What is an EV?

An electric vehicle (EV) is a type of vehicle that is powered by one or more electric motors using electricity stored in batteries or obtained from an external source such as a charging station.

Unlike conventional vehicles that rely on internal combustion engines fueled by gasoline or diesel, electric vehicles use electricity to generate the energy needed to propel the vehicle.

There are two main types of electric vehicles:

1. Battery Electric Vehicles (BEVs): These vehicles are powered solely by electricity stored in high-capacity rechargeable batteries. The batteries are typically lithium-ion and provide the energy needed to drive the electric motor, which turns the wheels and propels the vehicle. BEVs do not have an internal combustion engine and produce zero tailpipe emissions, making them environmentally friendly.

2. Plug-in Hybrid Electric Vehicles (PHEVs): These vehicles have both an electric motor and an internal combustion engine. They can be charged by plugging them into an external power source to charge their batteries, and they also have a traditional fuel tank. PHEVs can operate in electric-only mode for shorter distances, relying on the battery, and switch to the internal combustion engine for longer journeys. They offer a combination of electric and conventional driving capabilities.

Pros and Cons of Electric Vehicles

Pros of Electric Vehicles:

1. Environmental Benefits: Electric vehicles produce lower or zero tailpipe emissions, reducing air pollution and greenhouse gas emissions. They help in combating climate change and improving air quality, especially in urban areas.

2. Energy Efficiency: Electric motors are more energy-efficient than internal combustion engines. EVs convert a higher percentage of the energy stored in batteries into motion, resulting in lower energy waste and potentially lower energy costs for the driver.

3. Lower Operating Costs: The cost of electricity is generally lower than gasoline or diesel fuel, making EVs cheaper to operate. Electric vehicles require less maintenance since they have fewer moving parts compared to internal combustion engines, reducing maintenance and repair costs over time.

4. Quiet and Smooth Operation: Electric motors operate silently and offer smooth acceleration, providing a quieter and more comfortable driving experience.

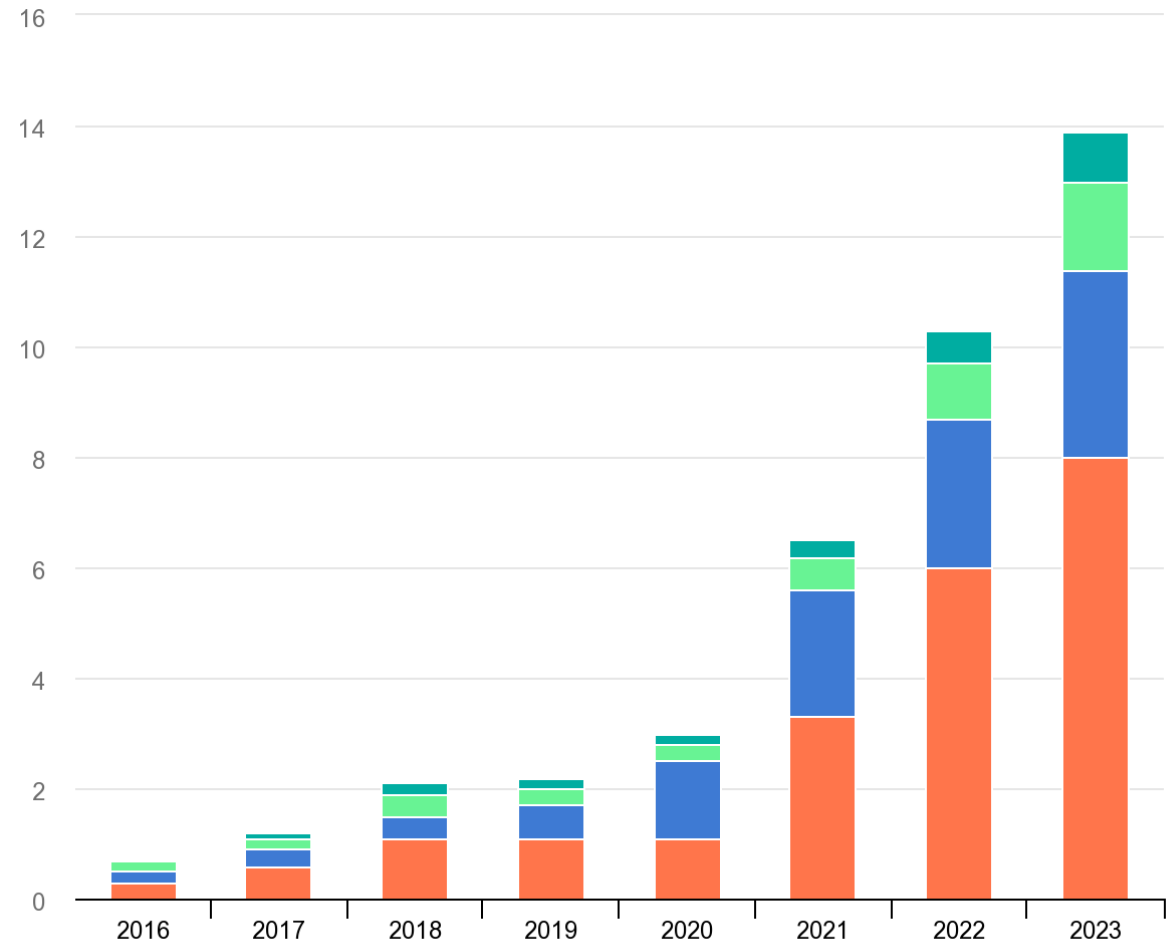
Cons of Electric Vehicles:

1. Limited Driving Range: Compared to internal combustion engine vehicles, electric vehicles typically have a more limited driving range per charge. While the range has been improving with advancements in battery technology, it may still be a concern for drivers who frequently undertake long-distance trips.

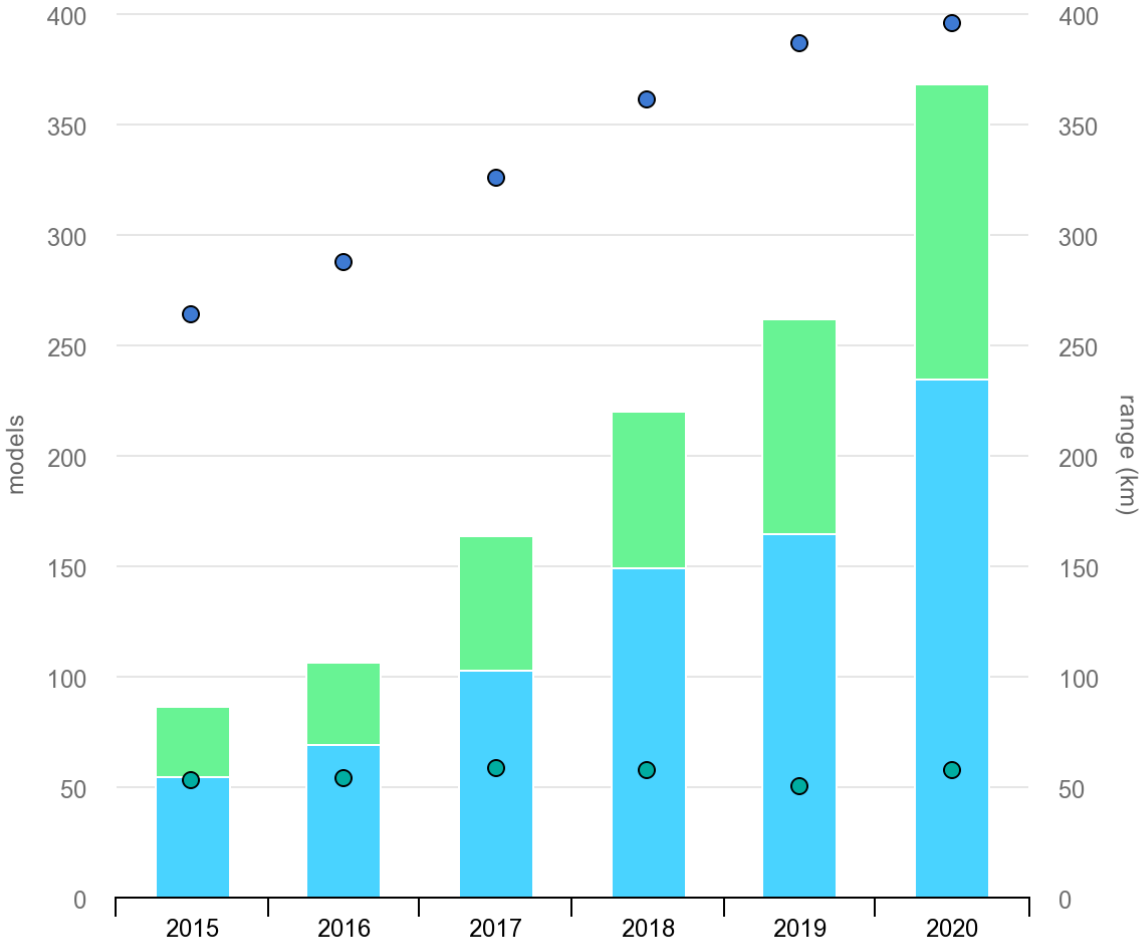
2. Longer Recharge Time: Charging an electric vehicle takes longer than refueling a conventional vehicle with gasoline. Even with fast-charging options, it still takes more time to charge an EV's battery compared to filling up a fuel tank.
3. Charging Infrastructure: The availability of charging stations can vary depending on the region. In some areas, the charging infrastructure may be limited, making it inconvenient for EV owners to find charging stations, especially for those who do not have a private charging point at home.
4. Upfront Cost: Electric vehicles often have a higher upfront cost compared to similar internal combustion engine vehicles. The cost of batteries, which are a significant component of EVs, contributes to their higher price. However, it's worth noting that prices have been gradually decreasing as technology advances and economies of scale are achieved.

International EV Market

After a decade of rapid growth, in 2020 the global electric car stock hit the 10 million mark, a 43% increase over 2019, and representing a 1% stock share. Battery electric vehicles (BEVs) accounted for two-thirds of new electric car registrations and two-thirds of the stock in 2020. China, with 4.5 million electric cars, has the largest fleet, though in 2020 Europe had the largest annual increase to reach 3.2 million.



Overall, the global market for all types of cars was significantly affected by the economic repercussions of the Covid-19 pandemic. The first part of 2020 saw new car registrations drop about one-third from the preceding year. This was partially offset by stronger activity in the secondhalf, resulting in a 16% drop overall year-on-year. Notably, with conventional and overall new car registrations falling, global electric car sales share rose 70% to a record 4.6% in 2020.



Worldwide about 370 electric car models were available in 2020, a 40% increase from 2019. China has the widest offering, reflecting its less consolidated automotive sector and that it is the world's largest EV market. But in 2020 the biggest increase in number of models was in Europe where it more than doubled. Here are some key points regarding the international EV market:

1. Market Growth: The international EV market has been witnessing rapid growth. Sales of electric vehicles have been increasing year over year, driven by a combination of factors such as improving battery technology, expanded charging infrastructure, and a wider selection of electric vehicle models.

2. Regional Variations: The adoption of EVs varies across different regions. Some countries have been at the forefront of EV adoption and have implemented ambitious targets and policies to promote electric mobility. China has been the largest market for EVs, followed by Europe, particularly Norway, Germany, and the Netherlands. The United States is also a significant market for electric vehicles.

3. Government Support: Many governments around the world have implemented supportive policies and incentives to accelerate the adoption of EVs. These measures include financial incentives, tax credits, grants, and subsidies to reduce the upfront cost of electric vehicles and promote the development of charging infrastructure.

4. Charging Infrastructure: The availability and accessibility of charging infrastructure plays a crucial role in the widespread adoption of electric vehicles. Governments and private companies are investing in the development of public and private charging stations to address range anxiety and provide convenient charging options for EV owners.

5. Automotive Industry Transition: The global automotive industry is undergoing a major transition toward electric mobility. Many traditional automakers are investing heavily in the development of electric vehicles and shifting their production focus from internal combustion engines to electric powertrains. This transition is accompanied by technological advancements, increased research and development, and collaborations between automakers and technology companies.

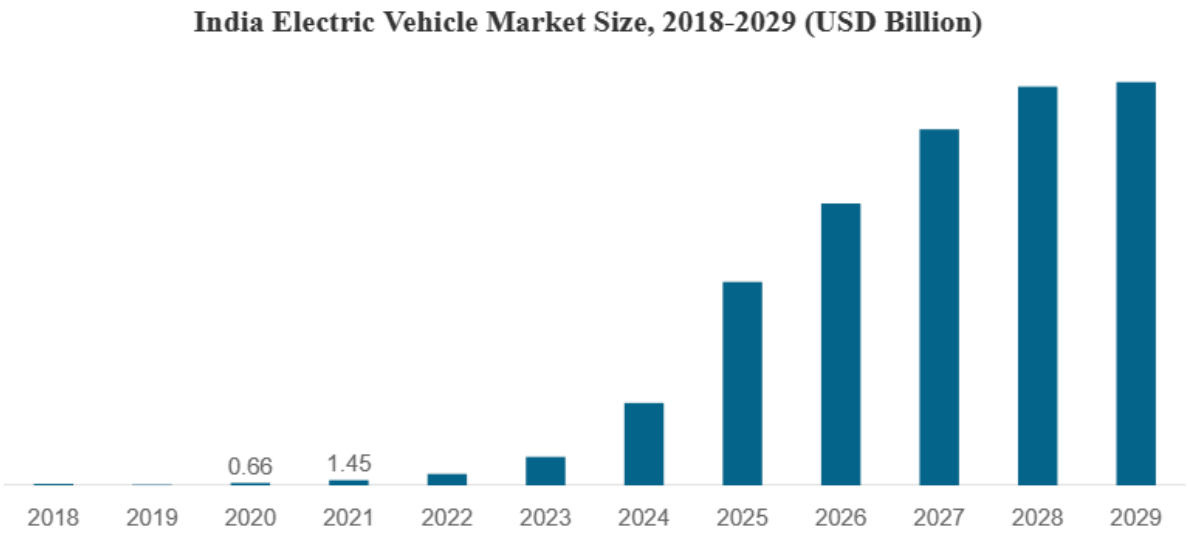
6. Market Competition: The international EV market is highly competitive, with both established automakers and new entrants vying for market share. Established automakers are expanding their electric vehicle offerings, while new players, including startups and technology companies, are entering the market with innovative electric vehicle designs and technologies.

7. Environmental Impact: The growth of the international EV market has positive environmental implications, as electric vehicles produce zero tailpipe emissions and help reduce greenhouse gas emissions and air pollution. The increased adoption of EVs contributes to global efforts to mitigate climate change and improve air quality.

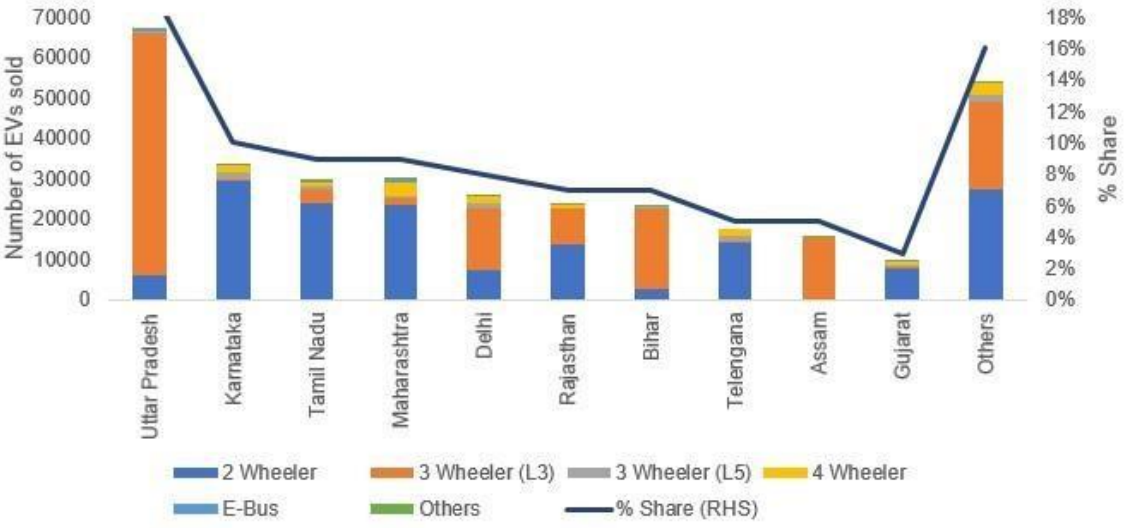
It's important to note that the international EV market is dynamic and constantly evolving. Factors such as government policies, technological advancements, and consumer preferences will continue to shape the growth and development of the global EV market in the coming years.

Indian EV Market

- India electric vehicle market is projected to grow from $3.21 billion in 2022 to $113.99 billion by 2029 at a CAGR of 66.52% in forecast period, 2022-2029 forecast period. Based on our analysis, the Indian electric vehicle industry exhibited a rise of 11.34% in 2020 as compared to 2019.



- Over the last three years, 0.52 million EVs were registered in India, according to the Ministry of Heavy Industries. EVs recorded robust growth in 2021, supported by the implementation of favourable policies and programmes by the government.
- In India, Uttar Pradesh held the highest share in EV sales in 2021, with the number of units sold across all segments reaching 66,704, followed by Karnataka with 33,302 units and Tamil Nadu with 30,036 units. Uttar Pradesh dominated the three-wheeler segment, while Karnataka and Maharashtra led the two-wheeler segment and four-wheeler segment, respectively.



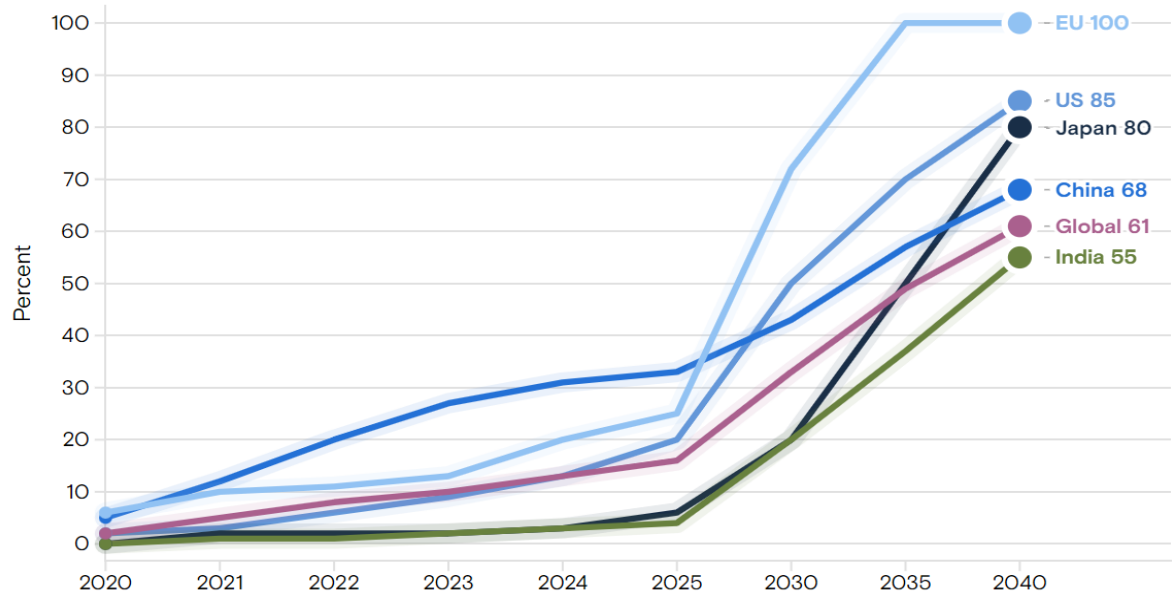
Future prediction of EV world wide

The adoption of electric vehicles is rising sharply as the global push for net-zero carbon emissions accelerates. EVs will make up about half of new car sales worldwide by 2035, according to Goldman Sachs Research.

While the EV sector is beset by some major crosscurrents — rising prices for electrical power, inflation for the materials that make up battery components and government policies like the Inflation Reduction Act in the U.S. and Europe's response to the IRA — our strategists expect technology innovation to supersede these forces in the coming years.

The shift to electric vehicles is forecast to accelerate

Electric vehicle sales ratio (%)



Source: IHS Global Insight, Goldman Sachs Research • 2022-2040 are forecasts

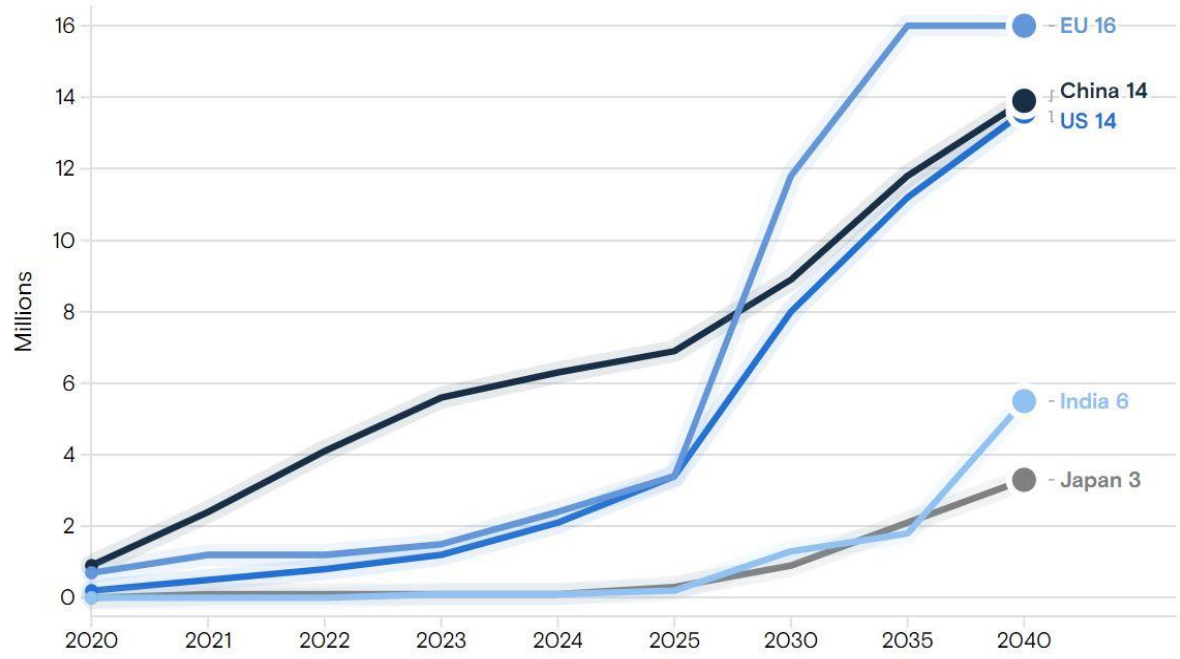
Goldman Sachs

EV sales will soar to about 73 million units in 2040, up from around 2 million in 2020, according to forecasts by Goldman Sachs Research. The percentage of EVs in worldwide car sales, meanwhile, is expected to rise to 61% from 2% during that span. The share of EV sales is anticipated to be well over 80% in many developed countries.

"We expect the automobile industry to undergo a major transformation between 2020 and 2030, driven by the increasing adoption of vehicle electrification and autonomous driving," Goldman Sachs equity research strategist Kota Yuzawa wrote in the team's report. There will be no let-up in the EV industry's expansion as environmental rules tighten and electrification technologies become more sophisticated. But the sector's sources of profits will change dramatically.

EU is forecast to lead sales of electric vehicles

Electric vehicle sales



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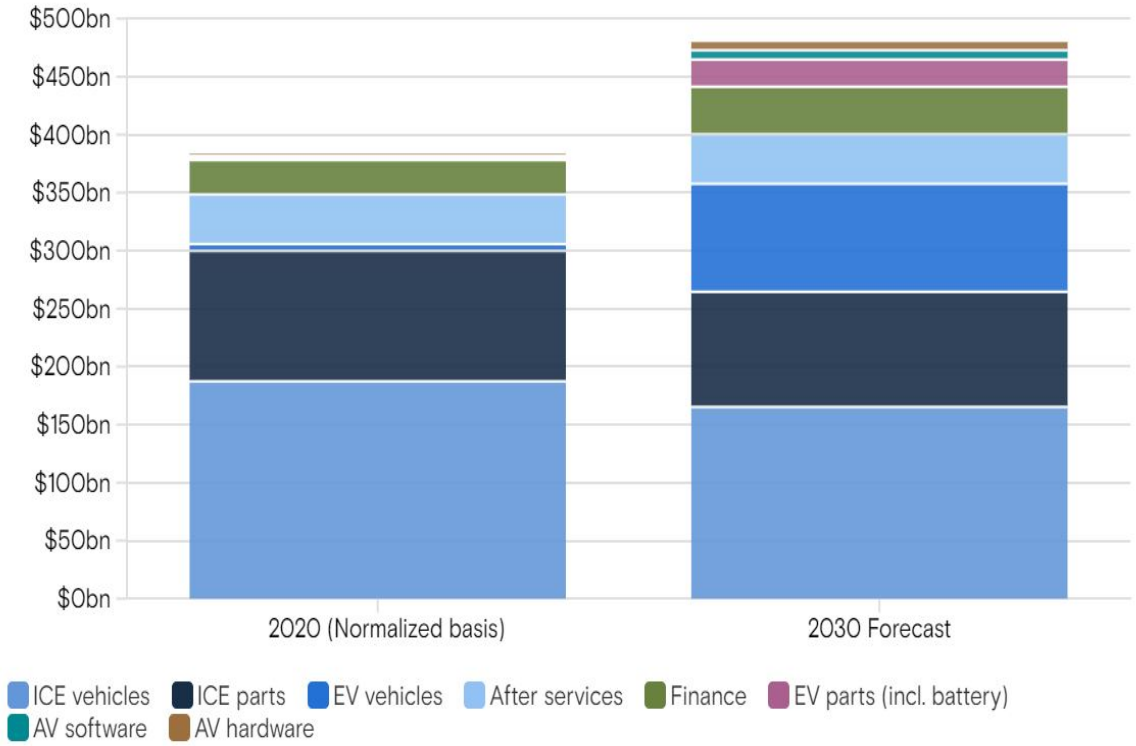
Goldman Sachs

As the ecosystem grows, Goldman Sachs Research expects the way the industry makes money will be transformed. Our strategists forecast sales of EVs to grow by 32% annually this decade, even as sales of products related to gasoline engines slump. The global car industry's operating profits are expected to rise to $418 billion in 2030, up from $315 billion in 2020, while the pool of profits for EVs is forecast to increase to $110 billion from $1 billion.

In the meantime, the market for EV batteries, which account for as much as 40% of the car's cost, is becoming concentrated. The top five battery makers had more than 80% of the global market share in 2020, according to Goldman Sachs Research estimates. By comparison, the top five automakers had about 40% of the worldwide market. Pricing power has shifted to the battery makers, giving them an edge in generating higher earnings. In an attempt to rebalance their pricing power with battery makers, finished-vehicle assemblers are rushing to develop vertically integrated production and joint-venture plants.

The profits produced by electric vehicles are expected to grow rapidly

Profit pool for the global automobile industry



Source: IHS Global Insight, company data, Goldman Sachs Research • 2020 numbers are based on the industry wide average OPM by each segment and not an aggregate of each company's profit pool by segment

Goldman Sachs