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# Biobased Energy Project on Electric Vehicles

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# History

- Electric vehicles date back to 1828 where the first electric motor was designed
- Between 1842-1881 a newly designed battery (non-rechargeable) was designed for a higher storage
- By 1899, an electric racing car set the world record for fastest on-land speed (68 MPH)
- By the 1920's electric vehicle became rare as the need for long range vehicles increased

# Why EV?

- Transportation uses a great significance of our petroleum and petroleum prices are expected to rise
- Gas powered vehicles release green house gas emissions through the tailpipe while EVs do not
- EV's have a greater energy per mile efficiency than gas powered vehicles

# Why EV?

- The average cost to operate an EV in the United States is \$485 per year, while the average for a gasoline-powered vehicle is \$1,117
- EV's do not require a liquid energy source which can be hard to produce economically and environmentally
- EV's can be run from renewable energy created elsewhere while gas powered vehicles run on fossil fuels

# EV Outlook

- Technology has rapidly advanced in EVs over the past 20 years
- Battery technology and electric motor has become more advanced for longer runtime and greater power
- Future technology is hard to know, current working of EVs are those to reduce price, find new materials, and improve battery capacity

# Type OF EV

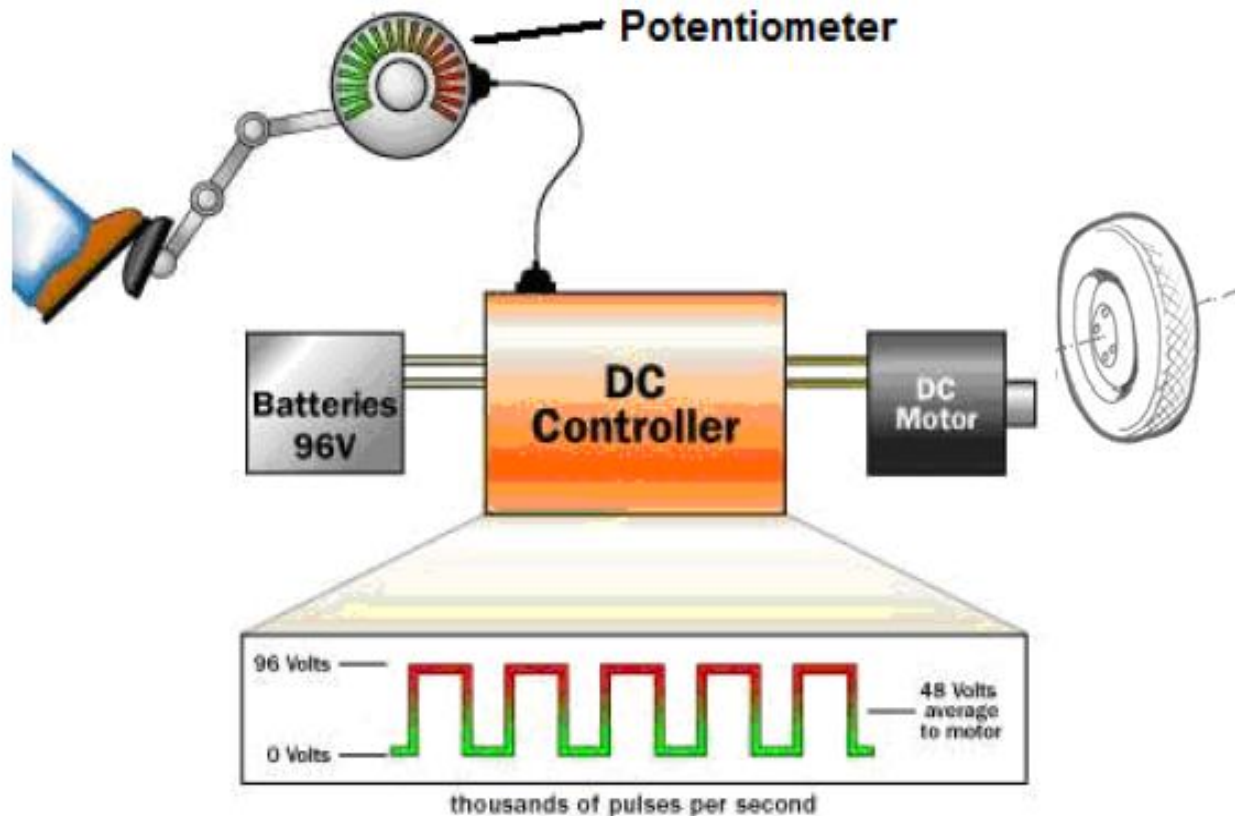
- **All-electric Vehicles or Battery Electric Vehicles (BEV)**
- **Hybrid Electric Vehicles (HEVs)**
- **Plug-in Hybrid Electric Vehicles (PHEVs)**

# All-electric Vehicles or Battery Electric Vehicles (BEV)

- first generation of the electric vehicles
- no tailpipe emission
- vehicles have limitations of battery power storage capacity



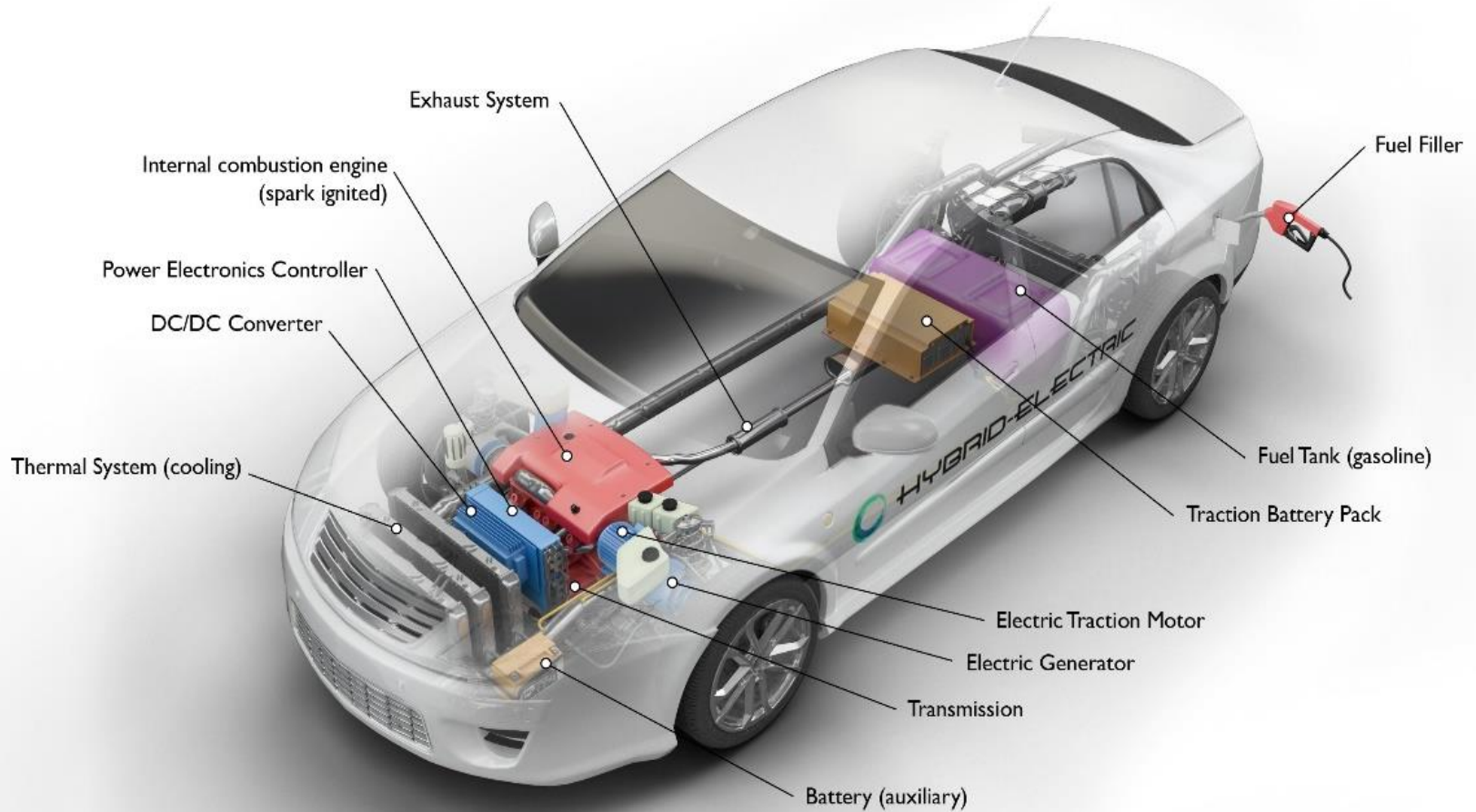
# All-electric Vehicles or Battery Electric Vehicles (BEV)



# Hybrid Electric Vehicles (HEVs)

- have both Gasoline engine (internal combustion engine) and motor to run the vehicles
- Motor uses power from the battery to drive the vehicle's wheel
- Electric energy is generated by the vehicle's own braking system to recharge the battery

# Hybrid Electric Vehicles (HEVs)

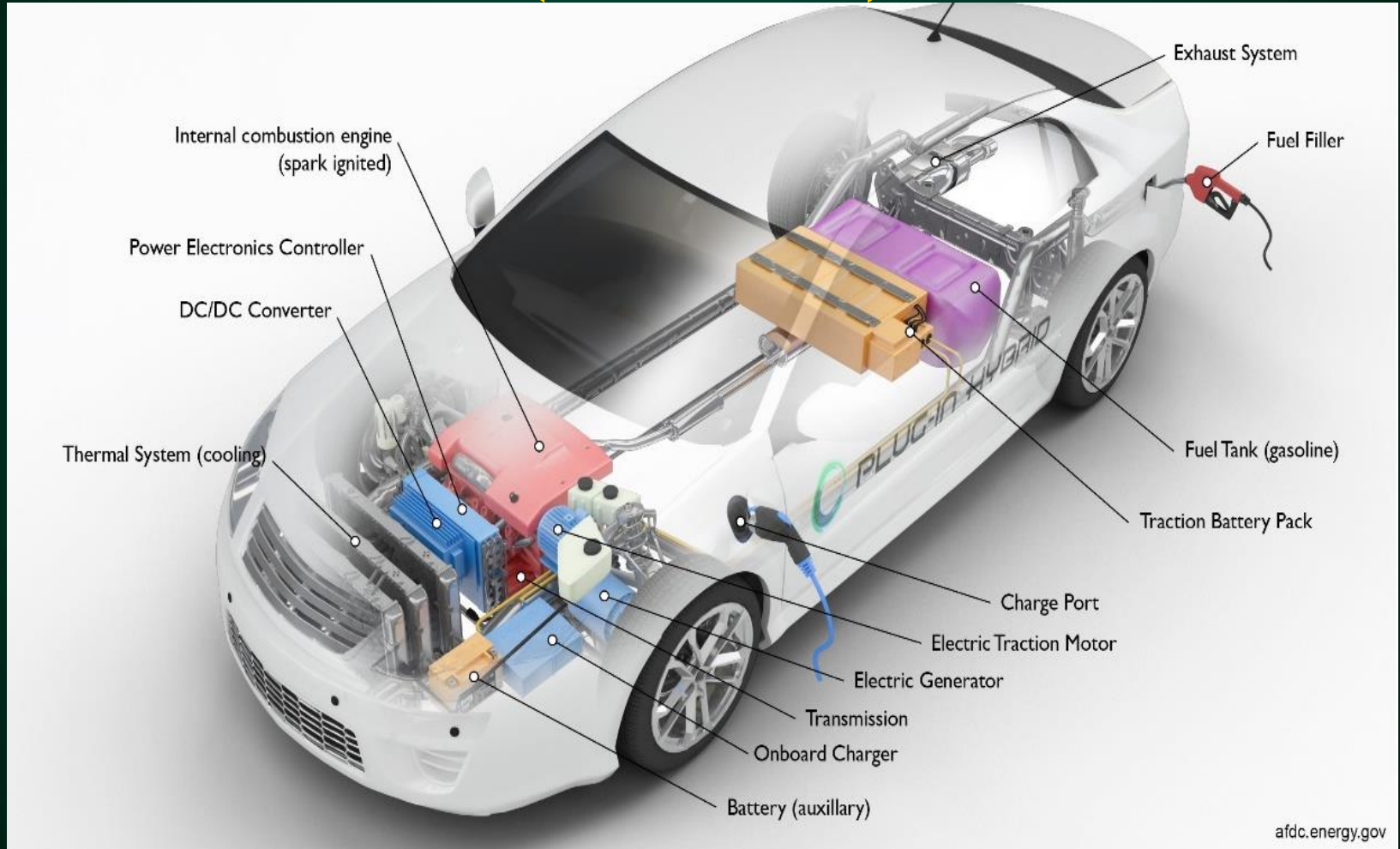


[afdc.energy.gov](http://afdc.energy.gov)

# Plug-in Hybrid Electric Vehicles (PHEVs)

- functionality of both Battery electric vehicles and Hybrid Electric Vehicles
- plugged into the electric grid for charging which is the limitation of the previous two vehicles
- travel a longer distance than that of HEV using electric mode
- perform bi-directional flow of power from Grid to Vehicle and Vehicle to grid

# Plug-in Hybrid Electric Vehicles (PHEVs)



# Charging OF EV

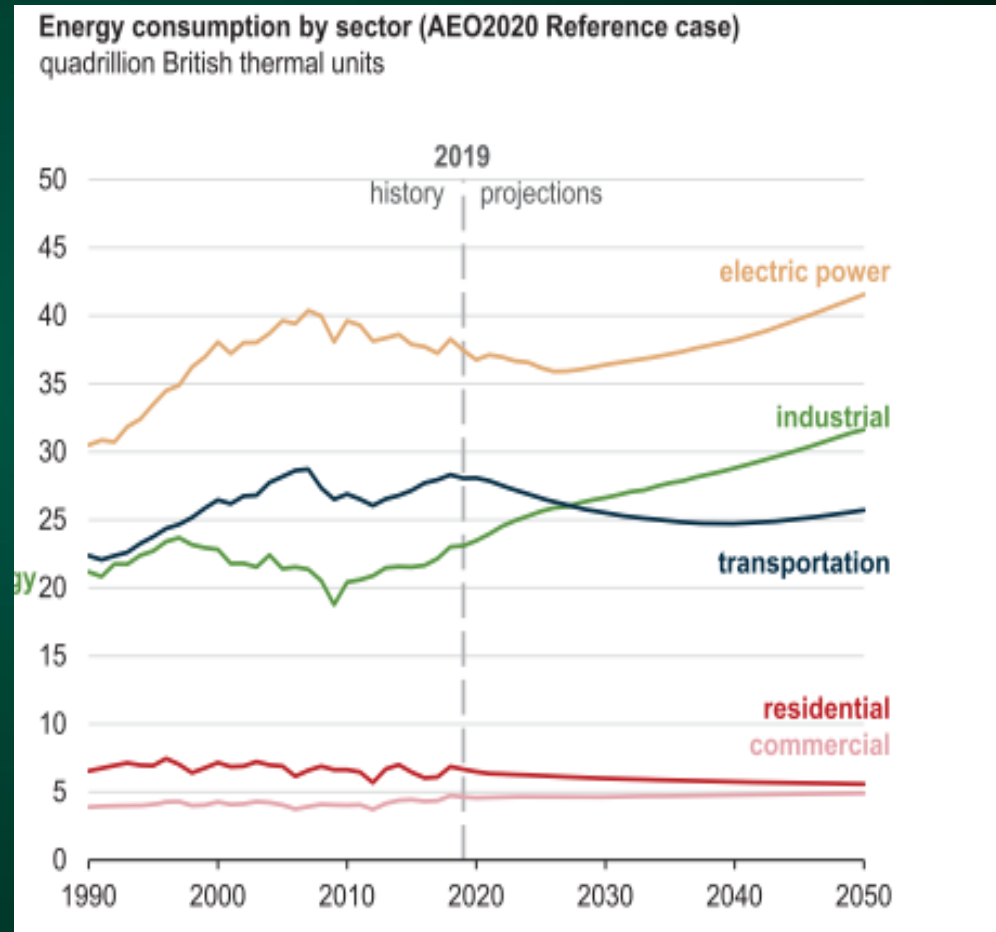
- Two levels of charging
- Level 1 charging are standard equipment on new vehicles
- Require grounded 120V (three prong)
- Add about 40 miles of range in an eight-hour charge
- Tesla superchargers can add up to 170 miles of range in half hour.

# Charging of EV cont.

- Level 2 most common public charging stations
- Have standard electric vehicle connection plug that fits all current vehicles, except Tesla
- With typical 30 amp circuit, about 180 miles of range can be added in 8 hours
- Typically requires a 240V charging unit

# Socio-Economic and Environmental Impact Of EV

- Transportation sectors consume the large portion of the petroleum oil in the World and US out of total energy consumption
- Electric vehicles are related to the transportation





# Socio-Economic Impact

- add a new job to the market and generate demand for existing jobs
- improving a quality of life by reducing energy spend and decreasing our dependence on fossil fuels
- induce the job in other sectors like electricity development
- Electric vehicles reduce the reliance on foreign oil (non oil producing nation)
- EV can help to improve people's health(reduce CO, SO<sub>2</sub> emission)

# Socio-Economic Impact

## What is eGallon?

It is the cost of fueling a vehicle with electricity compared to a similar vehicle that runs on gasoline.

## Did you know?

On average, it costs about half as much to drive an electric vehicle.

Find out how much it costs to fuel an electric vehicle in your state

US Average

regular  
gasoline

2.25

electric  
eGallon

1.15

Data and Methodology  
Updated: March 21, 2020

ENERGY.GOV

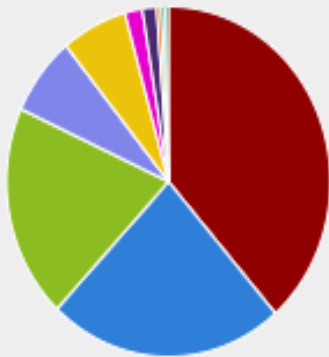
# Environmental Impact

- Global warming and climate change are the one of the major problem worlds
- Transportation sector contribute the higher portion of carbon emission
- zero tailpipe emission vehicles in electric mode
- electricity to charge a vehicle has an effect on emission from electric vehicles (fossil fuels vs non-fossils)

# Environmental Impact

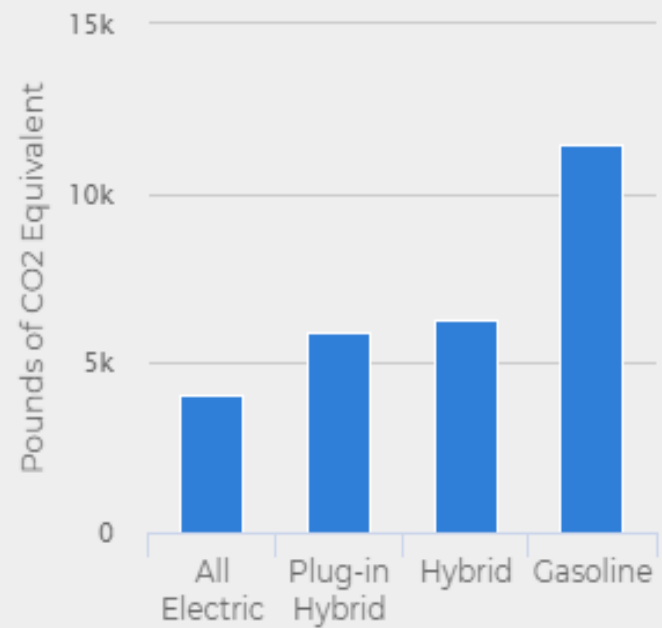
## National Averages

Electricity Sources



- Natural Gas: 38.54%
- Coal: 23.54%
- Nuclear: 19.72%
- Wind: 7.31%
- Hydro: 6.54%
- Solar: 1.76%
- Biomass: 1.42%
- Oil: 0.45%
- Geothermal: 0.39%
- Other Fossil: 0.32%

Annual Emissions per Vehicle



# Different policies for EV

- Energy sectors policies and Government policies always play an important role
- Zero-Emission mandate, which is special provision in the clean air act.
- different financial incentives, including tax credits and tax exemption to decrease the cost of electric vehicles
- U.S. federal government has initiated a tax credit for plug-in electric vehicles (PEVs) purchased after December 31, 2009

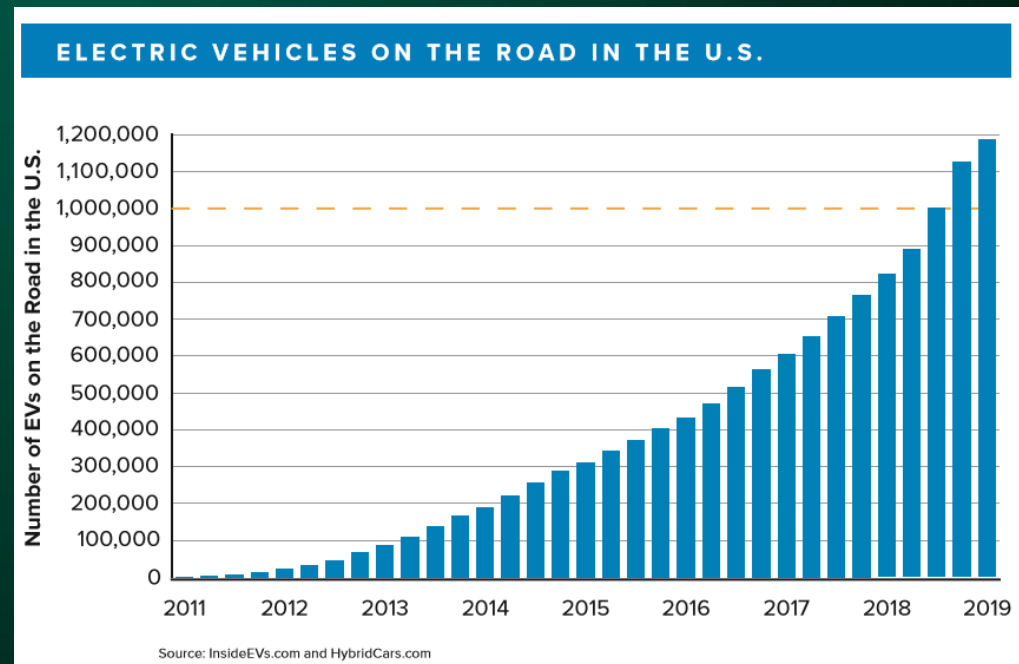
# Electric Vehicles in different sectors

- Agricultural and Mining
- Slow but some progress in research and development.
- Some parts of autonomous driving already implemented.



# EVs US Current State, Future Forecast and Market Overview

- In 2018, about 1% of all vehicles sold were electric
- The number of EVs sold is growing exponentially
- EV sales went up 81% from 2017-18
- Tesla, GM, and Nissan account for 62% of the EVs sold.

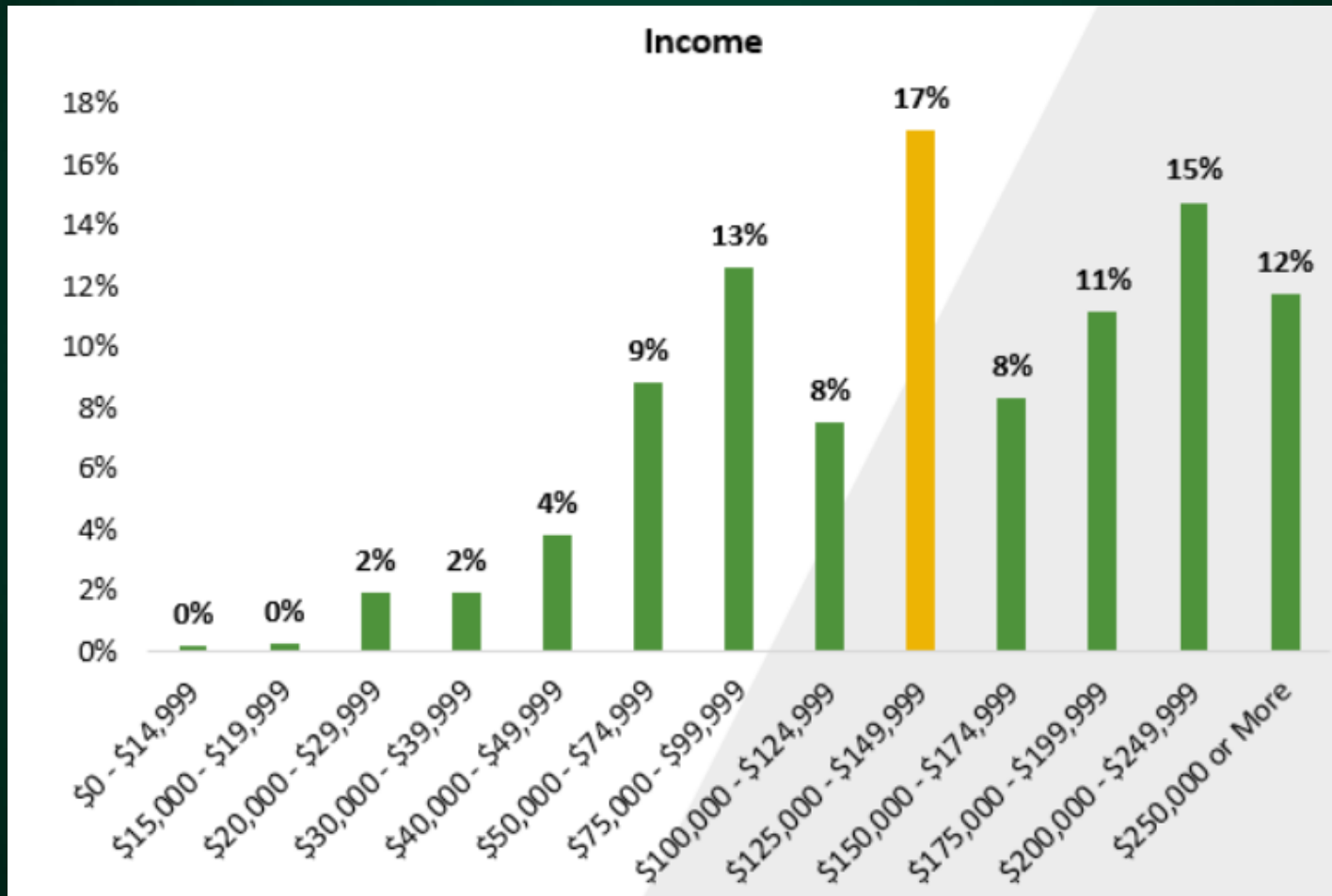


# EVs US Current State, Future Forecast and Market Overview

- Electric vehicles are projected to account for 7.6 percent of the US market in 2026
- North Americas EV market is estimated to reach \$194.20 billion by 2027
- The cost gap between EV and gas vehicles has shrunk
- With a current lack of EV models, and more anticipated models coming soon, the EV sales is expected to rise quickly

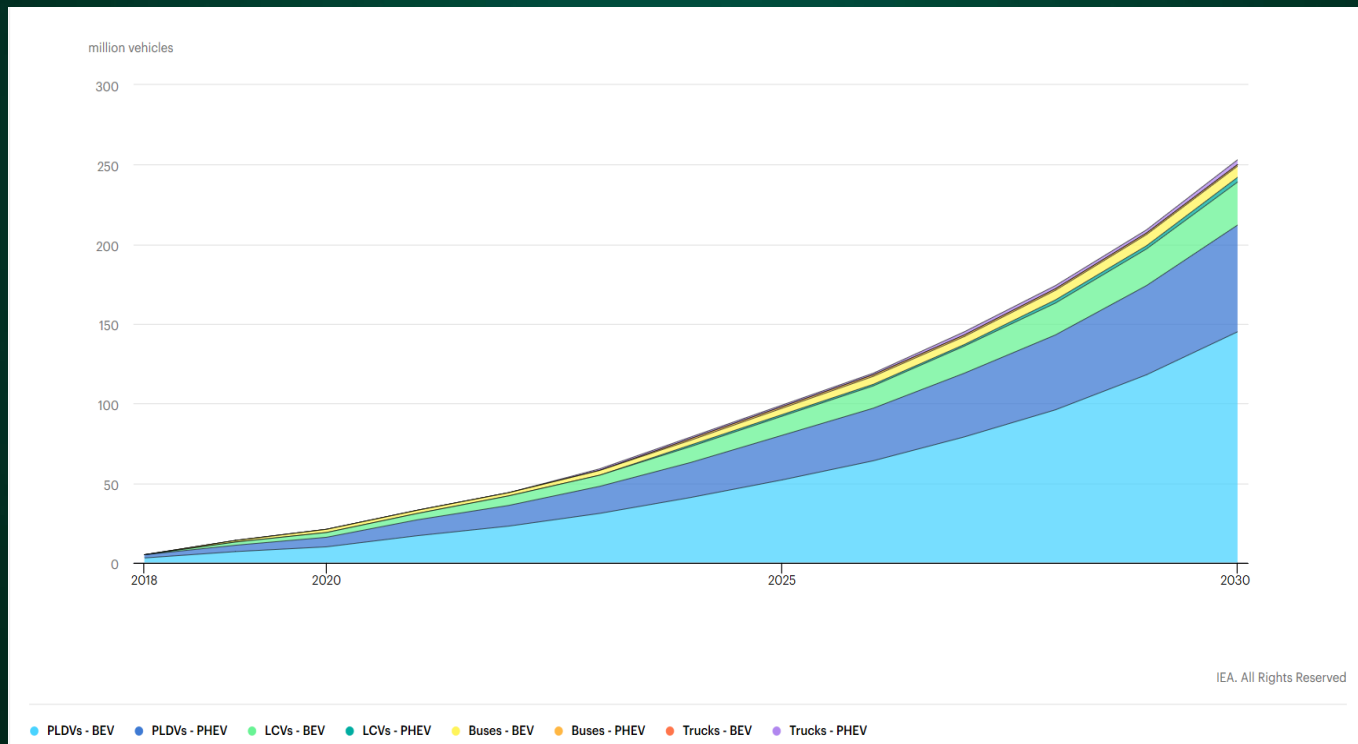


# EVs US Current State, Future Forecast and Market Overview



# EVs Current State, Future Forecast and Market Overview

- The EV30@30 global campaign set a goal of 30% market share for electric vehicles in 2030



# Challenges to the Adaptation of Electrical Vehicles

A big challenge of EV's is the cobalt battery

- Batteries consume about 60% of the world's cobalt usage
- A replacement for cobalt has not yet been found

Gas powered vehicles are becoming more energy efficient and environmentally cleaner than ever before

- Gas powered vehicles real world CO2 emission fell to 357 grams/mile while the fuel efficiency rose to 24.9MPG marking the best numbers in history

# Challenges to the Adaptation of Electrical Vehicles

## Battery Charging-

- Charging stations are a lot less common than gas stations, especially in smaller towns
- The inconvenience to charge the battery

# Conclusion

- EV is the future potential worlds need to focus
- PHEV's could be the better option
- Carbon emission during life cycle of EV and electricity production should be considered
- Technology has rapidly increased in EVs
- Sales of EVs are projected to grow exponentially

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Thank You!