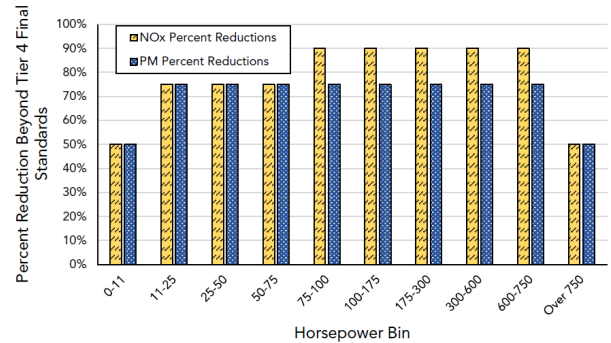
ZEVs must maintain 80% of certified range for 10 years/150,000 miles. Min. battery warranty – 80% state of health at 8 years/100,000 miles. State of health monitors will be required.

**CARB Tier 5 Off-road**

CARB held their first workshop on a potential Tier 5 off-road standard. Some targets discussed:

- Relative to Tier 4 Final standards:
  - Up to 75% reduction in NOx & PM for diesel engines < 75 hp
  - 75% or 90% reduction in NOx & PM for 75 – 750 hp engines
  - 50% reduction in NOx & PM for engines > 750 hp
- Zero emission limit for equipment < 25 hp
- First-ever CO<sub>2</sub> tailpipe standard for diesels: 5 – 8.6% reduction
- New Low Load Application Cycle (LLAC) for certification
- Increased useful life from 8000 hrs to 12,000 hrs for 75 – 750 hp engines.
- Idling measures (engine shut-off for prolonged idling)
- Manufacturer-run in-use testing program – could be moving average window (MAW) type similar to on-road
- Timing: Board hearing planned for 2025. Implementation timeline not discussed but likely > 2028-2029

A demonstration program is being conducted by Southwest Research on a John Deere 6068 (6.8L, 187 kW, 6-cyl.) engine with two after-treatment packages.



**DOE SuperTruck 3**

The US Department of Energy has announced awards for the SuperTruck 3 program. Five participants will get a cumulative \$127M over five years to develop electrified medium and heavy-duty trucks.

Participant	Vehicle Class/Type	Objective	Award
PACCAR	Class 8 BEV & FCEV	Develop 18 vehicles MW charging station	\$33M
Volvo	Class 8	Develop 400 mi range tractor-trailer - Advanced aerodynamics, electric braking, EV optimized tires, automation and route planning MW charging station	\$18M
Daimler Truck	Class 8 FCEV	2 FCEV trucks with 600 mi range - 25K hour durability, equivalent payload to diesel	\$26M
Ford	Class-6 / FCEV	5 Super Duty FCEV trucks - Cost, payload, towing, and refueling times that are equivalent to conventional gasoline trucks	\$25M
GM	Class 4 – 6 BEV / FCEV	4 BEV & FCEV trucks each Clean H <sub>2</sub> via electrolysis	\$26M

**Focus: COP26 summit and related studies**

**Major automakers and countries divided on pledge to phase out fossil-fuel vehicles by 2040**

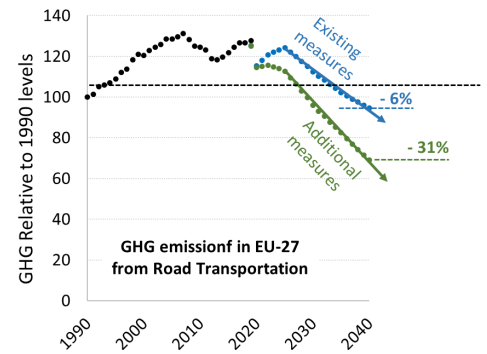
Several national and local governments, and major automakers have signed a pledge to “work towards all sales of new cars and vans being zero emission by 2040 or earlier, or by no later than 2035 in leading markets”. Key automakers who signed include Ford, GM, JLR, Mercedes-Benz & Volvo. However, Stellantis, Toyota, VW, Honda, Nissan, BMW and Hyundai did not sign the pledge. Also absent were major auto markets – US, Germany and China.

In a related development, UK has pledged to transition all heavy-duty vehicles to zero tailpipe-emitting by 2040, the first country to state such a target.

**European Environment Agency Progress Report**

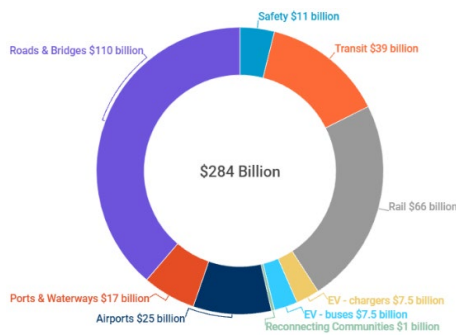
The EEA published a report “Trends and Projections in Europe 2021” which shows that greenhouse gas emissions in the EU-27 reduced by 31% compared to 1990 levels. A key contributor is the increase in renewable share of energy consumption to 21.3%, but a significant fraction of the GHG emission reduction - 10% - was associated with the pandemic. Specific to the transportation sector:

- GHG emissions decreased by 12.7%, ascribed to a pandemic-related drastic decrease in transportation.
- Road transport was the highest contributor (72% of transportation related GHG emissions) and has been increasing in the past years. Current fuel economy measures will reduce emissions by only 6% by 2040, however additional measures (such as in the Fit-for-55 package) could reduce by 31%.
- The share of renewable energy in transportation increased from 2% in 2005 to 10.1% in 2020, primarily driven by the increase in biofuel use in accordance with the Renewable Energy Directive (RED). The latest target is 14% by 2030. A fuel quality report was also published, which shows that the GHG intensity of fuels has reduced by ~ 4% in the last decade, but short of the 6% target.



### FVV fuels study on transport decarbonization

FVV has published a comprehensive new [report](#) on alternative pathways to achieve decarbonization of the transportation sector. It considers 7 powertrain technologies and 6 fuels, all derived ultimately from solar or wind renewable electricity. The study found that the annual wells-to-wheel energy demand of fuel cell and ICE vehicles fueled by green H2 or synthetic fuels could be 2 – 4X that of battery electric vehicle in 2050. However, the incremental cost of converting the entire fleet to electric is higher than that for the use of synthetic fuels. The report (very detailed and cannot be covered here) shows that reducing fossil fuel use is absolutely critical to meet the Paris target but cautions against policies that favor only one technology due to barriers and resource constraints faced by all pathways.



### US Infrastructure package and allocation for transportation

The US has passed the “Infrastructure Investment and Jobs Act”, committing ~ \$550 billion of new federal spending over five years on key infrastructure measures including transportation, water, broadband, energy, environmental remediation, and climate resiliency. Nearly half of the spending, \$284 billion, is allocated to the transportation sector. \$7.5 billion are reserved for electric vehicle chargers and \$7.5 billion for zero- and low-emitting buses and ferries. \$110 billion of funding is reserved for highways, roads and bridges.

### Don't miss these upcoming events ...

5<sup>th</sup> International FEV Conference, Zero CO<sub>2</sub> Mobility, November 16 – 17, 2021 in Aachen, Germany

<https://www.fev.com/en/coming-up/fev-conferences/fev-conference-zero-co2-mobility/introduction.html>