

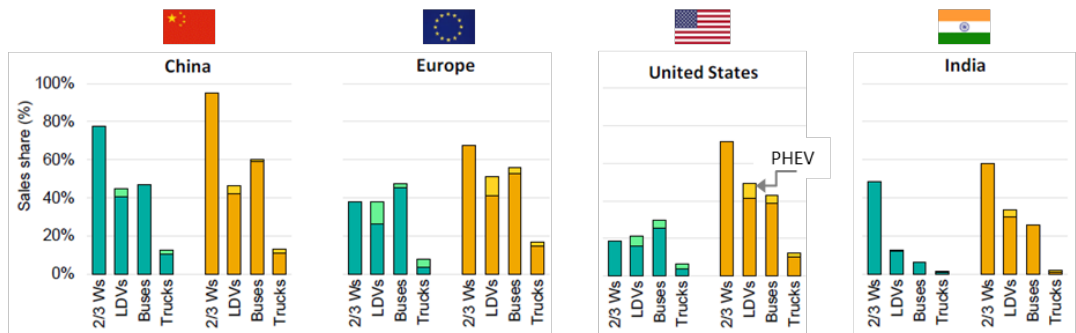
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A Tale of Two EV Outlooks

Global EV Outlook 2022 [published](#) by the International Energy Agency (IEA). A few takeaways –

Plot and table below summarize the 2030 EV projections based on announced targets and stated policies

2030 EV projections according to: **Announced Pledges Scenario** (teal) and **Stated policies scenario** (orange)



Pure EV sales

Category	China	Europe	United States	India
Light-duty vehicles	40%	30 – 40%	15 – 40%	15 – 30%
M-HD Trucks	10%	5 – 15%	5 – 10%	< 5%

Batteries: By 2030, 2.2 – 3.5 TWh of battery capacity will be needed, translating to an additional 52 – 90 gigafactories. Cars account for 85% of the demand. Announced battery production is 4.6 TWh, higher than the demand. However, the bottleneck will be raw material supply. The lead time for a lithium and nickel mine to begin commercial production is 4 – 20 years.

Charging infrastructure: 22 million charging points need to be added each year till 2030.

Electricity: EVs will consume an additional 780 – 1100 TWh of electricity by 2030, which is projected to be only 3 – 4% of the total electricity demand then.

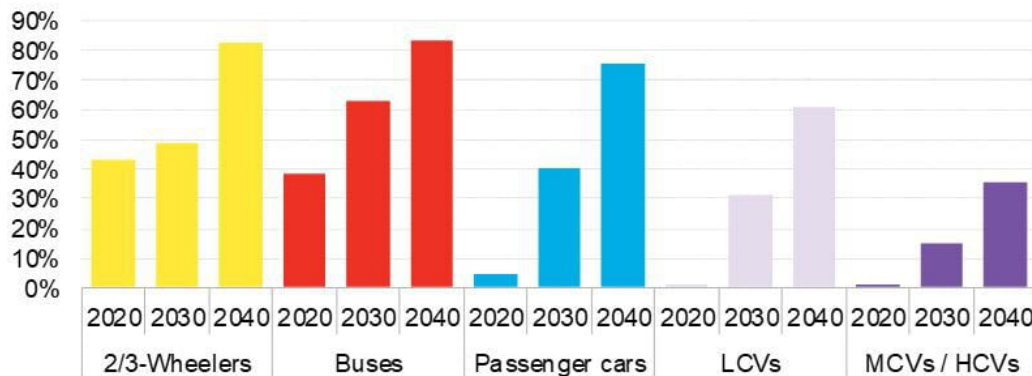
GHG reduction: On a wells-to-wheel basis, electrification in the two scenarios lead to reduced GHG emissions of 460 – 580 Mt CO2-eq. by 2030. This is ~ 7% of the global GHG emissions from the transportation sector in 2019 (8.5Gtons). As reference – Covid led to a 10% reduction.

Electric Vehicle Outlook 2022 [published](#) by Bloomberg

EV market share projections: Scenario driven by techno-economic and market forces

- Global EV share of new passenger car sales: 19% by 2025, 40% by 2030 and ~ 75% by 2040
 - In 2025, 39% share in China and Europe, 15% in the US
- Global EV share of medium and heavy-duty sales: 1/3rd by 2040. Share in EU, US and China at ~ 50%
- Over 80% of new buses sold globally in 2040 are electric
- **800 million ICEs on the road – more than 50% of the fleet**

EV share of global new vehicle sales by segment - Economic Transition Scenario



Source: BNEF

Batteries:

- By 2030, 3.5 TWh of battery capacity will be needed (4.1 TWh has already been announced by 2025). Lithium demand will increase by 3.5X by 2030, leading to a raw material squeeze, but new projects being developed will ease prices in a year. Developing mines has a 2 – 5 year timeline.
- LFP chemistry will account for 42% of the demand by 2023.

Charging infrastructure: 12 – 14 million charging points need to be added each year till 2030 (globally).

Electricity: EVs will consume an additional 980 – 1100 TWh of electricity by 2030, which is projected to be only 3 – 4% of the total electricity demand then. The demand increases to ~ 10% by 2040 and 15 – 20% by 2050.

GHG reduction: Emissions increase up to 2029 by 7% compared to 2019. Even in 2040, the net reduction from a well-to-wheel basis is ~ 10%, emphasizing the need for increased emphasis on cleaning up the grid and addressing the commercial vehicle sector.

Regulatory Update

EU Environment Committee vote on CO₂ standards for passenger cars and vans

The European Parliament's Committee on the Environment, Public Health and Food Safety (ENVI) [voted](#) in favor of effectively banning internal combustion engines by 2035. The vote supports CO₂ reductions of 20% by 2025, 55% by 2030 and 100% by 2035, compared to 2021. Other demands for an interim target for 2027 and a greater CO₂ reduction target of 75% by 2030 were rejected. Other provisions include:

- Removing incentives for zero- and low-emission vehicles (ZLEVs) and phasing out eco-innovations which currently allow up to 7 g-CO₂/km ([eco-innovations](#) include a range of technologies which save > 1 g/-CO₂/km and have small market penetration, such as LED light, solar roofs, efficient alternators)
- Methodology for life cycle CO₂ emissions including fuel and energy used by vehicles

European Commission REPowerEU Plan

To reduce European dependence on Russian fuels for its energy needs, the Commission [presented](#) the REPowerEU Plan which proposes amongst other measures:

- Increasing renewables target for 2030 to 45%, resulting in 1.2 GW of renewable generation. This exceeds the previous target of 40% set in the Fit for 55 plan. Half envisioned to be achieved by solar photovoltaic.
- Reduce natural gas usage through energy efficiency measures, including in glass and ceramic industries.
- Regulatory measures to increase energy efficiency in the transport sector
- Building 17.5 GW of electrolyzers by 2025 to support 10 million tons of green H₂, and a modern regulatory framework for H₂. 30% of steel production to be decarbonized using some of this green H₂.

US EPA launches Clean School Bus program

As part of President Biden's Bipartisan Infrastructure Law, the EPA [announced](#) the Clean School Bus program which allocates \$500M for replacing older higher polluting school buses. The funding is split evenly amongst zero-emission and "clean" buses, the latter fueled by CNG or propane. Rebates include \$375,000 for replacing a Class 7 bus with a ZEV and \$45,000 for a CNG. That should cover ~640 electric buses and 5,500 CNG or 12,000 propane buses. The current school bus fleet is nearly half a million. The age of school buses is around 10 – 12 years so that most pre-2010 buses would have been replaced anyway.

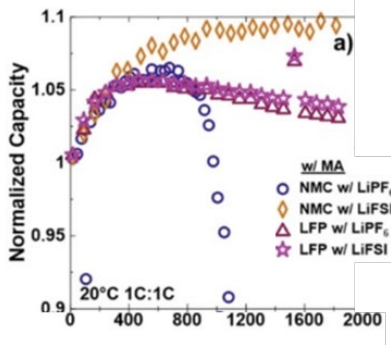
Electrification / Batteries

Largest 800 Class 8 battery truck order

Food distributor Sysco and Daimler Truck North America [announced](#) a letter of intent to deploy 800 Freightliner eCascadia Class 8 tractors by 2026. Through a pilot [demonstration](#) done last year, the company found that an electric truck can serve most of its routes on a single charge while carrying payloads up to a max gross combined weight of 82,000 pounds.

TRATON eyeing e-mobility across all brands

The TRATON group, which includes Scania, MAN, VW Truck and Bus and Navistar, [presented](#) an update on their decarbonization strategy. The group is investing €2.6B in the first half of this decade on e-mobility, targeting battery electric vehicles to become the majority technology for trucks and buses in the next decade. Last year, TRATON, Volvo Group and Daimler Truck [announced](#) a joint venture to create a public network of > 1,700 charging points in Europe, with a view to providing 45-min charging mandated after 4.5 hour long drives in Europe. TRATON is also taking a modular system approach to ensure common components across its major brands.

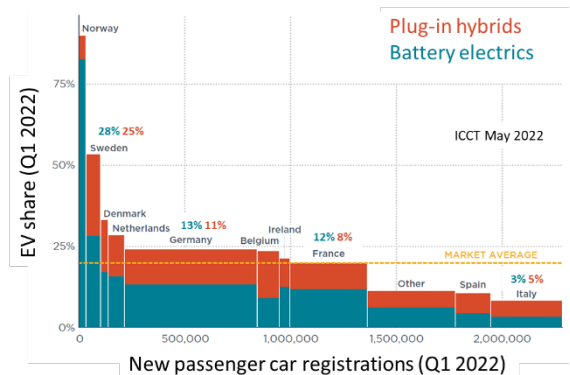


Research shows pathway to 100-year durable battery

A recently [published](#) paper by Tesla's battery research group and Dalhousie University measured performance of NMC532 cells with just sufficient graphite to be charged at 3.8V (rather than > 4.2V) to facilitate comparison with LFP cells. The NMC532 cells paired with electrolytes containing lithium bis(fluorosulfonyl)imide (LiFSI) salt showed better coulombic efficiency and less capacity degradation, projected to last 100 years when operated at 25 °C.

ICCT Fact Sheet on European light-duty vehicle market [published](#)

- Q1 2022 saw 2.3M cars registered in Europe, a 12% reduction vs. Q1, 2021. Registration of commercial vans fell by 21% in the same period.
- Share of EVs for passenger cars was 20%, with BEV share at 11% and PHEV at 9%. For vans, the share of EVs (all BEVs) is 4% on average.
- OEMs are mostly on track to meet the 2022 CO₂ target for cars (VW is 7 g/km over the target). For vans, there is a larger spread, with Stellantis emitting 18 g/km below and Renault-Nissan-Mitsubishi emitting 24 g/km above the 2022 target.



Low carbon fuels

Phillips 66 renewable fuels

Phillips 66 will [invest](#) \$850million to convert its San Francisco Refinery into one of the world's largest renewable fuels facilities. Instead of crude oil, the facility will process waste oils, fats greases and vegetable oils to produce 800 million gallons per year of renewable gasoline, diesel and sustainable aviation fuel starting 2024. The use of these fuels is expected to reduce carbon emissions by ~ 65%, equivalent of taking 1.4 million cars off the road.

H₂ ICE developments

Cummins [debuted](#) a 15L H₂ engine at the ACT Expo this month. The engine is built on the recently announced fuel-agnostic platform which has modified components above the head gasket to match the fuel. The engine is expected to go into production in 2027. A 6.7L engine will also be released later.



Also at the ACT Expo, Westport Fuel Systems [revealed](#) their H₂ HPDI fuel system on a demonstrator truck, running on a 13L turbocharged 6-cylinder engine converted from a diesel to run on H₂. The engine delivers 5 – 10% better thermal efficiency and 20% higher power and torque compared to the base diesel engine.

Don't miss these upcoming events ...

Vehicle efficiency, electrification and emissions conference and Expo, June 8th – 9th, Troy MI and online
<https://gamcinc.com/conferences/emissions/>

DOE Annual Merit Review, June 21-23, Washington D.C and online
<https://www.energy.gov/eere/vehicles/vehicle-technologies-annual-merit-review>

CO₂ Reduction for Transportation Systems Conference, June 21st – 22nd, Turin, Italy
<https://conferences.ata.it/>
