TECHNOLOGY BREAKTHROUGH IN ELECTRIC VEHICLES AND AUTONOMOUS VEHICLES

Malaysian Pacific Industries Berhad

A Member of the Hong Leong Group

13th January 2021

ENVIRONMENTAL CONCERNS DRIVE ELECTRIC VEHICLES FORWARD

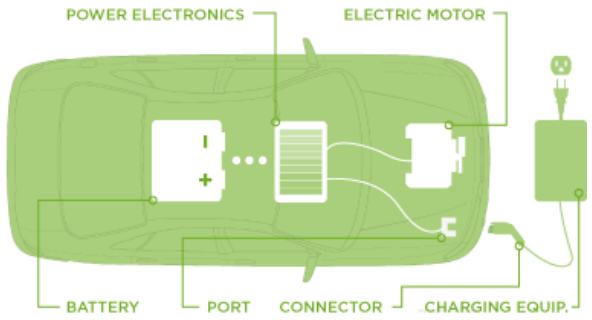
- By 2050, there will be around **3.5 Billion cars on the road**, compared to 1.4 billion in 2020. – Automotive Industry Projections
- Of all the oil consumed, **30% is used for transportation** and majority used by passenger vehicles.– International Economic Development Council
- Crude Oil reserves are depleting by more than 4 billion tons a year, at this rate oil deposits could **run out in next 53 years**. – McKinsey Report
- Carbon emissions from Cars **lead to 80% of lung diseases** and depletion of ozone layer at an alarming rate. – Grail Research Report
- **Need of the hour is to seek a long term solution to avoid emission from personal vehicles via Innovation & Technology**. – McKinsey Report

SUSTAINABLE SOLUTION – ELECTRIC VEHICLES

Electric Vehicles (EV) - operates on an **electric motor**, instead of an internal-combustion engine that generates power by burning a mix of fuel & gases

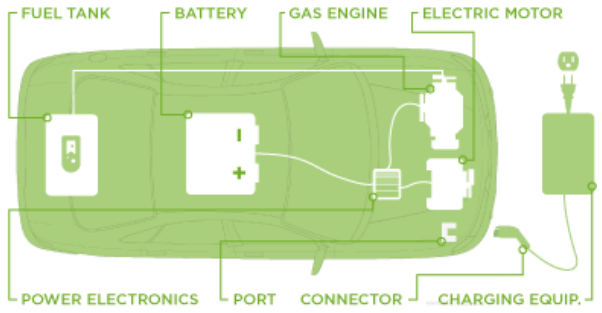
Types of EVs

Battery Electric Vehicles (BEV)



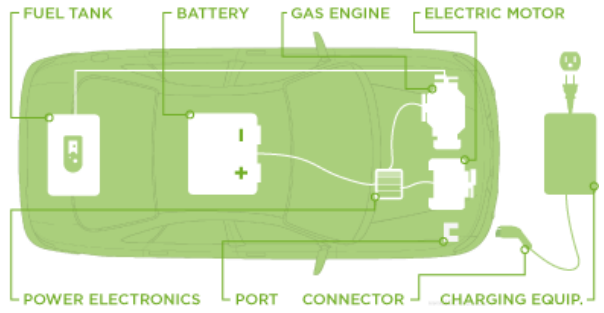
Fully electric vehicles

Plug In Hybrid Electric Vehicle (PHEV)



First uses Battery then Fuel to run

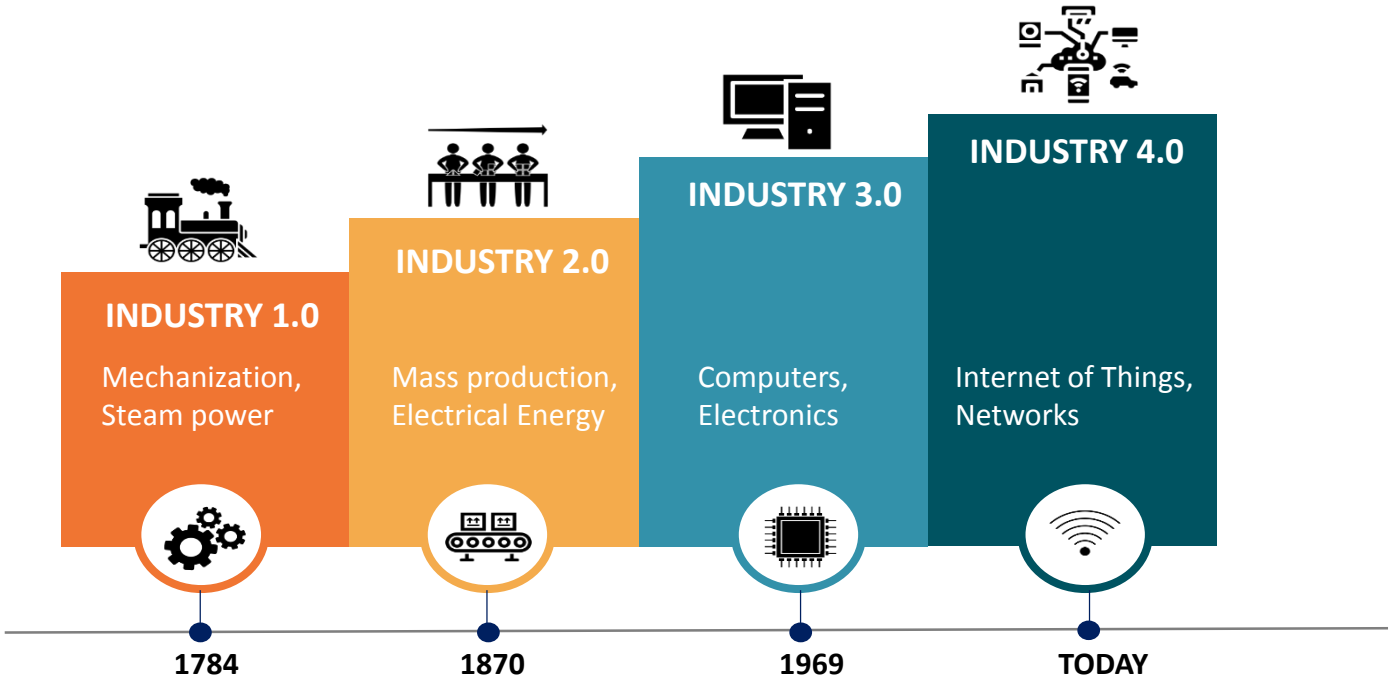
Hybrid Electric Vehicles (HEV)



Simultaneously uses Battery & Fuel

IMPROVED TECHNOLOGY & INNOVATION LED TO SUPERIOR ELECTRIC CARS

Electric Vehicles go back as long as the beginning of 1900 but the adoption to EV failed in the Second Industrial Revolution

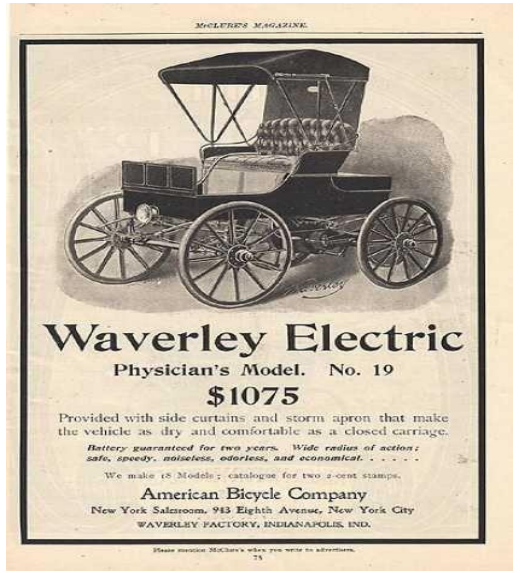


Too few customers
EV – US$ 1,000+
Gas Vehicle – US$ 500

Expensive Electricity & Batteries held little charge & had short life

- ❑ Discouraging Gas vehicles
- ❑ Battery Revolution/Faster Charging
- ❑ High Speed
- ❑ Reduced prices

BACK THEN



NOW

MAJOR PLAYERS WITH HUGE INVESTMENTS IN ELECTRIC VEHICLE SEGMENT

Bloomberg

BMW AG pledged to invest 500 million euros ($563 million) at its largest European factory as the German carmaker bolsters its electric-car manufacturing capabilities to better compete with rivals including Tesla Inc.

Daimler brings its EV plans to the table with €20 billion battery cell order

Another German car manufacturer has announced ambitious electric vehicle plans. Daimler AG says it has invested €20 billion in the purchase of battery cells to further advance its electric fleet.

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Audi Announces €12 Billion For EV Development, BMW €400 Million For 2021 iNEXT Production

ch Bloomberg Sign

Fiat Chrysler to Invest Up to $1.1 Billion On Canada EVs

By Ilya Banares and Gabrielle Coppola
October 15, 2020, 12:22 PM GMT+8 *Updated on October 16, 2020, 1:01 AM GMT+8*

APAC NOVEMBER 13, 2020 / 11:34 PM / UPDATED A MONTH AGO

VW boosts investment in electric and autonomous car technology to $86 billon

ALL THE MAJOR AUTOMOTIVE PLAYERS WORLDWIDE ARE INVESTING HUGELY IN EV SINCE THE ADVANCEMENT IN NEW TECHNOLOGY **- SILICON CARBIDE**

Automotive World est. 1992

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Silicon Carbide breakthroughs to accelerate electric vehicle innovation

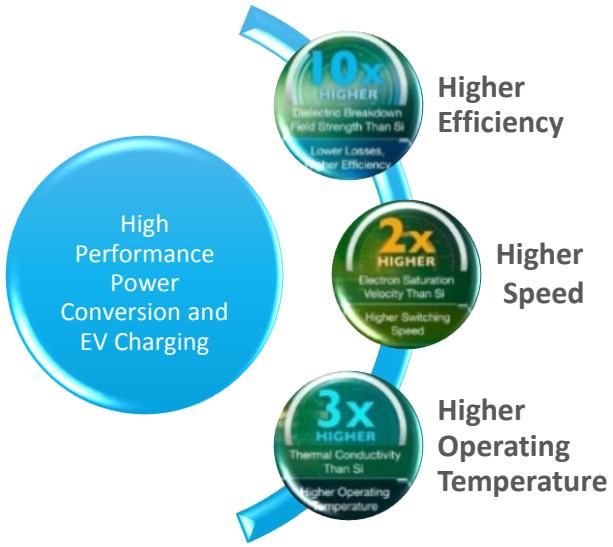
TECHNOLOGY BREAKTHROUGH - SILICON CARBIDE (SiC)

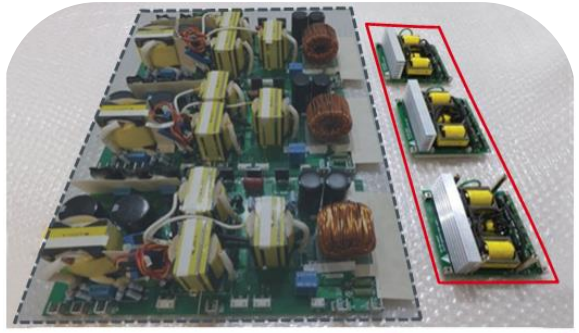
Silicon Carbide (SiC) is significantly more energy – efficient and better able to handle the demands of rapid charging

SiC is a semiconductor material containing silicon & carbon. This technology focusses on High power & High frequency devices.

It has various advantages which have proven to be path breaking in Automotive & Telecommunications segments compared to the traditional silicon used previously.

Traditional Silicon Vs Silicon Carbide





	System with Si IGBT	System with SiC
Weight	7 kg	0.9 kg
Volume	8.775 cc	1.350 cc

PRACTICAL BENEFITS

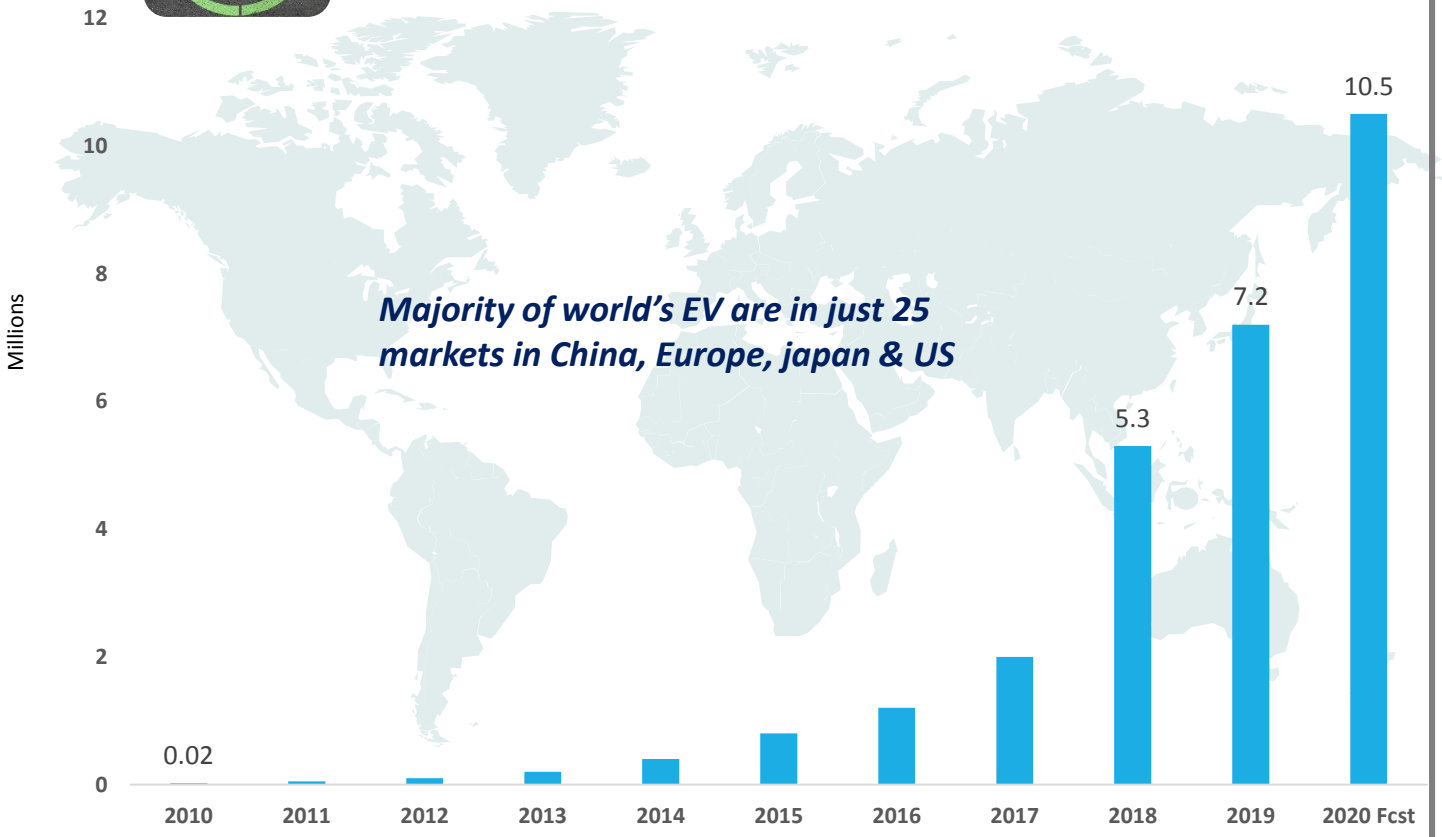
- **Rapid Charging:** Charging in less than 30 Mins. Before EV 12 Hrs
- **Long battery life:** Last longer with same usage in one charge
- **Energy Efficiency:** Only 5% energy loss in power conversion compared to 20% loss with standard power semiconductors
- **Thermal conductivity:** Keeps the device cool at high temp.
- **Lower cost:** Cheaper solution with additional advantages.
- **Package Miniaturization:** Smaller/lighter devices for daily use

APPLICATIONS

• EV/Driverless • 5G base stations • Mobiles • Big Data/IoT • Servers

THE GLOBAL ELECTRIC FLEET EXPANDED SIGNIFICANTLY OVER THE LAST DECADE

Worldwide number of Electric Vehicles in use



Ratio between BEV & PHEV - 56:44 in 2012 to 74:26 in 2019

Source: Statista & automotive world

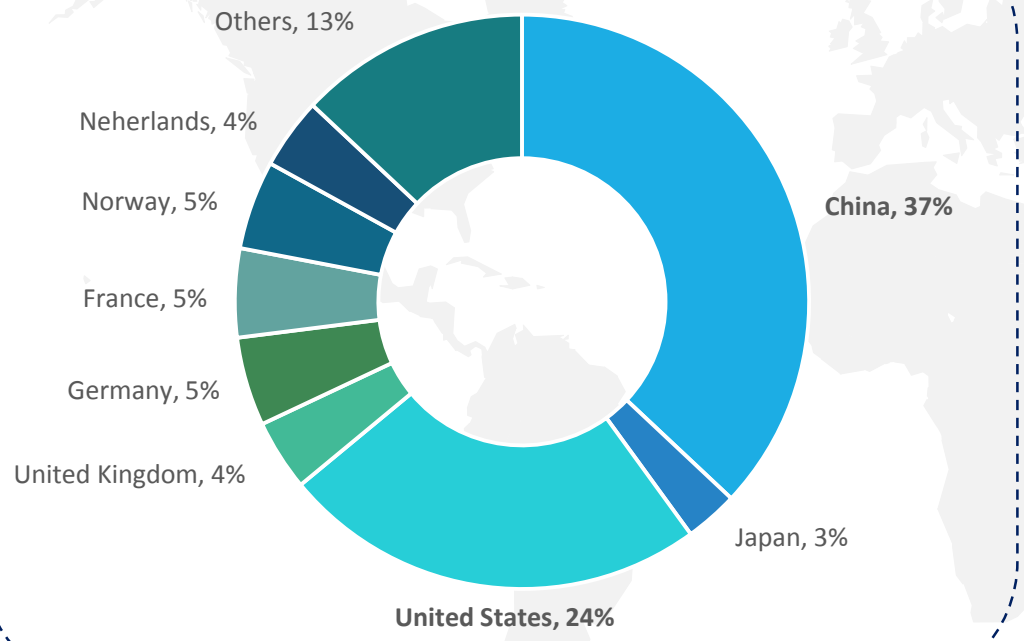
Reasons behind the surge in demand of EV

- ✓ Supportive government policies and purchase subsidies.
- ✓ Infrastructure to support EV on the roads.
- ✓ Superior SiC technology supports higher speed & can travel longer distances in one charge.
- ✓ Latest SiC technology also provides fast charging thereby reducing the wait time.
- ✓ Smart car designs exterior as well as interior thereby making it popular among millennials.
- ✓ Substantial reduction in prices and more electric vehicle manufacturers in the market in last 3-4 years.
- ✓ Strict restriction in countries for carbon emissions makes the buyer lean towards EV.

RAPIDLY INCREASING INFRASTRUCTURE FOR EV CHARGING WORLDWIDE

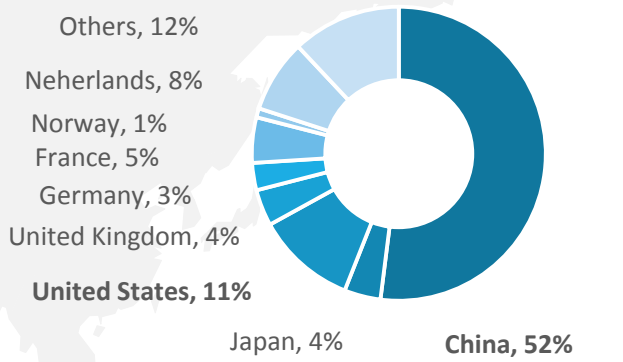
Due to the advancement of Silicon Carbide technology, there were around **7.4 million charging stations worldwide in 2019 (60% more compared to 2018).** 6.5 million are private chargers and remaining 0.9 are publicly accessible chargers.

6.5M Private Chargers at home & work place

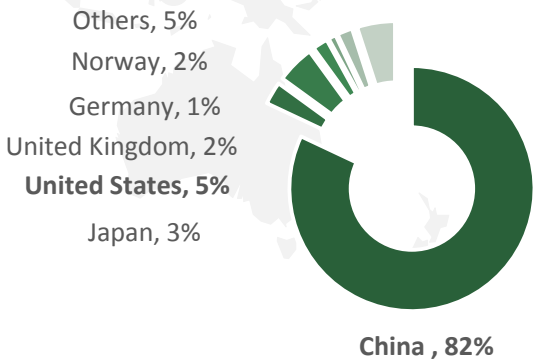


China & United States are better equipped for EV

0.6M Publicly Accessible Slow Chargers



0.3M Publicly Accessible Fast Chargers



Source: International Energy Agency

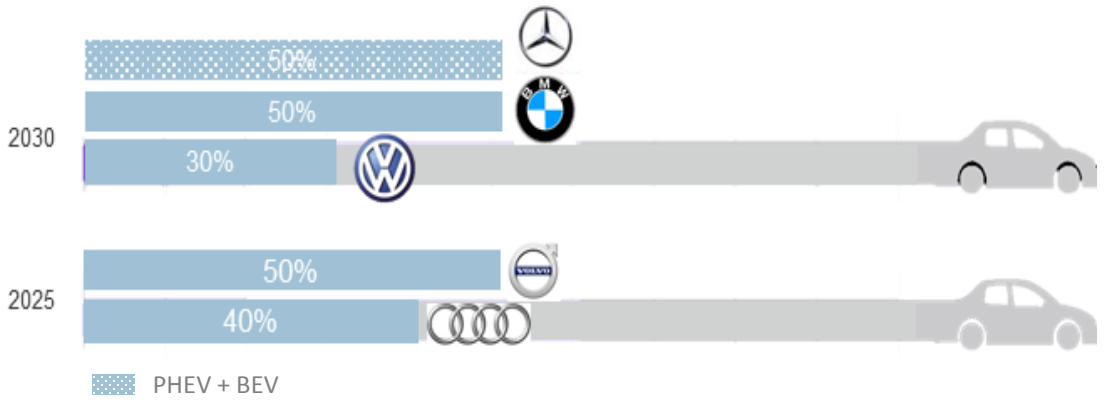
IMPACT OF COVID-19 ON ELECTRIC VEHICLES SEGMENT

NO IMPACT ON EV DUE TO SUPPORTIVE POLICIES IN CHINA & EUROPE…

- According to International Energy Agency, current estimate as per the car sales data is that **overall passenger car market will contract by 15-20%** over the sales of 2019 due to the ongoing pandemic.
- Electric Cars will remain at the broad levels of 2019 sales. **No change in these turbulent times** as China & Europe have extended their subsidy scheme until 2022.

Even in these difficult times of the ongoing Pandemic, All Automobile manufacturers have a positive outlook for the future of EVs

YEAR 2020 QUARTER 3



ACCELERATING TRANSITION TO EV

1. Governments push to New Energy Vehicles (NEV)
2. Diesel vehicles are discouraged
3. Increased awareness on benefits of clean air
4. **Year 2024 will be the turnaround year for EV**

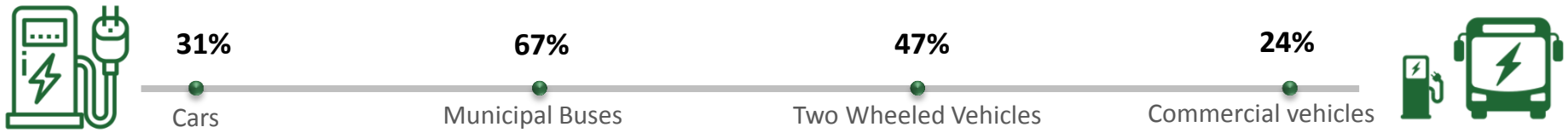
Source: VW AG IR presentation, BMW AG IR presentation, Daimler AG IR presentation, Audi Sustainability Report 2019,Volvocars.com Website

FUTURE OF ELECTRIC VEHICLES

ELECTRIC VEHICLE GROWTH IN THE COMING YEARS…

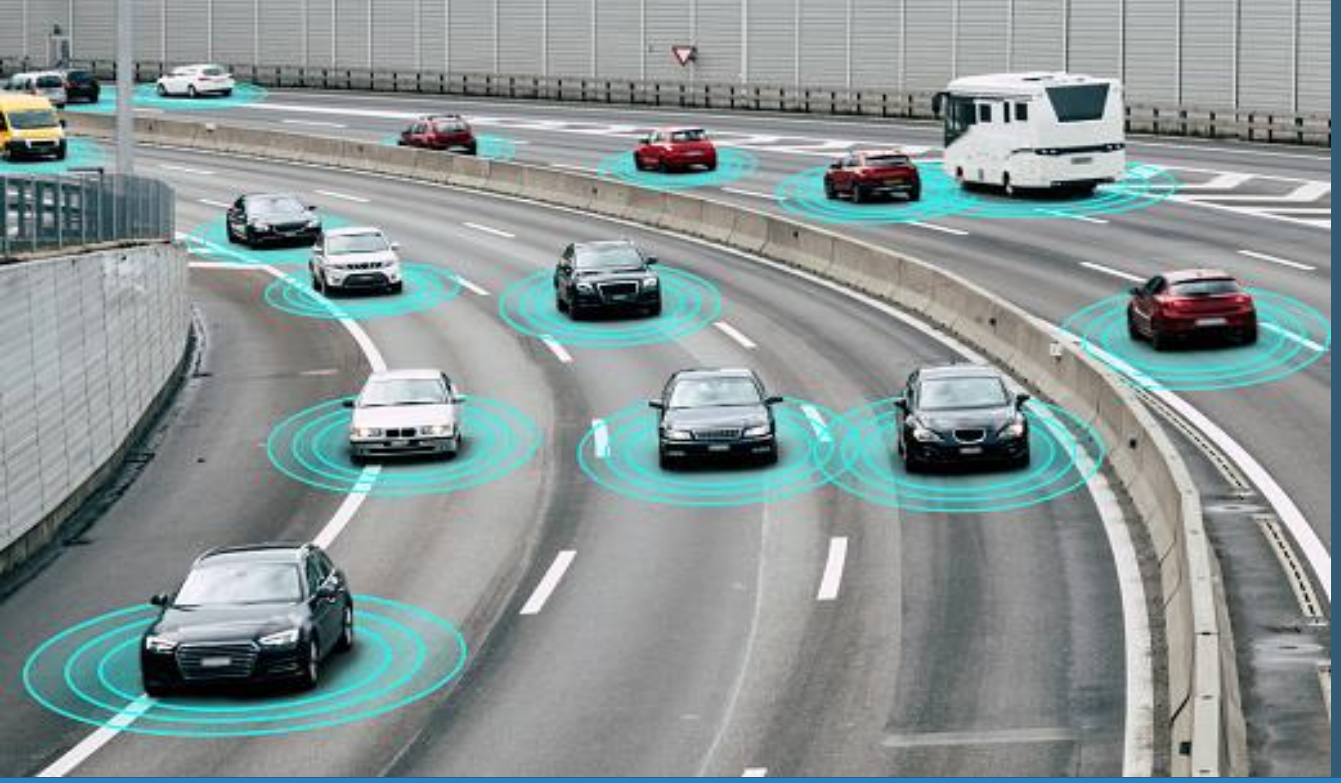
New Passenger Car Sales

Overall EV in the world by year 2040

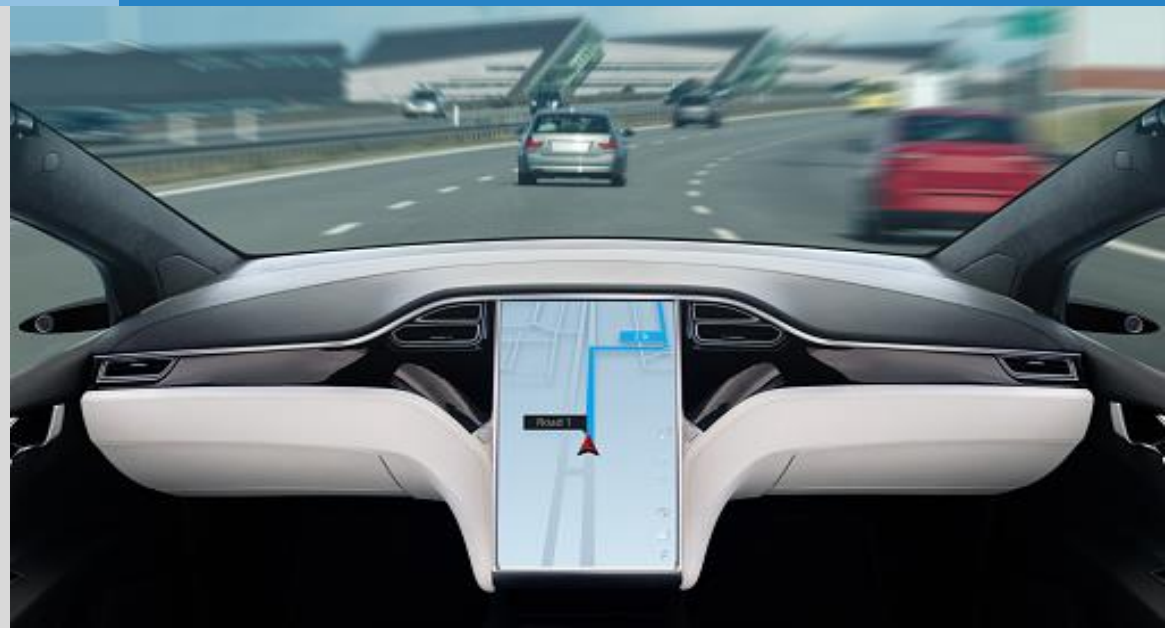


Source: Bloomberg Report

FUTURE OF AUTOMOTIVE IS ENVIRONMENT FRIENDLY & POLLUTION FREE



FUTURE READY!
AUTONOMOUS VEHICLES WITH SiC & SENSORS



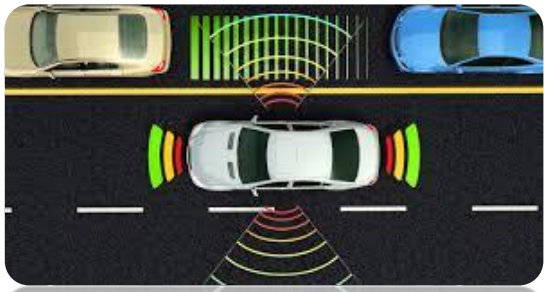
AUTONOMOUS VEHICLES

An autonomous vehicle is capable of sensing its environment and operating **without human intervention**.
It can go anywhere a traditional car goes and do everything that an experienced human driver does.

6 LEVELS OF AUTONOMY

Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
No Automation (Fully Manual)	Driver Assistance	Partial Automation	Conditional Automation	High Automation	Full Automation (No Human Intervention)
Traditional Cars Human performs all driving tasks	Single Automated System Monitor speed by Cruise Control	Automated Steering & Acceleration. Human can take control at any time	Environmental detection capabilities. Automated but human still required	Vehicle performs all tasks under specific conditions. Human override still an option	Vehicle performs all tasks in all conditions. Zero human involvement required

Highly Sensitive Sensors



Advantages of Autonomy Vehicles

- ❑ **90% reduction** in road accidents & deaths
- ❑ Less traffic congestion. **60% drop in harmful emissions**
- ❑ Monitored speed will lead to **10% improvement** in fuel economy or charge in EV
- ❑ **40% reduction** in average travel time

Source: KPMG Report

MALAYSIAN PACIFIC INDUSTRIES EXCELS IN PACKAGING & TESTING OF SiC & SENSORS SEMICONDUCTORS

Malaysian Pacific Industries Berhad

96% Carsem

4% Dynacraft Industries

YEARS	REVENUE	EDR	NET CASH
48	~US 400M/Yr	100:0	RM 943M

MPI'S SUBSIDIARY CARSEM IS A GLOBAL LEADER IN PACKAGING & TESTING SEMICONDUCTORS

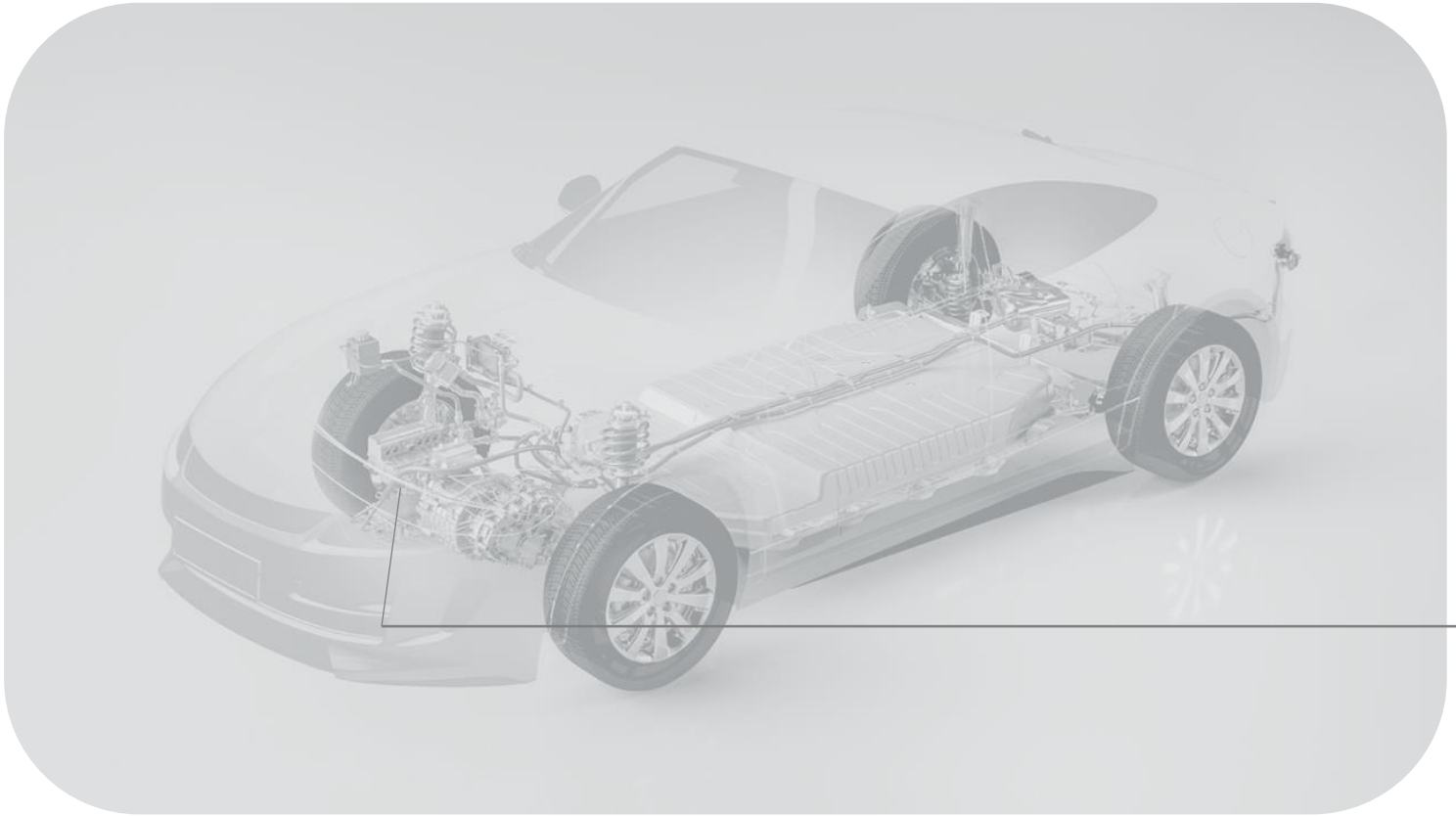
Carsem has **factories in Ipoh, Malaysia & Suzhou, China**
Customers: Asia, Europe & America

- Carsem has an **exclusive partnership with the world leader of SiC Technology**
- **Entire backend of the SiC world leader** is packaged & tested by Carsem
- **100% Automated "Lights Off factory"** for Sensors
- **Zero defects quality**, the best in the industry for Automotive
- Carsem Invested **over US 30Million in the last 2 years** for SiC & Sensors:

Technical talent | Embedded Technology | Superior Machines | Research & Development

SILICON CARBIDE TECHNOLOGY & SENSORS FOR AUTOMOTIVE, POWER & TELECOMMUNICATION SEGMENTS

SiC PACKAGED & TESTED BY CARSEM FOR AUTOMOTIVE SEGMENTS



Discrete Power Devices

STRATEGICALLY WELL POSITIONED TO LEAD FROM THE FRONT IN LATEST AUTOMOTIVE SOLUTIONS

SiC PACKAGED & TESTED BY CARSEM FOR OTHER SEGMENTS

SKILLED MANPOWER, LATEST EQUIPMENTS & EXTENSIVE TECHNICAL CAPABILITIES WITH IN DEPTH R&D

Servers

Internet of Things

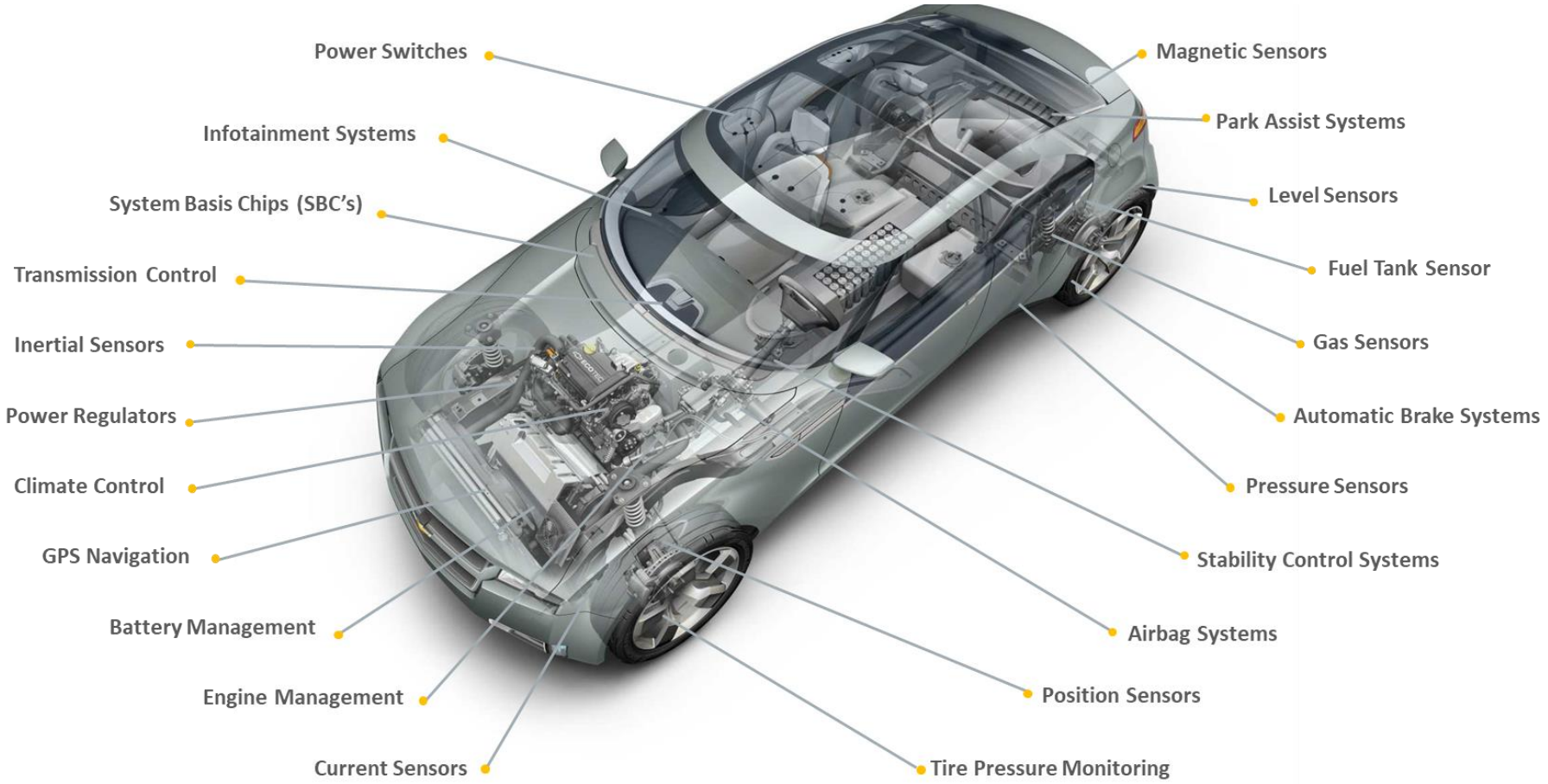
POWER SEGMENTS

5G Base Stations

TELECOMMUNICATION SEGMENTS

BEST IN CLASS QUALITY STANDARDS LED BY AUTOMATION

SENSORS PACKAGED & TESTED BY CARSEM FOR AUTOMOTIVE SEGMENTS



LATEST TECHNICAL CAPABILITIES FOR PACKAGING & TESTING SENSORS USED IN FUEL VEHICLES, ELECTRIC VEHICLES AND AUTONOMOUS VEHICLES

CARSEM'S IMPECCABLE QUALITY STANDARDS THROUGH AUTOMATION

- Proper Packaging & Testing is extremely important in Automotive segment as slight glitch can prove to be a disaster.
- In order to have world class quality and packaging/testing techniques, Carsem makes huge investments each year in technology, machines & R&D to automate the entire process.
- Fully Automated lines with minimal dependence on people.
- Quality Certifications – IATF 16949, ISO-9001, ISO-14001, ISO8001, ANSI/ESD S20.20.

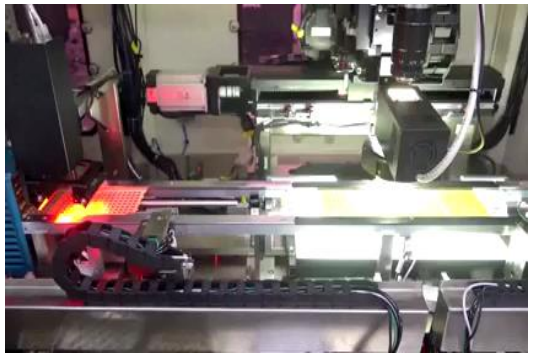
Flip Chip Inline System

Intelligent Factory Program – Production Lines

Auto Visual Inspection (AVI)

Before :

Now :



Customized AVI system for Assembly Level operations

Smart Production Line – Sensors Unit

Zero Defects Quality - No Human Interference

Automated Guided Vehicles

THANK YOU!