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# Pivoting to an Electrified Future

## The Automotive Industry Amps Up

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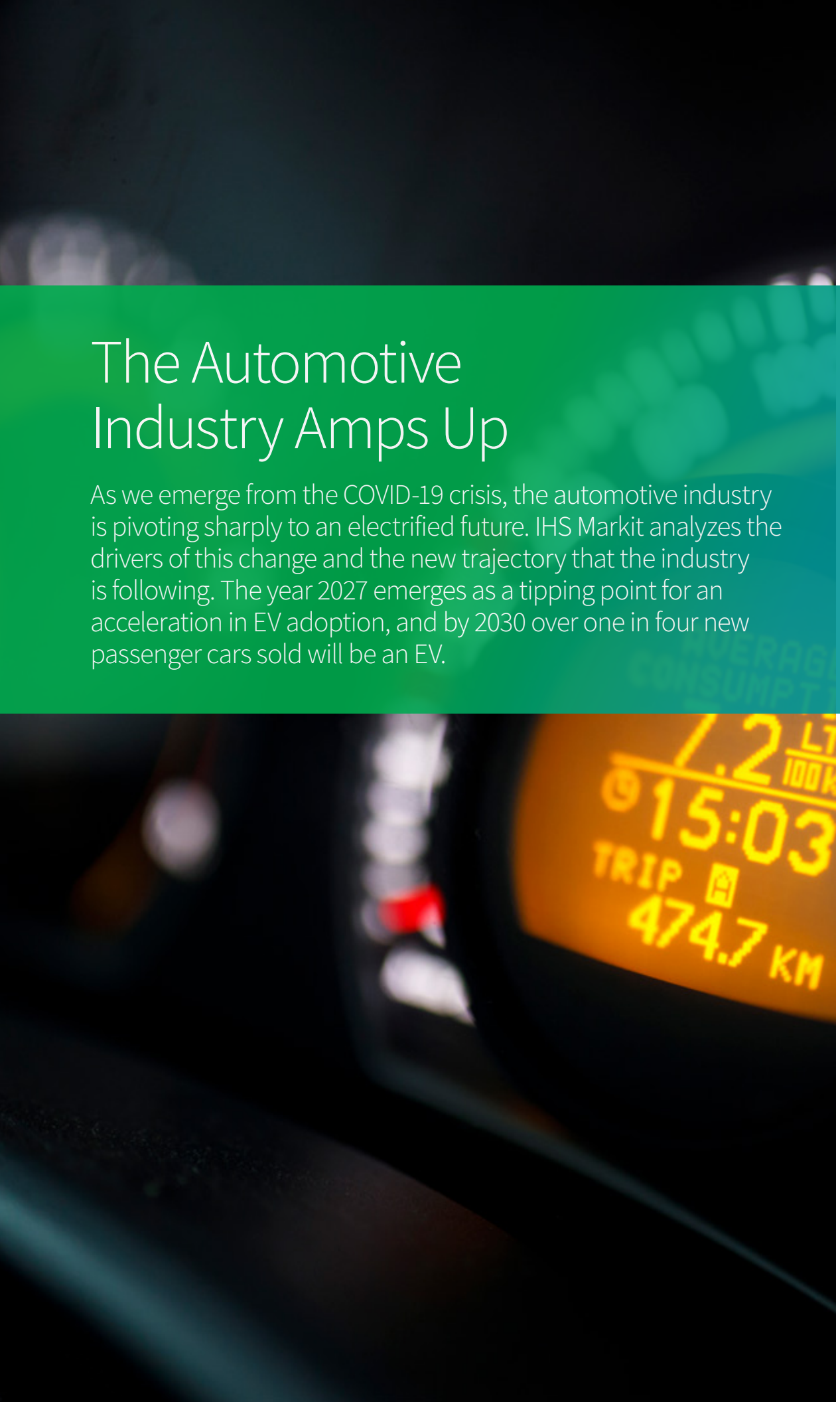



# The Automotive Industry Amps Up

As we emerge from the COVID-19 crisis, the automotive industry is pivoting sharply to an electrified future. IHS Markit analyzes the drivers of this change and the new trajectory that the industry is following. The year 2027 emerges as a tipping point for an acceleration in EV adoption, and by 2030 over one in four new passenger cars sold will be an EV.

The automotive industry is pivoting toward an electrified future driven by the Paris COP-21 agreement and the intensification of green policy initiatives by country governments. The timetable for industry change is now led by legislation rather than the consumer with OEMs announcing aggressive target dates for zero tailpipe emissions.

The world has undergone two significant dislocations in recent years. As of February 2021, 194 states and the European Union have signed the Paris Climate agreement (COP-21), which effectively sets the legislative framework for the decarbonization of the global economy. Policies targeting emissions from transportation, which amount to about one-third of overall greenhouse gas (GHG) emissions in the EU or the US, are becoming a central plank in governmental policy. In addition, as governments grapple with huge adjustments in their fiscal balances after the COVID-19 pandemic, an even greater relative focus has been placed on supporting low-carbon growth strategies. The COVID-19 crisis has arguably accelerated the promotion of electrified vehicles as part of an overall green-friendly solution. Rather than resisting this trend, OEMs are now actively embracing it, with many planning to go completely electric. In consequence, IHS Markit has significantly increased its forecasts for global electrification. The year 2027 emerges as a tipping point after which rates of electric vehicle (EV) sales will rise sharply. By 2030, one in four new passenger car sales will be fully electric. This article seeks to outline the key drivers of this new accelerated trend and their impact on the industry's propulsion choices. This high-level assessment of the forecast will be incorporated into each of the IHS Markit forecast product sets in the upcoming months.

## Legislative forces become irresistible

The Paris accord set target levels for global decarbonization (see table). Achieving a target of a 55% reduction in greenhouse gas emissions by 2030 in the EU will require action across all sectors, including the three largest contributors of transport, industry, and power generation. While the precise sectoral contributions to this target are somewhat fungible, it is clear that transport will need to be heavily decarbonized in the coming years in all the major industrialized economies. Legislation to this effect is now being tightened significantly in the three major geographies (US, Europe, and mainland China).

**Emissions Levels and Climate Change Commitments**

| Country/ Region | All sector emissions $CO_2$ (mt $CO_2$) | Transport sector emissions $CO_2$ (mt $CO_2$) | Transport sector (%) | Net-Zero target date | Transport sector $CO_2$ pledge |
|---|---|---|---|---|---|
| Mainland China | 9,497 | 925 | 9.7% | 2060 | 60–65% carbon intensity reduction from 2005 levels by 2030 |
| US | 4,921 | 1,762 | 35.8% | 2050 | 26–28% reduction by 2025 from 2005 levels. * |
| EU | 3,150 | 928 | 29.5% | 2050 | Net zero goal for 2050, seeks 90% $CO_2$ reduction from 1990 levels by 2050 for a sustainable transport system |

Source: IEA, 2018 figures. At the time of writing the US was about to announce targets of up to 50% reductions on 2030 levels.

In Europe, $CO_2$ targets for passenger cars by 2030 are now likely to move to a 55% reduction on 2021 levels as measured by the World Harmonized Light Vehicle Test Procedure (WLTP). The current target reduction is 37.5%. Although not formally agreed yet, IHS Markit analysts expect an EU-wide internal combustion engine (ICE) phase-out by 2040 or before. In fact, there are nine EU member states lobbying for a phase out by 2035 or earlier. Ultimately even more stringent $CO_2$ measurements are likely to be adopted, which will include the entire manufacturing process. The EU will decide in 2023 on proposals to include this full Life Cycle Assessment (LCA) starting in 2026–27. OEMs are already beginning to adopt low-carbon supply chains; a recent signal of this is an agreement between Audi and Alcoa to source zero-carbon aluminum for its E-tron model wheels.

In the US, the Joe Biden administration is laying down strong markers that it is much more serious on climate change than the previous administration. It has rejoined the Paris accord and is pressing for significant decarbonization upstream in the fossil fuels industry. For example, the Securities and Exchange Commission (SEC) recently gave direction to Conoco Philips and Occidental Petroleum Corp to hold shareholder votes on far-reaching new emission targets. At the time of writing it was considering increasing its targets to around a 50% reduction on 2005 levels by 2030.

Currently, in the automotive sector, the US is tied to the Safer Affordable Fuel-Efficient (SAFE) rules up to model year (MY) 2026. These rules require a relatively small 8.5% increase in fuel economy in the five-year period to MY 2026. Starting with MY 2027, IHS Markit analysts assume that the Biden administration will revert to the more stringent rules under the Barack Obama administration (starting at around 57.7 mpg for passenger cars in 2027). Furthermore, IHS Markit analysts expect five states (California, Washington, Massachusetts, Rhode Island, and New York) will ban ICE vehicles by 2035. As seen with the decline of diesel in Europe (in that case, city-level banning of diesels), tight regional legislation can set the tone for a rapid decline across a whole market.

Meanwhile, mainland China has committed to achieve net-zero emissions by 2060. From an automotive regulatory perspective mainland China is only a few years behind Europe. In 2026, the Phase 6 emission legislation for passenger vehicles will be introduced and could have quotas of 25% new-energy vehicles (NEVs). NEVs are defined as pure battery-electric vehicles (BEVs) and plug-in hybrid vehicles (PHEVs). There could also be tighter Corporate Average Fuel Consumption (CAFC) fuel economy targets of 4.65l/100kms for new vehicle sales.

## COVID-19, the unlikely electrification accelerator

One of the side effects of the COVID-19 pandemic has been the increased focus on a low carbon policies by fiscally constrained governments. Examples of the fallout from the COVID-19 pandemic that are propelling EV adoption forward are:

**The European Green Deal.** This strategy aims to provide the policy tools to ensure that the financial system supports the transition of businesses toward sustainability in a context of recovery from the impact of the COVID-19 outbreak. It will support the creation of an enabling framework for private investors and the public sector to facilitate sustainable investments. Environmental, social, and corporate governance (ESG) compliance will have a direct impact on a company's ability to receive fresh capital from the financial markets.

**Commuter mobility.** The slowdown in commuter traffic has led cities to install nonmotorized transport networks—e.g., dedicated bike lanes in Paris. City legislators are using the COVID-19 disruption to drive nonessential car use from their roads.

**Bonus-malus automotive policies.** Countries are explicitly targeting low-emissions vehicles in their recovery plans for the automotive sector. In France, for example, subsidies of up to EUR7,000 per vehicle are available for the purchase of a zero-emissions vehicle.

**Equity markets.** Massive spending by governments to support their economies is seeping into equity markets. Combined with the low-carbon transformation story, equity prices among EV-intensive OEMs have shot up. At the time of writing (mid-April 2021) Tesla's capitalization of USD675 billion made it more valuable than the next five OEMs combined: Toyota (USD215 billion), Volkswagen (USD162 billion), Daimler (USD97 billion), General Motors (USD86 billion), and BYD (USD69 billion). Additionally, the use of special purpose acquisition companies (SPACs) to take emerging players such as Lucid, Fisker, Reev, and Arrival public has given the sector access to capital at levels unimagined just a few months ago. This capital can be deployed in investments that will accelerate the shift of the global industry toward EVs.

## The economic stars of EV adoption are aligning—2027 is a key tipping point

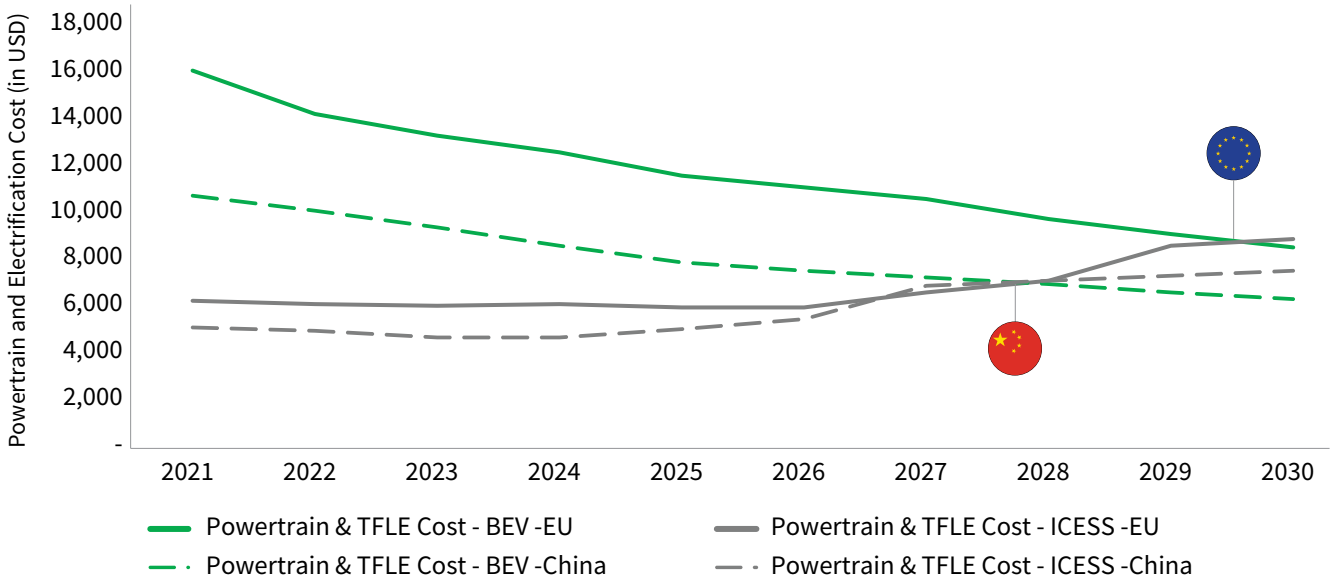
Meanwhile, the economic underpinnings for this EV revolution are beginning to align.

**Range anxiety is being addressed.** As an example, the 2021 Nissan Leaf (62kWh) today has a WLTP certified range of 385Km. With progress in battery technology and energy management, it is possible to imagine a range in 2030 of 600km with a battery that has a larger capacity, lower mass, and lower cost than today.

**Battery costs are falling fast.** Battery costs have already fallen significantly as improved chemistry, economies of scale, standardization of cells, and improved packaging feed into the supply chain. The costs of a battery pack manufactured in mainland China will fall another 30% between 2020 and 2027 to USD98/kWh.

**Manufacturing costs reach tipping point for BEVs by 2027.** As BEV production rises, OEM development costs can be spread over more vehicles, thus reducing the cost per vehicle; meanwhile, the reduced output of ICE vehicles will work in the other direction. This effect is compounded by the relative simplicity of a BEV powertrain that contains 20 moving parts compared with an ICE powertrain that contains nearly 2,000. When one considers powertrain costs and associated tooling, facilities and launch engineering costs (TFLE), the tipping point for cost parity of a typical C- and D-segment passenger vehicle will be 2030 in the EU and 2027 in mainland China (see chart). Beyond these dates, the vehicle-cost gap will increasingly favor BEVs relative to ICEs.

**Cost tipping point in BEVs is Reached by 2027 in China and 2030 in Europe**




Source: IHS Markit. Assumptions : C&D- Segment, EU Battery pack cost : 2020 ($ 153/kWh) 2030 Tipping Point ($ 102/kWh).
China Battery pack cost : 2020 ($ 130/kWh) 2027 Tipping Point ($ 98/kWh). ICE : Internal Combustion Engine Vehicle with start stop

**EV vehicle prices will reach parity by 2027. I**ncluding incentives, price parity between comparable BEVs, ICE vehicles, and hybrids largely exists today. The Volkswagen ID.3 with incentives is often at parity versus the Golf at about EUR31,000 in major European markets. As the costs come down, even the unincentivized list price of a private vehicle is likely to reach parity by 2027. On a total cost of ownership (TCO) basis it could reach parity even earlier. By 2025, a Volkswagen ID.3 is assumed to have a TCO advantage of EUR4,100 over an equivalent Golf model. Beyond 2027, BEV pricing is likely to be more competitive than an equivalent ICE vehicle.

**Infrastructure is a key enabler.** Infrastructure's role as an enabler of this transition is well documented. Obviously any infrastructure gap will slow the deployment of EVs across global markets. IHS Markit analysts calculate that there are currently about 290,000 publicly accessible EV charging points in the EU27+1 countries to serve a vehicle parc of around 1.66 million full battery-electric vehicles in 2020, giving a ratio of around 5.7 BEVs per public point. Calculating the optimum ratio is highly geo-specific and depends on varying plug-in capable propulsion systems (i.e., BEV, PHEV, REEV, etc.), electric ranges of these vehicles, and use cases. Adding complexity to this conundrum is the extent to which charging needs might be met at home or at the workplace, which will vary significantly by country and by sub-geography.

**The tax burden is shifting.** One challenge for governments will be how to replace taxation revenues generated from fossil fuels. Fuel taxes in the US, for example, raised nearly USD50 billion in 2018. It is not clear where these revenues would be levied across a highly electrified EV fleet. Although note that it will likely take another 10 years for electrification to penetrate the car parc (vehicles in operation) before the effect of reduced revenues fully materializes. Governments will therefore have a grace period in which they can adjust to the new fiscal reality, which will likely be felt near 2040 and after.

## OEMs adopt the EV narrative en-masse

Such is the power of these forces that full-scale transformation is now inevitable. OEMs are embracing a shift that is arguably running ahead of a consumer who is still ambivalent toward these new technologies. In recent months, Jaguar, Volvo, Mini, Bentley, and Ford Europe have announced ambitions to become BEV-only brands by 2030. Other brands are striving to make BEVs their major propulsion system by then (see table). Naturally, IHS Markit analysts expect a rapid rise in the number of BEVs coming to market. In 2020, there were a total of 335 separate BEV models on sale. By 2030 this will have risen to over 800 models. By that time the number of models in the market will no longer be a constraint to consumer demand. Nonetheless, the consumer will still play a pivotal role in determining whether these lofty OEM ambitions can be reached on the expected timescale.

**OEM announced ambitions: BEV sales shares by brand**

| OEM brand | Date | BEV target |
|---|---|---|
| Alpine | 2025 | 100% |
| Aston Martin | 2030 | 50% |
| Audi | 2040 | 90% |
| Bentley | 2030 | 100% |
| BMW | 2030 | 50% |
| Ford Europe Passenger Cars | 2030 | 100% |
| GM | 2035 | 100% |
| Hyundai Motor Corp | 2040 | 78% |
| Kia Europe | 2030 | 47% |
| Kia Worldwide | 2030 | 34% |
| Jaguar | 2027 | 100% |
| LandRover | 2036 | 100% |
| Lotus | 2030 | 100% |
| Mercedes-Benz | 2039 | 100% |
| Mini | 2032 | 100% |
| Porsche | 2030 | 80% |
| Renault | 2025 | 30% |
| Rolls-Royce | 2040 | 100% |
| Smart | 2019 | 100% |
| Volvo | 2030 | 100% |
| VW Group worldwide | 2030 | 50% |
| VW Group Europe | 2030 | 60% |
| VW Brand Europe | 2030 | 70% |

Source: IHS Markit. Notes: Ford 100% only applies to European passenger cars. Alpine: Depending on production phase out of A110. Aston Martin:50% of production BEV, 5% track only ICE, rest Hybrid. Road car BEV share thus planned slightly higher than 50%. Audi:Shortly before 2040 almost the entire portfolio BEV. Ford Europe Passenger Cars:LCV to be 2/3 xEV (PHEV + BEV).GM:Towards 100% but with exceptions. Jaguar:Only BEV launches from 2025 but ICE phase out in 2027.Lotus:Last non-BEV launch in 2021 (Type 131), ICE phase out depending on production life-cycle. Mercedes-Benz: Consideration to move the target forward to 2035.Mini:last non-BEV launch in 2025, ICE phase out depending on production life-cycle, Mini mentions “early 2030’s”.

Against this background, the strategy for most OEMs is clear; there is no alternative but to fully commit to electrification. With significant upfront investments being committed, they are hoping that the price parity on EVs from around 2027 will mean the consumer progressively convert to EVs, allowing them to reach scale and profitability on their EV investments.

## Outlook for EV adoption is revised up significantly

As a result, IHS Markit has significantly revised up its EV penetration forecasts. The forecasts for global BEV passenger car sales as of this writing are 23.5 million in 2030—approximately 26.4% of total global sales of 89 million cars.

**The EU leads the way.** The EU has the strongest regulatory pressure and shows the highest OEM ambition to phase out the ICE. About 50% of passenger cars sold in 2030 will be a BEV compared with 41% in the previous forecast setting of first quarter 2021.

**Mainland China rises fast.** IHS Markit analysts expect NEV sales in mainland China to be around 38% by 2030, and at least 45% by 2035. Government targets by 2050 will likely be close to 100%, so the mainland Chinese market at that point would be nearly entirely dedicated to NEV vehicles.

**The US catches up.** Under the assumption of progressively tightening legislation and the adoption by five states of a complete ICE ban by 2035, US BEV sales will reach 25–30% of total passenger car sales by 2030 and 45–50% by 2035.

Our upcoming forecasts will incorporate these assumptions and will break these figures into detailed projections by brand, model, and powertrain technology, revealing winners and losers from the ongoing transition. There are a number of risks to these projections, including shifting policy environments and the emerging interplay between consumer and OEM. The deployment of charging infrastructure and the emerging cost profile of BEVs versus ICE vehicles are also important influences of the outlook. Despite these caveats, it is virtually certain that the industry will reach its tipping point by 2027. Beyond that the future will be highly electrified.

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