ELECTRIC VEHICLES

INDUSTRY ANALYSIS AND FORECAST

APRIL 2023

CONCLUSIONS

The pace of EV growth from 2020 to 2026 is severely impacted by the Covid-19 pandemic that heavily impacted manufacturing, disrupted supply chains, and contributed to a shortage of both semiconductor chips (coupled with stiff competition from the computer industry) and raw materials.

Incorrys now expects electric cars will reach cost parity with gasoline cars after 2026 leading to significant growth in electric car production.

In 2030, global sales of electric vehicles will reach 38 million, 40% being sold in China.

Total registered electric vehicles worldwide are expected to grow almost 20 times from 10.7 million in 2020 to almost 200 million 2030.

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Incorrys forecast is based on a thorough and detailed analysis of the EV industry. The list of references are included in the notes section and are available upon request.

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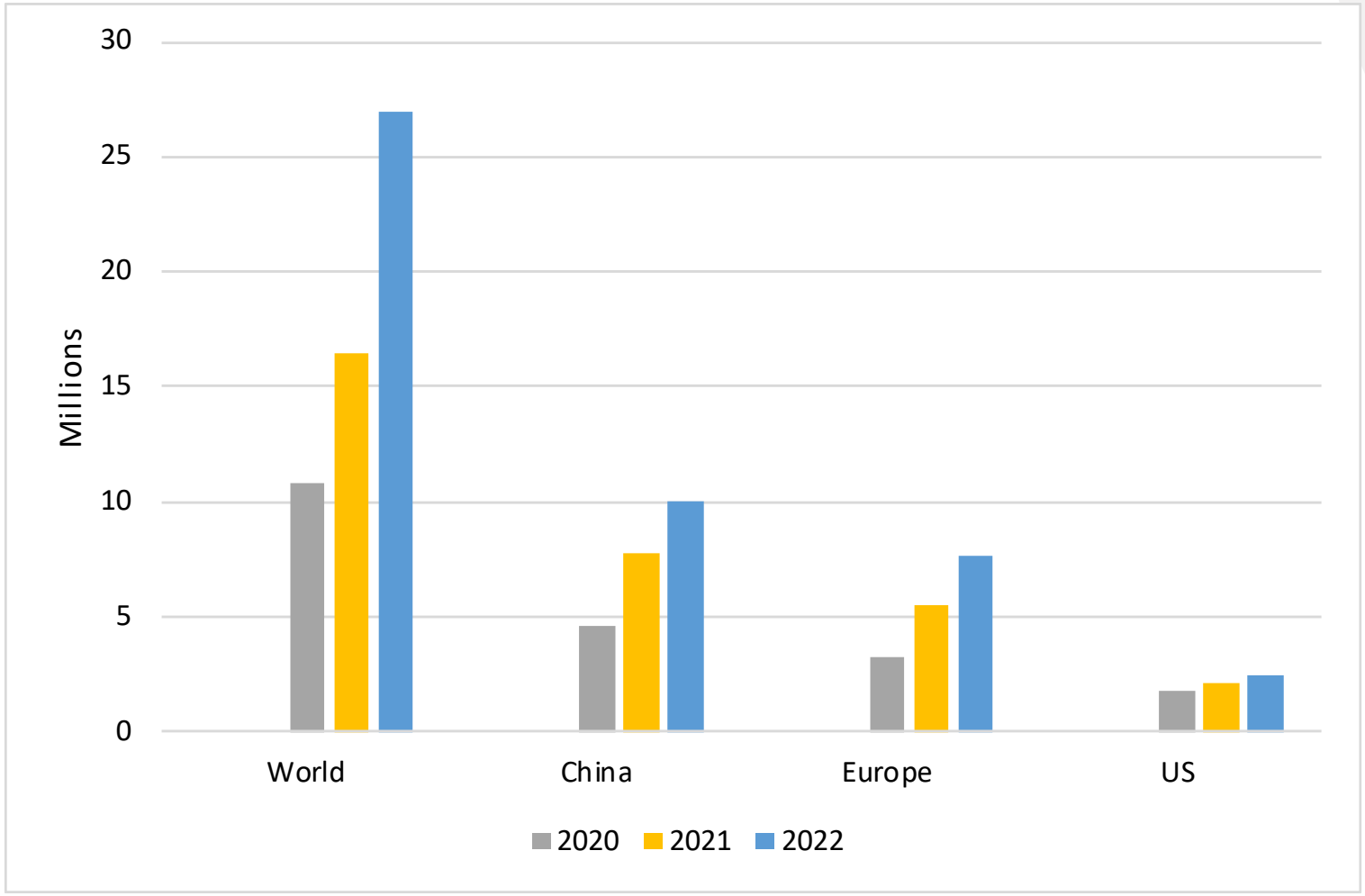
ELECTRIC CAR STOCK PER COUNTRY



The chart shows number of light duty battery electric vehicles (BEV)* and hybrid plug-in electric vehicles (PHEV)* in 2020-2022.

Global EVs have increased from about 11 million in 2020 to 27 million in 2022 – and increase of 150% in 3 short years.

China represented 37% of the 2022 global EV stock followed by Europe** at 29% and the US at 9%. Both China and Europe more than doubled between 2020 and 2022.

In 2022, almost 2.2 million new passenger plug-in electric cars were registered in Europe - the highest were in Norway (88%), Iceland (58%) and Sweden (56%).

US EV stock has increased about 20% per year between 2020 and 2022. Most of the growth occurred in California.

* Includes SUVs and light trucks

** EU + 4: UK, Iceland, Switzerland, and Norway

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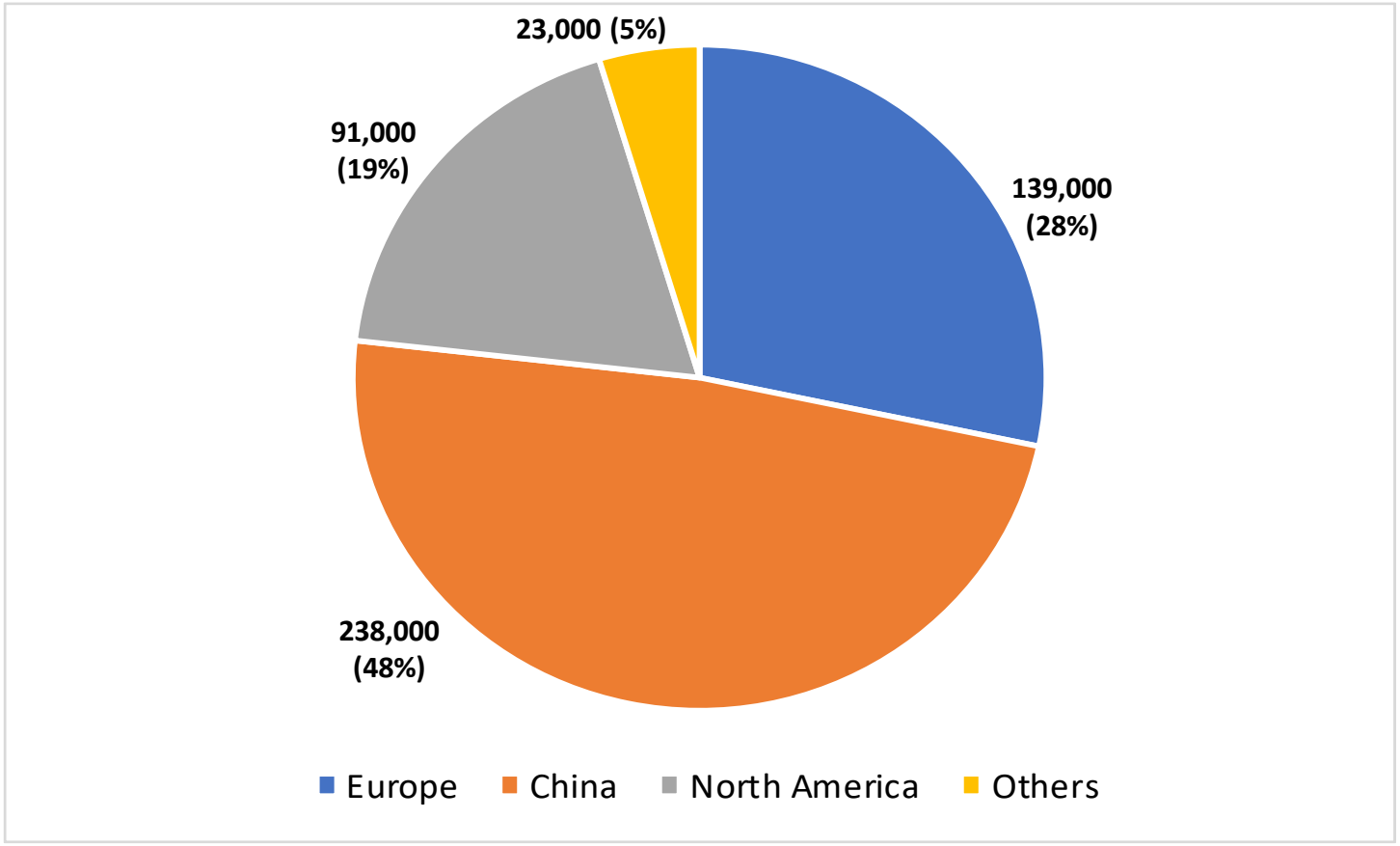
ELECTRIC LIGHT COMMERCIAL VEHICLES STOCK PER COUNTRY



Source: IEA Global EV Outlook 2020 and Incorrys data

The chart shows number of battery and hybrid plugin electric light commercial vehicles (LCV) in 2022.

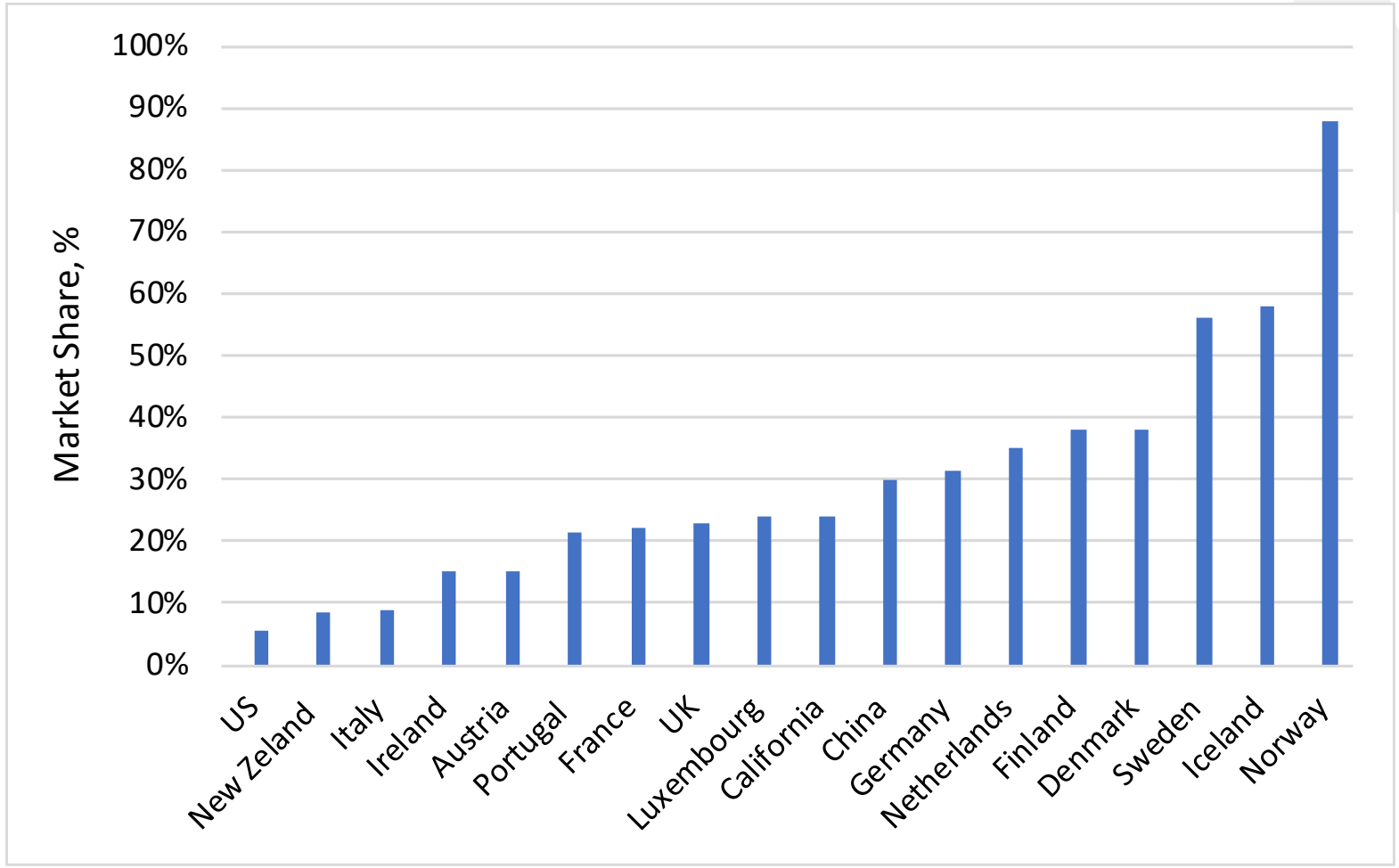
Total number of all LCV worldwide in 2022 was 491,000. China accounted for almost half of all electric LCVs while Europe accounted for almost 28%, and North America 19%.

Although the sale of electric LCVs was only 5% of the total EV market, the size of the fleet almost doubled since 2021 and continues to increase.

Sales of new energy buses and trucks in China reached an all-time high of 238,000 units in 2022, an increase of 90% compared to 2021.

The light commercial vehicle market is currently valued at almost USD 550 billion, and it is expected to register an annual growth rate of about 7% over the next five years.

MARKET SHARE OF NEW ELECTRIC VEHICLES



Market share is defined as the share of new EV registrations as a percentage of total new vehicle registrations in 2022.

The world average EV market share in 2022 was 14%, up from 9% in 2021. The largest market share was in Norway at 88% followed by Iceland, Sweden, and Denmark. Although the US Market share was just 6% in 2022, it has doubled from the 3% in 2021. This compares to California's market share of 24%.

In general, the results demonstrate the extraordinary performance of some governments in their activities to support manufacturers of EVs and batteries, as well as the installation of charging stations.

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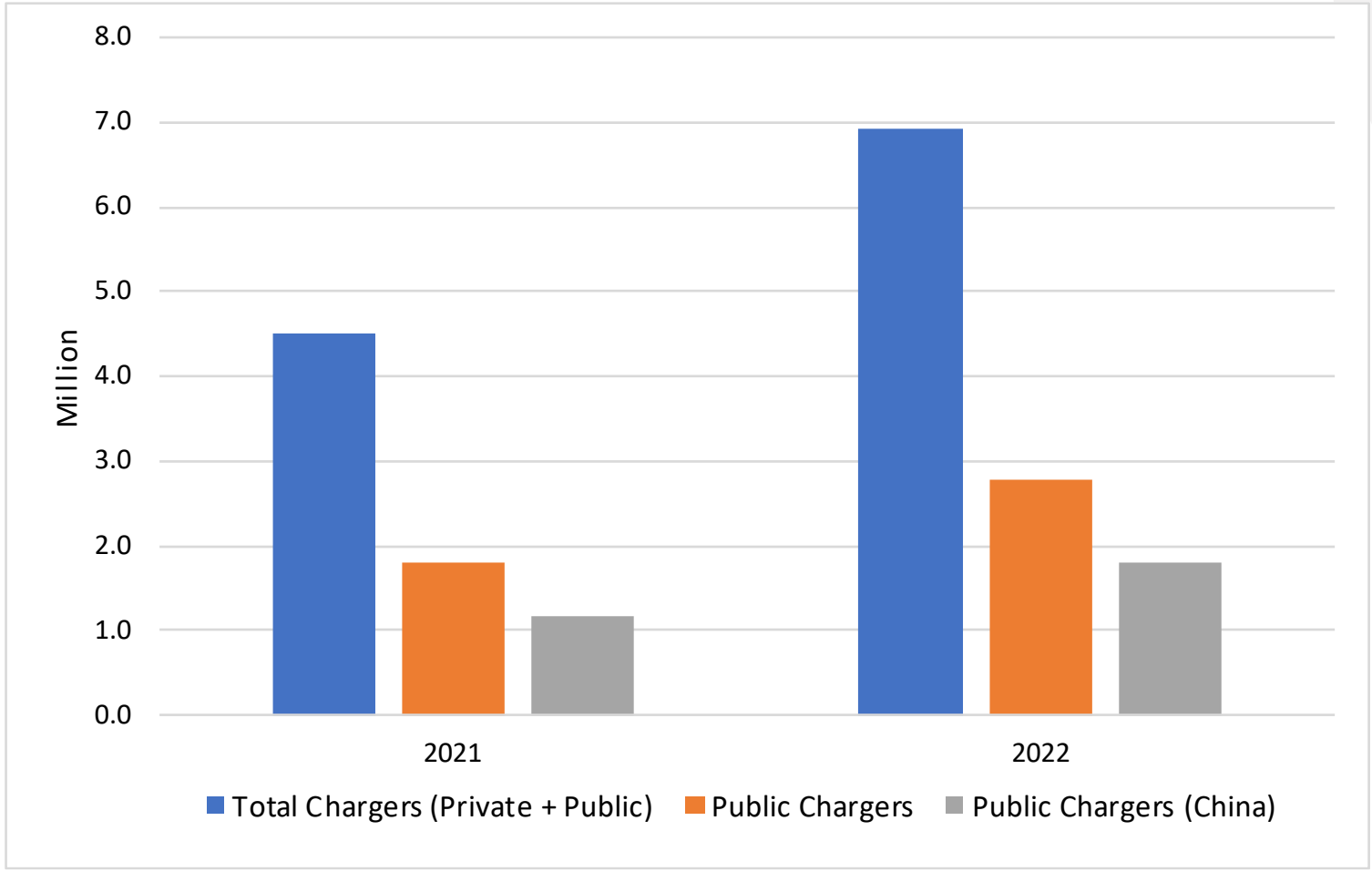
CHARGING INFRASTRUCTURE



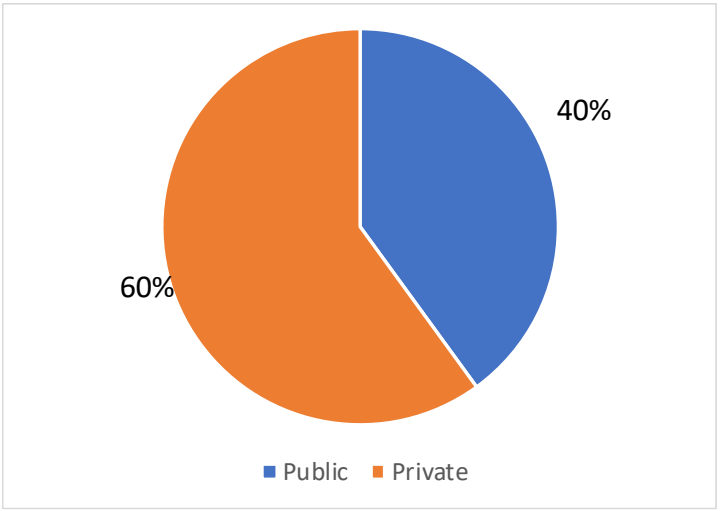
The chart shows publicly accessible slow and fast electric vehicle supply equipment (EVSE) stock globally in 2021 and 2022.

Total number of EVSE worldwide was 6.9 million. Publicly available EV charging accounted for 40% of the total (almost 3 million) up from only 12% in 2020.

China is the global leader in available chargers, including public where they have a 65% market share in 2022 and doubled the total number of chargers since 2021

Europe, the second largest EV market, only has 400,000 public charging – almost half are in the Netherlands (90,000) and Germany (60,000).

EVSE Worldwide



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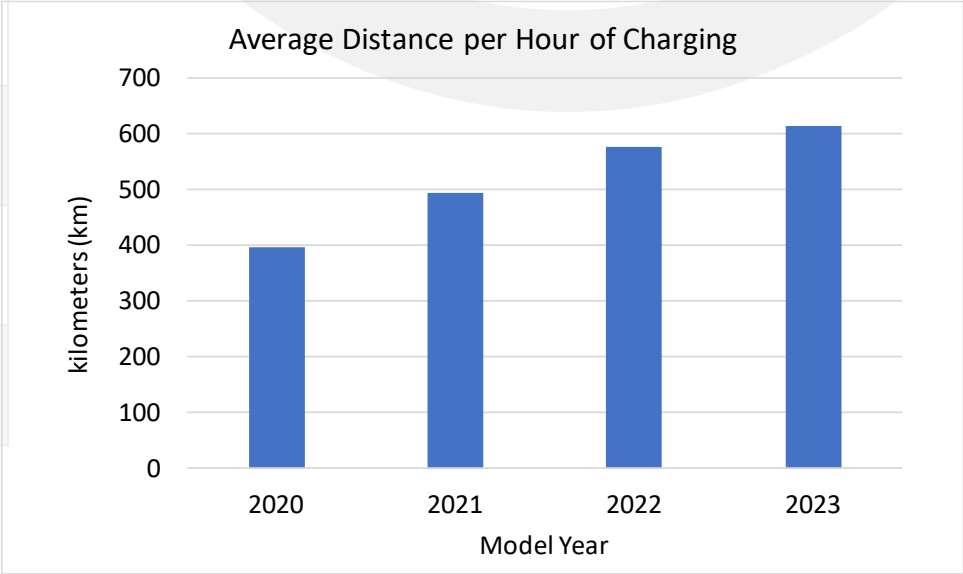
CHARGING TIME FOR ELECTRIC VEHICLES

Charger Type	Electric Car Range added
AC Level 1 240V 2-3kW	Up to 15km/hour
AC Level 2 "Wall Charger" 240V 7KW	Up to 40km/hour
AC Level 2 "Destination Charger" 415V 11-22kW	60-120km/hour
DC Fast Charger 50kW DC Fast Charger	Around 40km/10 min
DC Rapid Charger 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 a fast charger.

Changing time for electric vehicles is measured by range added per hour of charging. Average driving distance per hour of charging increased 55% from 2020 to 2023.



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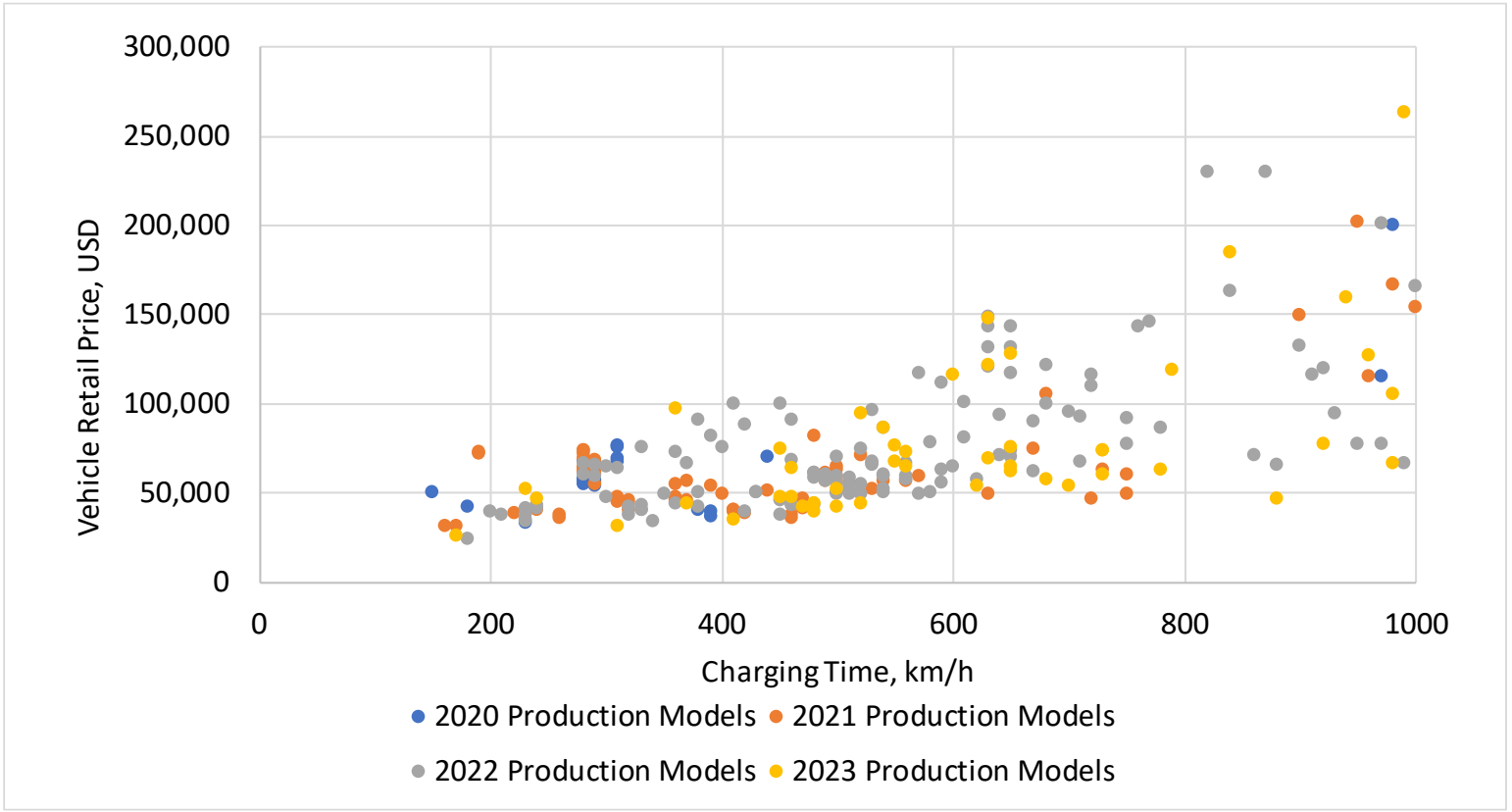
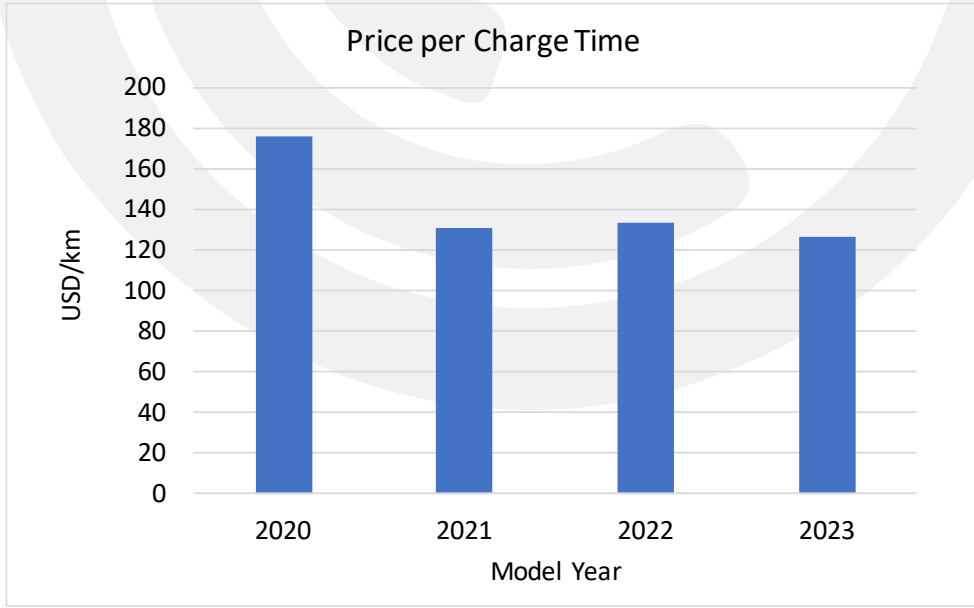
CHARGING TIME FOR ELECTRIC VEHICLES





Average price per charging time has declined since 2020 reaching $126 per kilometer for 1 hour of charging in 2023. This is due to the introduction of fast charging for many models. Incorrys believes that this parameter will remain flat over the next few years.

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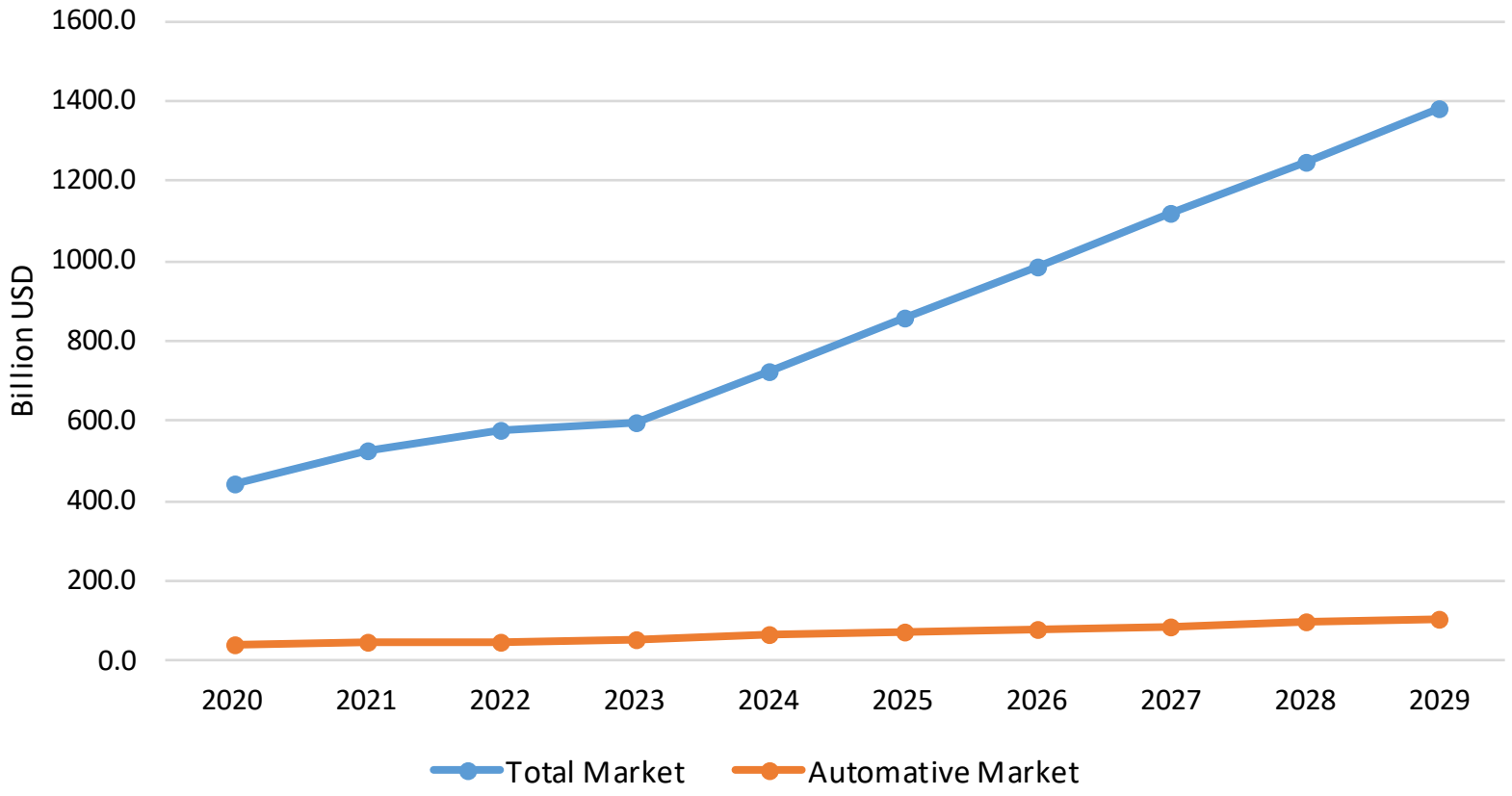
GLOBAL SEMICONDUCTOR MARKET, 2020-2029



The long-term demand in the semiconductor industry is expected to more than double in comparison to current levels and will exceed USD $1 trillion by 2030 in a low case scenario up to USD $1.380 trillion in the base scenario.

Although the automotive semiconductor market represents about 10% of the total market, a trend that is expected to generally continue through 2030, it is overshadowed in comparison with computer applications, that are much larger and more profitable.

The semiconductor industry reached 90% utilization in 2020, so it is considered a mature industry. As such, companies are currently mapping plans and laying out enormous investments.

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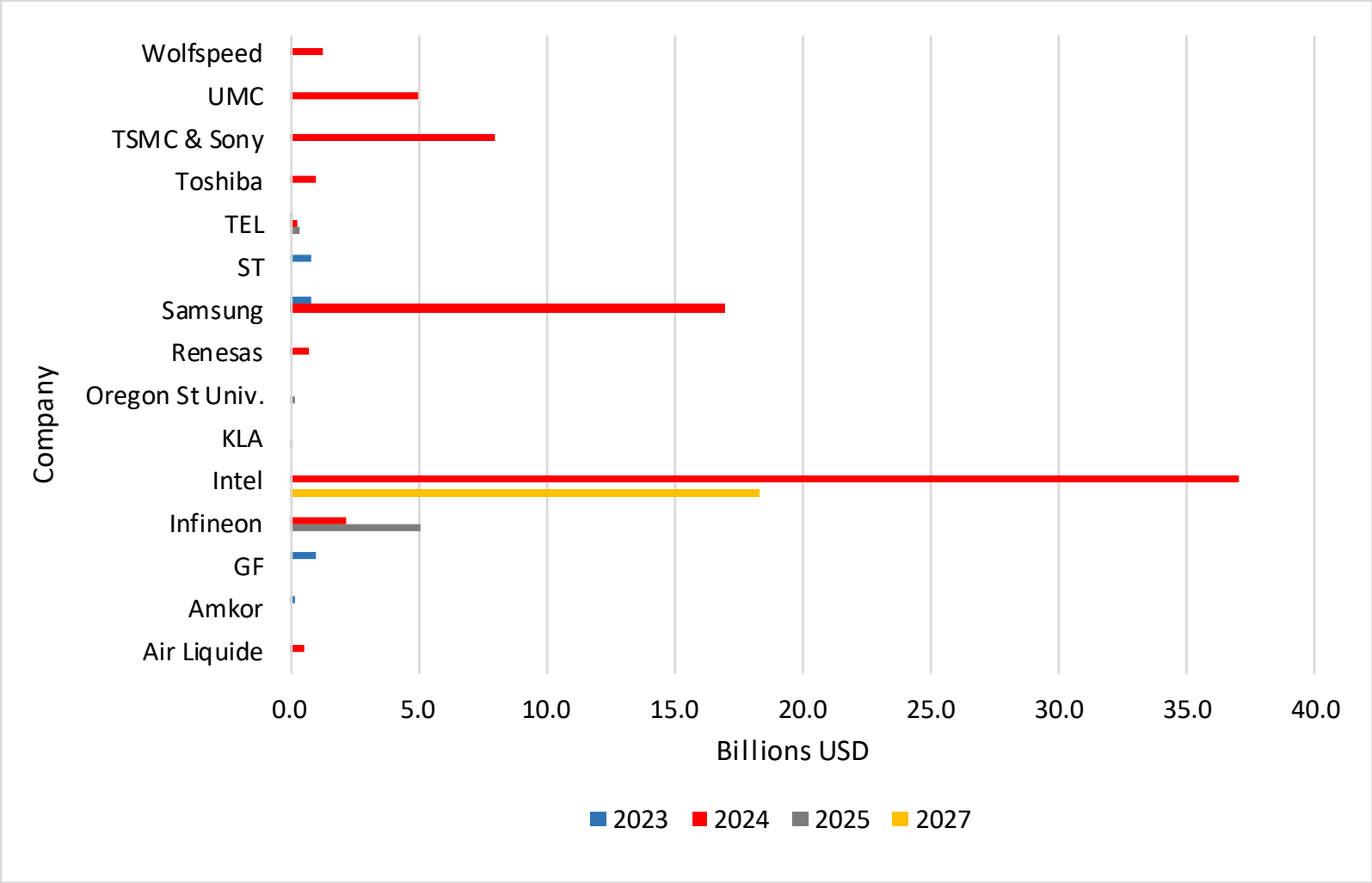
TOTAL ANNUAL INVESTMENT INTO SEMICONDUCTORS



A total of USD $100 billion is expected to be invested over the 5-year span of 2023-2027.

The largest investors with the nearest start-of-production (SOP) dates in 2024 are Intel (USD $37 billion) and Samsung (USD $17 billion).

There is a chance the chip shortage will stabilize in 2024 however, to overcome the crisis in the automotive industry next year not only requires readiness from the semiconductor manufacturers but also:

- resolving the shortage of critical raw materials coming from Ukraine and Russia
- standardization of technical specifications
- transitioning to long-term strategies and
- developing trustful relationships between all parties

– no easy task!.

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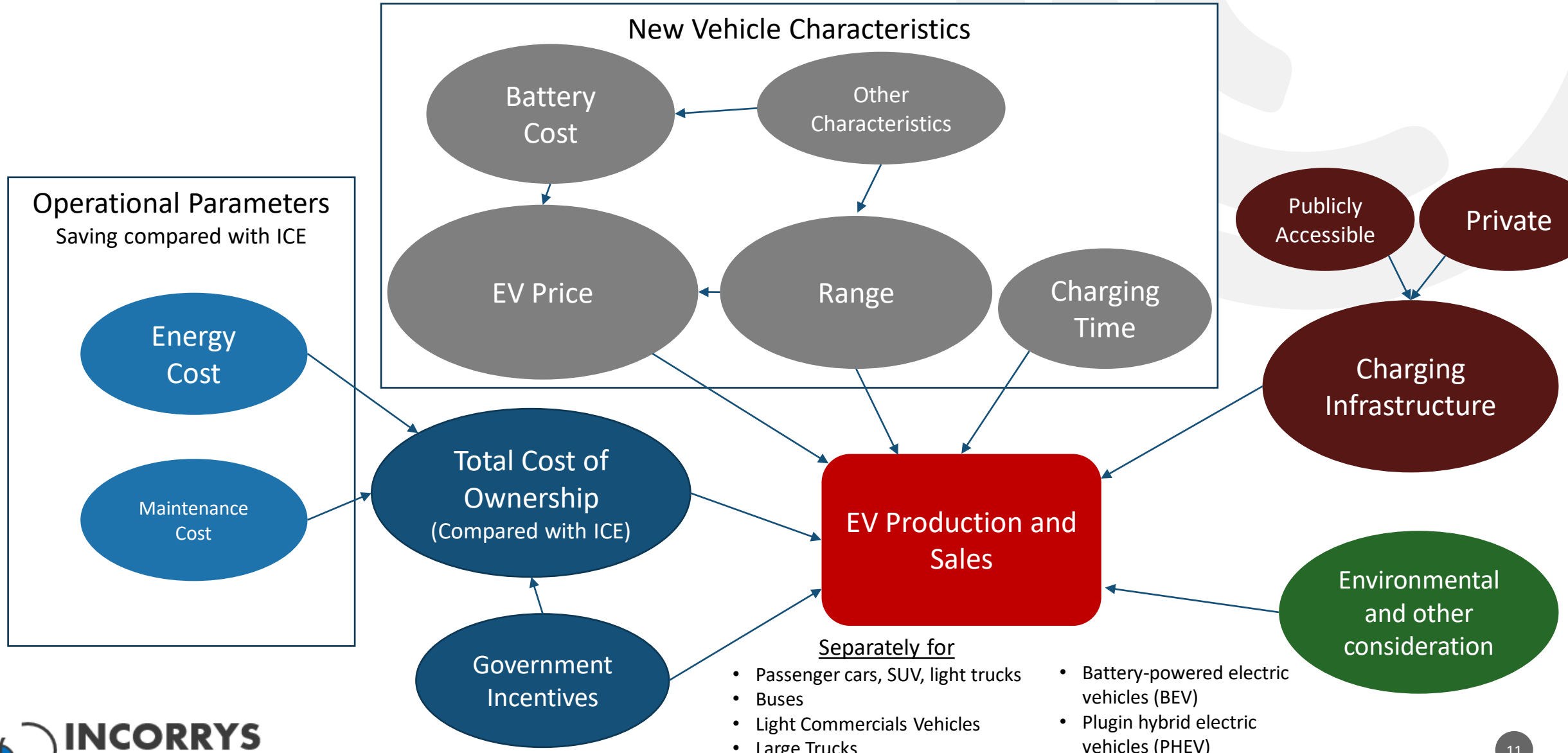
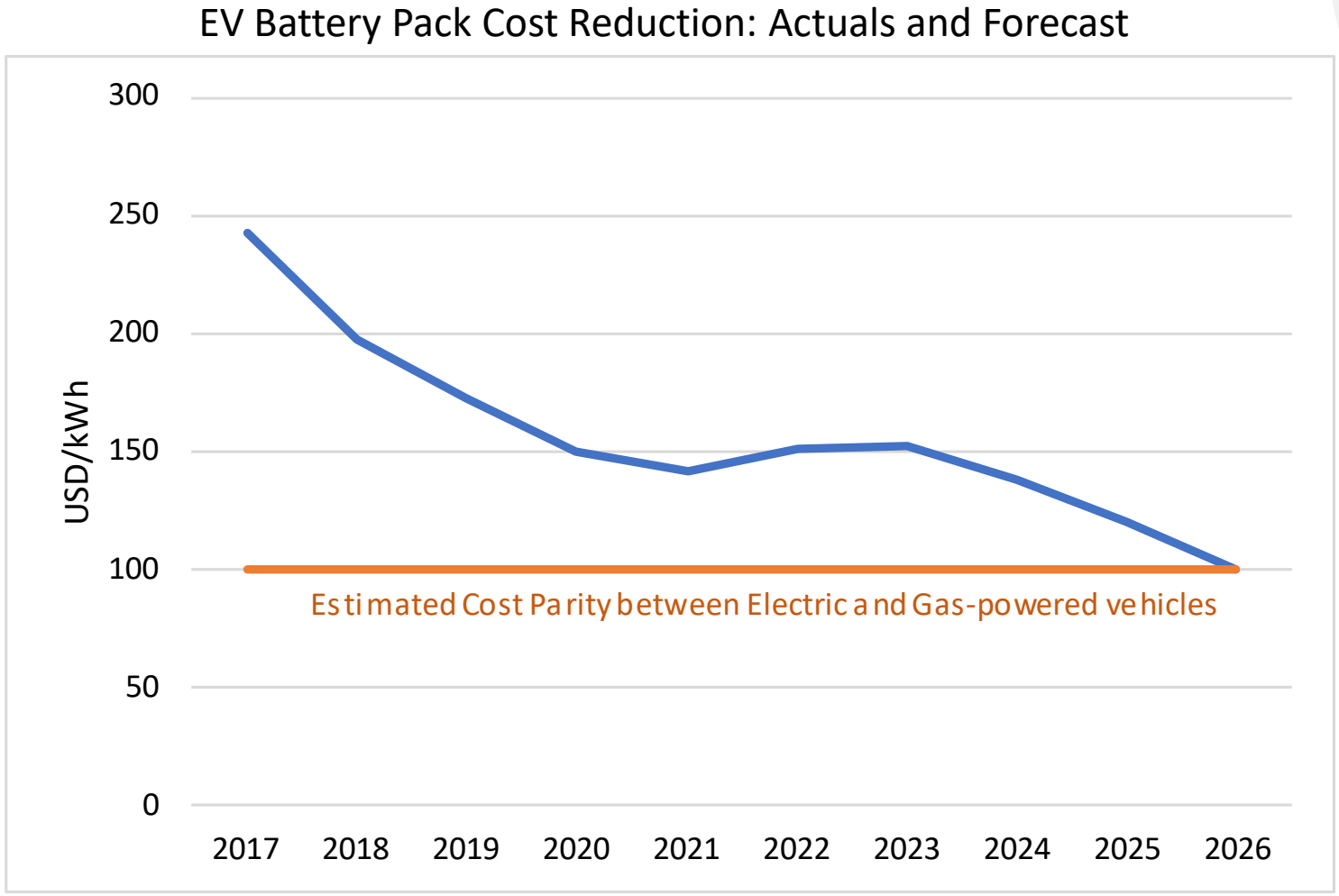
EV FORCAST MODEL



ELECTRIC VEHICLE BATTERY COST



Source: Bloomberg and Incorrys Analysis

The price for battery packs used in EVs increased to USD $151/kWh in 2022, a 7% increase over 2021 primarily due to increased prices for lithium, nickel and cobalt.

Prices are expected rise slightly in 2023 before continuing their downward trend to USD 138/kWh in 2024.

Average battery pack prices are forecast to reach USD $100/kWh (Incorry's threshold for price parity between electric and gas-powered cars) by 2026, two years later than previously projected.

Two years ago, Tesla CEO Elon Musk, promised a cylindrical battery that would improve range and drive down costs – needless to say, Tesla has fallen behind on those promises. The issue being the dry-coating technique used to produce the bigger cells in Tesla's 4680 battery is so new and unproven that they are not yet ready for mass production. This new technique is key in meeting Tesla's vision of selling EVs for USD $25,000 – for a profit.

Incorrys now expects electric cars will reach cost parity with gasoline cars after 2026 leading to significant growth in electric car production.

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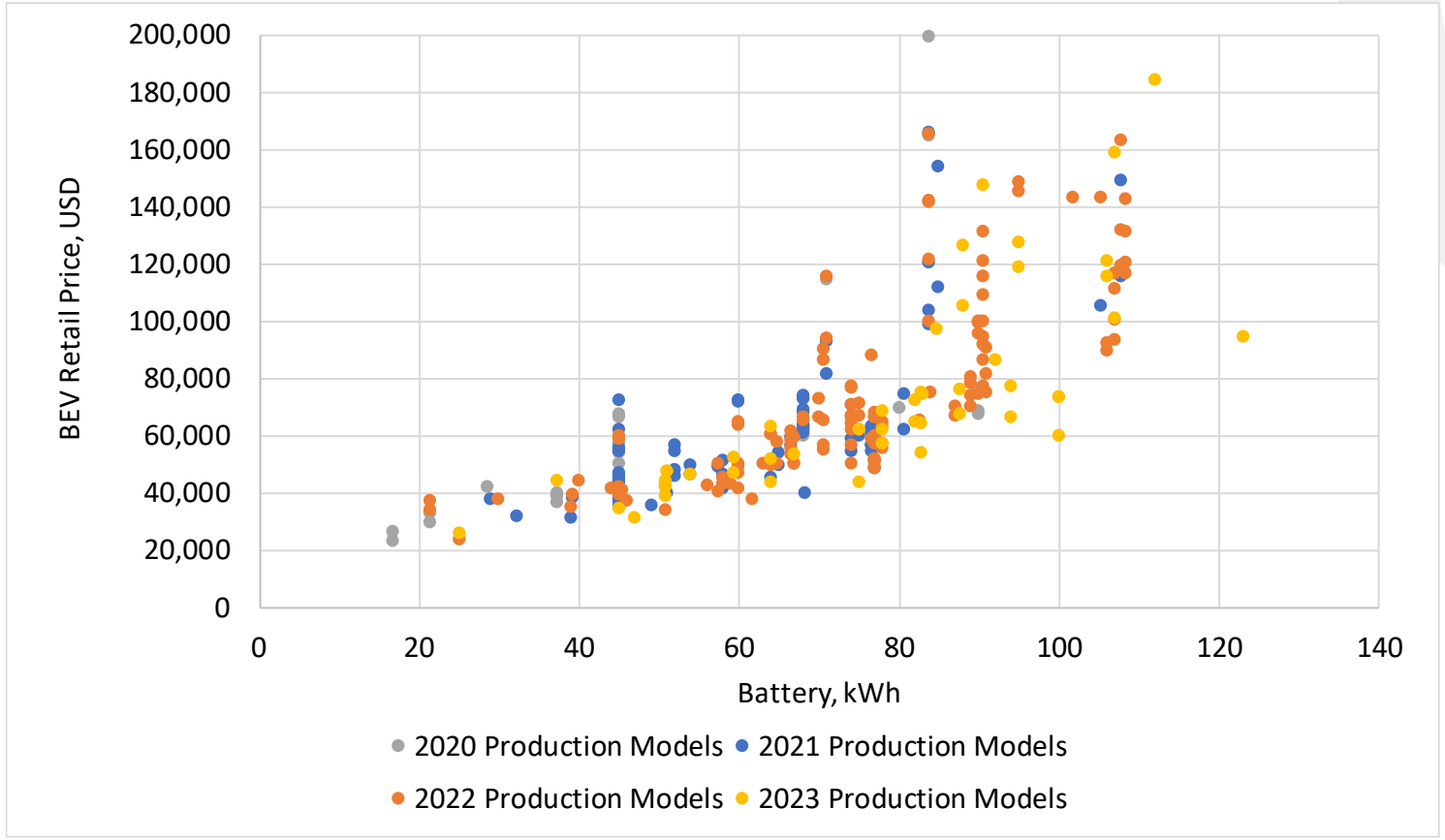
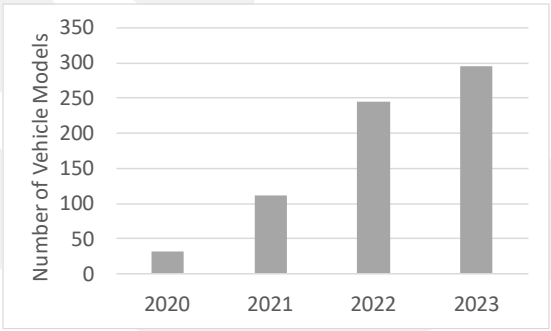
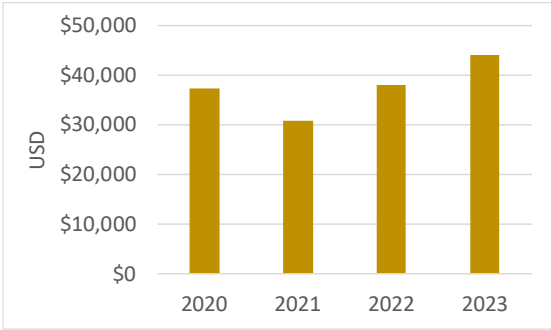
ELECTRIC VEHICLE PRICE VS. BATTERY CAPACITY



Number of BEV Models on the Worldwide Market



Standard Deviation of Retail Price of BEVs



The chart shows retail price vs. battery capacity of all Battery Electric Vehicles (BEV) currently on the market worldwide, before government incentives. Approximately 300 models from 49 brands are included in the analysis.

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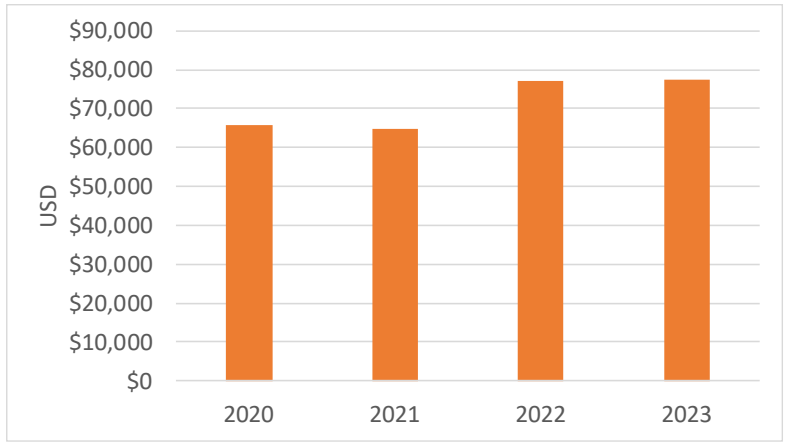
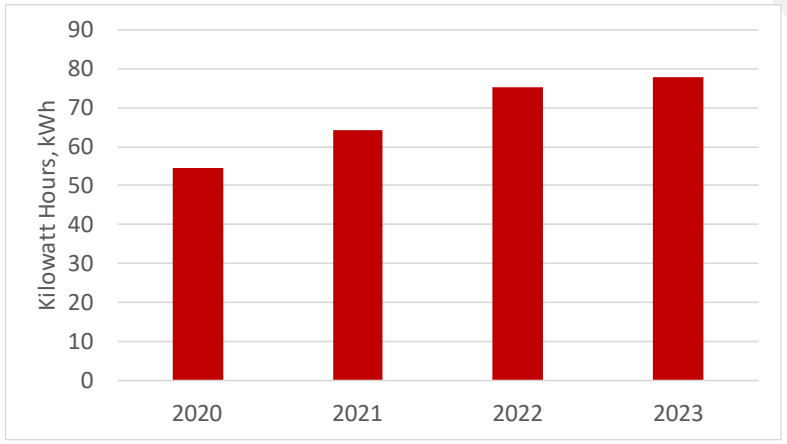
BATTERY ELECTRIC VEHICLE (BEV) RETAIL PRICE TRENDS

Retail Price of Battery Electric Vehicles on the Market per Production Start Year



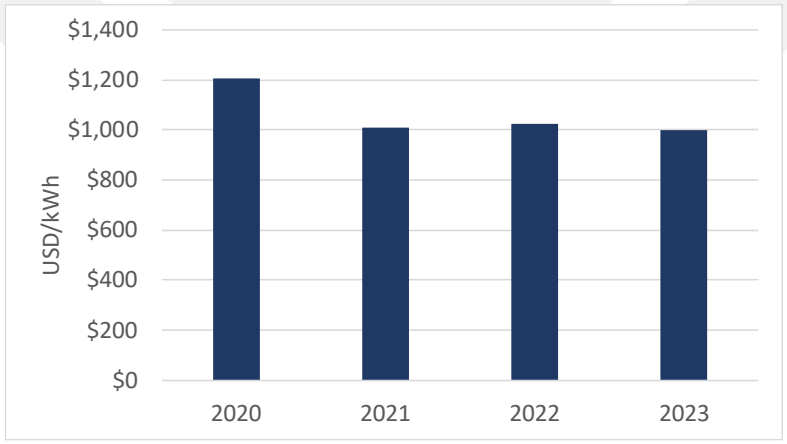
Despite efforts aimed to reduce battery cost, average retail prices of electric vehicles, before government incentives, is around USD $72,600. Incorrys expects the price of electric vehicles will not decline relative to the price of gasoline vehicles over the next few years.

Battery Capacity of Battery Electric Vehicles per Production Start Year



Battery capacity of electric vehicles continues to increase primarily due to the introduction of more expensive luxury models.

Retail Price vs. Battery Capacity for Battery Electric Vehicles per Production Start Year



The retail car price per kWh of battery capacity is expected to remain relatively flat at around $1000/kWh for next few years.

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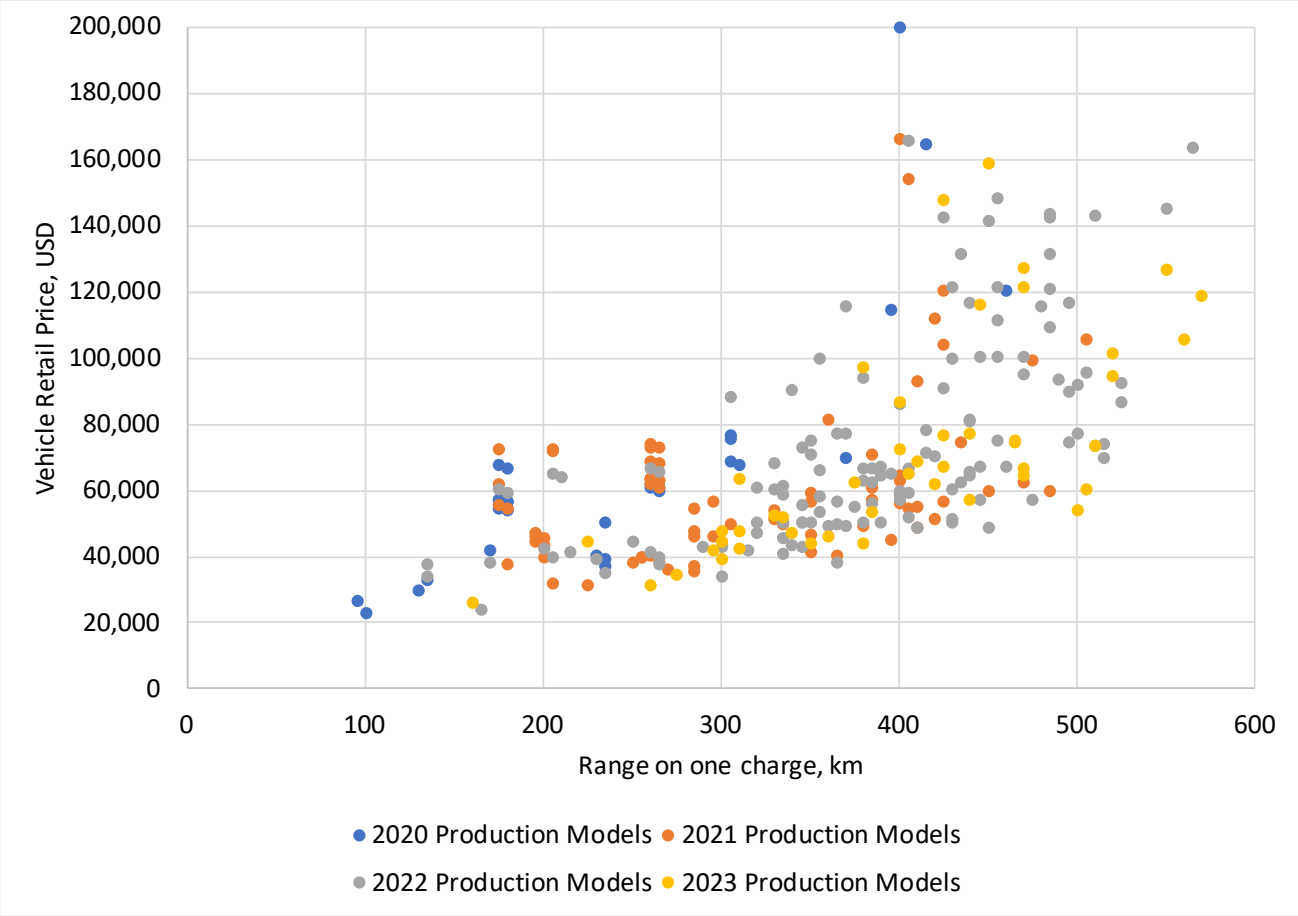
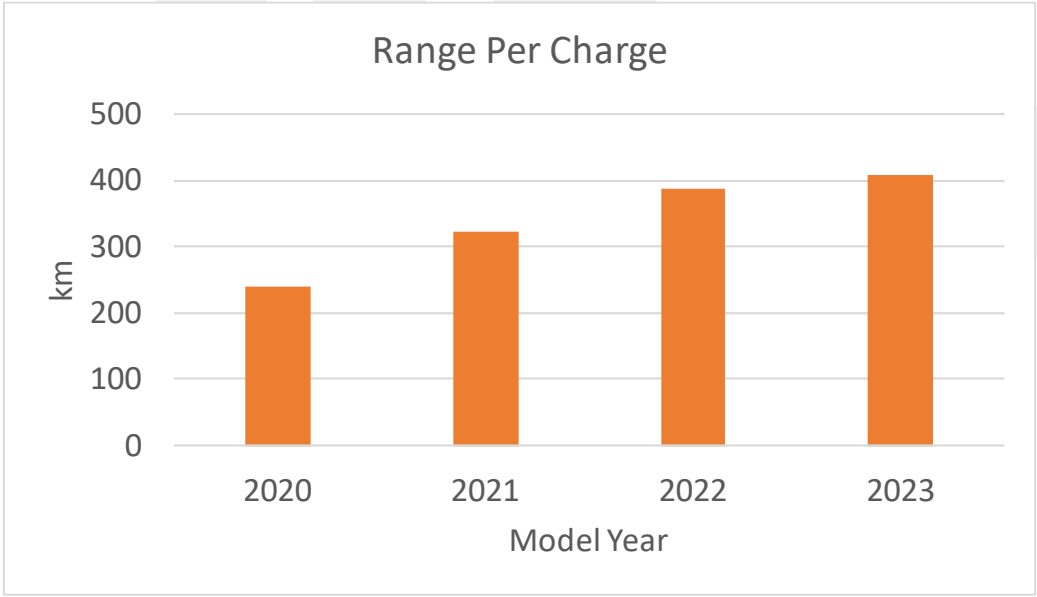
ELECTRIC VEHICLE PRICE VS. RANGE





Average range of electric vehicles reached 408 km per charge for 2023 models - up from 240 km per charge for 2020 models: 70% growth.

Incorrys expects average range will reach 500 km in 2025 which would make electric vehicles comparable to gasoline engine vehicles. Combined with an increased number of charging stations would lead to a greater acceptance of electrical vehicles.

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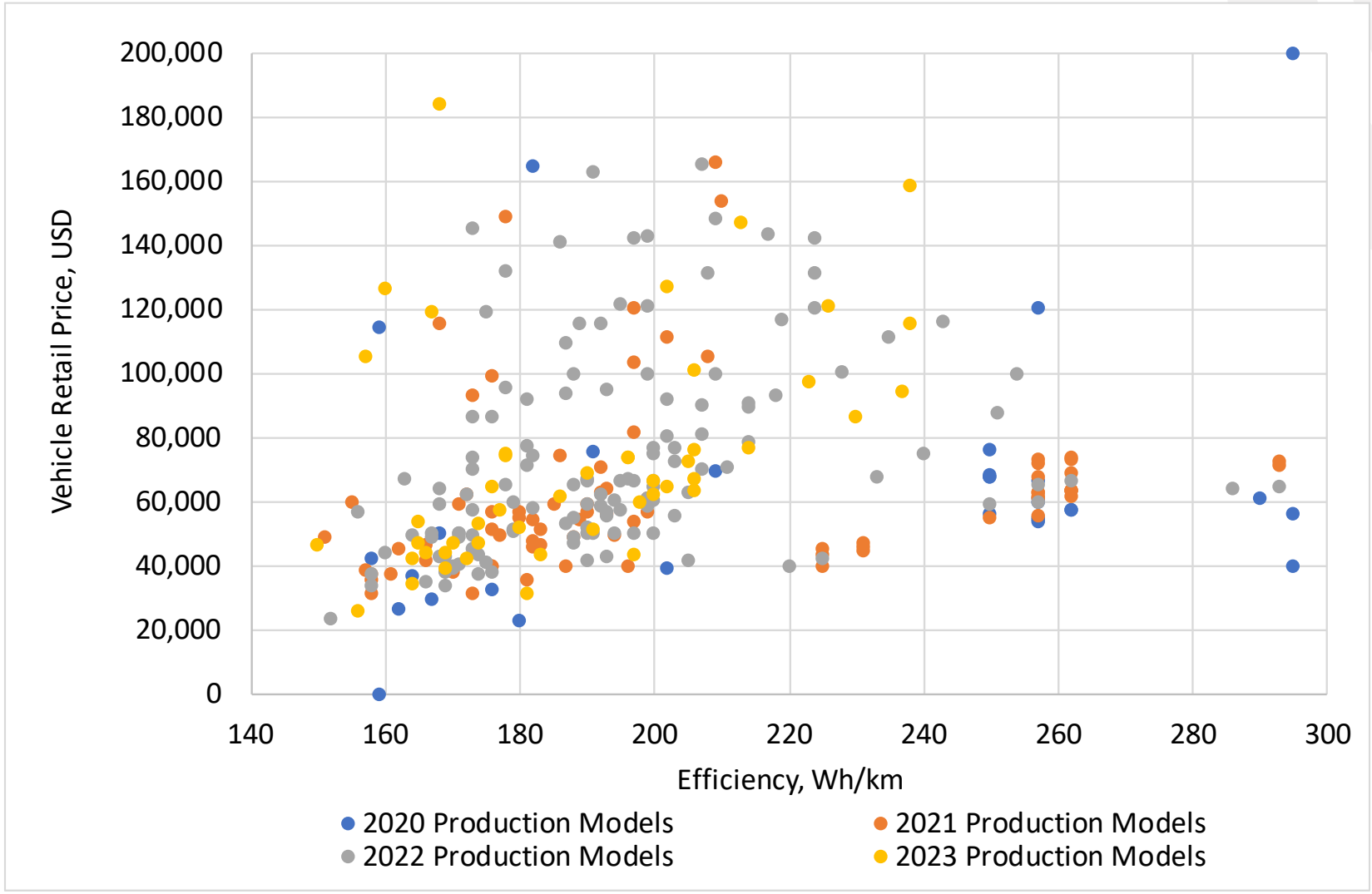
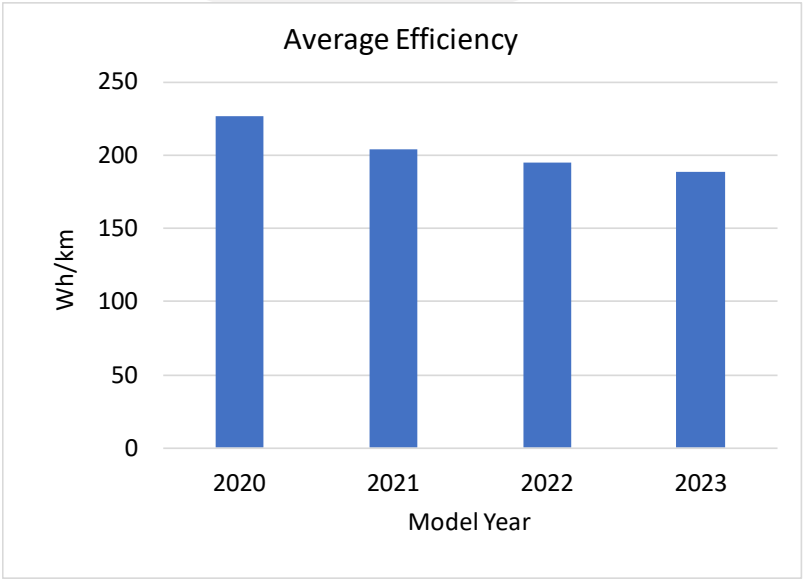
ELECTRIC VEHICLE EFFICIENCY



Electric vehicle efficiency is measured as power consumption(Wh) per kilometre traveled. It continues to improve due to the introduction of larger and heavier models.

Average efficiency dropped to 189 Wh/km for 2023 models down from 226 Wh/km for 2020 models.



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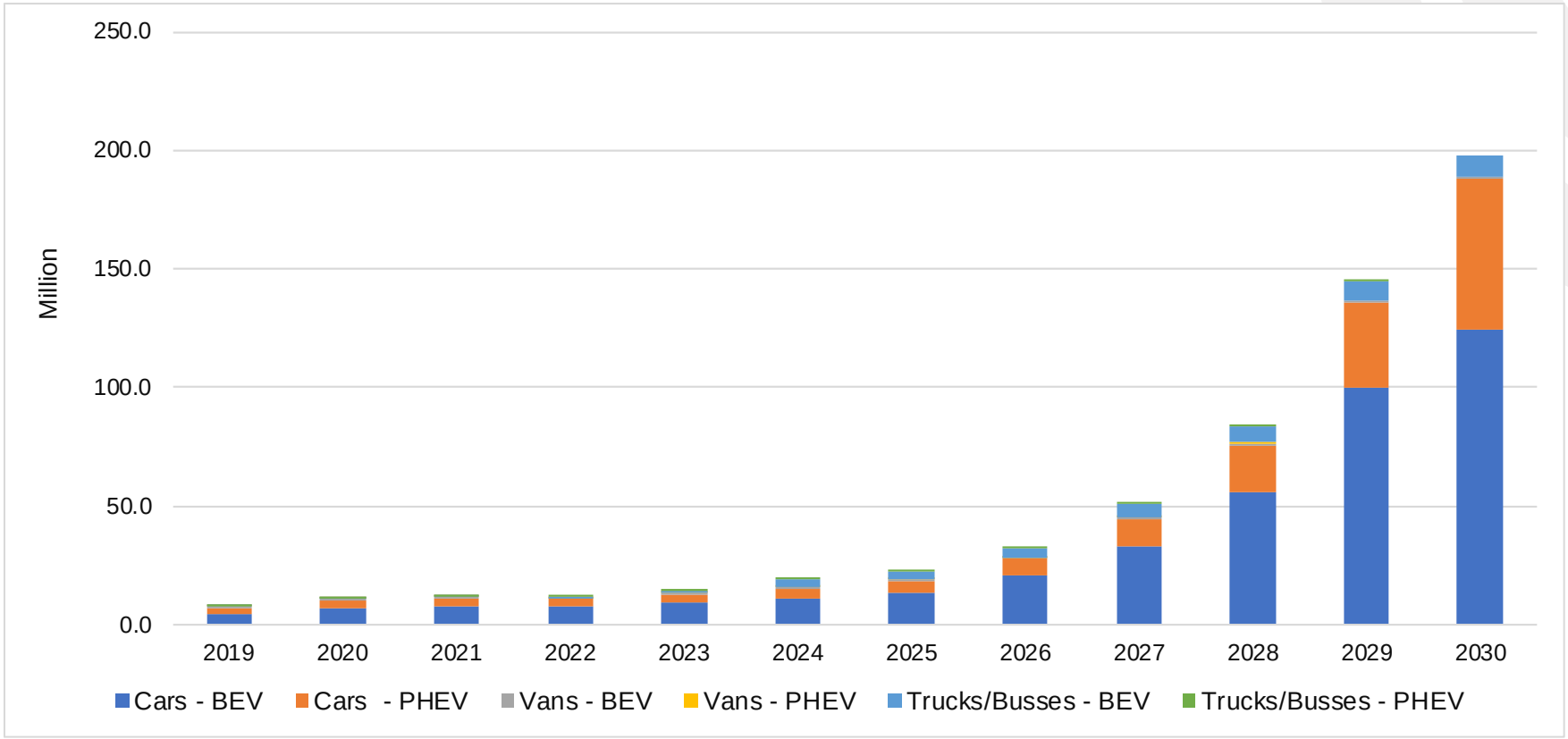
TOTAL NUMBER OF ELECTRIC VEHICLES WORLDWIDE



Cars are passenger light-duty vehicles, vans are light-commercial vehicles, and trucks/buses include medium and heavy-duty vehicles (Two/three-wheelers are not included).

Incorrys estimates total registered electric vehicles worldwide will grow almost 20 times from 10.7 million in 2020 to almost 200 million 2030. In 2030, total number of trucks and buses will reach 10 million, while the total number of vans (LCV) will barely reach 1 million.

Incorrys estimates that the number of buses will reach 9 million in 2030. Most electric buses and trucks will operate in urban areas making shorter trips than between cities.

In 2030, Battery electric vehicles (BEV) will represent 68% of all registered electric vehicles while plug-in hybrid electric vehicles (PHEV) make up the remaining 32%.

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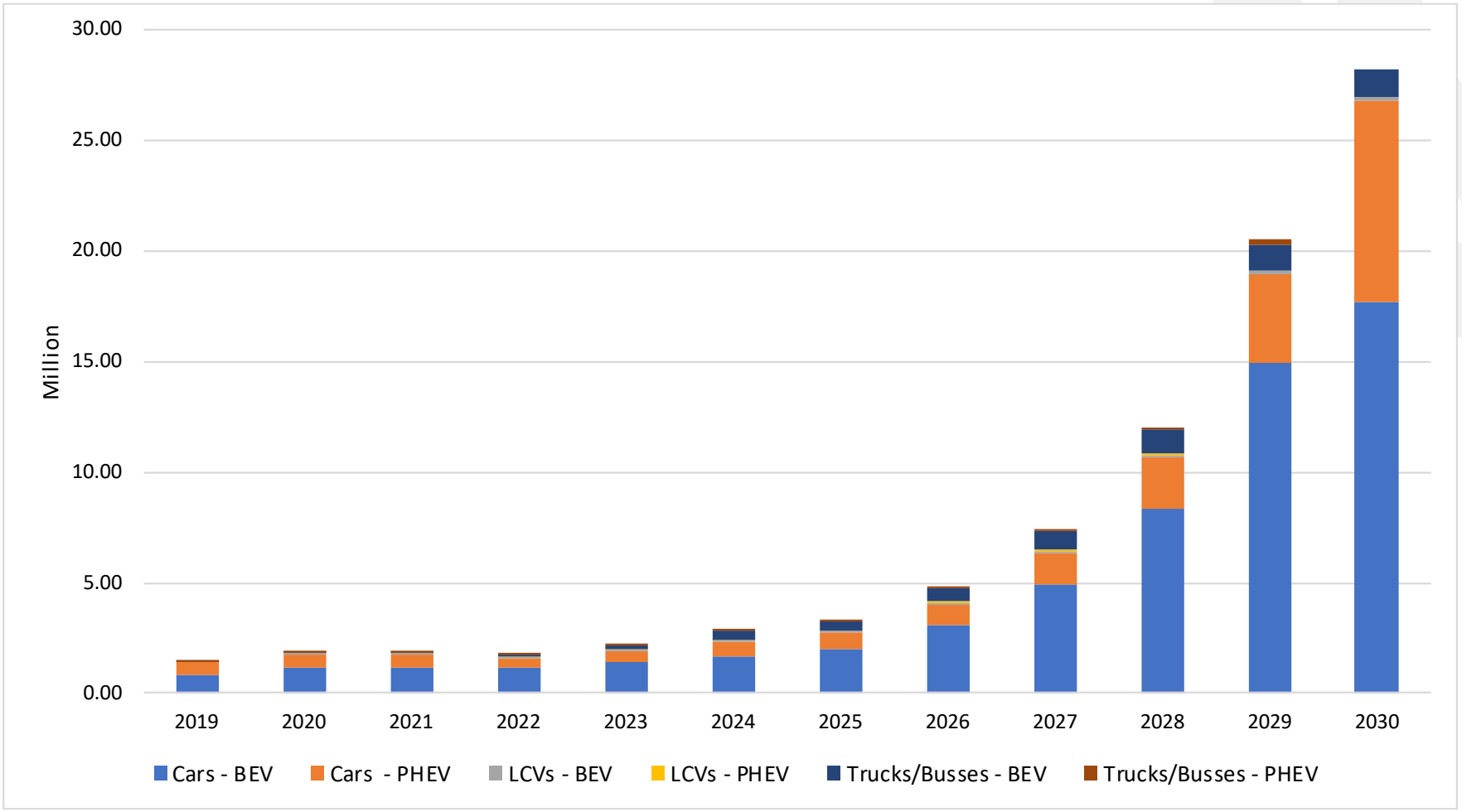
TOTAL NUMBER OF ELECTRIC VEHICLES IN US



Car are passenger light-duty vehicles and include light trucks and SUVs. Vans are light commercial vehicles. Trucks/Buses include medium and heavy-duty vehicles.

In 2022, the US electrical vehicles market share is just 5.6% and it is less than 1% of the 250 million cars, SUVs and light-duty trucks on the road.

Incorrys expects the total number of registered electric vehicles in the US to reach 28 million in 2030, up from just 1.6 million in 2020.

Battery powered cars, SUVs and light trucks (BEV) accounts for 68% of all registered electric vehicles in 2030; PHEVs represent 32%.

A switch to EVs is essential for the US to be carbon-neutral by 2050. However, it will be a slow process as only about 17 million new cars are sold each year.

President Biden has set an ambitious goal of half of new car sales to be electric, fuel cell or hybrid electric vehicles by 2030. The EPA projects the revised standard would lead to 17% more EV sales in 2026, which is very challenging.

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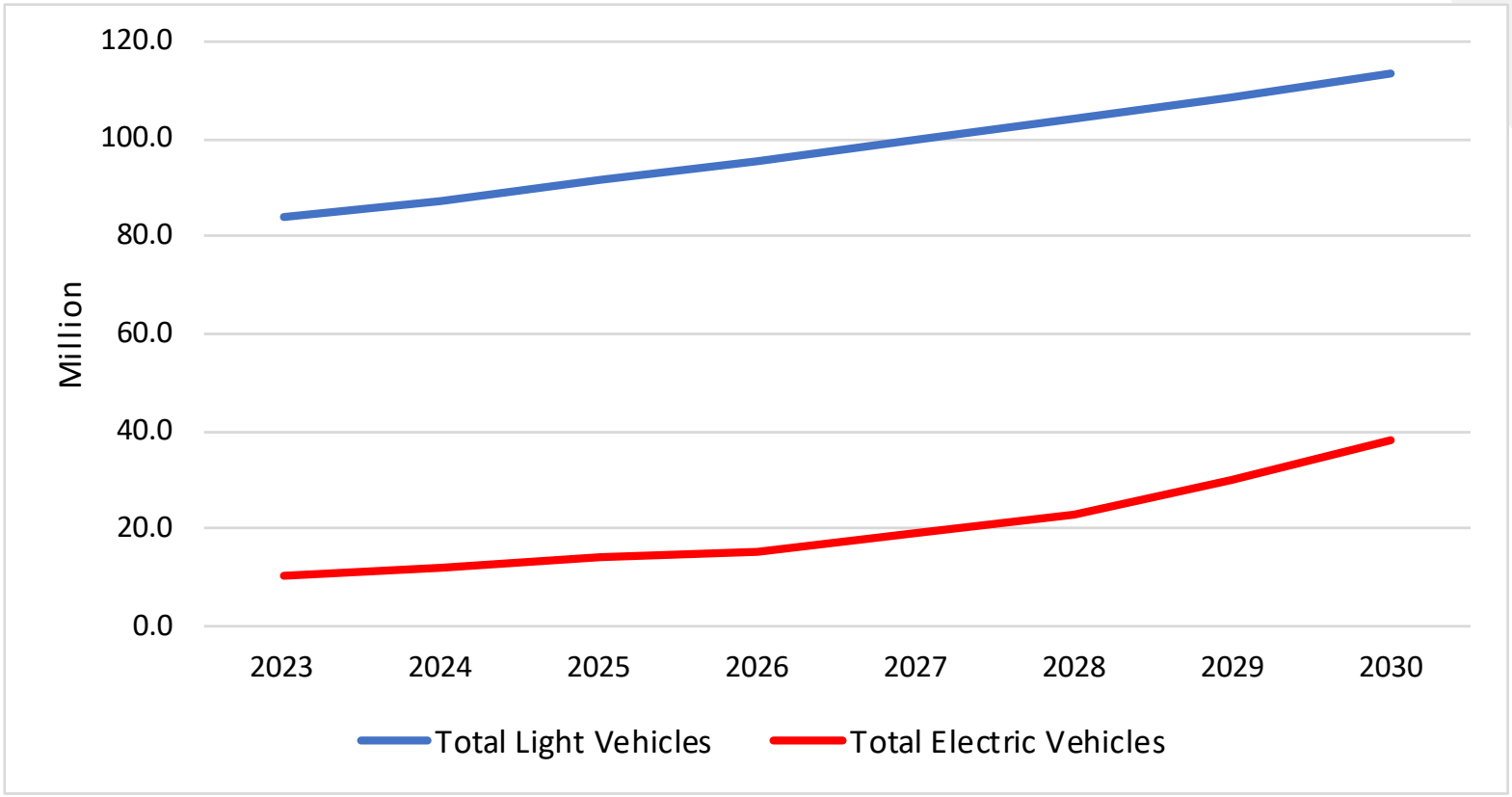
GLOBAL TREND IN LIGHT VEHICLE SALES 2023-2030



The global light vehicles market was valued at almost USD $2 trillion in 2022.

In 2023, the total number of light vehicles is expected to reach 84 million. It is forecast to increase at an annual average rate of about 4.5% reaching 114 million in 2030.

The total sales of EVs increase from 10 million in 2023 to 38 million in 2030. This represents a growing share of the total light vehicle market increasing from 12% in 2023 to 33% in 2030.

Light vehicles includes both cars and LCVs (small trucks and vans) but does not include buses and vans.

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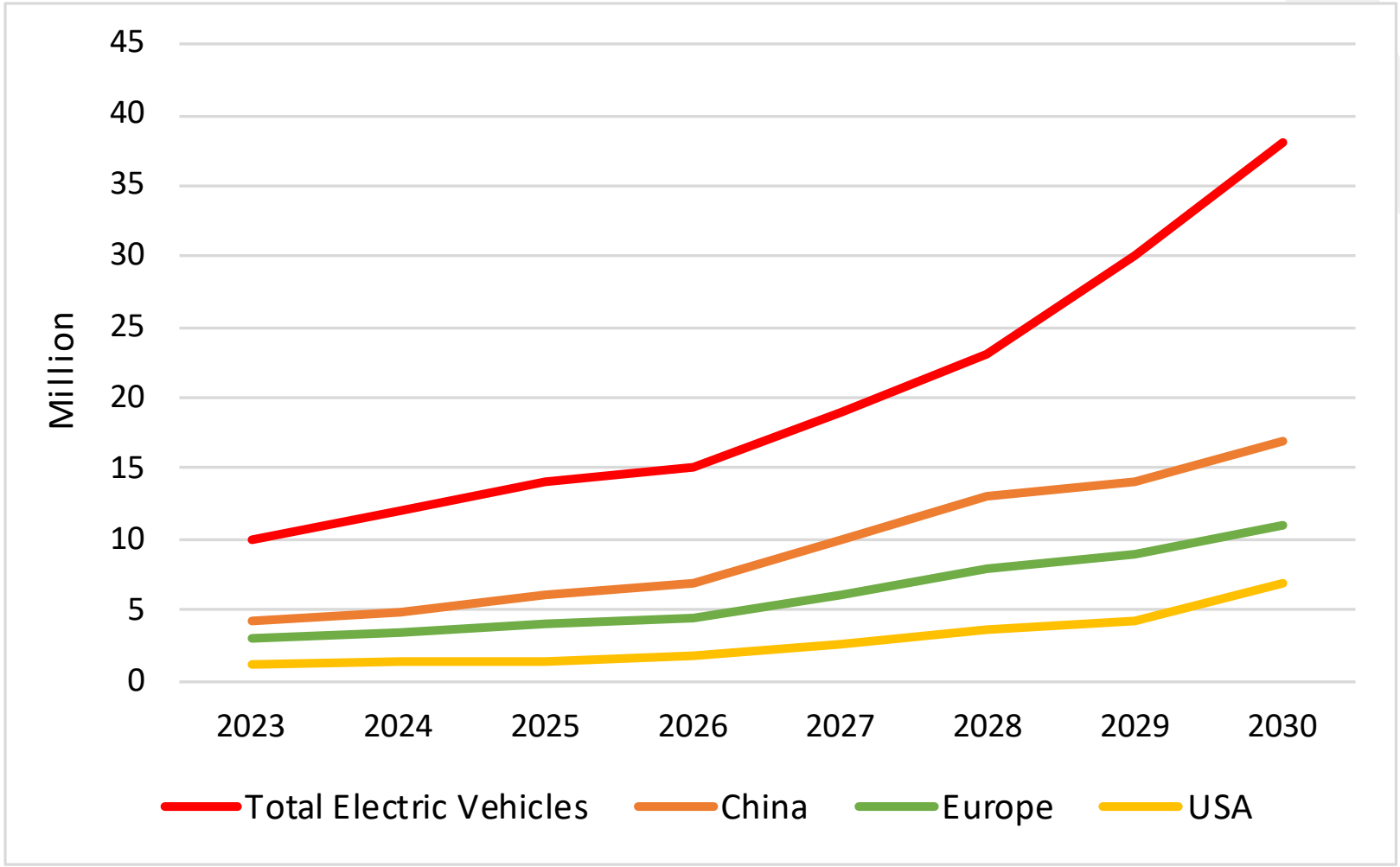
GLOBAL TREND IN ELECTRIC VEHICLE SALES 2023-2030



This chart shows the total EV sales (from the previous slide) by major markets – China, Europe, and the US.

Incorrys expects an acceleration in the sales of EVs post 2026 as the main issues that have plagued the industry are overcome.

Total EV sales increased at a rate of 15% between 2023 – 2026. This compares to China at 18%, Europe at 14% and the US at 13%.

Total EV sales are forecast to increase at an average annual rate of 26% over the remainder of the forecast period, similar to China, Europe, and the US.

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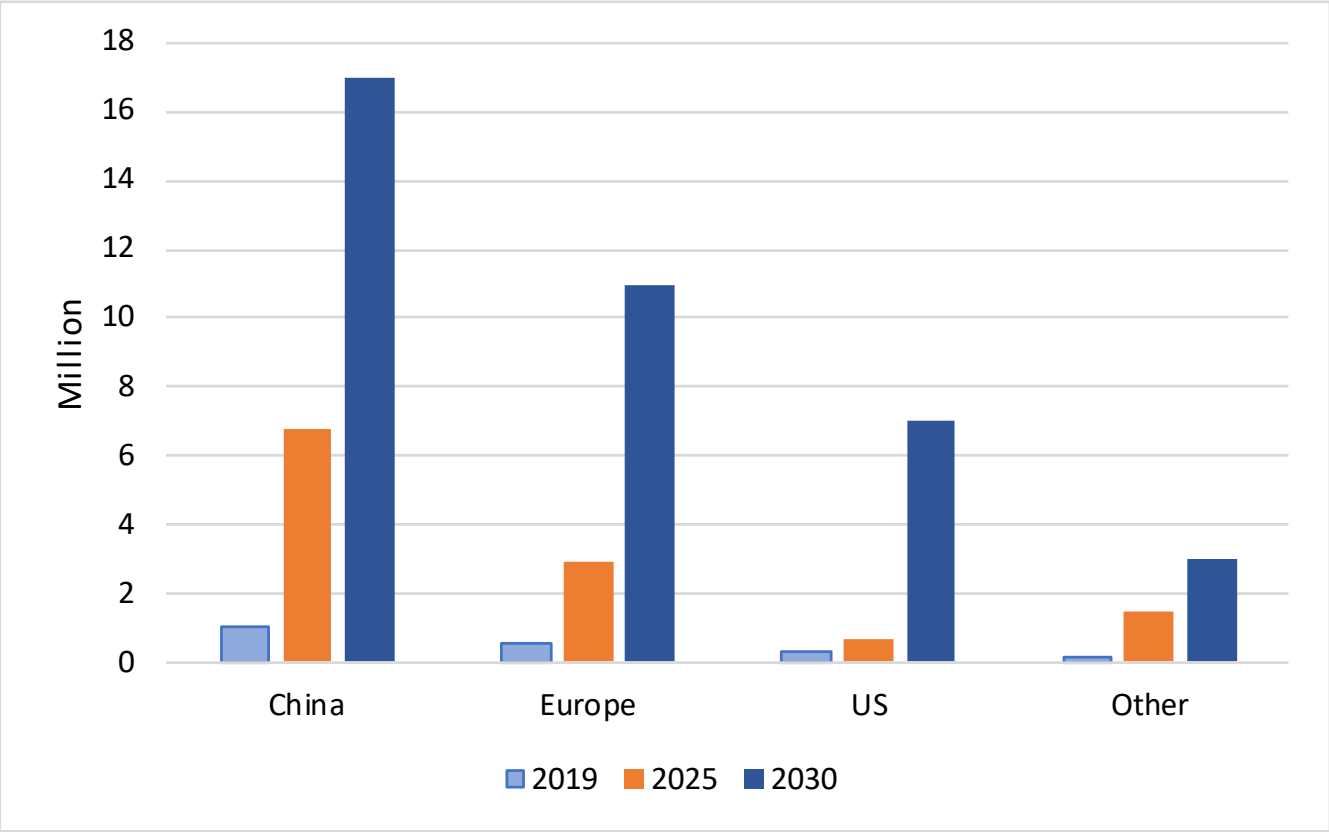
ANNUAL NEW EV SALES 2030



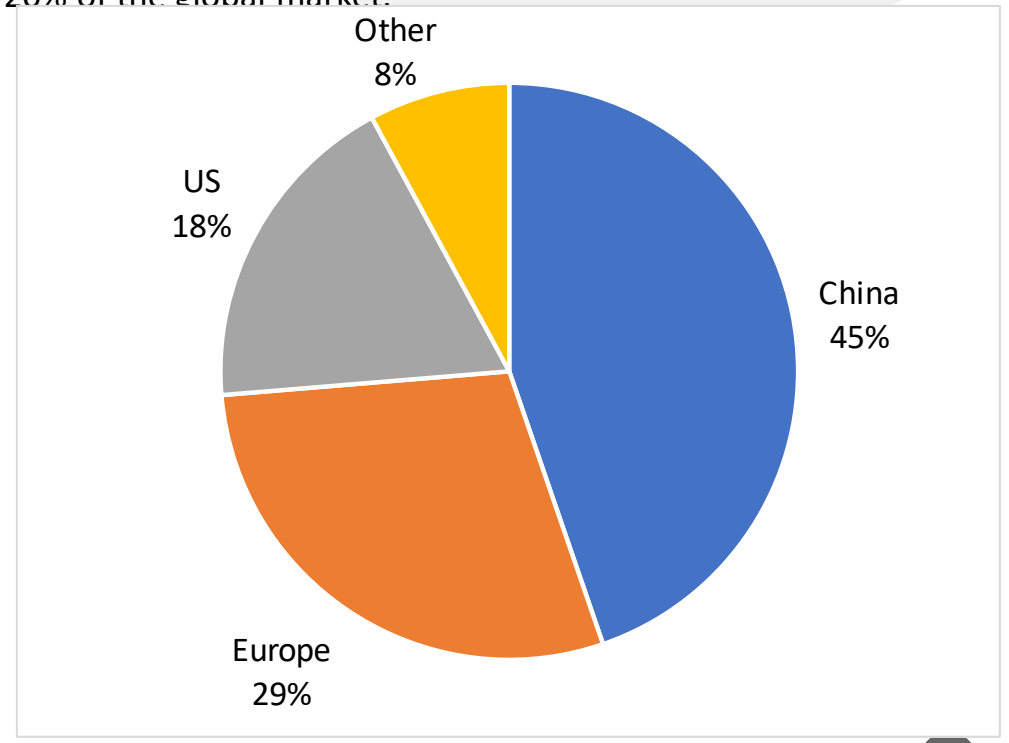
Based on a sustainable development scenario, Incorrys expects the global sales of electric vehicles to reach 38 million in 2030.

China is expected to maintain its position as global leader thanks to efforts in infrastructure development and organizational measures.

China represents 45% of the world's electric vehicle (EV) 2030 Sales with the potential to achieve 60% as they have dominant control of over 70% of the global battery production supply chain.

The European market accounts for 29% (about 11 million vehicles), well behind China due to delays in developing infrastructure.

The US is forecast to have 2030 sales of about 7 million – under 20% of the global market.



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