



Global Emissions Bulletin

2200 Wilson Boulevard * Suite 310 * Arlington, VA 22201 * (202) 296-4797 * www.meca.org

For MECA Members Only

Prepared and Edited by Joe Kubsh

April 1, 2021

Executive Summary

Mobile Source Regulatory News from Around the Globe:

1. [Nine EU States Call for EU-wide Phase-out on the Sale of Conventional Cars/Stringent CO₂ Standards](#)
2. [ICCT: The Role of the EU's Vehicle CO₂ Standards in the European Green Deal](#)
3. [Euro VI-E Emission Standards Phase-in Underway in Europe](#)
4. [India will Not Delay April 2022 CAFE Limits](#)
5. [ICCT Urges India to do More to Reduce Transport CO₂ Emissions](#)
6. [Vietnam to Implement Euro 5 Light-duty Vehicle Emission Standards on January 1, 2022](#)
7. [ACEA Releases Euro 7/VII Impact Assessment Report](#)

News from Asia and the Pacific Rim

- [Australian State of New South Wales Considering Adoption of Euro 6/VI Emission Standards](#)
- [Australia's Car Industry Releases 2020 Report Card vs. Voluntary CO₂ Emission Levels](#)
- [Fuel Cell News from Toyota and Great Wall](#)
- [China Targets Further Reductions in PM_{2.5} Levels in the Coming Five Years](#)
- [ICCT Study Assesses Impacts of China's Heavy-duty Fuel Consumption Standards](#)
- [Delhi Government to only use EVs](#)
- [Meghalaya State in India 2021 EV Policy includes Purchase Incentives](#)
- [India's Transport Minister Calls on Industry to Produce Flex-fuel Vehicles](#)
- [Indian Automakers to Provide New Purchase Rebates as part of Vehicle Scrappage Policy](#)
- [India to Provide OEMs and Part Suppliers with New Incentives for Domestic Production of EVs](#)
- [Fuel Consumption Reduction Technologies for the Two-wheeler Fleet in India](#)
- [Chinese Studies Explore Ce-Si Mixed Oxide and Mn-based SCR Catalysts](#)
- [Opportunities for Waste Fat/Oil Feedstocks for Biodiesel and Renewable Diesel in Indonesia](#)

News from Europe

- [UBA Reports NO₂ Levels Down in German Cities in 2020](#)
- [EU Court Cites UK for Breaching EU NO₂ Air Quality Standards](#)
- [Transport & Environment: EV Batteries Need Far Less Raw Materials than Fossil-fueled Cars](#)
- [UK Tests find PHEV Real World Fuel Economy Substantially Lower than Manufacturers' Claims](#)
- [UK Passenger Car Carbon Emissions Show only Small Decrease Since 2011](#)
- [UK to Introduce E10 in September 2021](#)
- [High-blend Renewable Fuels could cut 46 Million Tons GHG Emissions from Truck Operations in UK by 2030](#)
- [New UK Bus Strategy includes Adding 4,000 Zero Emission Buses](#)
- [UK Awards £54 Million to 3 Projects to Advance Electric Trucks and Hydrogen Buses](#)
- [CLEPA Issues Technology Neutral Position Paper on Climate Neutral Transport](#)
- [Volvo's Car Lineup to be Fully Electric by 2030; BMW MINI to be Fully Electric by Early 2030s](#)
- [VW Announces Expansion of Battery Manufacturing and Charging Infrastructure in Europe](#)
- [Deutsche Post DHL Group Investing €7 billion over 10 years to Reduce CO₂ Emissions](#)
- [Moscow Aiming for All-electric Bus Fleet by 2032](#)
- [Romania Adding More than 100 Electric Buses to City Fleets](#)
- [London Tightens LEZ Rules: Euro VI Emission Levels Required for Trucks and Buses](#)
- [European Public Health Alliance Calls for More Traffic Restrictions in European Cities](#)
- [Transport & Environment: Pandemic Lockdown Clean Air Gains can be Achieved with Switch to Zero Emission Vehicles](#)
- [ACEA Publishes 2020 Market Statistics on Global Vehicle Registrations and EU Truck Registrations](#)
- [Swiss Researchers Publish Life Cycle Assessment for Medium- and Heavy-duty Trucks](#)
- [German Court Rules Audi Not Liable for Compensating Owners unless Audi Bosses Knew about Diesel Cheat Devices](#)
- [VW to Seek Damages from Former Executives for Diesel Scandal](#)
- [First Stage V Retrofit Solution Approved in the UK for Diesel Generators](#)
- [Highly Loaded Pt/CeO₂ Catalysts Found to have High CO Oxidation Activity at Sub-ambient Temperatures](#)
- [ICCT Report Assesses the Sustainability Implications of Alternative Aviation Fuels](#)

Executive Summary (cont.)

News from Africa and the Middle East

- [UNEP Launches Electric Bike Pilot Project in Kenya](#)

News from the Americas

- [ICCT Debunks Truck Industry Arguments for the Pandemic-related Delay in Mexico's NOM-44 Regulation](#)
- [Zero Emission Buses in Bogotá from 2022](#)
- [Brazil's Ethanol Producers Push Back on EVs](#)
- [Hydro-Québec to Commercialize Manganese Hydride Molecular Sieve for H₂ Storage](#)

Mobile Source Regulatory News from Around the Globe:

1. **Nine EU States Call for EU-wide Phase-out on the Sale of Conventional Cars/Stringent CO₂ Standards** – On March 10, 2021, Nine EU states called on the European Commission to accelerate the move to zero emissions vehicles and set a date to phase out the sale of new gasoline- and diesel-fueled cars. The nine countries are Austria, Belgium, Denmark, Greece, Ireland, Lithuania, Luxembourg, Malta and the Netherlands. France, Germany and Italy did not sign, nor did central and eastern European members. The nine states called for a phase-out date for the sale of new gasoline and diesel cars and vans in the EU, as well as EU legislation allowing member states to further incentivize the early phase-out of such vehicles. The countries also want a "significant" strengthening of CO₂ emissions performance standards and a further drive for zero emissions vehicle charging and refueling infrastructure. A press release is available from the Danish Ministry of Transport website at: <https://www.trm.dk/en/english-articles/denmark-and-eight-eu-member-states-are-calling-on-the-european-commission-to-accelerate-the-phase-out-of-petrol-and-diesel-cars/>.

In some related news, the European NGO Transport & Environment (T&E) presented testimony to the UK Parliament's Transport Select Committee in late February on the UK's plans to phase-out the sale of new, conventional ICE cars and vans by 2035. T&E's testimony included a policy proposal that sets a UK sales target for battery electric vehicle (BEV) cars and vans of 17% in 2024, rising to 40% in 2027, 69% in 2030, and 88% in 2033, before reaching the government's stated target of 100% in 2035. The NGO said that only plug-in hybrid electric vehicles (PHEVs) that meet strict criteria to ensure they can be driven in electric mode for the vast majority of their trips should be allowed to be sold. T&E proposed that PHEVs sold between 2030 and 2035 should have a minimum equivalent all electric range of 75 miles (120 km) measured on the WLTP test, as this will ensure the PHEV can undertake a larger share of miles driven in electric mode. PHEV electric motors should have at least an equal power output as the accompanying ICE engine and have the ability to operate in ZEV mode in all conditions, including when the car's heater or air conditioning units are switched on. In addition to its proposals on light-duty vehicles, T&E said that in order to fully decarbonize the heavy-duty fleet by 2050, a start must be made in the early 2020s. This should begin with a phase out of sales of new smaller diesel trucks (less than 26 tons) by 2035 and all diesel trucks by 2040. A usage ban on the legacy diesel fleet would then be needed from 2050. T&E's testimony to the committee is available at: https://www.transportenvironment.org/sites/te/files/publications/2021_02_Evidence_UK_Transport_Select_Committee_engine_phase-out.pdf.

2. **ICCT: The Role of the EU’s Vehicle CO₂ Standards in the European Green Deal –** A new ICCT briefing paper (see: <https://theicct.org/publications/eu-vehicle-standards-green-deal-mar21>) identifies several possible levels of stringency for the post-2021 CO₂ standards in the EU for light-duty and heavy-duty vehicles and compares them against economy-wide greenhouse gas reduction targets for 2030 and 2050, as well as the 2050 target for transport sector emission reductions in the EU Green Deal. The analysis shows that currently adopted policies would reduce 2030 CO₂ emissions by 24% from 2020. A policy scenario that achieves a 50% reduction in light-duty type-approval targets from 2021 to 2030 and sets a 100% zero emission, light-duty vehicle sales target by 2040 would reduce 2030 CO₂ emissions by 27% compared to 2020. By 2050, a 90% reduction would be achieved compared to only 53% under adopted policies. In a higher-ambition scenario, where 100% zero emission, light-duty vehicle sales are achieved by 2030, CO₂ emissions would be reduced by 35% in 2030 and by 97% in 2050. For heavy-duty vehicles, a higher-ambition policy scenario, in which a zero-emission sales target is achieved in 2040 and efficiency improves by 8.4% for medium-duty trucks and buses and 7.2% for heavy-duty trucks annually until 2030, CO₂ emissions are reduced by 15% in 2030 and 91% by 2050. ICCT recommendations for the upcoming standard reviews for light-duty and heavy-duty vehicles include setting the stringency of the 2030 fleet-average type-approval targets for light-duty vehicles as close to 0 g CO₂/km as feasible, considering a fleet-average maximum for CO₂ emissions from remaining internal combustion engine vehicles, and closely monitoring real-world CO₂ performance and expediting the adjustment of manufacturers’ average CO₂ emissions.
3. **Euro VI-E Emission Standards Phase-in Underway in Europe –** Euro VI-E (EU regulation 2019/1939, see: <https://eur-lex.europa.eu/eli/reg/2019/1939/oj>) entered into force on September 1, 2020 in Europe for new type approvals and will apply to all new engines from September 1, 2021. This stage includes consideration of cold-start emissions in data evaluation of the portable emissions measurement systems (PEMS) testing, as well as the measurement and evaluation of particle number (PN) during the on-road test. Particle number (PN) measurement is included in Euro VI Step E from the beginning for compression ignition engines. For positive ignition engines (e.g., stoichiometric natural gas engines) the PN needs to be declared for monitoring purposes for new type approved vehicles from January 1, 2021 and will need to be complied with for all new positive ignition engines from January 1, 2023. Omnitek Engineering Corp. received Euro VI-E certification for its OT13 heavy-duty natural gas engine in February. The 13 liter stoichiometric natural gas engine, which will be marketed worldwide in countries where this emissions requirement is mandated, can be utilized for truck and bus applications, and provides 420 hp and 1,960 N·m of torque, essentially equivalent to diesel engine performance levels. This Euro VI-E natural gas engine features Omnitek’s patented natural gas engine management system components and a high-efficiency catalytic converter.
4. **India will Not Delay April 2022 CAFE Limits –** India will not extend an April 2022 deadline to tighten fuel efficiency standards, in a potential setback for carmakers which have been lobbying for more time, government and industry sources told Reuters in late March. “The deadline to meet CAFE norms will not be extended,” a senior government official told Reuters, adding that some concessions could be considered if it sees serious intent by

automakers to invest in clean technologies. The corporate average fuel efficiency (CAFE) requirements are designed to reduce carbon emissions from vehicles as India pushes auto manufacturers to invest in more fuel-efficient cars or in cleaner technologies like electric and hybrid. India introduced the first phase of CAFE rules in April 2017, allowing carmakers through the end of March 2022 to cut sales averaged CO₂ emissions from new passenger cars to under 130 grams/kilometer. In a second phase starting from April 1, 2022, the CAFE requirements tighten sales averaged CO₂ emissions to 113 grams/kilometer. Additional details on India's light-duty CAFE standards are available at: <https://www.transportpolicy.net/standard/india-light-duty-fuel-consumption/>.

5. **ICCT Urges India to do More to Reduce Transport CO₂ Emissions** – In a policy note by ICCT's Anup Bandivadekar released in late March (see: <https://mailchi.mp/theicct/policy-note-03252021?e=786f3d087d>), ICCT called on India to do more to reduce transport-related CO₂ emissions. In particular the policy note urged further Indian policy progress in reducing CO₂ emissions in three areas:
 1. India should strengthen existing new vehicle fuel efficiency requirements for passenger cars and introduce standards for commercial vehicles that are on par with EU 2030 CO₂ standards. In addition, regulators should turn their attention to two-wheelers, which are responsible for nearly two-thirds of the gasoline used in the country. A recent ICCT [analysis](#) suggests that requiring a 50% reduction of the fuel consumption of new two-wheeler vehicles by 2030 will unleash a host of internal combustion engine efficiency improvements and ensure that nearly 60% of all new two-wheelers sold in India are electric drive.
 2. To complement more stringent efficiency standards, India should seek to implement zero emission vehicle targets for both passenger cars and two-wheeled vehicles. Requiring that 30% of new passenger car sales be zero emission by 2030 would put the country on track with regulations in other countries. In addition, regulators should consider taking action to spur the electrification of ride-hailing fleets.
 3. To help spur the second-generation biofuel industry, India should consider adding newer policy strategies to its regulatory frameworks. Adopting a [contracts for difference mechanism](#), where producers would bid for the lowest ethanol selling prices and the government would guarantee this price for ten years, would help to ensure a sufficient biofuel supply.
6. **Vietnam to Implement Euro 5 Light-duty Vehicle Emission Standards on January 1, 2022** – The Vietnam Ministry of Transport has implemented a series of measures to control the emission of pollutants from motor vehicles. Cars and motorcycles are among major sources of emissions in Vietnam that cause air pollution, especially urban air pollution, directly affecting people's health. Euro 3 exhaust emission standards have been applied on new two-wheeled motorcycles since January 1, 2017, while new gasoline cars were required to meet Euro 4 emission standards. From January 1, 2018, diesel vehicles were required to follow Euro 4 standards. Starting from January 1, 2022, new assembled or imported cars will be required to follow Euro 5 emission standards. Among other ASEAN countries, only Singapore has applied Euro 6 emission standards for new light-duty vehicles (since 2017). Vietnam's decision to apply Euro 5 emission standards from January 1, 2022 demonstrates the government's determination to cut emissions of atmospheric pollutants, thus protecting

the environment and people's health. Under Prime Ministerial Directive No 03/CT-TTg dated January 18, 2021 on enhancing air pollution control, the Vietnam Ministry of Transport is requested to urgently develop a national program to develop means of environmentally-friendly transport and public transport. The Prime Minister asked for more communication activities to encourage people to use public transport and environmentally-friendly transport, and to promote the implementation of the roadmap for the application of the national technical regulation on the environment related to emissions from transport.

- 7. ACEA Releases Euro 7/VII Impact Assessment Report** – In order to put the Euro 7 pollutant emission regulation into context and to add data to the European Commission studies, the European Automobile Manufacturers' Association (ACEA) tasked AERIS Europe to look at the impact that the roll-out of the latest new Euro 6/VI vehicles is having on air quality and air quality compliance rates, at EU, regional, and city levels. The study also explores the impact that a range of potential Euro 7/VII standards might have in the future. The key findings are summarized in a [new AERIS Air Quality Report](#) released in late March. Well-known fleet models and derived emission factors were supplemented by carefully considered assumptions for the rate of electrification of cars, vans, and HDVs (so as not to overplay the air quality benefit of electric vehicles). The impact of this base case was modeled out to 2030 and 2035, showing that natural fleet replacement by the latest Euro 6/VI vehicles will achieve a 67% reduction in road transport NO_x emissions by 2030 (compared to 2020), rising to a 79% reduction by 2035. The reductions in PM_{2.5} are smaller (because exhaust particle emissions have been falling for many years already) but still amount to a 21% reduction in PM_{2.5} by 2030 (compared to 2020), falling to a 17.3% reduction by 2035.

The study puts those baseline figures into context by comparing the additional benefit that a range of moderate to very stringent Euro 7/VII scenarios could achieve. For NO_x, Euro 7/VII scenarios would deliver, by 2030, an additional reduction of only 3.4% (max) from cars and vans, and an additional 1.6% reduction (max) from HDVs. By 2035, those figures would increase by just an additional 1.2% and 0.8%, respectively. The study also modelled air quality concentration levels for more than 1,600 EU urban air quality monitoring stations. It showed that the compliance rates for the key air quality limit values for NO₂, PM₁₀, and PM_{2.5} will approach 100% by 2025, leaving a small number of city hot spots where local measures can be more effective than an EU regulation. Ozone presents a different picture, but the effect of reducing road transport emissions beyond that achieved in the base case does not improve the ozone compliance situation in urban areas. Looking at the background level of emissions during the first COVID lockdown periods, it is also clear that further reductions in emissions from road transport will not impact the background level coming from other sources of pollution. Bearing in mind the progress in road transport electrification that is already happening, this clearly suggests that the air quality benefit of a Euro 7/VII regulation would be minimal (but hugely expensive if it followed what has been proposed by the Commission consultants). A more sensible approach, linking in with the post-COVID EU recovery program, would be to accelerate fleet replacement with the latest Euro 6/VI vehicles via scrappage and incentive programs that can be targeted to where there will be remaining air quality issues (i.e., in some cities) rather than the broad-brush and expensive approach of a new Euro 7/VII regulation.

Additional information concerning the latest world emission regulatory topics was covered at the MECA International Committee meeting held via a Zoom call-in on the morning of March 23, 2021. MECA members are encouraged to read over the minutes of the International Committee Meeting and access the slides presented by Reggie Zhan (China), AECC's Dirk Bosteels (Europe), and Joe Kubsh (recent regulatory highlights from the rest of the world) for information on regulatory topics from major international markets. Slides shown at the International Committee Meeting are available on the member-only portion of MECA's website. As always, you can send your questions or comments to Joe Kubsh at jkubsh@meca.org. Here's some more recent industry news of interest to MECA members from around the globe:

News from Asia and the Pacific Rim

Australian State of New South Wales Considering Adoption of Euro 6/VI Emission Standards – According to a story published by *The Guardian* in March, plans are in the works for Australia's state of New South Wales (NSW, state capital is Sydney) to go it alone on vehicle emissions regulations after nearly two decades of inaction by the Australian federal government. The details were revealed after a draft copy of the New South Wales 2020-2030 Clean Air Strategy, outlining proposals for stricter regulations around criteria emissions and CO₂ standards for vehicles sold within the state, was leaked to the media. While the document raises concerns about pollution caused by wood-fired heaters in regional areas, its most ambitious proposal is for a plan to harmonize the state's vehicle emissions regulations with European standards (e.g., Euro 6/VI emission standards) and encourage the uptake of electric vehicles. The New South Wales minister for environment, Matt Kean, declined to comment about any specifics as the strategy was still subject to cabinet processes. "Any changes NSW proposes to the national vehicle emission standards would only apply to new cars that are already available overseas. More importantly, cleaner vehicles are more fuel efficient, saving motorists money at the bowser," Kean said. "I will always advocate for policies to stop NSW being used as a dumping ground for the world's dirtiest vehicles." While the plans have yet to be officially released in their final form, any NSW push to pass CO₂ emissions standards may force the hand of the Australian federal government. The move signals an evolving states-based approach on the issue of fuel efficiency and emissions regulations after decades of inaction by federal Labor and Liberal governments. Should the neighboring state of Victoria (state capital is Melbourne) follow suit and introduce a plan to harmonize its fuel efficiency and emissions regulations with Europe, Australia's two largest regional economies would be covered by a stricter regulatory standard than that at the federal level (Australian federal emission standards are currently set at Euro 5/V).

Australia's Car Industry Releases 2020 Report Card vs. Voluntary CO₂ Emission Levels – The Australian new car industry has revealed its first set of voluntary CO₂ emissions figures for 2020, with some good news and bad news. In the absence of federal policy, car companies in 2020 agreed to a voluntary set of emissions standards, with the aim of significantly reducing vehicle pollution by 2030. The 2020 target (based on annual new vehicle sales) was 154g of CO₂/kilometer travelled for passenger cars and light SUVs and 197 g/km for bigger SUVs and light commercials. The first category hit its mark in 2020 with 150 g/km, but the latter category could only manage 218 g/km. Federal Chamber of Automotive Industries chief

executive Tony Weber said the industry now understood it currently sits in the pursuit of the 2030 targets, which aims to see passenger cars and light SUVs' emission drop 4% per year and heavier vehicles decrease 3% per year. "It is important to acknowledge that today's release marks the start of this journey to 2030," Mr Weber said. He added it was unrealistic for large declines in emissions to happen immediately, given the amount of time between updates on most vehicles. "The model development cycle for new vehicles can range from 5-10 years depending on the type of vehicle so the emissions reduction will continue to improve as the latest technologies arrive on our shores," he said. "Any expectation that emissions will decline rapidly over one or two years is unrealistic." He also said Australia's fuel quality meant we missed out on many models with low emissions. "Australia's fuel is among the lowest quality in the world," he said. "We urge the Federal Government to accelerate the improvement of Fuel Quality Standards for Australia's market fuels as this will enable the introduction of more of the fuel-efficient vehicle technologies already on the roads overseas." The FCAI will release report cards for each brand's emissions performance in April 2021.

Fuel Cell News from Toyota and Great Wall – Toyota Motor Corporation has developed a product that packages a fuel cell (FC) system into a compact module; the company plans to begin selling it in the spring of 2021 or later. The new module will be easily utilized by companies that are developing and manufacturing FC products for wide variety of applications, including mobility such as trucks, buses, trains, and ships, as well as stationary generators. Toyota developed the product that packages individual FC system-related products of second generation Toyota Mirai with enhanced performance, such as the FC stack, as well as components that handle air supply, hydrogen supply, cooling, and power control, into a single compact module. The new module is available in four models: a vertical type (Type I) and a horizontal type (Type II), with rated output of either 60 kW or 80 kW. The new module has a wide voltage range (400 to 750 V) and can be directly connected to an existing electrical instrument provided with a motor, inverter, and battery, etc., thanks to a built-in, dedicated FC boost converter that simplifies the development and manufacture of FC products. The four module models can be combined according to the application, flexibly adapting to the output level and amount of installation space available.

Beijing SinoHytec Co., Ltd. and Toyota have formed a 50-50 joint venture on fuel cells for commercial vehicles. Both parties will invest a total of 8 billion yen to the new joint venture, called Toyota Sinohytec Fuel Cell Co.,Ltd. (FCTS). In June 2020, six companies, including Toyota and SinoHytec, signed a joint venture agreement to establish United Fuel Cell System R&D (Beijing) Co., Ltd. (FCRD), whose primary business is to develop fuel cell systems for commercial vehicles sold in China. The newly established FCTS will be responsible for producing and selling the systems developed by FCRD. The first product from the new company will be based on Toyota's fuel cell system used in the Mirai and has an improved output power for application in commercial vehicles. According to the statement of SinoHytec, the new product is scheduled for China's market launch in 2021.

In other fuel cell vehicle news from China, Great Wall Motor Co., China's biggest SUV maker, plans to roll out its first hydrogen-powered SUV this year. The company will also deploy its hydrogen-powered cars during the 2022 Winter Olympics in China, Zhang Tianyu, head of FTXT Energy Technology Co., a Great Wall subsidiary, said in the city of Baoding on March 29,

2021 during a media briefing to outline the automaker's hydrogen strategy. Great Wall has invested 2 billion yuan (US\$305 million) over the past five years to develop hydrogen power-related technologies that can be used for vehicles as well as marine and rail transport, Zhang said. Founder Wei Jianjun added that Great Wall will invest another 3 billion yuan over the next three years and plans to become a top-three seller of hydrogen-powered automobiles by 2025.

China Targets Further Reductions in PM2.5 Levels in the Coming Five Years – In late February, China announced new targets for tackling air pollution over the next five years. The country vowed to reduce the average PM2.5 density by 10% in 337 major cities between 2021 and 2025 compared with that of the previous five years, said Liu Bingjiang, an official with China's Ministry of Ecology and Environment, at a press conference. The 337 cities should also reach the new target of enjoying good-quality air for 87.5% of the period, Liu said. Liu said that China has achieved the goals of its three-year action plan released in 2018, with days with good air accounting for 87% of 2020 in 337 major cities. Cities that failed to meet the national standards for average PM2.5 density saw the indicator decline by 28.8% last year from the 2015 level. To further mitigate air pollution, the ministry will prioritize cutting vehicle emissions amid its pollution-control efforts for the next five years, Liu said, stressing measures to lower carbon emissions and control air pollution simultaneously.

ICCT Study Assesses Impacts of China's Heavy-duty Fuel Consumption Standards – China's fuel consumption standards for heavy-duty vehicles (HDVs) have progressed since Stage 1 was first introduced in 2012, and Stage 4 standards are currently in development. However, to date there has been no independent retrospective assessment of the impact of Stage 1 and Stage 2 standards, including whether they spurred any reduction in the fuel consumption of HDVs. A new ICCT study (see: <https://theicct.org/publications/commercial-vehicles-china-evolution-mar2021>) fills that knowledge gap by analyzing data from 10.5 million trucks and buses in the period 2012 to 2017. Results show that Stage 1 and Stage 2 standards had only a limited impact on the certified fuel consumption of trucks and buses in China. After Stage 2 was introduced, some HDV segments exhibited only a slight downward trend in fuel consumption, and others even a slight upward trend. Additionally, because a significant portion of the vehicles certified to Stage 2 were already compliant with Stage 3 fuel consumption limits, the actual improvement in certified fuel consumption across the fleet as a result of Stage 3 will likely be less than the tightening of the standards suggests. Stage 4 is an opportunity to set a technology-forcing regulation that would force cost-effective new technologies into the market and improve the competitiveness of Chinese manufacturers in international markets. Moreover, a key finding is that the flexibilities given to manufacturers during the fuel consumption certification have a significant impact on the certified fuel consumption. Including road grade in the certification drive cycle would be beneficial for the real-world representativeness of the certification process and for incentivizing fuel-saving technologies that thrive on mountainous topographies.

Delhi Government to Only Use EVs – All departments of the Delhi government will now use only electric vehicles, Deputy Chief Minister Manish Sisodia announced on February 25, 2021. The transition to EVs will be done within the next six months, he said. The Delhi government, which has over 2,000 cars in its fleet, hopes its decision will inspire other cities in the country and the world to tackle the issues of pollution and climate change with the urgency they deserve, he said. The announcement came a day after the Aam Aadmi Party-led Delhi

government launched a campaign, “Switch Delhi,” to encourage private vehicle owners to take a pledge to shift to electric vehicles and install a charging point within their premises in the next three years. The Delhi government in August 2020 launched an Electric Vehicle Policy to tackle the problem of air pollution. Under the policy, it promised to waive registration fee, road tax, and provide an incentive of up to ₹150,000 for new cars in the national capital. Under Delhi's EV policy, 12 four-wheeler models are currently available and eligible for purchase and scrapping incentives.

Meghalaya State in India 2021 EV Policy includes Purchase Incentives – The Meghalaya state government in northeast India has issued the Meghalaya Electric Vehicle Policy 2021, which will come into effect from April 1, 2021 and remain in operation and valid for the next 5 years. The state government has decided to go green by facilitating the adoption of at least 15% EVs by 2025. The government plan is to have about 20,000 EVs added during the policy period. The policy provides incentives to a limited number of early EV adopters. The government will offer a purchase subsidy of INR 10,000/kWh for the first 3500 electric two-wheelers, INR 4,000/kWh for the first 200 electric three-wheelers, 2500 four-wheeler EVs, and 30 electric buses purchased and registered in the state during the policy period. A summary of proposed/adopted state-level EV policies for 15 different states in India (including Meghalaya and the National Capital Territory around Delhi) is available on the Transportpolicy.net website: <https://www.transportpolicy.net/standard/india-state-level-ev-policies/>.

India’s Transport Minister Calls on Industry to Produce Flex-fuel Vehicles – India’s Road Transport, Highways and Shipping Minister Nitin Gadkari, talking to a delegation of carmakers from the Society of India Automobile Manufacturers (SIAM), on March 2, 2021 stressed the need for indigenous technology for flex-fuel vehicles. "Gadkari has urged car manufacturers to give priority to the indigenous production of flex engines, which can be used in vehicles using alternative fuels such as ethanol," the Ministry of Road, Transport and Highways said in a statement. The minister said that with ethanol beginning to be easily available in the country and over 70% of gasoline consumption being done by two-wheelers, there is a need to develop indigenous technology for flex fuel vehicles. "Discussions were also held regarding the request by SIAM to postpone implementation of BS6 CAFE Phase-II regulations to April 1, 2024, on the grounds that the industry is still recovering from the impact of COVID-19 and slow consumer demand," the statement said. While agreeing to examine the request, Gadkari made it clear to them that the Indian automobile industry must have world-class quality, and that if the industry is meeting stringent anti-pollution standards in countries to which they are exporting vehicles, the same standards must be adhered to in India as well. The minister has asked the delegation to come back in April with a detailed study on what steps have been taken by the industry on meeting the BS6 Phase-I standards. He also sought the financial implications of going ahead with BS6 CAFE Phase II standards before a final decision can be taken on the demand to postpone its implementation.

Indian Automakers to Provide New Purchase Rebates as Part of Vehicle Scrappage Policy – There is good news for Indian consumers who are going to junk their old vehicles and buy a new one under the Vehicle Scrapping Policy as automakers will give about 5% rebate on the new purchase, according to India’s Transport Minister Nitin Gadkari. The voluntary vehicle scrapping policy announced in the Union Budget for 2021-22 provides for fitness test after 20

years for personal vehicles while commercial vehicles would require it after the completion of 15 years. "There are four major components of the policy... Apart from rebate, there are provisions of green taxes and other levies on old polluting vehicles. These will be required to undergo mandatory fitness and pollution tests in automated facilities. For this automated fitness centers would be required through out in the country and we are working in that direction," Gadkari said. Automated fitness tests will be set up under public private partnership (PPP) mode while the government will assist private partners and state governments for scrapping centers, he said. Driving such vehicles that fail to pass automated tests will attract huge penalties and also be impounded, the minister said. This policy is going to be a boon for India's automobile sector, making it one of the most profitable sectors which in turn would generate huge employment, the minister said. The policy is touted as a major step to boost the Indian automobile sector, reeling under the adverse impact of the COVID-19 pandemic.

In some related vehicle scrapping news, Indian government departments will not be able to renew registration of their vehicles older than 15 years from April 1, 2022, if a proposal issued by India's Ministry of Road Transport and Highways is finalized. Notification of the draft rules was issued on March 12, 2021 by the Ministry, seeking comments, objections, and suggestions from stakeholders within thirty days. Once approved, the rule will be applicable to all government vehicles - central and state governments, territories, public sector undertakings (PSUs), municipal and autonomous bodies, as per the notification. Road Transport and Highways Minister Nitin Gadkari introduced the Vehicle Scrapping Policy in India's Parliament on March 18, 2021. Mr Gadkari sought cooperation from members of Parliament to set up fitness centers, pollution centers, and driving centers for vehicles in their respective constituencies. Mr. Gadkari said that rules for fitness tests and scrapping centers will be tentatively notified by October 1, 2021. The government has also fixed the deadline to scrap vehicles above 15 years of age which are used by the government departments as well as PSUs from April 1, 2022. For heavy commercial vehicles the mandatory fitness testing will commence from April 1, 2023. Similarly, mandatory fitness testing will be carried out in a phased manner for other categories of vehicles from June 1, 2024.

India to Provide OEMs and Part Suppliers with New Incentives for Domestic Production of EVs – India plans to offer fresh incentives to companies making electric vehicles (EVs) as part of a broad auto sector scheme it expects to attract US\$14 billion of investment over five years, according to industry sources and a document seen by Reuters. The country's efforts to promote EVs to reduce its oil dependence and cut pollution have been stymied so far by a lack of investment and weak demand, as well as the patchwork nature of existing incentives that vary from state to state. The new automotive sector scheme, however, has been under discussion since mid-2020 to provide a more focused approach, industry sources close to the matter told Reuters. The plans envisage US\$8 billion of incentives for carmakers and suppliers over a five-year period to drive large investment in the sector. Final details of the scheme are expected in April 2021, but companies will be able to apply for incentives from April 1st the sources said. Companies will receive 4-7% government cashbacks on the eligible sale and export value of vehicles and components, but for EVs and their components there is an additional 2% as a "growth incentive" to promote electric mobility, according to the draft policy document seen by Reuters. Elon Musk's Tesla Inc. is already gearing up to enter India while rivals including Ford, Volkswagen, and India's Tata Motors and Mahindra & Mahindra also have plans to invest

billions of dollars in EVs to meet stricter global emissions regulations. Automotive component manufacturers in India must be ready to pivot their product offerings to cater for the shift towards EVs, the document said. The automotive incentive scheme is part of India's broader US\$27 billion program to attract manufacturers from the likes of China and Vietnam to capture a bigger share of the global supply chain and exports. But for new companies entering India, as well as existing automakers, challenges abound. Steep interest rates and power tariffs, as well as poor infrastructure and high logistics costs, make it costlier for companies to operate in India compared with rivals such as Thailand or Vietnam. The government expects the scheme to bring additional investment of US\$14 billion, create 5.8 million new jobs, and rake in more than US\$4 billion in total tax revenue over five years. To benefit from the scheme automakers must meet conditions including minimum global revenue of US\$1.4 billion. For auto parts makers it is US\$69 million. The companies must grow by at least 8% each year to qualify for the incentives, which are also linked to the distance between the factory and point of sale. The document added that existing programs focus on a large number of companies that lack scale and "are constrained in their ability to invest and undertake the risk required for rapid growth."

Fuel Consumption Reduction Technologies for the Two-wheeler Fleet in India – The shift from carburetor technology to fuel injection that has come with the implementation of India's Bharat Stage VI emission standards provides the basis from which to consider other incremental technologies for fuel efficiency improvement in the two-wheeler segment, which currently consumes more gasoline than all other forms of on-road transport combined. There are many technologies available that can achieve this, and to promote widespread adoption of them, ICCT believes that India needs to adopt a fuel consumption/CO₂ standard for two-wheelers. To identify realistic fuel consumption targets for small motorcycles, large motorcycles, and scooters, and for the two-wheeler fleet overall, a recent ICCT paper (see: <https://theicct.org/publications/2w-fuel-reduction-india-mar2021>) evaluates the cost-effectiveness and the payback period of different internal combustion engine (ICE) vehicle technologies. A variety of ICE technology packages were designed, with increasing numbers of fuel efficiency technologies, for each of the three segments. The report also includes an electric two-wheeler (E2W) with a range of 100 km for a small motorcycle and 75 km for a scooter as one of the technology packages for each of those segments.

While a transition to electric two-wheelers seems inevitable, results show there are opportunities in the interim to obtain better efficiency from ICE pathways. Even the most fuel-efficient segment of the two-wheeler fleet, small motorcycles, has the potential to further reduce fuel consumption up to 42% using ICE technologies alone. An analysis of manufacturer costs further shows that a mandated fleet average level of 25.3 g of CO₂/km for the two-wheeler fleet can be expected to drive 32% E2W penetration in the new two-wheeler fleet by 2025. Setting a fleet average target of 20.5 g CO₂/km in 2030 could achieve fuel consumption reductions of 50% in the two-wheeler fleet and a cost-effective penetration of 62% E2Ws. ICCT believes that adoption of stringent fuel consumption standards will give a clearer signal to vehicle manufacturers in terms of how much longer to exploit the ICE pathway and enable rapid transition to electrification.

Chinese Studies Explore Ce-Si Mixed Oxide and Mn-based SCR Catalysts – A team of Chinese researchers located in both China and the U.S. have published a study in

Environmental Science & Technology (see: doi.org/10.1021/acs.est.0c08410) that investigated a novel Ce-Si mixed oxide catalyst for the selective reduction of NO by NH₃. Aimed at improving both the catalytic performance and SO₂ resistance ability of catalysts in the selective reduction of NO by NH₃, or NH₃-SCR, an innovative CeO₂-SiO₂ mixed oxide catalyst (CeSi₂) was developed based on the researchers' understanding of both the sulfur poisoning and reaction mechanisms, which exhibited excellent SO₂/H₂O resistance ability even in harsh working conditions (i.e., containing 500 ppm SO₂ and 5% H₂O). The strong interaction between Ce and Si (Ce-O-Si) and the abundant surface hydroxyl groups on CeSi₂ not only provided fruitful surface acid sites but also significantly inhibited SO₂ adsorption. The NH₃-SCR performance of CeSi₂ was promoted by an enhanced Eley-Rideal mechanism in which more active acid sites were preserved under the reaction conditions and gaseous NO could directly react with adsorbed NH₃. This mechanism-enhanced process was even further promoted on sulfated CeSi₂. This work provides a reaction mechanism-enhanced strategy to develop an environmentally friendly NH₃-SCR catalyst with superior SO₂ resistance.

Mn-based oxides exhibit outstanding low-temperature activity for the selective catalytic reduction of NO_x with NH₃ (NH₃-SCR) compared with other catalysts. However, the underlying principle responsible for the excellent low-temperature activity is not yet clear. In a new publication available from *Environmental Science & Technology* (see: doi.org/10.1021/acs.est.0c08214), the atomic-level mechanism and activity-limiting factor in the NH₃-SCR process over Mn-, Fe-, and Ce-based oxide catalysts are elucidated by a combination of first-principles calculations and experimental measurements. A team of Chinese researchers found that the superior oxidative dehydrogenation performance toward NH₃ of Mn-based catalysts reduces the energy barriers for the activation of NH₃ and the formation of the key intermediate NH₂NO, which is the rate-determining step in NH₃-SCR over these oxide catalysts. The findings of this study provide a fundamental basis for the development of future generation SCR catalysts with excellent low-temperature activity.

Opportunities for Waste Fat/Oil Feedstocks for Biodiesel and Renewable Diesel in Indonesia – Today, virtually all biodiesel in Indonesia is produced from palm oil. But as the government is seeking to increase biodiesel blending rates in the years ahead, this single feedstock might not be adequate to support those ambitions. Indonesia is also seeking opportunities to produce renewable diesel, a more advanced biofuel that can be made from the same oil and fat feedstocks as biodiesel, but which possesses superior compatibility properties as a drop-in fuel. A recent ICCT paper (see: <https://theicct.org/publications/waste-fats-and-oils-biodiesel-indonesia-en-mar2021>) evaluates the potential for Indonesia to diversify its biofuel industry by including waste feedstocks. The report assesses the likely availability of four different waste biodiesel and renewable diesel feedstocks in Indonesia: inedible animal fats, waste fish oil, sludge palm oil (SPO), and tall oil. While other countries have been using these feedstocks in biodiesel and renewable diesel production, Indonesia is generally throwing away inedible animal fats and fish wastes and not collecting SPO. Tall oil is not extracted to its full technical potential and most of what is produced is exported. Results of the analysis show that approximately 1.4 billion liters of biodiesel or 1.35 billion liters of renewable diesel can be produced from these four waste oil/fat feedstocks annually in Indonesia. This would be in addition to the 3.2 billion (biodiesel) or 3 billion (renewable diesel) liters from used cooking oil that is technically available, as estimated in a 2018 ICCT study. In total, 4.6 billion liters of biodiesel or 4.35

billion liters of renewable diesel could be produced from waste oils and fats each year, and waste biodiesel can provide almost 60% of Indonesia's B30 volumetric blending target.

News from Europe

UBA Reports NO₂ Levels Down in German Cities in 2020 – In mid-February, the German Environment Agency (UBA) published a report of compliance with the European Air Quality Directives in German cities (see: <https://www.umweltbundesamt.de/presse/pressemitteilungen/luftqualitaet-2020-nur-noch-wenige-staedte-ueber>). This report is based on a preliminary evaluation of the measurement data from the German federal states and the UBA (as of February 1, 2021) from around 400 measuring stations so far. Whereas 25 cities were affected by the exceedance of the NO₂ limit value in 2019, UBA says that there will be significantly fewer than ten in 2020. Mr Dirk Messner, President of the UBA, commented: “The fact that newly registered diesel cars have only recently been complying with the limit values on the road is the main reason for the ten-year misery.” Modelling by the UBA shows that software updates and fleet renewals in 2020 together resulted in a reduction of around 3 micrograms of NO₂/m³. Around two thirds of this can be traced back to the new, significantly cleaner vehicles, and one third to vehicle software updates. Mr Messner added that “If all vehicles on German roads had complied with the exhaust emission limit values in real operation, there would have been no more violations in 2020. It is also regrettable that software updates took so long and that there were hardly any hardware upgrades.” 2020 was the year with the least amount of fine particulate since measurements began in the late 1990s. The limit values for PM10 and PM2.5 were complied with throughout Germany. However, the WHO annual mean recommendation of 20 micrograms/m³ for PM10 was not complied with in 2020 at around 4% (2019: 13%) of all measuring stations.

EU Court Cites UK for Breaching EU NO₂ Air Quality Standards – The EU Court of Justice on March 4, 2021 admonished Britain for air pollution over urban areas including London that “persistently” breached European Union levels for nitrogen dioxide associated with heavy vehicle traffic. The case covered the years 2010 to 2017 and stemmed from a European Commission complaint lodged in 2018, when Britain was still an EU member, thus giving the court jurisdiction. It found that NO₂ levels over 16 urban zones including Greater London and Greater Manchester (Britain's two biggest urban regions) “systematically” exceeded EU air quality targets set out in a 2008 EU directive and not enough was done to reduce them. Despite leaving the EU in 2020, Britain was ordered to come into compliance with the EU standard. If it does not, it could be fined. However, an environmental group that hailed the verdict, ClientEarth, said a fine was unlikely, given Brexit.

Transport & Environment: EV Batteries Need Far Less Raw Materials than Fossil-fueled Cars – An electric vehicle (EV) battery uses up just 30 kg of raw materials with recycling compared to the 17,000 liters of gasoline burned by the average car. That's according to a new study from Europe's environment advocacy group, Transport & Environment (T&E; see: <https://www.transportenvironment.org/press/electric-car-batteries-need-far-less-raw-materials-fossil-fuel-cars-study>) that shows Europe's current crude oil dependency far outweighs its need for battery raw materials. The gap is set to increase further as technological advancements drive

down the amount of lithium required to make an EV battery by half over the next decade. The amount of cobalt required will drop by more than three-quarters and nickel by around a fifth. Lucien Mathieu, transport and e-mobility analyst at T&E, said: “When it comes to raw materials there is simply no comparison. Over its lifetime, an average fossil-fuel car burns the equivalent of a stack of oil barrels, 25 stories high. If you take into account the recycling of battery materials, only around 30 kg of metals would be lost - roughly the size of a football. In 2035 over a fifth of the lithium and 65% of the cobalt needed to make a new battery could come from recycling, the study finds. T&E said the recycling rates, which are required under a new law proposed by the European Commission, will significantly reduce EVs’ demand for new materials, something that cannot be said for conventional cars. Europe will likely produce enough batteries to supply its own EV market as early as 2021, the study also finds. Already 22 battery gigafactories are planned for the next decade with total production capacity extending to 460 GWh in 2025, enough for around 8 million battery electric cars. Lucien Mathieu, added: “This is a far cry from the current situation where Europe’s car fleet is almost entirely dependent on crude oil imports. Increased battery efficiency and recycling will leave the EU significantly less dependent on imports for raw materials than it is for oil.” Overall, EVs are also far better for the climate, requiring 58% less energy than a gasoline car over their lifetime, the study finds. And, as T&E’s lifecycle analysis tool shows, even in Poland, which has the dirtiest electricity supply in the EU, EVs emit 22% less CO₂ than gasoline cars.

In other EV news from Transport & Environment, the group posted an opinion blog on their website in early March aimed at debunking claims that battery electric vehicles (BEVs) will make air quality worse due to particle emissions from non-exhaust sources, such as tires and brakes (see: <https://www.transportenvironment.org/newsroom/blog/electric-vehicles-are-far-better-combustion-engine-cars-when-it-comes-air-pollution>). This blog concludes by stating BEVs do not produce more air pollution than fossil fuel cars. In fact BEVs eliminate emissions from engine exhaust and significantly reduce emissions from brakes. The evidence on tires is more mixed but claims that battery cars create more particle pollution due to tires are misleading as they ignore the overall air quality benefits of EVs. T&E argues that particle emissions should not be used as an excuse to slow down the transition to zero emission mobility which will beyond doubt improve air quality across Europe. Instead, regulation should address pollution from brakes and tires to ensure that these emissions are reduced for all road vehicles.

UK Tests find PHEV Real World Fuel Economy Substantially Lower than Manufacturers’ Claims – Plug-in hybrid cars (PHEVs) could prove a tempting alternative for those that can’t yet make the leap to an electric car, particularly as many claim to offer incredible three-figure mpg returns and get around the range anxiety of an all-electric model. However, in independent lab fuel economy tests conducted by *Which?* in the UK (see: <https://www.which.co.uk/news/2021/03/plug-in-hybrid-cars-use-more-fuel-than-official-figures-claim/>), this group found that average fuel economy (over the 22 models examined) was 61% less than official manufacturer claims. Based on driving 9,000 miles each year, that could add £400 a year to annual fuel bills in the UK. Manufacturer fuel economy claims are based on the WLTP test cycle, which has been the official standard since 2017. The WLTP replaced the now defunct NEDC test cycle, as it was deemed to be a more realistic representation of actual driving conditions. However, the *Which?* independent tests were more stringent and included tougher test cycles (including a unique UK motorway test) to better replicate the strain put on cars by real

owners. *Which?* also calculated mpg for PHEVs by driving each of them over a fixed distance with their batteries in varying states of charge, to determine comparable energy consumption. This is a key difference to the WLTP test, where overall mpg is calculated based on the vehicle's electric driving range (amongst other factors). Based on the difference between manufacturer claims and the *Which?* test results and fuel calculations, the three PHEVs with the biggest discrepancy were:

BMW X5 Plug-in hybrid luxury SUV:

188.3 mpg – minimum claimed

52.8 mpg – *Which?* tested, 72% decrease

£669.17 – how much more a year one could pay in fuel in the UK

BMW 2 Series Active Tourer MPV:

156.9 mpg – minimum claimed

44.8 mpg – *Which?* tested, 71% decrease

£772.08 – how much more a year one could pay in fuel in the UK

Mercedes-Benz GLE Plug-in hybrid:

313.0 mpg – minimum claimed

104.6 mpg – *Which?* tested, 67% decrease

£317 – how much more a year one could pay in fuel in the UK

That's not to say one can't find a plug-in hybrid that serves up excellent fuel economy. Based on the *Which?* analysis, the Toyota Prius PHEV returns 114.4 mpg in their tests. Although this is still some way off of Toyota's official claim of 188.3 mpg.

UK Passenger Car Carbon Emissions Show Only Small Decrease Since 2011 –

Despite an increase in the number of electric and hybrid vehicles, carbon emissions from passenger cars in the UK have fallen by just 1% since 2011, according to the UK National Audit Office (NAO). According to the report, average emissions from new cars in Britain fell year on year between 2011 and 2016, however, emissions increased by 6% between 2016 and 2019. According to the NAO, this increase is largely due to an increase in the sale of SUVs, increased road traffic, and revised methods for estimating carbon emissions. Based on this, the NAO has highlighted that the UK still has a long way to go to achieve its aims of zero-carbon by 2050. The UK Office for Zero-Emission Vehicles (OZEV) provides grants to encourage consumers to buy ultra-low emission cars and subsidies to fund the installation of charge-points, by March 2020, it had spent £1.1 billion. However, according to the NAO, despite its efforts, the OZEV cannot clearly demonstrate the cumulative impact the grant has had on the growth of ultra-low emission cars above and beyond what might have happened anyway. Based on this, the NAO has recommended that OZEV, the UK Department for Transport and the UK Department for Business, Energy & Industrial Strategy (BEIS) should develop detailed plans to achieve the 2050 target, reporting progress against clear milestones at regular intervals. Gareth Davies, the head of the NAO, said: "The number of ultra-low emission cars on UK roads has increased, but meeting the government's ambitious targets to phase out new petrol and diesel cars in less than a decade still requires a major transition for consumers, carmakers, and those responsible for charging infrastructure."

In related EV grant news from the UK, starting March 18, 2021, the UK grant scheme for electric cars, vans and trucks was updated to target less expensive models and reflect a greater

range of affordable vehicles available, allowing the scheme's funding to go further and help more people make the switch to an electric vehicle. The government will now provide grants of up to £2,500 (down from £3,000) for electric vehicles on cars priced under £35,000. The government has also altered how it calculates the plug-in van grant, and changed the eligibility for the grant to vehicles that are able to travel for 60 miles without any emissions.

UK to Introduce E10 in September 2021 – A greener vehicle gasoline that could cut transport CO₂ emissions by 750,000 tons a year is to be introduced across Britain in September; the British government announced in late February. The UK Department for Transport (DfT) said the greener fuel E10 gasoline could cut transport emissions equivalent to 350,000 fewer cars on the roads of Britain. The DfT said the move follows consultations with drivers and industry over the introduction of E10 fuel. British Transport Secretary Grant Shapps said, "The small switch to E10 petrol will help drivers across the country reduce the environmental impact of every journey." "A small number of older vehicles, including classic cars and some from the early 2000s, will continue to need E5 fuel (containing no more than 5% ethanol), which is why supplies of E5 petrol will be maintained," said the DfT.

High-blend Renewable Fuels could cut 46 Million Tons GHG Emissions from Truck Operations in UK by 2030 – A new study by the UK Zemo Partnership (formerly the UK Low Carbon Vehicle Partnership) shows that with a market average of 30% high blend renewable fuels (HBRF), used in place of fossil fuels (diesel and natural gas) by 2030, the UK transport sector could save an additional 46 million tons in GHG emissions over the next decade, with savings continuing to 2050 (see: https://www.zemo.org.uk/assets/lowcvpreports/Market_opportunities_decarb_HDVs%20using%20HBRF_2021_.pdf). The biggest opportunities are in the heaviest vehicles with the longest journey profiles, which also produce the most GHG emissions. The study covered three heavy-duty vehicle sectors: trucks, buses, and coaches. For renewable fuels, this focused on liquid and gaseous biofuels above blends of 20%, specifically biodiesel (fatty acid methyl ester), hydrotreated vegetable oil (HVO), and biomethane. High blend biodiesel has already made good inroads in the UK bus market while both biomethane and HVO adoption in heavy-duty fleets have shown encouraging recent increases in the UK, driven partly by requirements for carbon reporting and GHG emissions improvements. Coming shortly after the announcement to introduce E10 into the UK (potentially doubling the renewable content of gasoline) the report shows that even greater greenhouse gas (GHG) savings can be realized with an aggressive policy framework for HBRF in heavy-duty vehicles currently running on diesel and natural gas. A key recommendation of the report is for a robust and transparent assurance scheme to provide operators with confidence in the credentials of the renewable fuels they purchase. The Zemo Partnership's new Renewable Fuels Assurance Scheme and declaration certificate have been developed in parallel and will be launching soon.

New UK Bus Strategy includes Adding 4,000 Zero Emission Buses – On March 15, 2021, UK Prime Minister Boris Johnson unveiled the most ambitious shake-up of the bus sector in a generation, which will see lower, simpler flat fares in towns and cities, turn-up-and-go services on main routes, and new flexible services to reconnect communities. The government's new bus strategy (see: <https://www.gov.uk/government/publications/bus-back-better>), backed by £3 billion of investment, will see passengers across England benefiting from more frequent,

more reliable, easier to use and understand, better coordinated, and cheaper bus services. Levelling up services across the country will encourage more people to use the bus, rather than the car, as the UK builds back better from the coronavirus pandemic. Hundreds of miles of new bus lanes will make journeys quicker and more reliable, getting people out of their cars, reducing pollution and operating costs. The Prime Minister's 10-point plan sets out how the UK will accelerate the transition to greener and more sustainable transport including:

- Delivery of 4,000 new British-built electric or hydrogen buses to provide clean, quiet, zero-emission travel
- Transition cities and regions across England to emission-free buses, safeguarding the UK bus manufacturing industry
- Ending the sales of new diesel buses, a consultation on the end date was launched on March 15, 2021

In other UK electric bus news, the Scottish government approved £40.5 million in funding in March to replace around 215 diesel buses with low-emission, electric models, with the majority of the new electric buses to be built in Falkirk by Alexander Dennis Limited in collaboration with BYD, the company's partner for electric buses in the UK and Ireland.

UK Awards £54 Million to 3 Projects to Advance Electric Trucks and Hydrogen Buses – The UK Government awarded more than £54 million (US\$75 million) in March to three projects to advance the next generation of electric trucks and hydrogen buses:

- £31.9 million (US\$44.3 million) to develop electric propulsion systems for heavy goods vehicles in Cwmbran, Wales. The EPIC project led by Meritor integrates the key elements of motor, inverter, gearbox, differential and brakes in a single lightweight system for vehicles up to 44 tons and includes coaches and off-highway vehicles. The funding also goes towards the construction of a new technology center in Scotland.
- £11.3 million (US\$15.7 million) to develop and manufacture energy-saving technology from motorsport for use in cars and vans from a center in Warwickshire. The e-MOTIF project led by Shield Manufacturing Technologies in Warwickshire combines lightweight energy recovery technology from motorsport with a new motor and inverter for cars and vans to cut energy consumption and CO₂ emissions.
- £11.2 million (US\$15.5 million) to develop and manufacture low-cost hydrogen fuel cell technology for buses and create a hydrogen center of excellence with Wrightbus in Ballymena, Northern Ireland. Wrightbus is developing hydrogen-powered fuel cell electric single and double-deck buses.

The funding is being coordinated by the UK Advanced Propulsion Center (APC) which supports the development of low carbon emission technologies for cars, buses, heavy goods vehicles, and vans. These projects will help further the UK's ongoing efforts to develop a sustainable supply chain for manufacturing electric vehicles by 2026.

CLEPA Issues Technology Neutral Position Paper on Climate Neutral Transport – In late February, the European Association of Automotive Suppliers (CLEPA) published a position paper on climate neutral transport and CO₂ emission standards. The position paper states that the industry is convinced that the way to climate neutrality is through a technology

open environment that balances environmental, social as well as economic goals. In its view, achieving climate neutrality by ‘simply increasing the level of ambition of the existing regulations in isolation’ creates a high cost to society. CLEPA claims that such an approach risks disrupting revenues and capacity to invest in innovation and employment at a time when scarce resources are needed to counter the COVID-19 crisis. The trade association goes on to say that climate neutral mobility requires technology openness in the political approach and regulatory implementation, and that all technology options are needed to achieve climate neutrality – from battery electric vehicles (BEV), to fuel cell electric vehicles (FCEV), as well as efficient internal combustion engines (ICE), including hybrid vehicles and plug-in hybrid vehicles (PHEV). De-fossilizing energy and fuels to meet the demand of a climate-neutral fleet must be a priority. In CLEPA’s view, a ban on the combustion engine would be counterproductive and unnecessary. It supports policies to enable and accelerate electrification but says that a ban on the combustion engine is not only potentially highly detrimental to industry, to its employees and to consumers, but would also be counterproductive to reducing emissions. By eliminating affordable low-carbon options for those consumers and businesses for which electrification does not provide the necessary utility or cost effectiveness, it will leave older, higher-emitting vehicles on the road. Investment in engine efficiency will be further disincentivized and the strong technical progress of the past years abandoned. A ban is also not necessary, according to CLEPA, as climate-neutral internal combustion with renewable and low carbon fuels is viable and can cut emissions not only from new vehicles, but also from the existing fleet. In an open letter to the European Commission published in late March (see: <https://www.aecc.eu/wp-content/uploads/2021/03/210324-AECC-open-letter-on-Euro-7-and-renewable-fuels.pdf>), AECC also strongly recommends the use of sustainable and renewable fuels in vehicles with ICEs to further improve the sustainability of these powertrains. The complete CLEPA position paper can be found at: <https://clepa.eu/mediaroom/clepa-position-paper-on-climate-neutral-transport-and-co2-emission-standards/>.

Volvo’s Car Lineup to be Fully Electric by 2030; BMW MINI to be Fully Electric by Early 2030s – Volvo's entire car lineup will be fully electric by 2030, the Chinese-owned company said on March 2, 2021, joining a growing number of automakers planning to phase out fossil-fuel engines by the end of this decade. "I am totally convinced there will be no customers who really want to stay with a petrol engine," Volvo Chief Executive Hakan Samuelsson told reporters when asked about future demand for electric vehicles. "We are convinced that an electric car is more attractive for customers." The Swedish-based carmaker said 50% of its global sales should be fully-electric cars by 2025 and the other half hybrid models. Owned by Hangzhou-based Zhejiang Geely Holding Group, Volvo will launch a new family of electric cars in the next few years, all of which will be sold online only. On March 2, 2021 it unveiled the first of those models, the C40, a fully electric SUV, which will have an initial battery range of around 420 kilometers (261 miles). Volvo will include wireless upgrades and fixes for its new electric models - an approach originally pioneered by Tesla Inc. This means the C40's range will be extended over time with software upgrades, Chief Technology Officer Henrik Green said.

The BMW Group is going for breadth with its fully electric vehicles; the company will offer at least one fully electric model on the road in around 90% of its current market segments by 2023, according to Group management. The combination of smart vehicle architectures and a highly flexible production network will enable the BMW Group to have around a dozen fully

electric models on roads worldwide by 2023. The BMW Group said MINI will be introducing its last new combustion engine model as early as 2025 and launch only fully electric models from that point onwards. By 2027, fully electric vehicles will account for at least 50% of all MINI deliveries to customers. By the early 2030s, the entire MINI range will be fully electric, while still remaining a global brand with a footprint in every region of the world.

VW Announces Expansion of Battery Manufacturing and Charging Infrastructure in Europe – On March 16, 2021, the Volkswagen Group presented its technology roadmap for batteries and charging up to 2030 on its first “Power Day“ (see: <https://www.volkswagen-newsroom.com/en/press-releases/power-day-volkswagen-presents-technology-roadmap-for-batteries-and-charging-up-to-2030-6891>). The goal of the roadmap is to reduce the complexity and cost of the battery significantly in order to make the electric car attractive and viable for as many people as possible. At the same time, the Group is aiming to secure the supply of battery cells beyond 2025. In Europe alone, six gigafactories with a total production capacity of 240 GWh are to be established by the end of the decade. The first two factories will operate in the Swedish city of Skellefteå and in Salzgitter, Germany (near Hannover). In response to increased demand, Volkswagen has decided to refocus the previous plan in relation to cell production and concentrate production of its premium cells in the Swedish gigafactory “Northvolt Ett” in Skellefteå in collaboration with Northvolt. The production of these cells is set to commence in 2023 and will be expanded gradually to an annual capacity of up to 40 GWh. The gigafactory currently operated by Volkswagen in Salzgitter will produce the unified cell for the high-volume segment from 2025 and develop innovations in process, design, and chemistry. Production capacity of up to 40 GWh per year is also planned for Salzgitter. This refocusing will deliver enhanced economies of scale and reduce the complexity of production. Both gigafactories will be powered with electricity from renewable energy sources. Potential sites and partners are currently being considered for the other factories. Volkswagen is also vigorously pursuing expansion of the public fast-charging network globally. With this in mind, cooperations have been agreed in Europe with the energy companies BP (Great Britain), Iberdrola (Spain), and Enel (Italy). Along with its partners, VW intends to operate about 18,000 public fast-charging points in Europe by 2025. This represents a five-fold expansion of the current fast-charging network and corresponds to about one third of the total demand predicted on the continent for 2025.

Volkswagen has no plans to develop new combustion engines, CEO Ralf Brandstaeetter said in March, as the automaker shifts its focus to battery-powered cars. "At the moment, I don't expect a completely new engine family to be launched again," Brandstaeetter told *Automobilwoche*. VW will further develop the engines currently in use and prepare them for new emissions standards such as Euro 7. "We still need them for a certain time, and they have to be as efficient as possible," he said.

Deutsche Post DHL Group Investing €7 billion over 10 years to Reduce CO₂ Emissions – Deutsche Post DHL Group will invest a total of €7 billion over the next ten years in measures to reduce its CO₂ emissions. The funds will flow in particular into alternative aviation fuels, the expansion of the zero-emission e-vehicle fleet and climate-neutral buildings. For short distances and the last mile, the Group is continuing to drive forward the electrification of its vehicle fleet. By 2030, 60% of global delivery vehicles for the last mile are to be electrically powered, equating to more than 80,000 e-vehicles on the road by 2030. In 2020, the figure was

18%. On longer routes, especially in air transport, the Group is pushing for the development and use of fuels produced from renewable energies: By 2030, at least 30% of fuel requirements in aviation and line haul are to be covered by sustainable fuels.

Moscow Aiming for All-electric Bus Fleet by 2032 – Moscow started to replace outdated diesel buses with electric buses in September 2018. There are now 600 electric buses on 42 routes overall, and as replacements for traditional buses on 33 of those routes. Over the next 4 years, the city authorities are going to purchase 2675 more units of e-transport; Moscow expects that by 2032, all the urban transport will have been converted to electric traction. “Starting this year we are going to buy the e-buses only, we seek to make our city as clean and harmless for its citizens as we can. Obviously not only the rest of Russia but also the European countries try to attain to our level, since even now there are more e-buses in Moscow than in other European capitals,” said Maksim Liksutov, Moscow’s Deputy Mayor for Transport. The replacement of a diesel bus with an e-bus leads to an average reduction of CO₂ emissions of 60.7 tons/year. The increase in a number of e-buses in 2022 will already enable a decrease in emissions by almost 86K tons. The conversion of buses to electric traction will help to increase the share of e-transport rides up to 70%. In 2022 the city plans to move to another stage of transport electrification, Moscow e-buses will be equipped with an electric heater. In March, Russian-based manufacturer KAMAZ presented the first Russian electric articulated bus, the KAMAZ-6292. The bus was prepared for test operation at the NEFAZ factory, a subsidiary of KAMAZ. The 48 seat, electric articulated bus is expected to go into production by the end of this year, and will be used on Moscow’s busiest routes.

Romania Adding More than 100 Electric Buses to City Fleets – In a government tender run by the Romanian Ministry for Public Works, Development, and Administration (Ministerul Lucrărilor Publice, Dezvoltării Și Administrației), with seven local towns and cities as beneficiaries, Solaris has been awarded an order for 123 out of 131 electric buses. The total value of the contract stands at nearly €65 million. The 123 12-meter Solaris e-buses are destined for six locations: the towns and cities of Iași, Sibiu, Sighetu Marmăției, Suceava, Târgu Mureș, and Pitești. The detailed delivery schedules vary for different locations, however all orders are to be completed by the end of 2022. All the Urbino 12 electric buses will be designed for both pantograph and plug-in recharging. Together with the vehicles, Solaris will deliver the infrastructure for slow- and fast-charging to every location. This will encompass a total of 123 40 kW plug-in chargers and 36 300 kW pantograph chargers. The vehicles will be air-conditioned and equipped with a comprehensive passenger information system, tailored to the individual requirements and needs of each city. Solaris is already very well-known in Romania. The partnership with the country began in 2002. Since then, Solaris has supplied Romanian carriers with more than 300 vehicles, including more than 100 zero-emission, environmentally neutral trolleybuses and more than 40 Urbino 12 electric buses.

London Tightens LEZ Rules: Euro VI Emission Levels Required for Trucks and Buses – The Mayor of London, Sadiq Khan, has tightened the city-wide Low Emission Zone (LEZ) rules, which means that heavy goods vehicles (HGVs), buses and coaches that fail to meet emissions standards will be hit with a daily charge of up to 300 pounds. The new standards, Euro VI (NO_x and PM), apply to heavy vehicles across most of Greater London and match the emission standards of the central London Ultra Low Emission Zone (ULEZ). The LEZ, which

operates 24 hours a day and every day of the year starting from March 1, 2021, was set up to encourage the most polluting heavy diesel vehicles driving in the UK capital to become cleaner. Toxic air pollution causes long-lasting harm and is a national public health crisis. In London it contributes to thousands of premature deaths every year. There is also evidence linking air pollution with an increased vulnerability to the most severe impacts of COVID-19, said Khan. The date for enforcement of the tougher standards was delayed from October 2020 in the face of the pandemic and its impact on supply chains using such vehicles. New data from City Hall, the Mayor's office, shows compliance with the new standards is nearly at 90%, compared to around 70% in May 2019. The introduction of tougher standards for the LEZ, alongside the planned expansion of London's ULEZ later this year, is expected to reduce nitrogen oxides (NOx) emissions from road transport by around 30% across London in 2021.

In other UK LEZ news, England's first clean air zone outside of London launched in Bath on March 15, 2021 in a move which will see vehicles such as buses and trucks face charges. Commercial vehicles which do not meet required emission standards will pay a daily charge for driving into the center of Bath, but private cars and motorbikes are exempt. High-emission commercial vans will pay a £9 fee and heavy-duty trucks and buses £100. Private hire vehicles and taxis will also have to pay £9 per day. Charges will apply to pre-Euro 6/VI diesels and pre-Euro 4 gasoline vehicles. Several areas of Bath regularly exceed legal NO₂ limits. Bath and the North East Somerset Council are hoping the LEZ will cut emissions to legal levels by the end of 2021. The council introduced the clean air zone with £9.4 million of funding from the government to help residents and businesses replace polluting vehicles with cleaner, compliant ones. Automatic number plate recognition cameras have been installed on all roads leading into the zone, and plates will be checked against a UK Driver & Vehicle Licensing Agency database.

European Public Health Alliance Calls for More Traffic Restrictions in European Cities – Most cities throughout Europe should restrict traffic to tackle growing levels of air pollution as pandemic restrictions ease, the European Public Health Alliance (EPHA) urged on March 23, 2021, a call based on a wide-ranging new transport study. Banning polluting vehicles could cut harmful PM and NOx pollution in cities of over a million residents by up to 23% and 36%, respectively, saving up to €130 million/year in health and other costs, the study for EPHA found. EPHA represents more than 80 public health NGOs, patient groups, health professionals, disease groups, and health inequalities organizations. Air pollution is the number one cause of premature deaths from environmental factors, according to the European Environment Agency, with cities worst hit. Air pollution causes diseases that are linked to higher Covid-19 death rates, according to the WHO. Pandemic restrictions imposed from March 2020 cleaned the air rapidly. But pollution has been bouncing back, and in some cities is now worse than before the pandemic. The €672 billion EU COVID recovery fund is about to flow to national governments, a third of which is earmarked for green investments, including transport. EPHA's call is based on a new CE Delft study "Air pollution and transport policies at city level" (see: <https://epha.org/air-pollution-and-transport-policies-at-city-level/>). Researchers looked at 28 types of urban policies currently running in a host of cities around the world, from zero emission public buses to sharing e-scooters, to see their effect on PM and NOx reductions from traffic. Restricting polluting vehicles from cities like Milan, London, Krakow, and Athens, worked best, cutting PM and NOx pollution from traffic by up to 23% and 36% respectively, and saving the most populated cities up to an estimated €130 million in health and other costs per year. Charging such vehicles to

enter cities like London, Stockholm, Gothenburg, and Milan cut PM by up to 17% and NO_x up to 12%, saving up to an estimated €95 million in social costs. To work well, both types of scheme have to be a significant size and well policed. Cameras to scan vehicles and other infrastructure make both schemes expensive to set up, but charges quickly pay off these costs. Investing pollution charges into more active transport and public space boosts wellbeing and further cuts social costs. By contrast, the cost and availability of municipal parking is cheap to change and since vehicle ownership is strongly influenced by parking availability, this tool is effective. In the few cases it has been used specifically to cut pollution, it achieved 5-10% cuts, the researchers found. Setting aside space for cycling and walking is expensive, particularly in dense cities, relative to the small gains. Publicly subsidized commercial car sharing schemes, like those in Paris, Amsterdam, and Cologne, did little to bring down pollution and only make sense in the biggest cities, according to the CE Delft study. They can also compete with public transport and increase pollution if shared vehicles are old.

Transport & Environment: Pandemic Lockdown Clean Air Gains can be Achieved with Switch to Zero Emission Vehicles – The exceptionally clean air experienced in Europe during the early Covid-19 pandemic can be made permanent through a realistic switch to cleaner transport, according to a new analysis from the European green NGO Transport & Environment (see: <https://www.transportenvironment.org/press/lockdown-anniversary-study-shows-clean-air-possible-without-restrictions>). Released in March 2021, one year after the first lockdowns were put in place in Europe, the study comes as governments prepare to spend nearly €700 billion in EU Covid recovery funds, a third of which is earmarked for green investments, including transport. City bosses can permanently achieve pandemic-low air pollution levels by accelerating the ongoing switch to zero emission vehicles, as well as extra walking, cycling, public transport and teleworking, the researchers found. Cleaner air will return faster if mayors embrace both. This transition is already well underway in many cities and mayors have been redesigning city plans to make space for active mobility and physical distancing. In Budapest, Brussels, Berlin, and London, a switch to zero emission vehicles alone would suffice, even assuming limited availability of electric vans and trucks. Between 42% (Budapest) and 92% (London) of all kilometers driven by cars would need to switch to zero emission. Madrid and Paris saw particularly strong reductions of NO₂ pollution, so only a combination of zero emission vehicles and reduced car use can replicate lockdown levels. In Madrid, 10% of all kilometers travelled by light and heavy-goods vehicles, as well as 94% of car kilometers, would have to go zero emissions. In Paris, 67% of all kilometers driven by cars, vans, and trucks need to go zero emissions. In a future without ICEs in cities, the study finds that NO₂ pollution from traffic would be eliminated and small particles (PM_{2.5}) would be cut by up to 66%.

ACEA Publishes 2020 Market Statistics on Global Vehicle Registrations and EU Truck Registrations – In March, the European Automobile Manufacturers' Association (ACEA) published its 2020 Economic and Market Report on the state of the EU auto industry. This report provides information on global vehicle registrations and production as well as exports and imports. The number of passenger cars sold worldwide in 2020 fell by 15.3% to 63.4 million, with European sales dropping by 20.6%, in the U.S. by 16.6%, and China by 6.8%. Car production in these regions fell by 22.3%, 17.6%, and 6.4%, respectively. The number of vans, trucks, and buses registered throughout the EU contracted by 18.9% last year to 1.7 million units overall. Within this number, the medium and heavy commercial vehicle category fell by

25.7% to 247,499 units for the full year. New bus and coach registrations throughout the EU contracted by 20.3% in 2020 to 29,147. European production meanwhile fell by 17.7%, with corresponding production in South America dropping by 20%, China by 14.6%, and Japan and Korea combined falling by 16.3%. The ACEA 2020 market report is available at: <https://www.acea.be/statistics/article/economic-and-market-report-state-of-the-eu-auto-industry-full-year-2020>. ACEA in a separate report published details of the fuel types of new trucks registered in the European Union in 2020. Last year, diesel still dominated EU truck registrations in terms of market share (96.4%), while gasoline made up only 0.1% of total demand. Electrically chargeable vehicles accounted for 0.5% of all new trucks registered across the EU, while all alternatively powered vehicles (APVs) combined held a market share of 3.5% in 2020. This ACEA truck market report is available at: <https://www.acea.be/press-releases/article/fuel-types-of-new-trucks-diesel-96.4-electric-0.5-alternative-fuels-2.9-mar>.

Swiss Researchers Publish Life Cycle Assessment for Medium- and Heavy-duty Trucks – Swiss researchers have used the transparent, flexible, and open-source Python library *calculator_truck* program (developed by the Paul Scherrer Institute) to perform a life cycle assessment of a series of medium- and heavy-duty trucks across different powertrain types, size classes, fuel pathways, and years in a European context. The results are presented in a new publication available from *Environmental Science & Technology* (see: <https://pubs.acs.org/doi/10.1021/acs.est.0c07773>). Unsurprisingly, greenhouse gas emissions per ton-km reduce as size and load factor increase. By 2040, battery and fuel cell electric trucks appear to be promising options to reduce greenhouse gas emissions per ton-km on long distance segments, even where the required range autonomy is high. This requires that various conditions are met, such as improvements at the energy storage level and a drastic reduction of the greenhouse gas intensity of the electricity used for battery charging and hydrogen production. Meanwhile, these options may be considered for urban and regional applications, where they have a competitive advantage thanks to their superior engine efficiency. Finally, these alternative options will have to compete against combustion-based technologies which, despite lower drivetrain efficiencies, are expected to reduce their exhaust emissions via engine improvements, powertrain hybridization, as well as the use of biomass-based and synthetic fuels.

German Court Rules Audi Not Liable for Compensating Owners unless Audi Bosses Knew about Diesel Cheat Devices – On March 8, 2021, Germany's Federal Court of Justice ruled that the auto manufacturer Audi is not immediately liable to pay compensation for its parent company's role in rigging diesel emissions. Liability could shift to the Volkswagen subsidiary if it can be shown that bosses there knew that unauthorized technology had been installed in vehicles when they put them on the market. Judges had indicated that it would be difficult to prove Audi's liability, as a subsidiary of Volkswagen, in installing the so-called defeat devices from the parent company. Tens of thousands of vehicle owners in Germany are entitled to damages after a 2020 landmark court ruling on the Volkswagen diesel scandal. However, it was unclear whether the liability could also be applied to Volkswagen's subsidiary Audi. The ruling sends the decision back to lower court judges in the town of Naumburg, who said Audi should also pay out some €20,000 (US\$24,226) plus interest. The lower court judgment was based on Audi having known about the devices being installed. The Federal Court of Justice has now ruled that this needed to be proved in the lower court. The plaintiff in the latest case directly sued Audi rather than the Volkswagen Group, which developed the diesel engine in his

car. The man had bought the Audi A6 Avant, with the manipulated software installed in the vehicle, in May 2015. Despite a recall campaign and updates being installed on affected cars, the individual wanted to return his car in exchange for the purchase price. An engine developer for Audi told a court in October 2020 that the company's leadership had at least some knowledge of software to rig emissions tests being installed in thousands of vehicles. Volkswagen has always insisted that a handful of lower-level employees were responsible for the scam, without the knowledge of their superiors.

VW to Seek Damages from Former Executives for Diesel Scandal – Volkswagen is seeking damages from two former top executives for their role in the diesel emissions scandal that cost the German automaker billions of euros and a hefty dent in its reputation. VW said after a board meeting on March 26, 2021 that it wants damages from ex-chief executive Martin Winterkorn and Rupert Stadler, the former head of its Audi brand, “on account of breaches of the duty of care under stock corporation law.” In its statement, the company didn’t specify the amount of damages it would seek. VW said a law firm the supervisory board tasked with investigating liability issues reviewed millions of documents, conducted hundreds of interviews and “concluded that negligent breaches of duty had occurred” by the two executives. The probe found that Winterkorn allegedly “breached his duties of care (...) by failing, in the period from July 27, 2015 on, to comprehensively and promptly clarify the circumstances behind the use of unlawful software functions” in 2.0 TDI diesel engines sold in the North American market between 2009 and 2015. “Prof. Winterkorn also failed to ensure that the questions asked by the U.S. authorities in this context were answered truthfully, completely and without delay,” it said.

First Stage V Retrofit Solution Approved in UK for Diesel Generators – Eminox announced in March that it is the first company to receive approval from the official UK NRMM Retrofit Accreditation Scheme (RAS) for an EU Stage V emissions solution for constant speed engines, and has launched retrofit exhaust aftertreatment systems covering 37 to 560 kW engine power outputs, accredited by the UK Energy Saving Trust. Fully integrated into generators, Eminox’s new EMx S5 range prolongs the life of existing machinery, avoiding the requirement to replace them with newer models. Falcon Tower Crane Services has worked with Eminox to retrofit its generators to address emissions compliance. It runs a fleet of more than 60 diesel generators. “We collaborated with Eminox and they delivered a low-cost solution to support our business requirements now and in the future,” said Falcon’s generator manager, Andy Teanby. “Our adoption of this retrofit emissions reduction technology enables us to meet Stage V emissions standards, which is required on HS2 high speed rail project sites, and also comply with the medium combustion plant directive (MCPD) standards in London.” This DPF+SCR retrofit allows diesel generators to comply with London’s NRMM low emission zone requirements, which came into force on March 1, 2021.

Highly Loaded Pt/CeO₂ Catalysts Found to have High CO Oxidation Activity at Sub-ambient Temperatures – A collaboration between researchers from the University of Barcelona and from the Boreskov Institute of Catalysis of the Russian Academy of Sciences in Novosibirsk, Russia opens the way for reducing emissions of automotive pollutants at low ambient temperatures. In a recent study published in *Applied Catalysis B: Environmental* (see: <https://www.sciencedirect.com/science/article/abs/pii/S0926337321000576?via%3Dihub>), the scientists present design principles and catalyst syntheses to transform toxic molecules in the air

at temperatures below 0°C. Reducing the operating temperature of oxidation catalysts is important for designing energy efficient processes, extending catalyst lifetime, and abating pollutants, especially in cold climates. In this study, high CO oxidation activity at sub-ambient temperatures is reported for Pt/CeO₂ catalysts with high content of Pt in the form of dispersed Pt²⁺ and Pt⁴⁺ centers. Whereas the reference 1 wt% Pt catalyst was active for CO oxidation only above 100°C, the 8 and 20 wt% Pt catalysts converted 60 and 90% of CO, respectively, below 0°C. Ionic platinum was shown to facilitate oxygen release from ceria and lower the light-off temperature of the reaction occurring through the Mars-van-Krevelen mechanism. However, the remarkable activity observed at sub-ambient temperatures for the ≥8 wt% Pt catalysts is proposed to involve O₂ and CO reactants weakly adsorbed on PtOx clusters.

ICCT Report Assesses the Sustainability Implications of Alternative Aviation Fuels

– A recent ICCT working paper (see: <https://theicct.org/publications/alternative-aviation-fuel-sustainability-mar2021>) provides background and analysis to help identify how an effective policy for alternative aviation fuels could distinguish among fuels that can deliver deep greenhouse (GHG) reductions and those that cannot. It provides an overview of the life-cycle GHG emissions attributable to the production of sustainable aviation fuels (SAFs) from a variety of conversion processes and feedstocks. Taking into account each fuel pathway's GHG emissions and other sustainability considerations, the analysis assesses which SAF pathways are likely to play a meaningful role in European climate policy. The analysis finds that wide variation in climate impacts across different SAF feedstocks and conversion technologies illustrates that simply displacing petroleum jet fuel with any alternative jet fuel will be insufficient to drive deep de-carbonization in aviation. ICCT believes it is critical that European policies incentivize those fuels which offer the highest GHG savings estimated on a life-cycle basis. In particular, hydro-processed esters and fatty acid (HEFA) fuels are often made from feedstocks with high, indirect life-cycle emissions that undermine their supposed greenhouse gas savings. In contrast, many fuels made from by-products, wastes, and residues can offer substantial carbon savings but may be more difficult to produce. Strong sustainability protections will be necessary to ensure that SAF policies do not undermine their goals by diverting feedstocks with high-value existing uses. Similarly, ICCT finds that electro-fuels will not be able to generate meaningful GHG reductions without corresponding protections to ensure they are produced using additional, renewable electricity.

News from Africa and the Middle East

UNEP Launches Electric Bike Pilot Project in Kenya – The UN Environment Program (UNEP) on March 2, 2021 launched a pilot electric bikes project in Kenya's capital, Nairobi, setting the ball rolling for Africa's shift to electric mobility. The project which saw 49 motorcycles from China's Tailing Technology Group made little noise but raised much interest in Nairobi's Karura Forest with forest rangers, aims to help policymakers assess the barriers in uptake of the much-needed technological shift towards electric bikes, and to demonstrate that the shift is feasible and within reach. Joyce Msuya, UNEP deputy executive director said Kenya is importing more motorcycles than cars, doubling its fleet every 7-8 years, noting that the motorcycles are generally inefficient and poorly maintained with high tailpipe emissions. "Kenya's electricity is very green in 2019 with more than 80% generated by hydro, solar,

geothermal, and wind. Shifting to electric bikes in Kenya, Rwanda, Uganda and elsewhere will reduce costs, air pollution and greenhouse gas emissions, as well as create jobs," Msuya said in a statement issued after the launch. The pilot project which was rolled out in four locations in Kenya is expected to expand in an effort to reduce air pollution, improve national energy security, and create green jobs. The number of Kenya's newly registered motorcycles, commonly used as taxis (boda-bodas), was estimated in 2018 at 1.5 million and will likely grow to over five million by 2030, according to UNEP. It said though developing countries have the fastest growing fleets of bikes, most lack vehicle emissions standards or programs and incentives to promote zero emission vehicles.

News from the Americas

ICCT Debunks Truck Industry Arguments for the Pandemic-related Delay in Mexico's NOM-44 Regulation – An ICCT blog posted in mid-March debunks truck industry arguments made in Mexico to delay Mexico's NOM-44 Euro VI/U.S. 2010 requirement for new heavy-duty engines by one year to January 1, 2022. In the blog (see: <https://theicct.org/blog/staff/retraso-de-nom-044-mar2021>), ICCT asserts that the industry's argument for a pandemic-related delay is invalid for the following reasons:

- Sales of the Mexican domestic market of heavy vehicles have already recovered to the same level as in the months prior to the start of the pandemic in Mexico.
- National sales in Mexico represent only 20% of the total sales of heavy-duty engines produced in Mexico annually.
- 98% of exports from Mexico go to the U.S./Canada, vehicles that comply with U.S. EPA 2010 standards - the same class of engines that Mexico decided to delay by one year.

Based on Mexico's national sales averages and the age of the Mexican fleet, ICCT estimates that there will be approximately 40,000, dirtier Euro V vehicles that will be sold in Mexico during 2021 due to the delay in NOM-44.

Zero Emission Buses in Bogotá from 2022 – In December 2020 Bogotá's Mayor's Office and the Bogotá Council approved an agreement associated with the city's climate emergency declaration that sets the goal of only allowing zero-emission buses to be purchased for Bogotá's Transmilenio transit system as of 2022. The declaration establishes guidelines for adaptation, mitigation, and resilience to climate change in the city for the coming decades. Among the established goals are a 50% reduction in greenhouse gases by 2030 and conversion to carbon neutrality by 2050. This achievement makes Bogotá the first city in the region to establish tangible strategies through municipal statute. Bogotá is now a national benchmark by advancing the deadline established by the Columbian national government in Law 1964 by thirteen years, which requires that all vehicles purchased in the country's mass transportation systems must be zero emissions as of 2035.

Brazil's Ethanol Producers Push Back on EVs – Brazil's ethanol industry is working with the automotive industry to develop hybrid and hydrogen fuel-cell cars that run on the biofuel, bucking a global trend toward plug-in electric vehicles. Brazilian ethanol experts say plug-in EVs in the U.S. and EU are often charged with fossil fuel-based power generation such as coal, and emissions are higher. According to European data, the average EV produces 92

grams of CO₂/km, says Plinio Nastari, founder of agricultural analysis group Datagro. "And we are not even talking about the mining, production and disposal of batteries or the additional infrastructure needed for building charging stations." In comparison, current flex-fuel combustion engines widely used in Brazil using hydrous ethanol produce 58 g/km of CO₂. Even if the car is fueled with gasoline blended with only 27% anhydrous ethanol, emissions are still lower than an EV at 87 g/km, Nastari said. Toyota is already producing Corolla and Corolla Cross models in Brazil with ethanol, conventional hybrid technology. Toyota recently invested R1 billion (US\$178.5 million) to adapt its plant in Sao Paulo state to produce the Corolla Cross. On average, hybrid engine technology fueled by ethanol produces only 29 g/km of CO₂, Nastari said. Brazilian energy and logistics conglomerate Cosan, which controls Brazil's biggest sugar and ethanol milling group Raizen, compared its sugar cane operations to the carbon sequestration of EV leader Tesla. "In the 11 years of its existence, Tesla has reduced carbon emissions by 3.7 million tons of CO₂, while Raizen reduced emissions by 5.7 million tons in just the last year," Raizen chief executive Ricardo Mussa said. Even Brazil's EV association ABVE says plug-in-only vehicles are unlikely to gain significant market share in Brazil because of the high cost of electricity and greater potential for hybrid and fuel-cell vehicles that use ethanol. EV sales in Brazil jumped by 66.5% year on year in 2020, but the bulk were hybrids. Brazil currently has just 350 EV charging stations, according to ABVE. Longer term, the ethanol industry is betting on hydrogen fuel cells. Brazil's ethanol industry is working with automakers, including Nissan and Toyota, to launch a first commercial hydrogen fuel cell vehicle soon, with prototypes already undergoing tests to run on ethanol.

Hydro-Québec to Commercialize Manganese Hydride Molecular Sieve for H₂ Storage – Hydro-Québec's Center of Excellence in Transportation Electrification and Energy Storage (CETEES) and the University of South Wales (USW in the UK) have signed commercial agreements to transfer patented hydrogen storage technology arising from USW research to Hydro-Québec to enable its commercialization. This technology, a manganese hydride molecular sieve, allows for the hydrogen to be absorbed into a material at higher concentrations and densities. An open-access paper describing the technology was published in the Royal Society of Chemistry journal *Energy & Environmental Science* in 2019 (see: <https://pubs.rsc.org/en/content/articlelanding/2019/EE/C8EE02499E#!divAbstract>). The material takes advantage of a chemical process called Kubas binding. This process enables the storage of hydrogen by distancing the hydrogen atoms within a H₂ molecule and works at room temperature. This eliminates the need to split, and bind, the bonds between atoms, processes that require high energies and extremes of temperature and need complex equipment to deliver.

#