






Investment Attractiveness of the Korean EV & AV industries

INI R&C

November 05, 2019

-  1 Korean Automotive Industry
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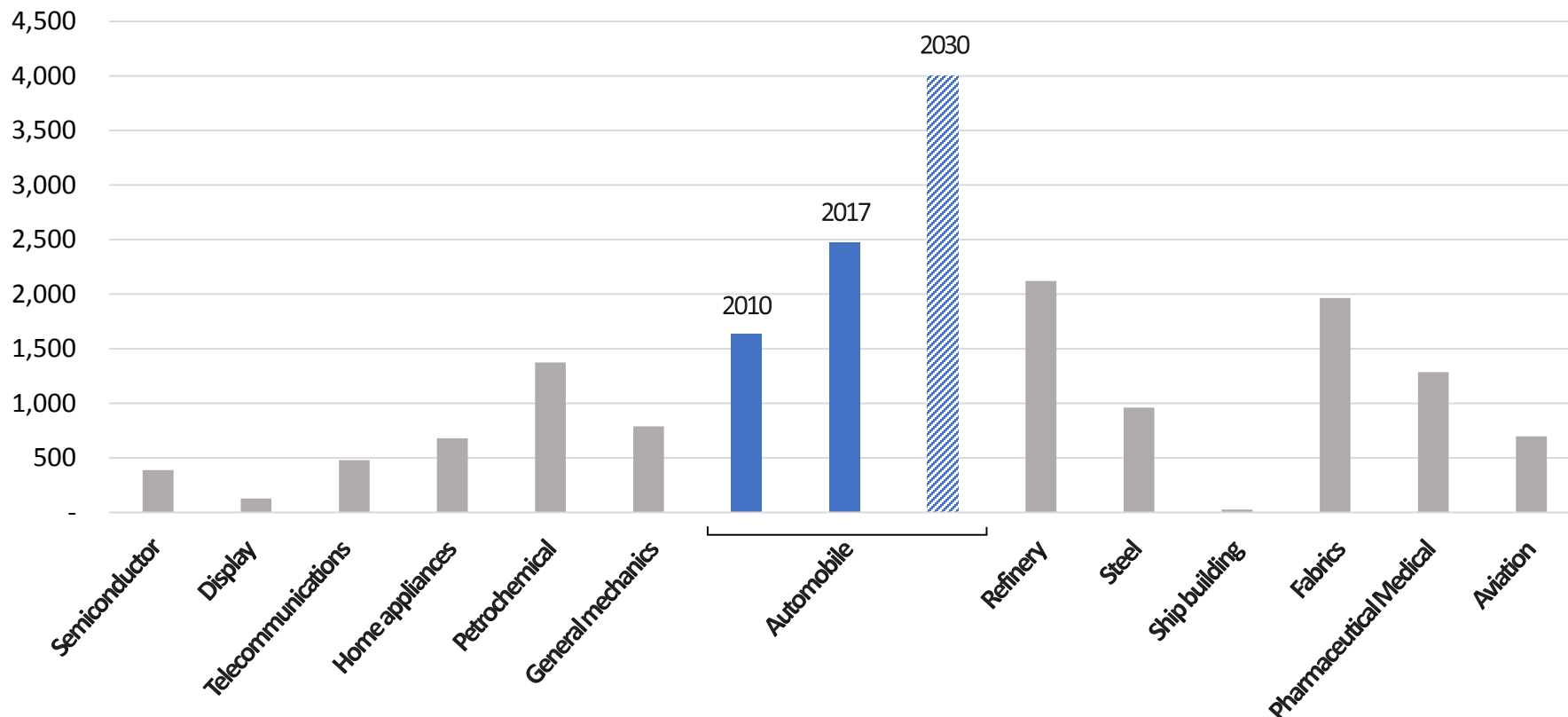
1. Korean Automotive Industry - Positioning in the automotive industry

The importance of the automobile industry is even greater than that of any other industry, as it already has a global market of 2,500 billion US \$ in 2017.

- The semiconductor market in which Korea is leading the world is 400 billion \$, the display is 130 billion \$, and the shipbuilding is only 30 billion \$.

Global Market Value by Industries

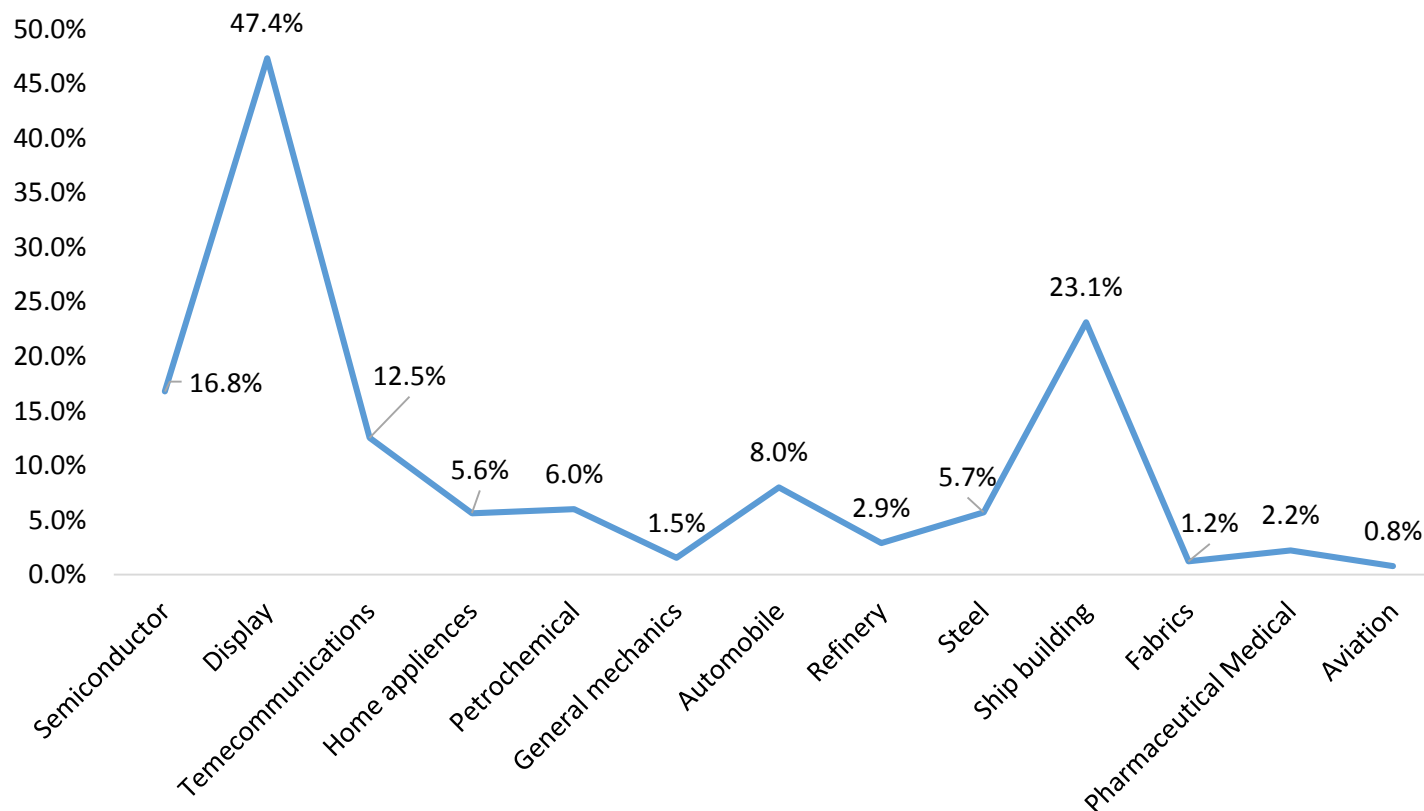
(Unit: bil US\$)



* Reconstructing data for each industry by INI R&C on a global market basis in 2017

The automotive industry has the largest amount of production and the largest amount of exports.

Global Market Value by Industries



1. Korean Automotive Industry - Positioning in the automotive industry of Korea

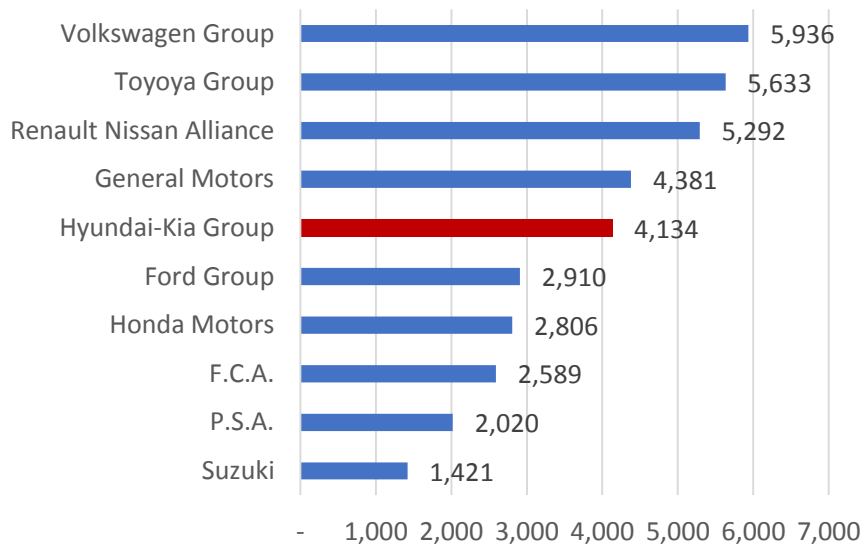
Hyundai / Kia Motors Group is the world's 5th largest automobile producer.

- Until July 2019, Hyundai Kia has sold 4.13 million units, the fifth largest in the world.
- In 2018, Hyundai / Kia sold 7.4 million units, the fifth-largest in the world.
- As of 2018, the automotive industry ranked 3rd in exports and the automotive parts ranked 5th in exports.

Hyundai / Kia's Market Position

(Unit: thousand)

Sales Volume(1~7,2019)



(Source : Automotive Industry)

Ranking by Export Industry

2016	2017	2018
Semiconductor	Semiconductor	Semiconductor
Automobile	Ship buildings	Petroleum Products
Ship buildings	Automobile	Automobile
Telecommunication	Petroleum Products	Display
Petroleum Products	Display	Automobile parts
Automobile parts	Automobile parts	Synthetic Resins
Synthetic Resins	Telecommunication	Ship buildings
Display	Synthetic Resins	Steel
Steel	Steel	Telecommunication
Plastic	Computer	Computer

(Source : e-Country Indicator, Korea Customs Service)

2. Paradigm Shift in the Automotive Industry

The automotive industry is changing from the mechanical industry to the electronics / IT industry.

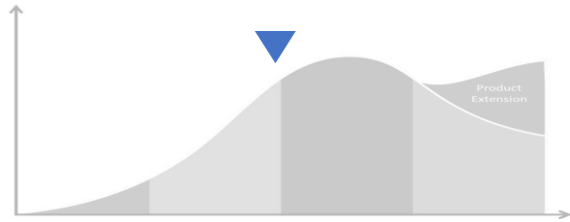
- Korea has no mechanical power but strong electronic/IT power.



2. Paradigm Shift in the Automotive Industry

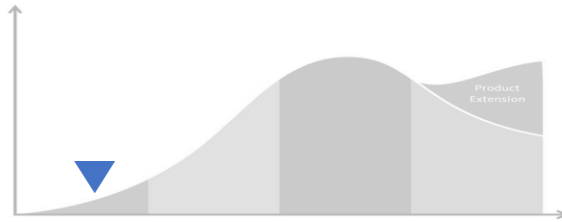
The automotive industry is changing from the mechanical industry to the electronics / IT industry.

- Korea has good mechanical power but best electronic / IT power.



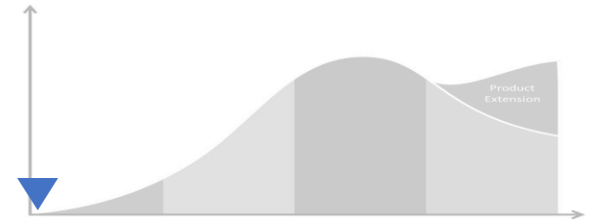
Connected

- Infotainment Services
- Telematics Services



Electric

- Battery Electric Vehicle
- Fuel Cell Electric Vehicle



Autonomous

- Self-driving Car
- Unmanned Car

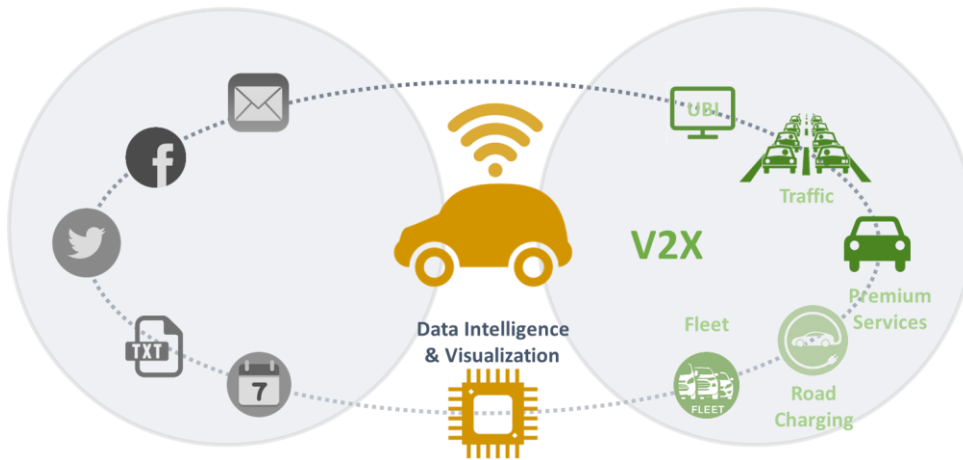


Connected cars evolve into smartphones with wheels.

- The concept of Connected Car began with the introduction of OnStar services to GM in the mid-1990s.

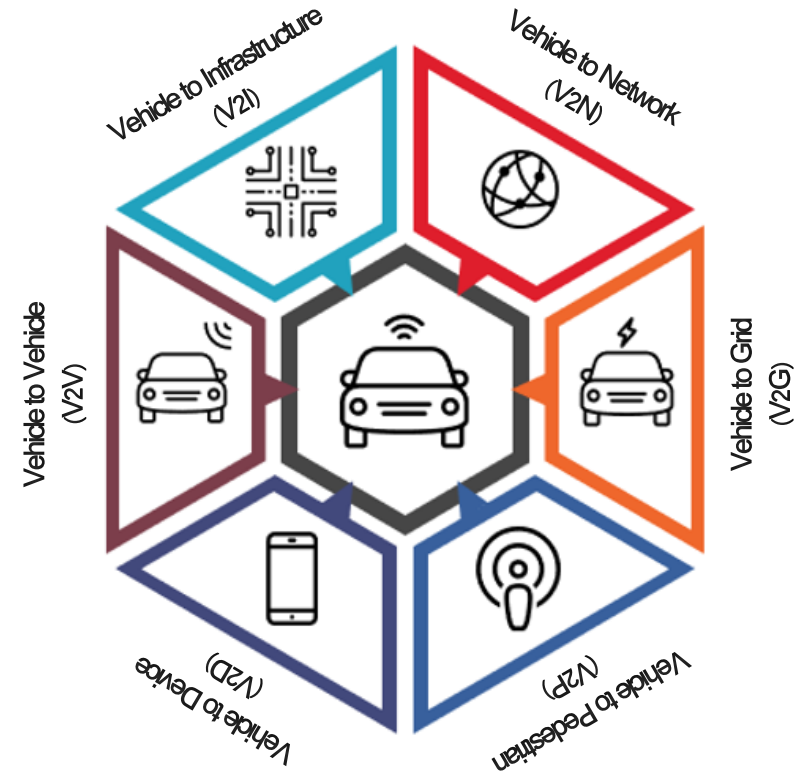
I&T

Infotainment Services



(Source: INIR&C)

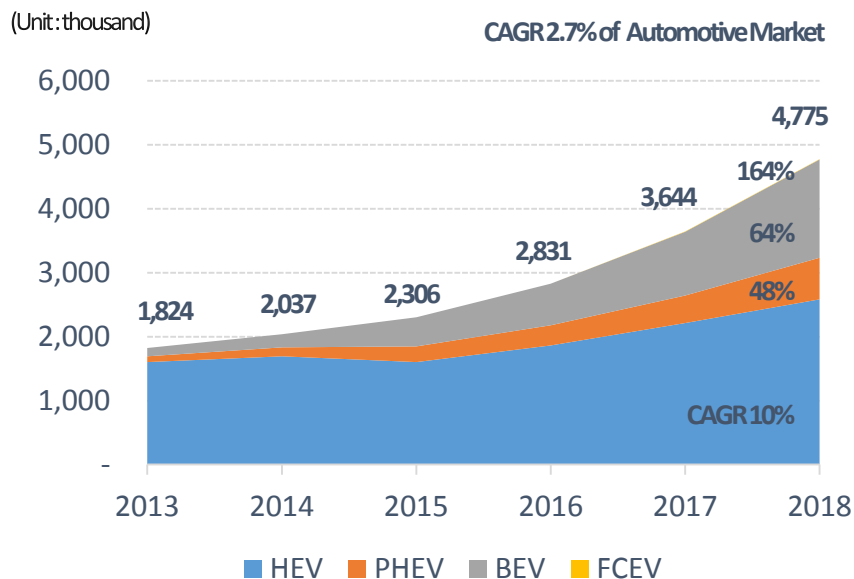
V2X



In 2018, 4.8 million electric vehicles were sold worldwide.

- Electric cars, which began selling in December 1997, only reached 2% of total car sales in 2013, 16 years later. It took 3 years to increase by 1%, and 1 year after 2016.

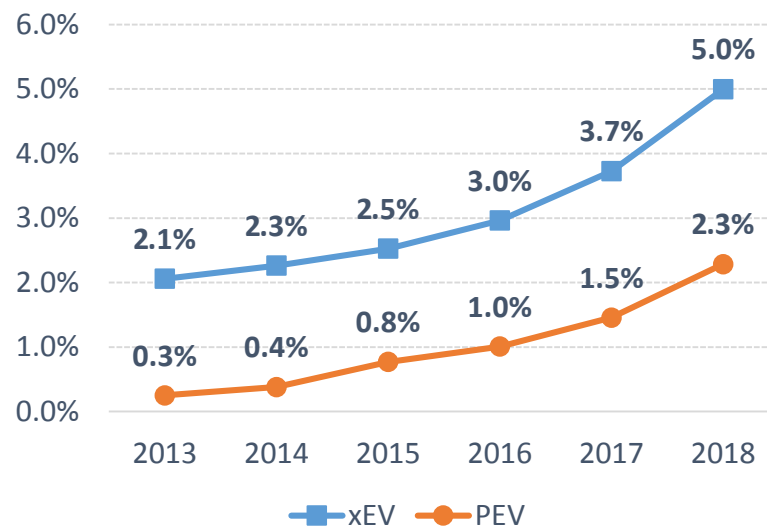
Global xEV Market Trend



(Source: INIR&C)

EV Market Penetration Rate

Note] PEV = PHEV + BEV

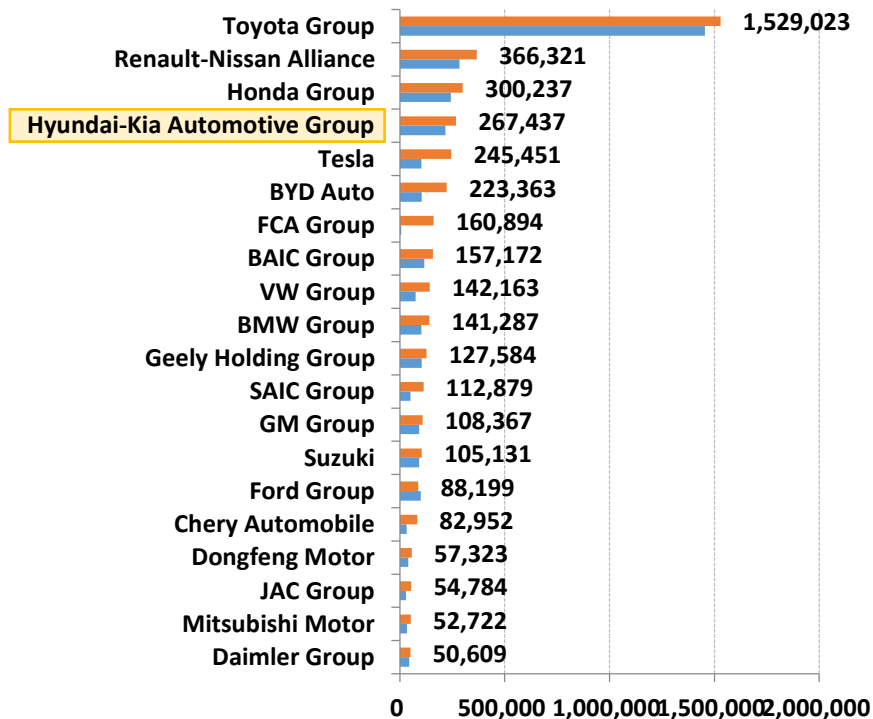


Korea's Hyundai / Kia Motors Group is a leading global electric vehicle company.

- In the XEV market, Hyundai / Kia is the fourth largest EV company in the world.
- In the PEV market, Hyundai / Kia is the 8th largest company in the world.

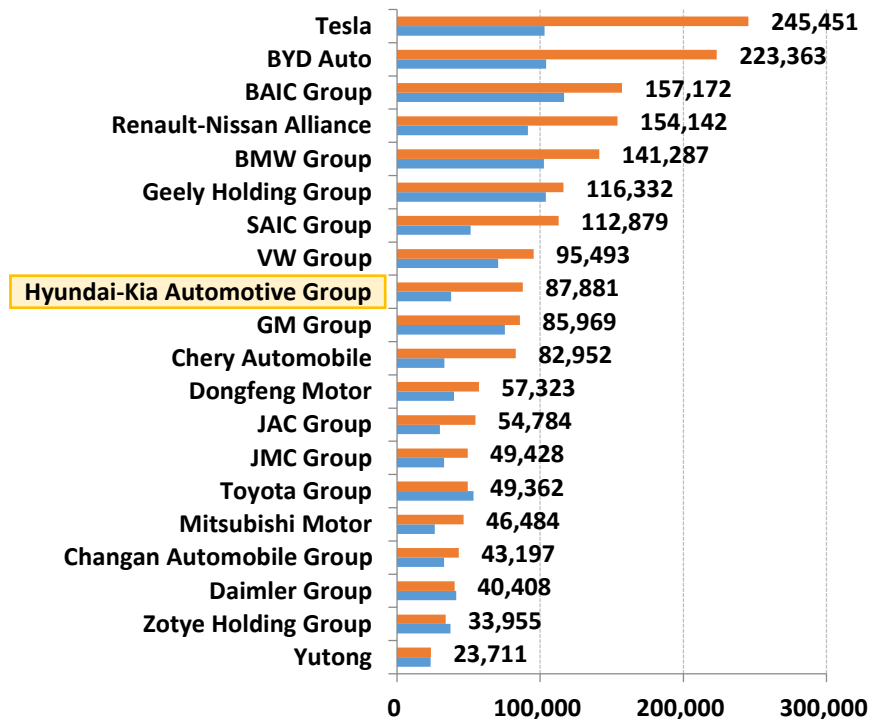
XEV Manufacturing Group Rankings

2018 2017



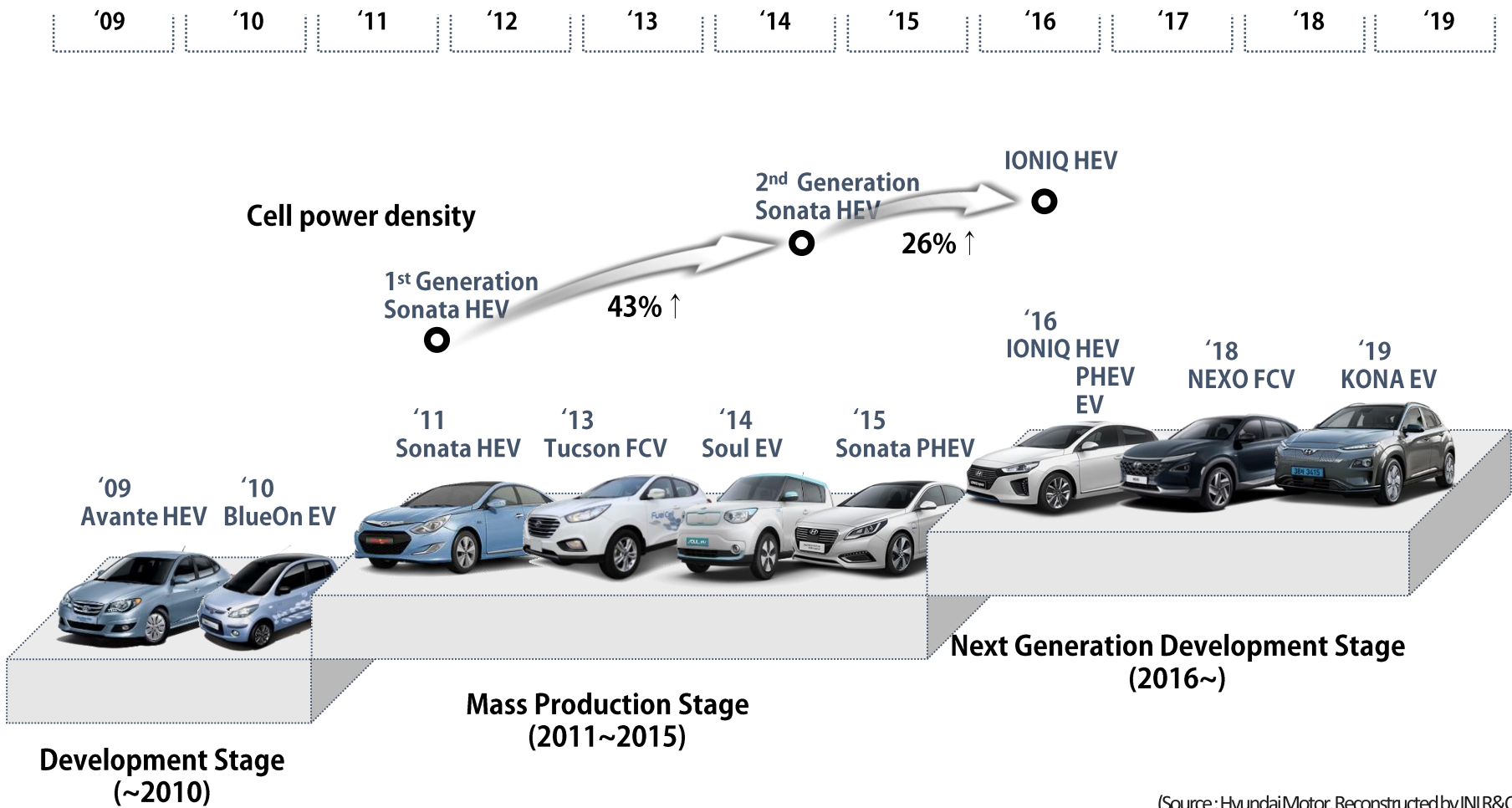
PEV Manufacturing Group Rankings

2018 2017



(Source: INIR&C)

The plan is to expand to more than 38 models by 2025.



(Source : Hyundai Motor, Reconstructed by INIR&C)

The electric vehicle industry requires many electronics, including lithium secondary batteries.

- Electric vehicles include batteries, DC / DC converters, chargers, motors and inverters.



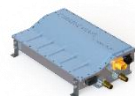
Battery Pack(30kWh)

\$5,280



DC/DC Converter

\$100



On-board Charger

\$350



Motor

\$1,000



Inverter

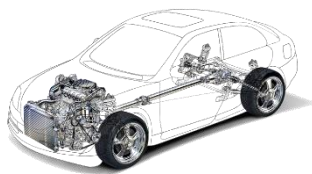
\$600

=

Total
\$7,330

* Assumed to drive 14,000km per year

Annual energy costs
\$150~350



Engine

\$2,000



Transmission

\$1,500



Drive Shaft

\$900



Fuel Tank

\$600

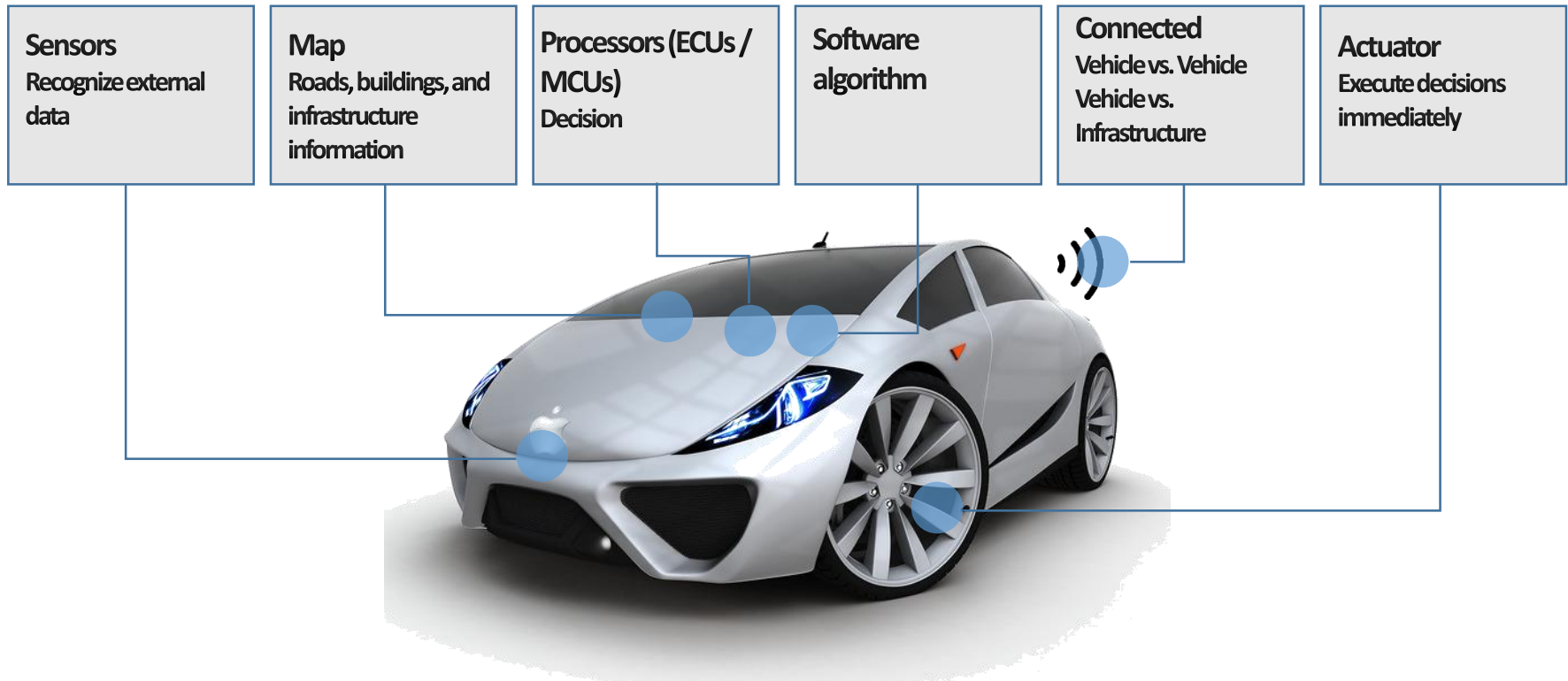
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Total
\$5,000

Annual energy costs
\$1,000~1,600

The technology of autonomous driving car is composed of driving environment recognition technology (radar / lidar / camera etc.), location recognition technology (precision map, GPS, sensor, etc.) Etc.) and interaction technology (HMI / V2X, etc.).

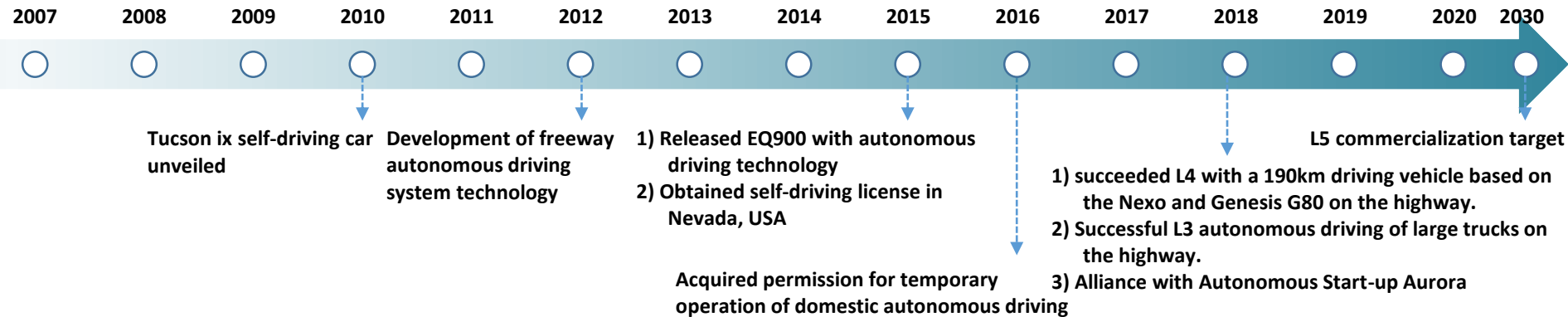
Autonomous Vehicle Technologies



4. Autonomous Vehicles - Autonomous vehicle market by sector

Realistic response from connected cars

- The Hyundai motor plans to start full-scale autonomous operation by 2030, and focuses primarily on autonomous self-driving of connected automobiles.



Hyundai's self-propelled truck test



Hydrogen electric car Nexo autonomous model



Bluelink - connected system



autonomous car partnership

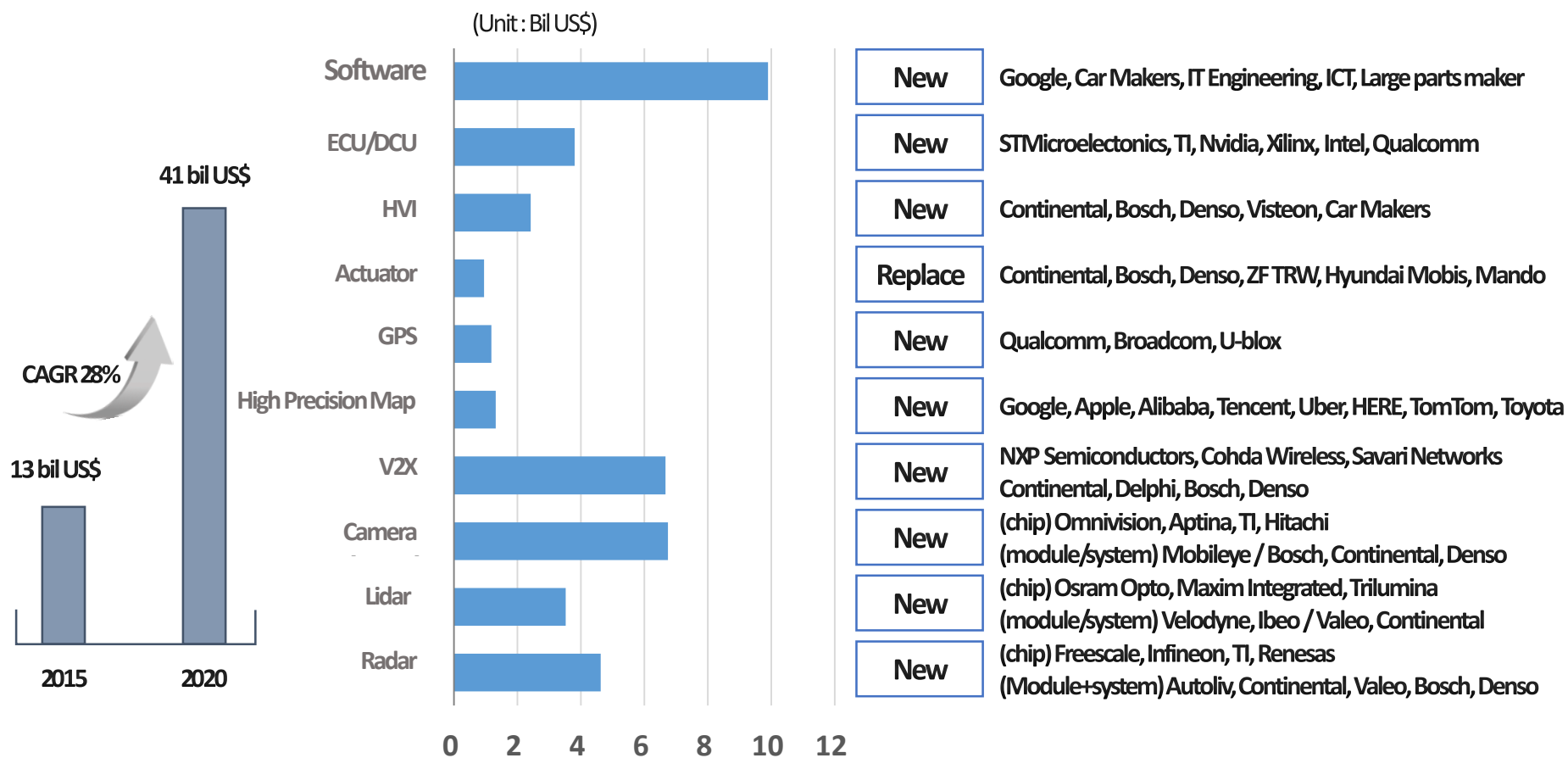
- In July 2017, Hyundai decided to cooperate with Mobile Eye in autonomous vehicle and in 2018, has partnership with the self-propelled start-up Aurora (January), and invested in US radar and AI start-up "Meta-wave"(May), US AI startup 'Perceptive Automata' (October).

Hyundai aim to develop L4 stage in Smart City by 2021, and to commercialize fully autonomous vehicle by 2030.

The market opportunity for autonomous vehicle technology is expected to grow rapidly from US \$ 12.9bn in 2015 to US \$ 41bn in 2020 (CAGR 28%).

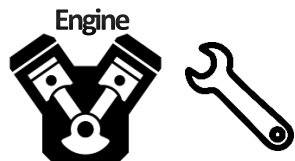
- The autonomous driving parts market will more than triple in five years. In addition, most of them are open to new markets.

Market opportunities related to autonomous vehicles(2020)

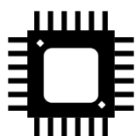


The automotive industry is evolving from the machinery industry to the ICT & electronics industry, and the evolution will soon be completed.

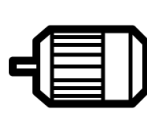
- Four areas of CASE will eventually become convergence.



Semiconductor



e-motor



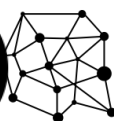
Battery



Sensors



Telecoms



Big data



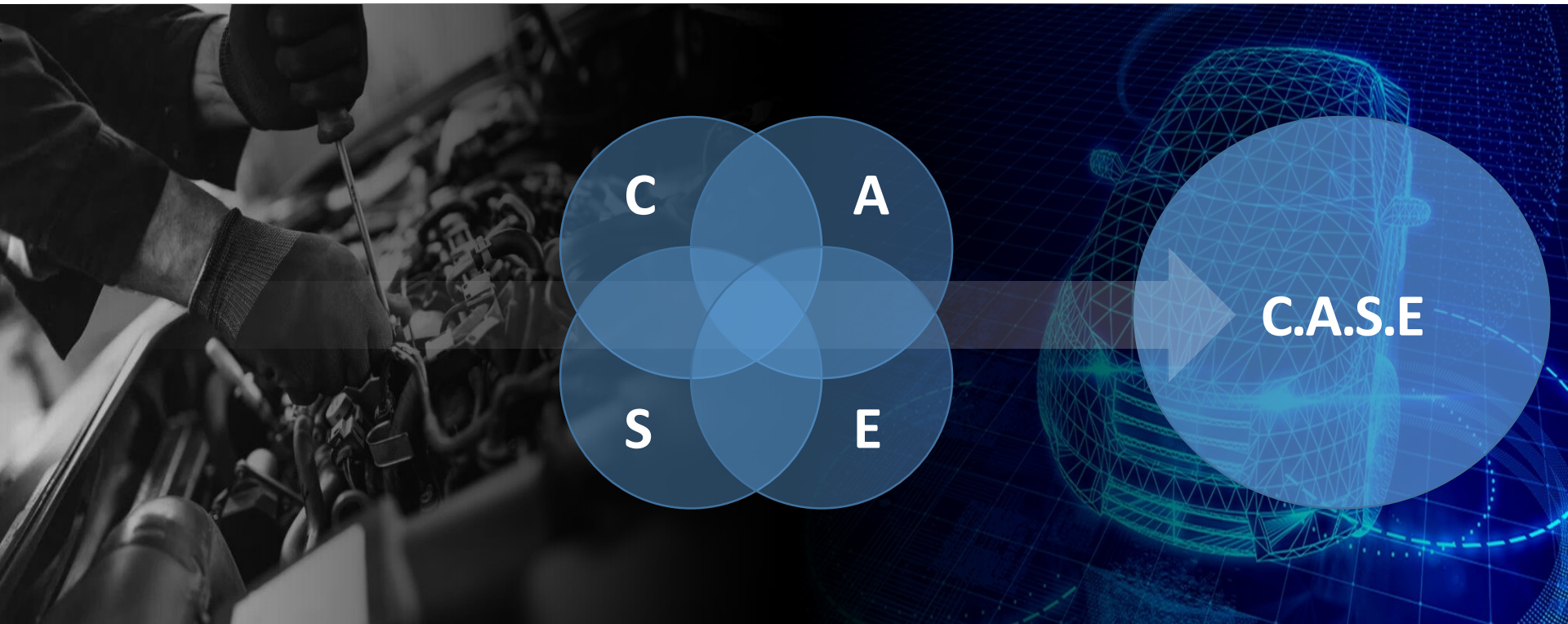
AI



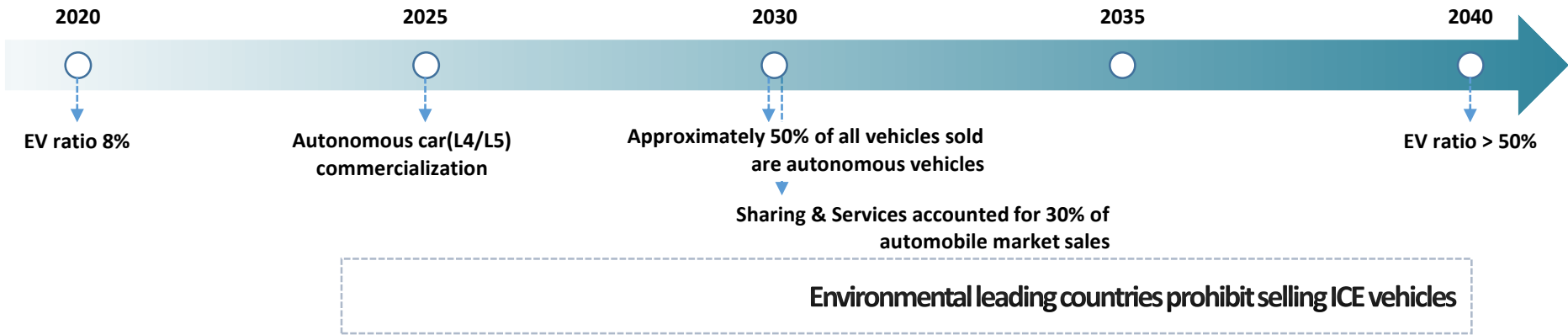
Robot



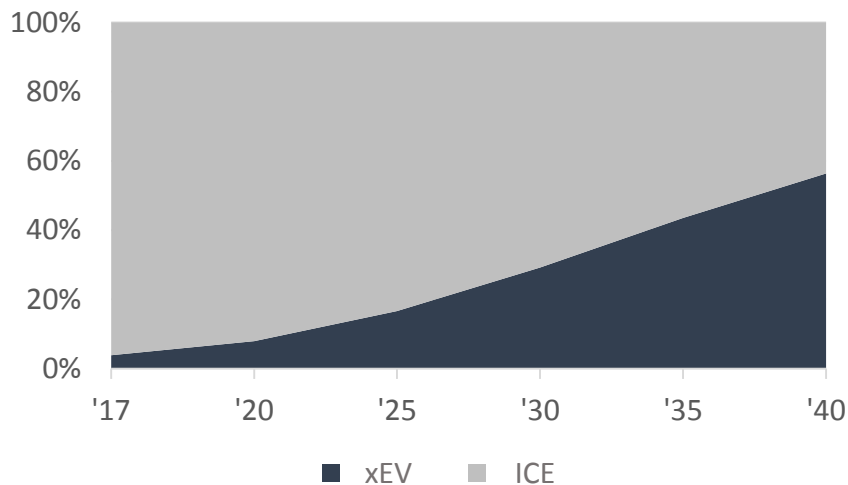
IoT



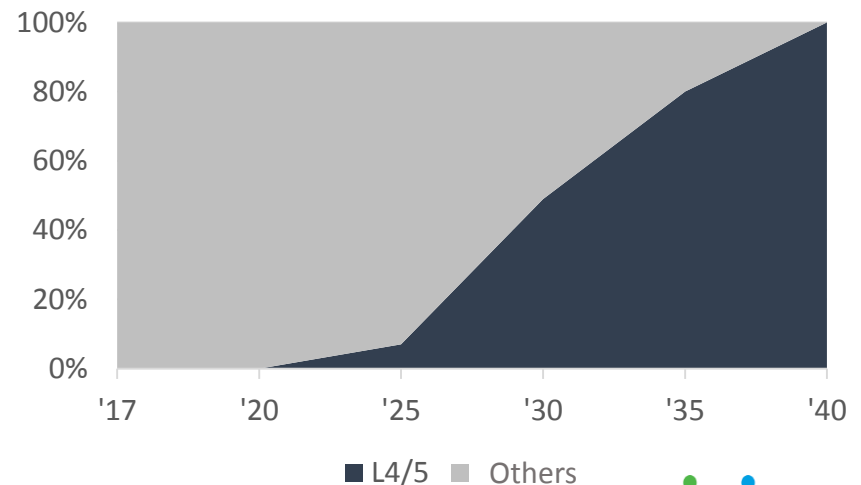
EV steadily make the market, but autonomous vehicles will rapidly penetrate the market.



Electric Vehicles



Autonomous Vehicles



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