

5-Min Monthly Read

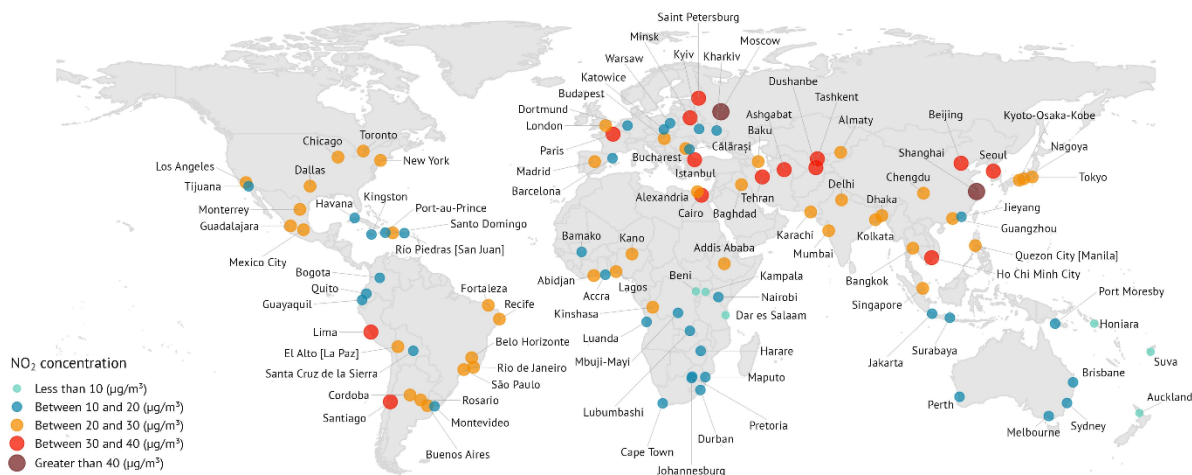
August 2022

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Regulatory Update

State of Global Air published and points to the need for continued improvement in air quality

The Health Effects Institute's latest "[State of Global Air](#)" report is published and provides analyses and an interactive tool to understand NO₂ and PM_{2.5} pollution in major cities across the world. Based on 2019 data, the report underscores the need for continued progress in reducing pollution in some of the most densely populated cities in the world. PM_{2.5} levels were found to exceed WHO PM_{2.5} interim target of 35 µg/m³ in 41% of the cities, almost no change since 2010. And improvements in air quality are disproportionately found in affluent regions. NO₂ concentrations have improved, but still 86% of the cities exceed the WHO recommended limit of 10 µg/m³.



CARB approved Advanced Clean Cars II, ICE ban post 2035

California Air Resources Board (CARB) voted in favor of ACC II, which will set the next set of criteria pollutant standards starting MY 2025. Notably, the ICE-only portion of the fleet will be required to meet the SULEV30 limit (NMOG + NO_x = 30 mg/mi), an effective tightening as zero tailpipe emissions from ZEVs will not be able to offset high emitting vehicles. Also included are tougher requirements on warm-start emissions and plug-in high powered cold starts. The details have been covered in previous newsletters.

Also approved as part of the package is the increasing sales requirement of ZEVs, culminating in 100% EV sales by 2035 for all OEMs. Up to 20% plug-in hybrids are allowed, if they meet certain all electric range requirements, can be driven completely on charge sustaining mode on the US06 and are SULEV30 compliant.

Other states which subscribe to California ZEV & LEV standards are [expected](#) to consider the ICE ban, however many of them will need to review these new requirements and approve. Here's a summary of the status:

State	2035 ICE ban?	State	2035 ICE ban?
California	Yes	Oregon	No
New York	No	New Jersey	Yes, automatically adopts CA
Massachusetts	No	Maryland	Likely, following update
Vermont	No	Delaware	No
Maine	No	Colorado	No
Pennsylvania	No	Minnesota	No
Connecticut	Likely, following update	Nevada	No
Rhode Island	Likely, following update	Virginia	No
Washington	Yes, 2035 ban already in place	New Mexico	No

CARB Off-Road Tier 5 Rulemaking

CARB held a [workshop](#) to review the latest thinking on the development of Tier 5 rulemaking aimed at lowering NOx emissions from off-road equipment.

- A new low load cycle is being developed targeting 56 – 560 kW machines, based on data from 240 off-road engines in different construction and agriculture applications. Staff is considering 15 – 25% of average load as possible cutoff for low load operation.
- Staff is considering NOx emission credits of 5 – 10% for hybrid powertrains if they help achieve > 20% fuel consumption reduction
- New and first CO₂ standards being considered, which will reduce CO₂ by 5 – 8.6% in the 56 – 560 kW power categories. Also considered are caps on N₂O and CH₄ for engines > 19 kW.

Special Issue on Euro 7/VII

An open-access article [published](#) in Transport Engineering discusses after-treatment system options and the advanced substrates and filter technologies which are likely to be considered for meeting the upcoming Euro 7/VII standards.

Electrification / Batteries

Japanese automakers step up investments in battery production

- Toyota has [announced](#) a total investment of ~ \$5.6B to produce up to 40 GWh batteries in Japan and the US, with production to start between 2024 – 2026. To put the capacity in context, that’s sufficient to “fuel” ~ 560,000 of its first all-electric car, the bZ4X SUV.
- [Honda](#) will also build a new \$4.4B Li-ion battery plant in the US, in partnership with LG Energy with an annual production capacity of 40 GWh starting 2026. Honda has also [announced](#) its first electric SUV, the Acura Precision, slated to arrive in 2024. Honda is [targeting](#) 100% of its vehicle sales in N. America to be 40% ZEVs by 2030, 80% by 2035 and 100% by 2040.

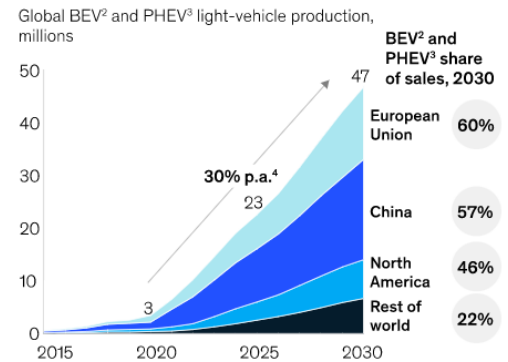


Ford added battery capacity to meet 600K EVs by late 2023, eyeing 2M by 2026

Ford has [secured](#) contracts for 60 GWh of annual battery capacity to power 600,000 EVs by late 2023 : 270,000 Mustang Mach-Es for NA, EU and CN, 150,000 F-150 Lightnings for NA, 150,000 Transit EVs for NA and EU, and 30,000 units of an all-new SUV for EU. It has also sourced ~ 70% of battery capacity needed to support 2M EVs by 2026. It will also add LFP batteries from CATL to its portfolio, for the Mustang and F-150 models. Beyond battery contracts, Ford is signing direct contracts with mining collaborators to source the key minerals required in batteries.

McKinsey projects 47M EVs (BEVs and PHEVs) sold globally by 2030

In a recent [article](#), McKinsey projects an increase in annual EV sales of 30% each year through this decade, to culminate in 47 million EVs sold annually by 2030. In a separate analysis, it reported that delivering the batteries would require ~ 4 million tons of Li-carbonate equivalent (LCE) by 2030, while there is line of sight to only 2.7M tons even including early-stage projects. There is clearly a disconnect between announced OEM electrification targets and raw material availability, and new mines (or techniques such as direct Li extraction) will have to be developed rapidly to meet the stated targets.

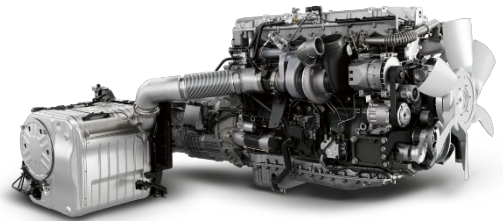


¹ Electric vehicle.
² Battery electric vehicle.
³ Plug-in hybrid electric vehicle.
⁴ Per annum.
Source: IHS Markit; McKinsey Center for Future Mobility

Engines & Fuels

Navistar introduces new International® S13 Integrated Powertrain

Navistar has [unveiled](#) the S13 Integrated Powertrain, developed in collaboration with the TRATON group. Compared to the previous A26 engine, the S13 is lighter by 52 lbs. and offers up to 15% increase in fuel efficiency. The 13L engine operates at a compression ratio of 23:1, a fixed geometry turbocharger, and uses low friction materials. The transmission is a 14-speed fully automated manual transmission. The EGR cooler is eliminated, and the resulting reduction in soot emissions eliminates the need for active regeneration and a DOC. A dual-stage SCR system in a one-box design helps mitigate NOx.



Cummins 15L H₂ ICE to power a future HD fleet

Transport Enterprise Leasing, a commercial truck and trailer equipment lease & remarketing provider signed a letter of intent to purchase Cummins' 15L H₂ internal combustion engines, when available, to power their fleet of HD trucks.

Stellantis is investing \$99M for new engine production

OEMs are clearly investing in electrification, but some of the investment is moving towards hybridization to meet upcoming fuel economy standards. Stellantis [announced](#) \$99M investment in 3 NA plants, one of which will produce a new 1.6-liter, I-4 turbocharged direct injected engine with flexibility for hybrid applications.

Topsoe to build the world's largest SOEC electrolyzer plant

Topsoe has [finalized](#) its investment decision to construct the world's largest solid oxide electrolyzer (SOEC) plant in Denmark, for producing green fuels. The plant will begin with 500 MW capacity and has the option to increase

up to 5 GW based on demand. According to Topsoe technical [factsheet](#), a 100 MW SOEC produces 32,000 Nm³/h of H₂, which translates to ~ 64 tons/day. So a 500 MW plant should produce ~ 300 tons of H₂/day. Earlier in the year, Hydrogenics (Cummins) and Sinopec also joined forces to build a [500 MW electrolyzer in China](#), that one based on PEM technology.

CONFERENCES

SAE Powertrains, Fuels & Lubricants Meeting, September 6th – 8th, Krakow, Poland

<https://www.sae.org/attend/pfl>

Thiesel, September 13th – 16th, València, Spain

<https://www.cmt.upv.es/#/thiesel2022>

SAE COMVEC, 2021, September 20th – 22nd, Indianapolis IL

<https://www.sae.org/attend/comvec>