# ELECTRIC VEHICLES

INDUSTRY ANALYSIS AND FORECAST

DECEMBER 2021

# CONCLUSIONS

Due to technological innovations, battery costs are expected to gradually decline in next few years.

Incorrys expects that electric cars will reach cost parity with gasoline cars in after 2024. This will lead to significant growth in electric car production.

In 2030, global sales of electric vehicles will reach 38 million, 26% being sold in China.

In 2030, total registered electric vehicles are expected to grow almost 25 times and reach over 200 million.

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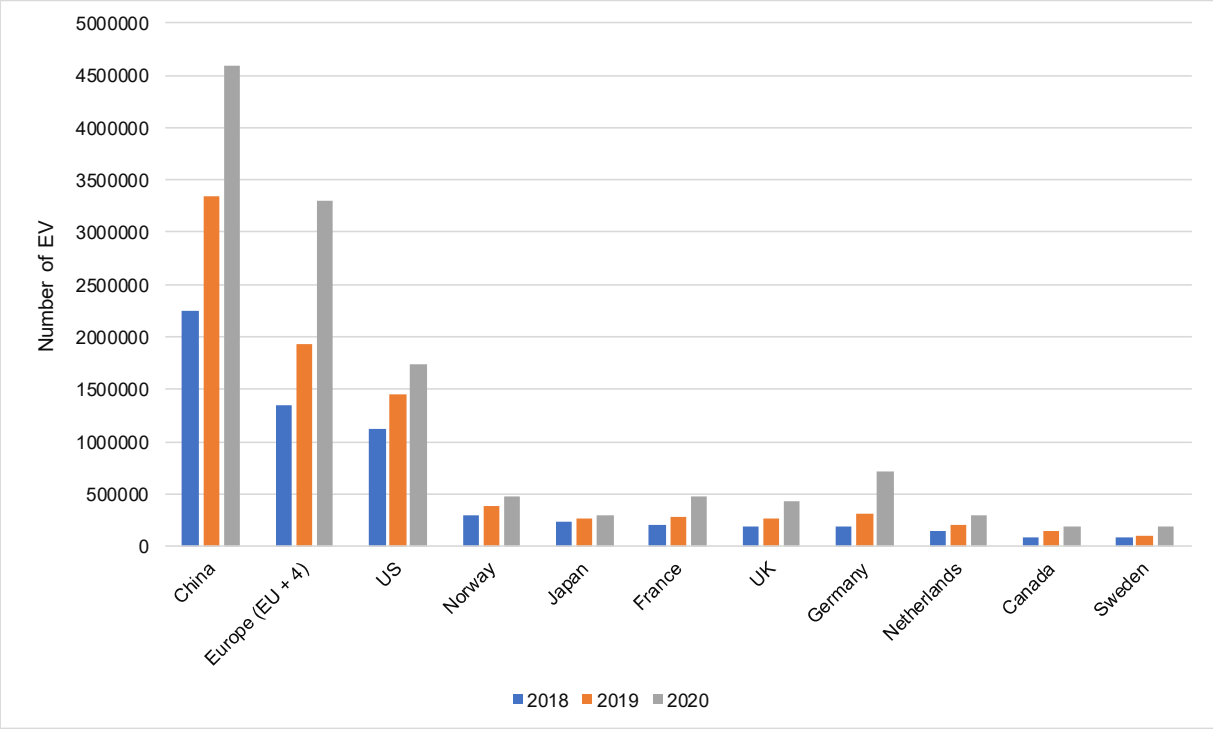
# ELECTRIC CAR STOCK PER COUNTRY




This chart shows the number of light duty battery electric vehicles (BEV)* and hybrid plug-in electric vehicles * (PHEV) from 2018-2020.

In 2020, China had 43% of all EV's compared to the US with just 16%. The number of EV's in China grew 27% in 2020 compared to 2019.

European EV stock** increased 41% compared to 2019, reaching 330,000 in 2020. The fastest year over year growth among large European economies was Germany (57%) and Sweden (50%).

US EV stocks increased by only 17% in 2020 compared to 2019. Most of the growth occurred in California.

The Total number of EV's worldwide in 2020 was 10,800,000 up from just 17,000 in 2010.

* Includes SUVs and light trucks
** EU + 4: UK, Iceland, Switzerland, and Norway

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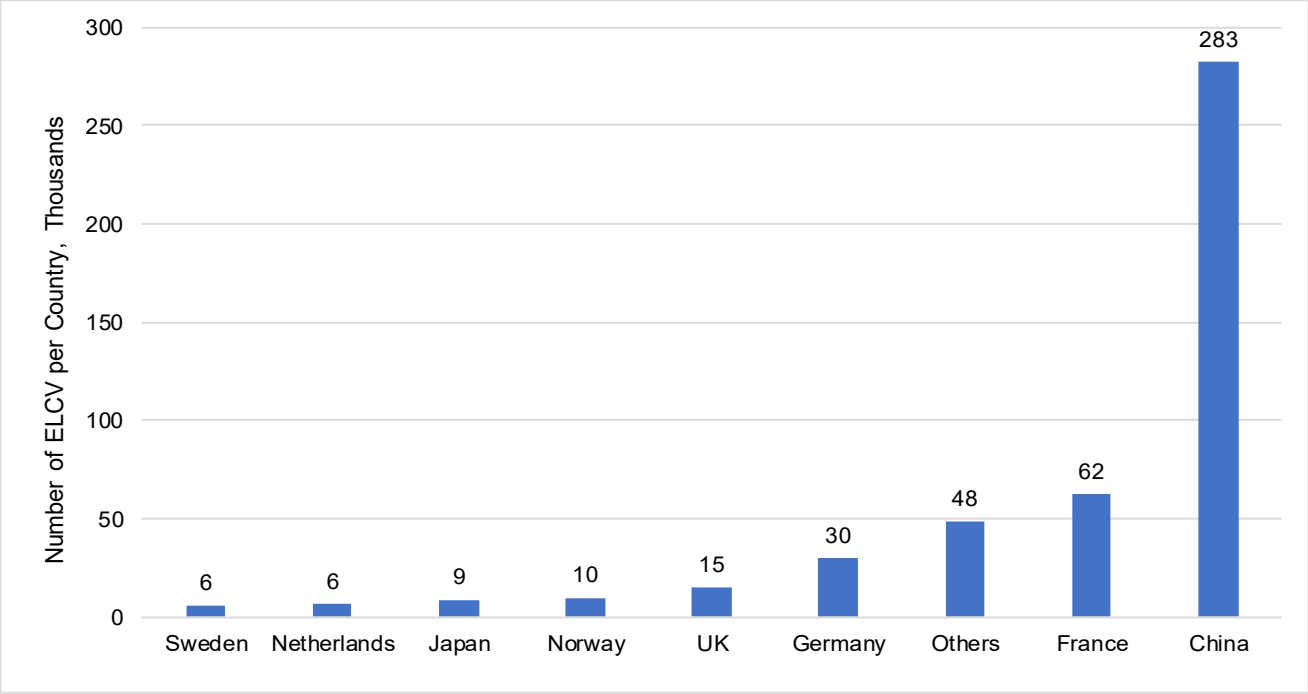
# ELECTRIC LIGHT COMMERCIAL VEHICLES STOCK PER COUNTRY




Source: IEA Global EV Outlook 2020 and Incorrys data

This chart shows the number of battery and hybrid plugin electric light commercial vehicles (ELCV) in 2020.

The total number of all ELCV's worldwide in 2020 was 468,000. China accounted for 60% of this total with 283,000.

In 2020-2021, Covid caused significant growth in demand for home deliveries. In response, a number of large companies declare their intention to switch to EV's. Some examples:

- Amazon ordered 100,000 BEV from start-up company Rivian.
- DHL plans to switch to EV's in medium term.
- FedEx plans to transition to a zero-emission vehicle fleet and become carbon neutral by 2040.
- Walmart plans to electrify their entire fleet by 2040.
- UPS ordered 10,000 BEV in 2019 and plans for second order.

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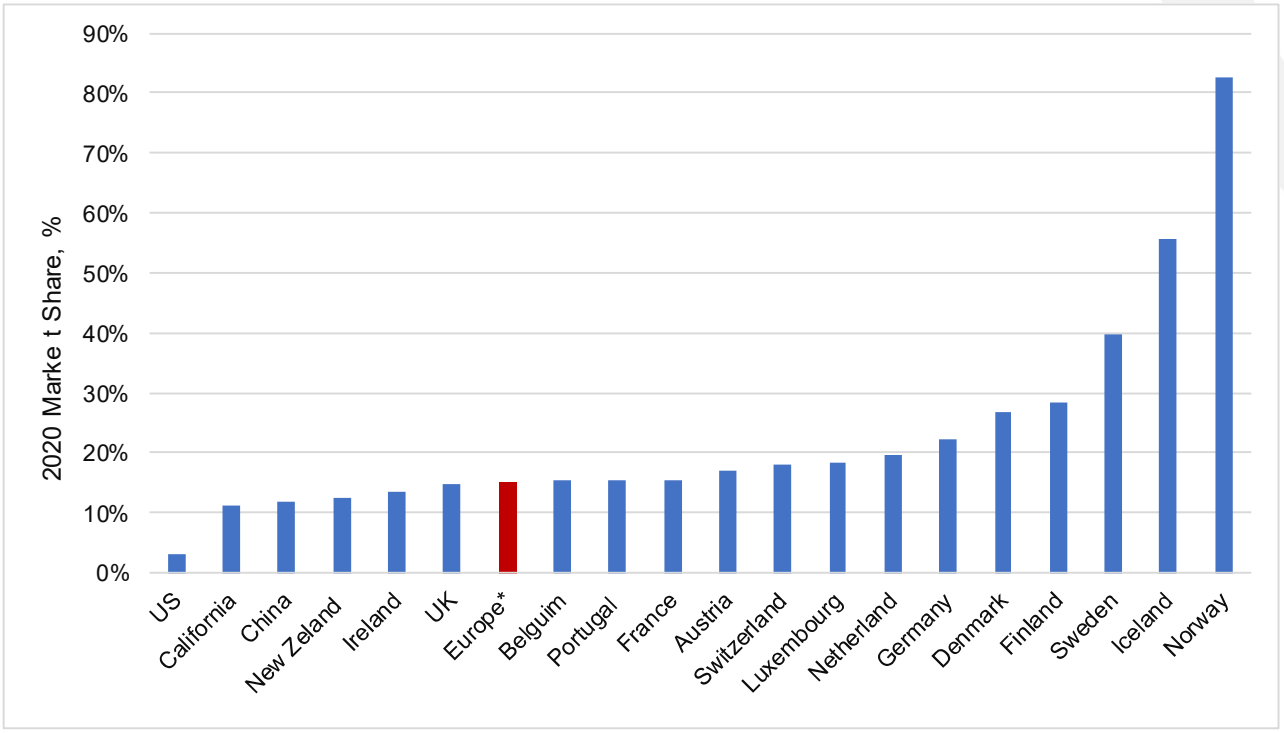
# MARKET SHARE OF NEW ELECTRIC VEHICLES




* Europe includes EU, UK, Iceland, Switzerland, and Norway

Market share is defined as the share of new EV registrations as a percentage of total new vehicle registrations in 2020.

In 2020, world average market share of new EV's was 4.6%, up from 2.5% in 2019. The largest market share was in Norway (74.7% in 2020 and 86.2% in 2021), followed by Iceland, Sweden, and Finland. The US Market share was just 2.2%, up from 1.9% in 2019. California's market share was 8.1% in 2020 (11.1% in H1 2021), up from 7.6% in 2019.

Market share of EV's in China reached 12.% in H1, 2021 up from 8.1% in 2020 and 4.9% in 2019.

In general, market share of new EV's is a function of government incentives to vehicle buyers and other programs, such as support of manufacturers of EV's and batteries, as well as installers of charging stations.

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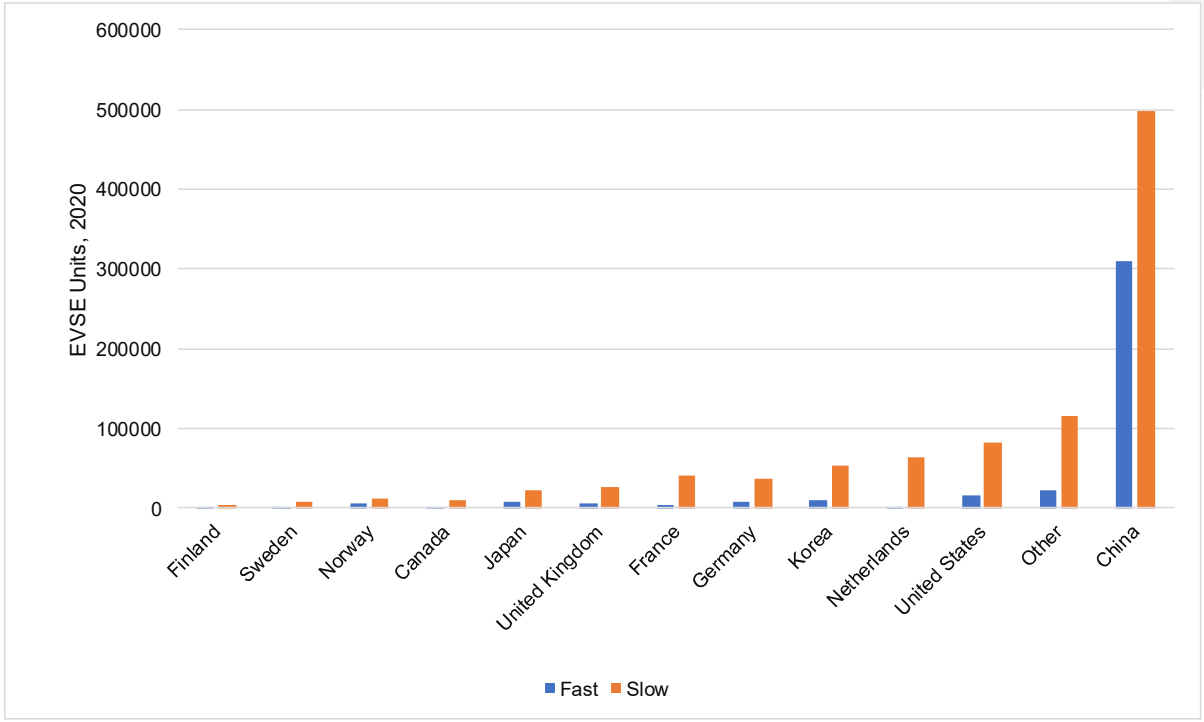
# CHARGING INFRASTRUCTURE

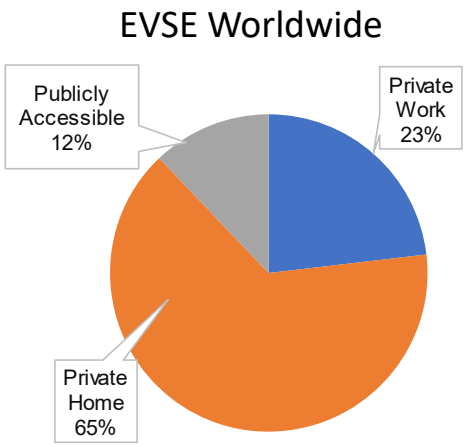



Source: IEA Global EV Outlook 2020 and Incorrys data

This chart shows publicly accessible slow and fast electric vehicle supply equipment (EVSE) stock by country in 2019.

The total number of EVSE worldwide was 10.8 million. Only 12% of them were publicly accessible. The total number of private EVSE in 2020 was 9.5 million with over 7 million located at residences and the remainder located at workplaces.

China had the largest number of publicly available EVSE at about 807,000, followed by US (~99,000) and Netherland (~66,000).

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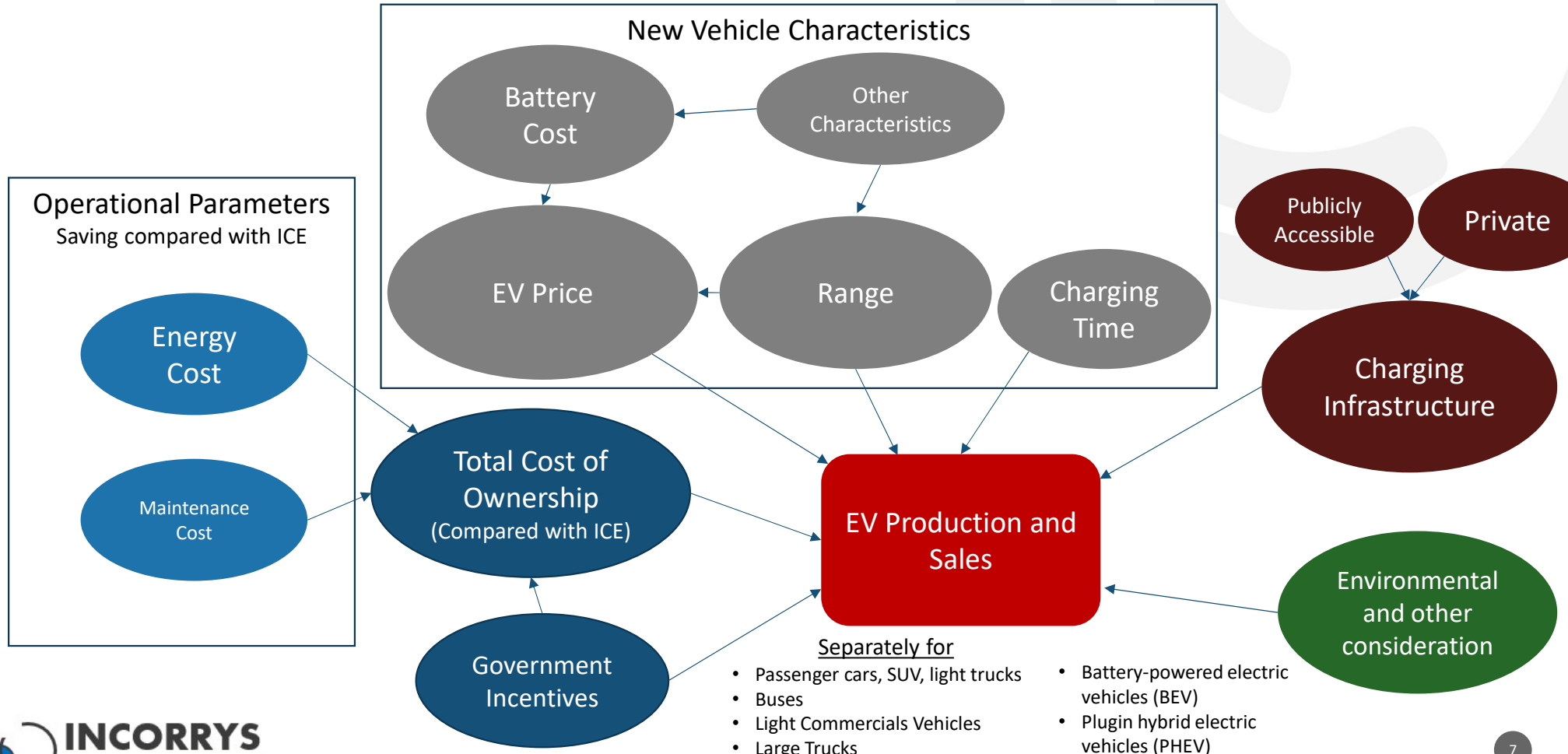
# EV FORCAST MODEL

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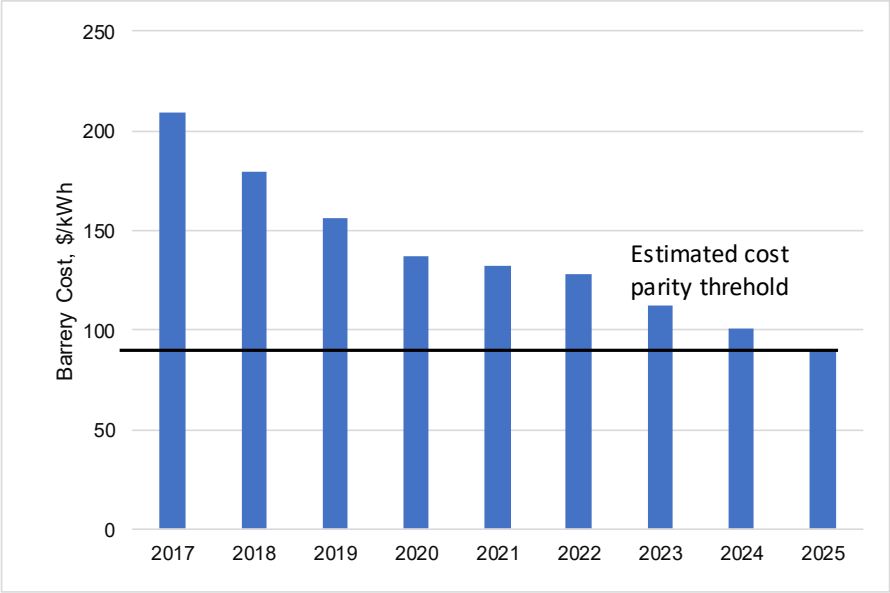
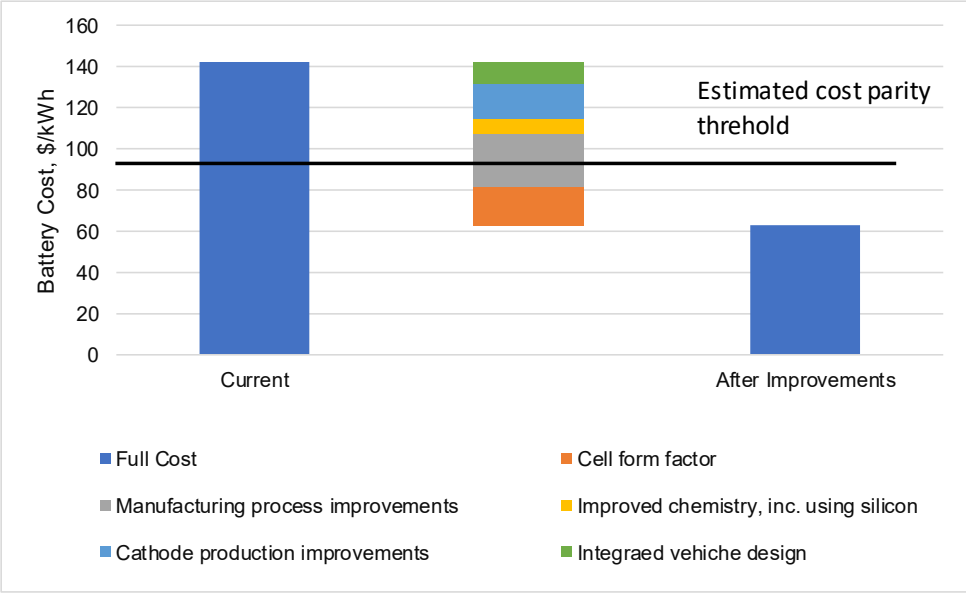
# ELECTRIC VEHICLE BATTERY COST

EV battery pack cost reduction: Actuals and Forecast




September 2020 Tesla Battery Day Presentation: Announced battery cost reduction activities




Source: Bloomberg and Incorrys Analysis

The cost of battery packs has fallen to USD $137/kWh in 2020, from USD $1,100/kWh in 2010. Incorrys expects that costs will continue to drop and reach $100/kWh in 2024. For example, VW already estimates a cost of USD 100/kWh for VW ID3 battery cells. Incorrys estimates that cost parity with internal combustion engine (ICE) vehicles will be achieved by 2025 when battery pack costs reach **$90 /kWh.**

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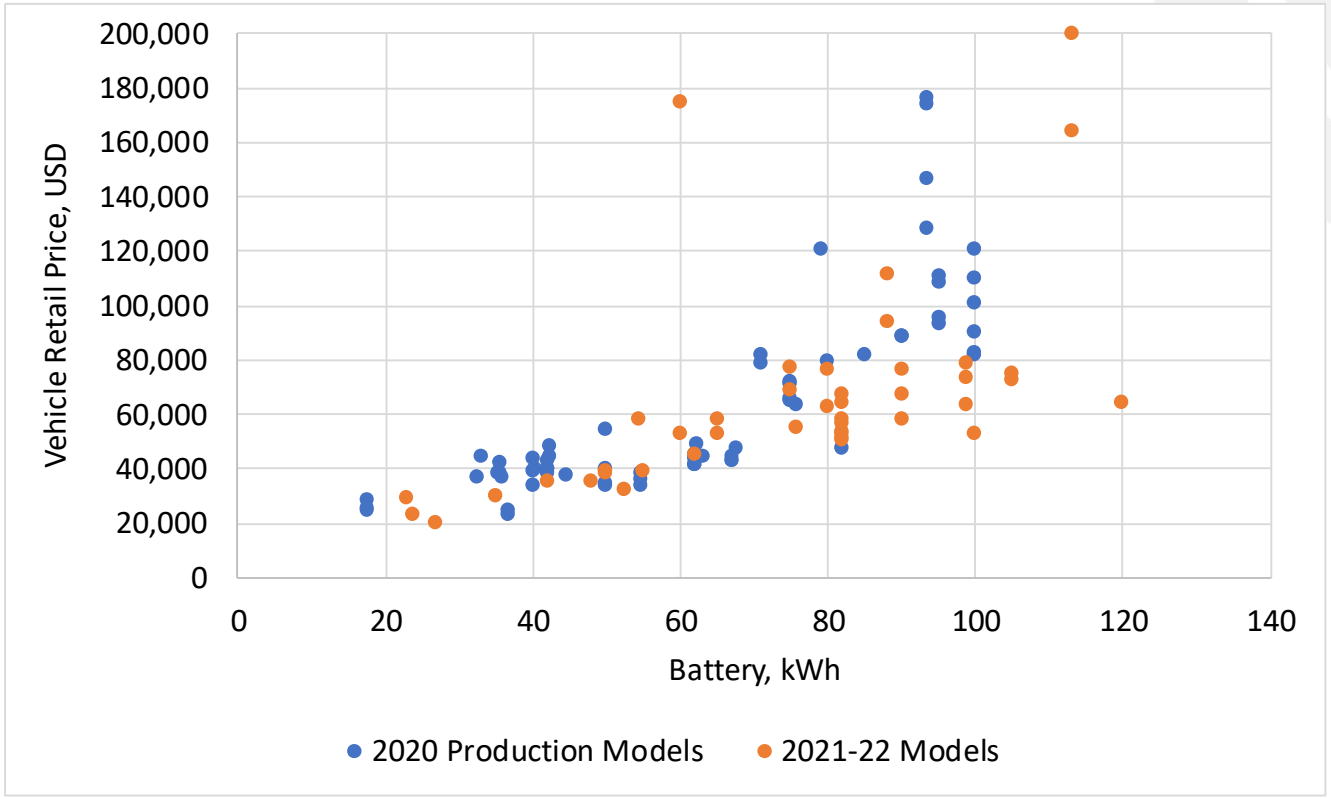
# ELECTRIC VEHICLE PRICE VS. BATTERY CAPACITY




Retail car price per kWh of battery capacity is expected to drop to USD $875/kWh for 2021-22 models from USD $1025/kWh for current production models, almost a 15% drop despite the fact that some new 2021-2022 vehicles are expensive luxury models.

Battery pack costs is currently around USD $137/kWh and are expected to gradually decline in the next few years. With the drop of battery costs and other electric vehicle cost reductions, Incorrys expects that overall electric vehicle costs will be comparable with gasoline powered vehicles of the same range.

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# ELECTRIC VEHICLE PRICE VS. RANGE


Average retail price of electric vehicles per km of range is expected to drop to USD $177/km in 2021-22 from USD $211/km in 2020; over a 16% drop even though many 2021-2022 models are luxury vehicles with larger battery sets.

Average range of 2021-2022 vehicles will reach almost 400 km, up from 308 km in 2020. The largest range is expected for Lucid Air Grand Touring (660 km), Tesla Cybertruck Tri Motor (750 km), and Tesla Roadster (970 km).

Incorrys expects that the average range will reach 600 km in 2025 which would make electric vehicles comparable with gasoline engine vehicles. Together, with an increased number of charging stations, will lead to greater acceptance of electrical vehicles.

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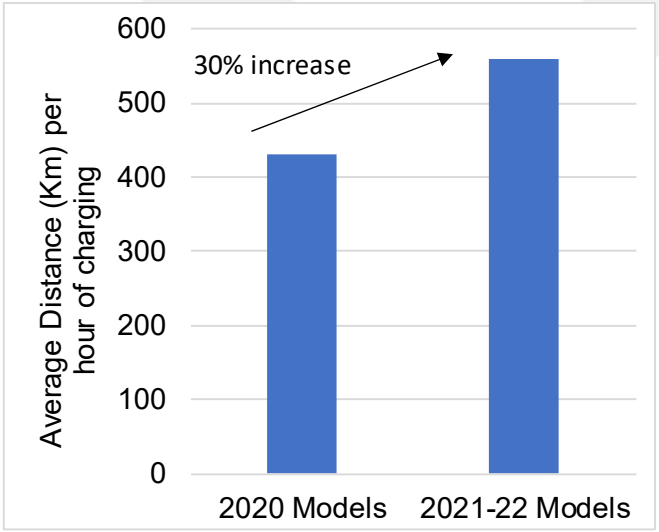
# CHANGING TIME FOR ELECTRIC VEHICLES

| Charger Type | Electric Car Range added |
|---|---|
| **AC Level 1**<br>240V 2-3kW | Up to 15km/hour |
| **AC Level 2 "Wall Charger"**<br>240V 7KW | Up to 40km/hour |
| **AC Level 2 "Destination Charger"**<br>415V 11-22kW | 60-120km/hour |
| **DC Fast Charger**<br>50kW DC Fast Charger | Around 40km/10 min |
| **DC Rapid Charger**<br>175kW DC Fast Charger | Around 200km/ 15 min |

Source: thedriven.io

Charging time is determined by charger type as well as electric vehicle hardware. Charging equipment over 22kW is considered to be a fast charger.

Changing time for electric vehicles is measured by range added by hour of charging. Average driving distance per hour of charging is expected to increase 30% for 2021-22 models.

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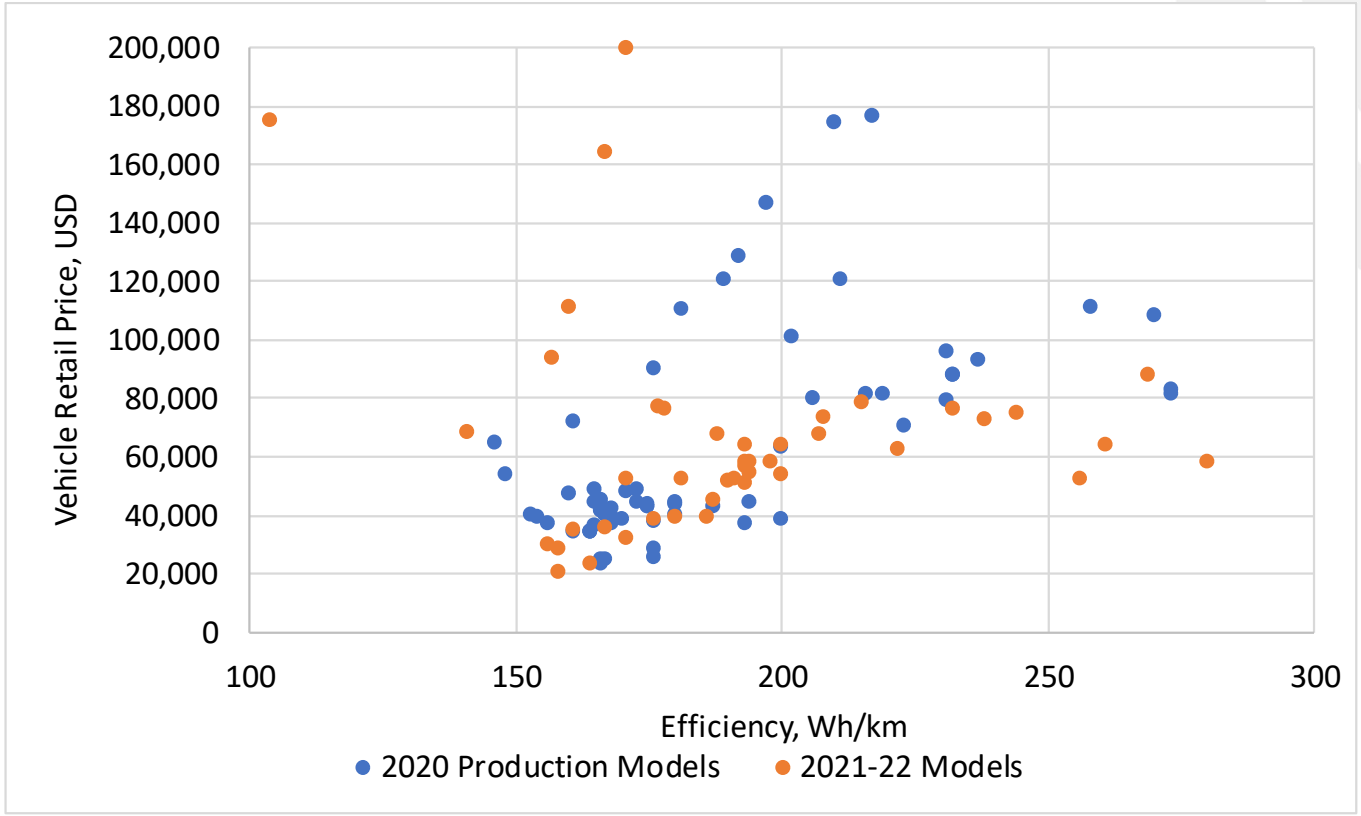
# ELECTRIC VEHICLE EFFICIENCY




Efficiency is a function of overall vehicle design and usually higher for heavier vehicles, including trucks.

Electric vehicle efficiency is similar for most models and is expected to remain flat from 2020-2022 at around 193 Wh/km.

Lightyear One, Tesla Model Y, and Tesla Model 3 have higher efficiency below 150 Wh/km. Tesla Cybertruck Tri Motor, Audi e-tron S 55 quattro, Mercedes EQV 300, Skoda Enyaq iV RS, and Polestar 2 have the lowest efficiency above 270 Wh/km.

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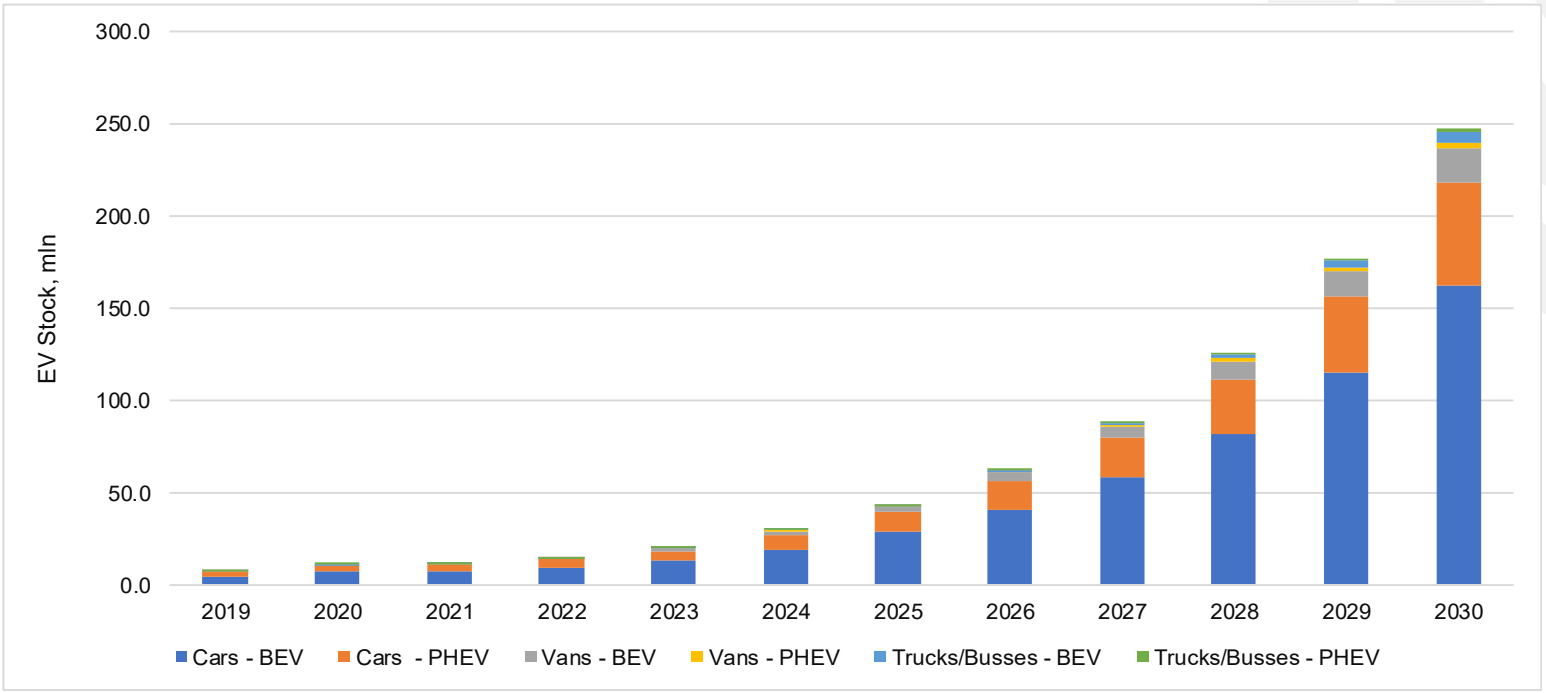
# TOTAL NUMBER OF ELECTRIC VEHICLES WORLDWIDE




Cars are passenger light-duty vehicles. Vans are light commercial vehicles. Trucks include medium and heavy-duty trucks and buses. Two/three-wheelers are not included. Electrification of two/three-wheelers currently economically viable in many regions mostly in Asia, since they require relatively small batteries for making shorter trips. Incorrys estimates that sales of two/three-wheelers will reach 60 million or almost two-thirds of all sales, up from 25 million in 2020.

Incorrys estimates that in 2030 total registered electric vehicles worldwide will grow almost 22 times from 2020 levels, reaching almost 245 million. In 2030, the total number of trucks and buses will reach 7.7 million, while total number of vans (LCV) will reach 22 million.

Incorrys estimates that the number of buses will reach 3.9 million. Most electric buses and trucks will operate in urban areas making shorter trips then between cities.

In 2030, Battery powered cars (BEV) will represent 65% and PHEV cars will account for 23% of all registered electric vehicles.

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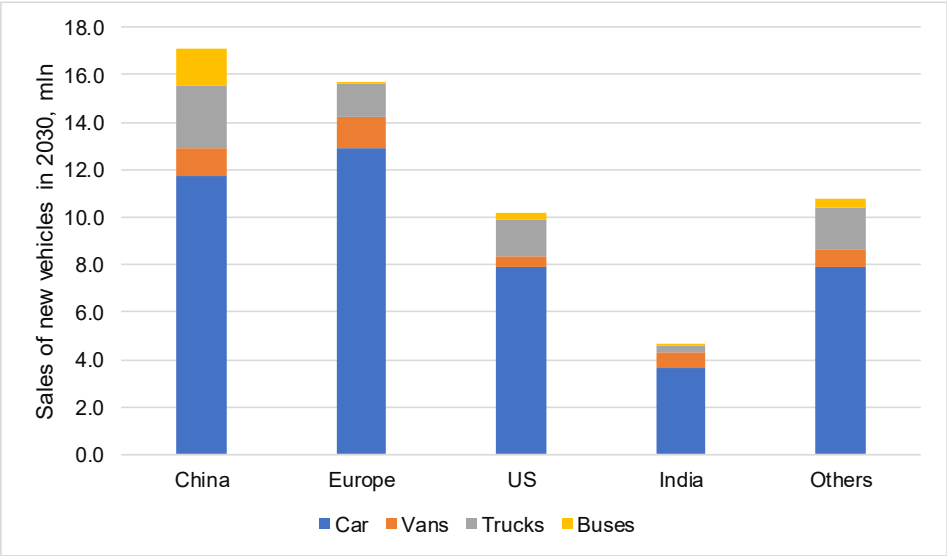
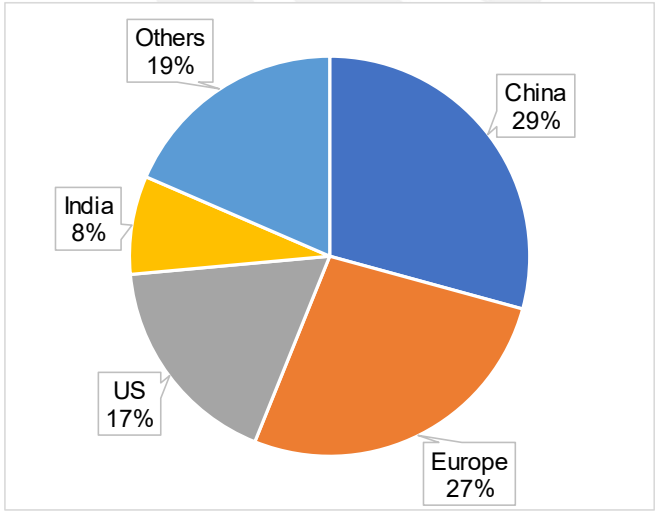
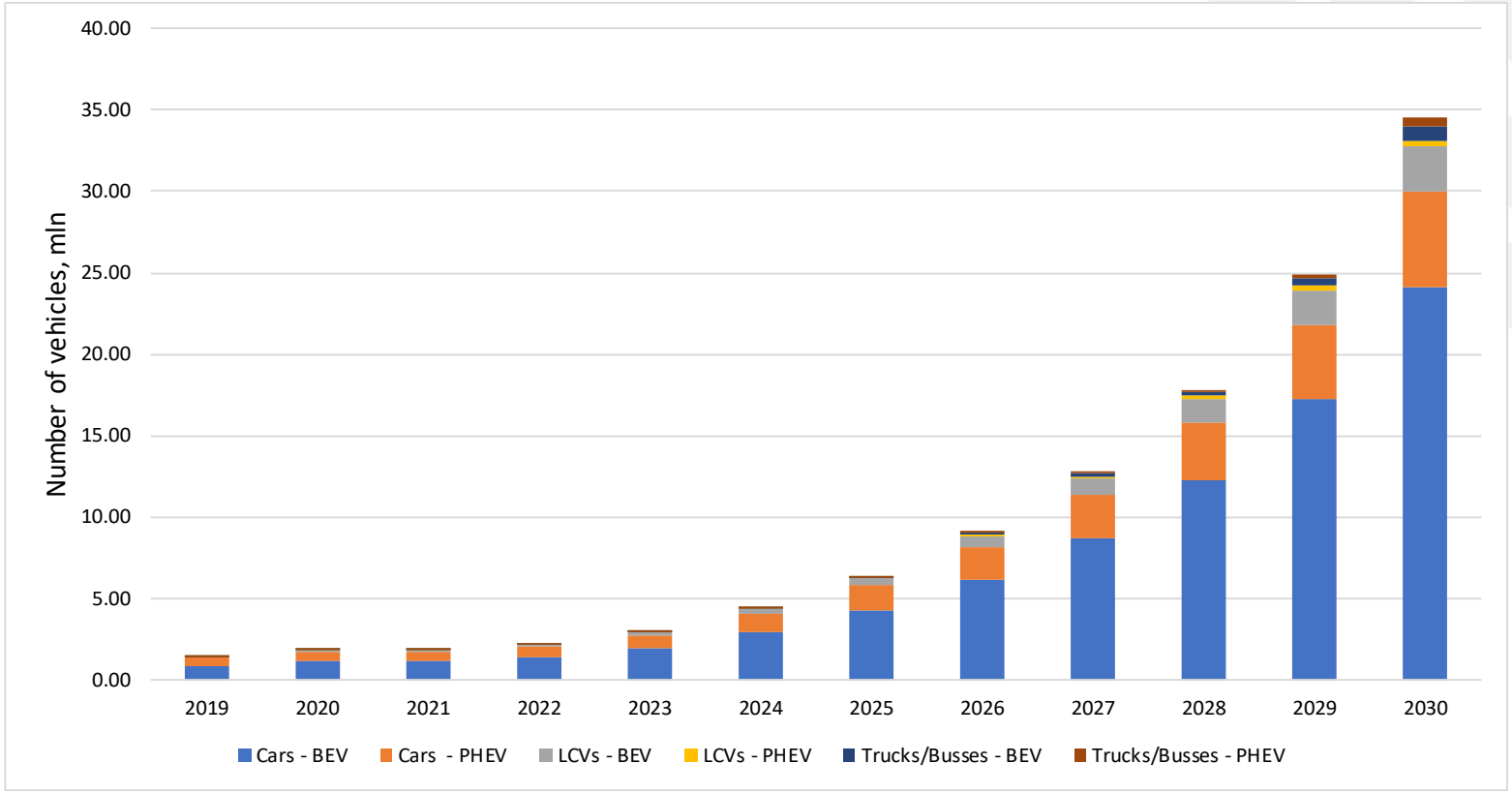
# ANNUAL 2030 EV SALES




In 2030, global sales of electric vehicles will reach almost 60 million with China accounting for the largest share at 27% of sales.



# TOTAL NUMBER OF ELECTRIC VEHICLES IN US




Cars are passenger light-duty vehicles and include light trucks and SUVs. Vans are light commercial vehicles. Trucks include medium and heavy-duty trucks and buses.

In 2030, Incorrys expects total registered electric vehicles in US will reach 34.4 million, up from 1.6 million in 2020.

Battery powered cars, SUVs and light trucks (BEV) in the US will represent 70% of all registered electric vehicles, while PHEV's will account for 17% of all EV stock in 2030.

Biden's Administration "Build Back Better" plan includes a very enticing incentive worth up to US$12,500 for Americans looking to buy electric vehicles and batteries made and built on U.S. soil.

Final legislation is changing, however, Incorrys expects that incentives will provide a significant boost to EV sales in the US.

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# THANK YOU !

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