ORGANIZATION AND OPERATION OF ELECTRIC VEHICLES

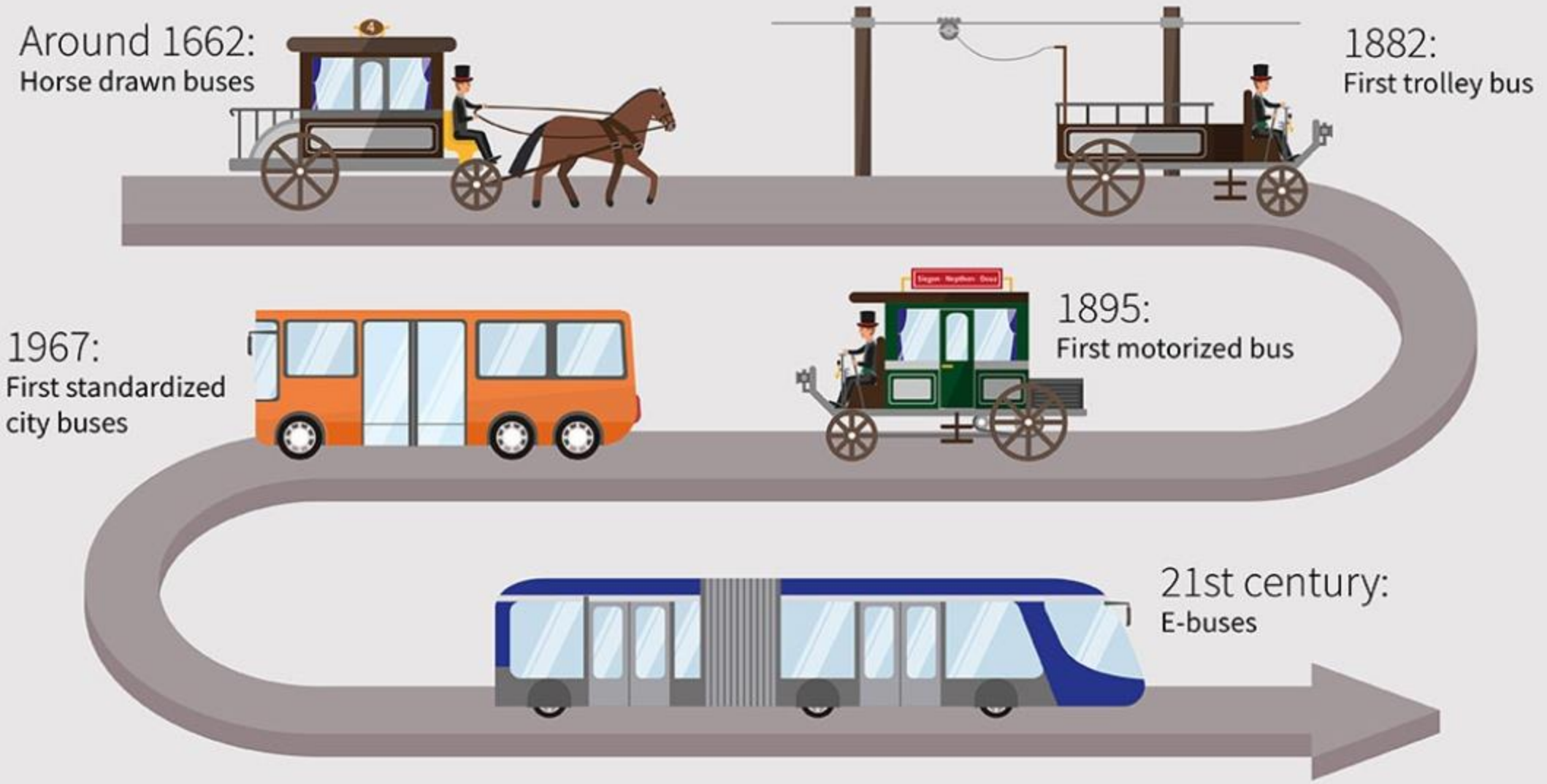
INTRODUCTION - BASIC KNOWLEDGE AND DEFINITIONS -

PARTNERSHIP FOR PROMOTION AND POPULARIZATION OF ELECTRICAL MOBILITY THROUGH TRANSFORMATION AND MODERNIZATION OF WB HEIS STUDY PROGRAMS/PELMOB

CALL: ERASMUS-EDU-2022-CBHE-STRAND-2

PROJECT NUMBER: 101082860

The evolution of urban bus transport



Electric Vehicles (EVs)

Definition:

an EV is an abbreviation for 'electric vehicle'. EVs are vehicles that are powered either partially or entirely by electricity ...

Components:

all EVs, also known as battery EVs (BEVs), have an electric motor instead of an internal combustion engine ...

Operating principle:

the vehicle uses a large traction battery pack to power the electric motor, so it needs to be plugged into a socket or charging device, also called an EV supply equipment (EVSE), to be charged ...

ELECTRIC VEHICLES

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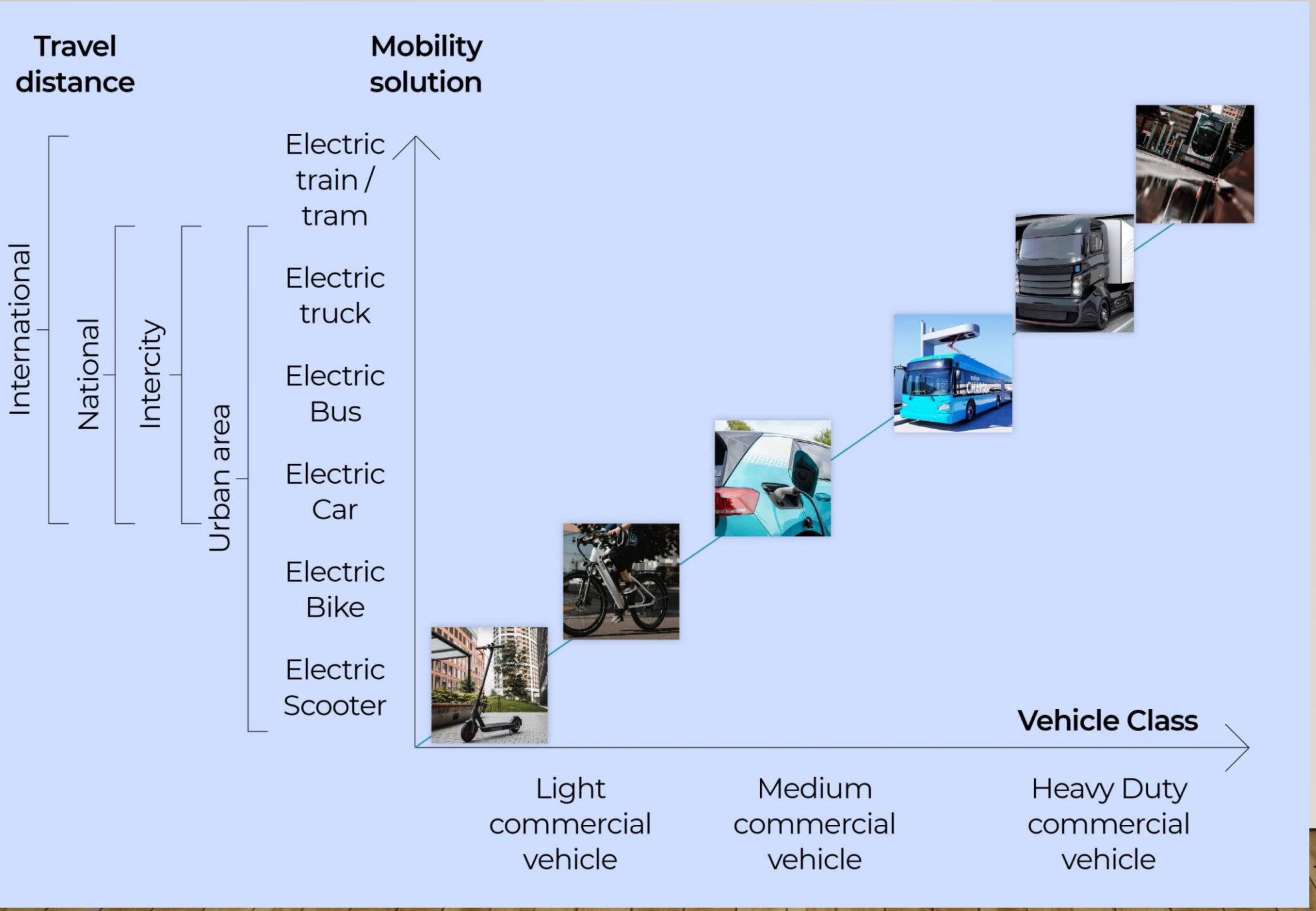

Travel distance
Mobility solution
International
National
Intercity
Urban area
Electric train / tram
Electric truck
Electric Bus
Electric Car
Electric Bike
Electric Scooter
Vehicle Class
Light commercial vehicle
Medium commercial vehicle
Heavy Duty commercial vehicle

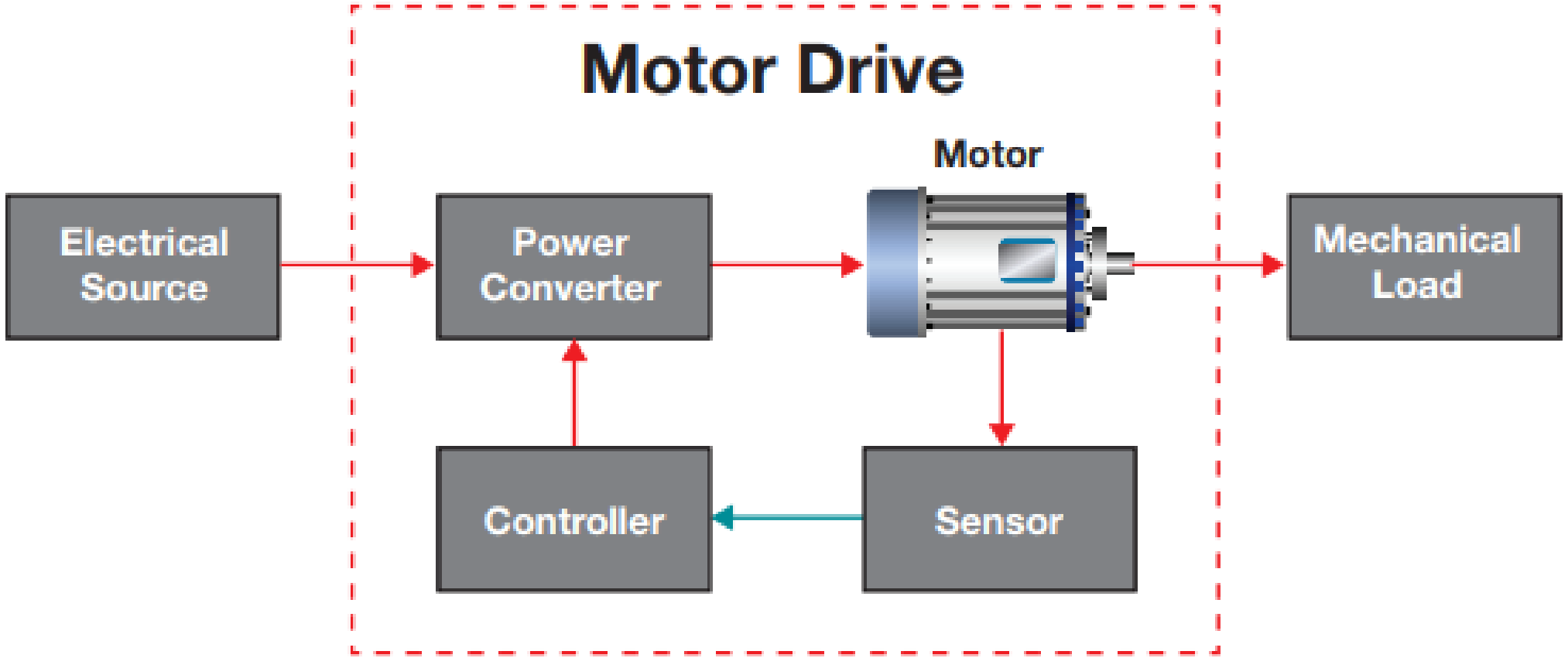


***Figure 1**. Block diagram of a motor drive system.*

https://www.ti.com/lit/wp/slyy078a/slyy078a.pdf?ts=1615976751703&ref_url=https%253A%252F%252Fwww.google.com%252F

Shunt Motor

Reluctance Motor

PDMC Motor

Stepper Motor

AC Motor

Types of Motors

Univerasl Motor

Series Motor

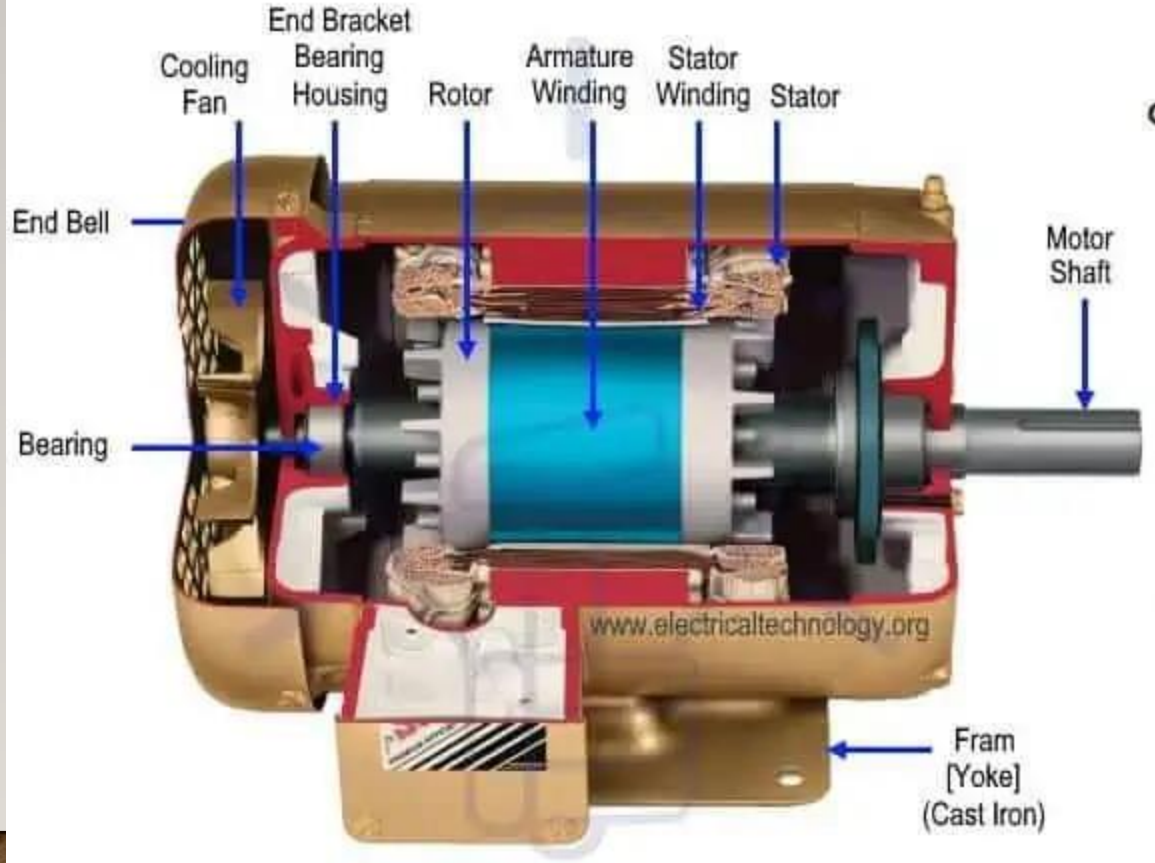
Servo Motor

DC Motor

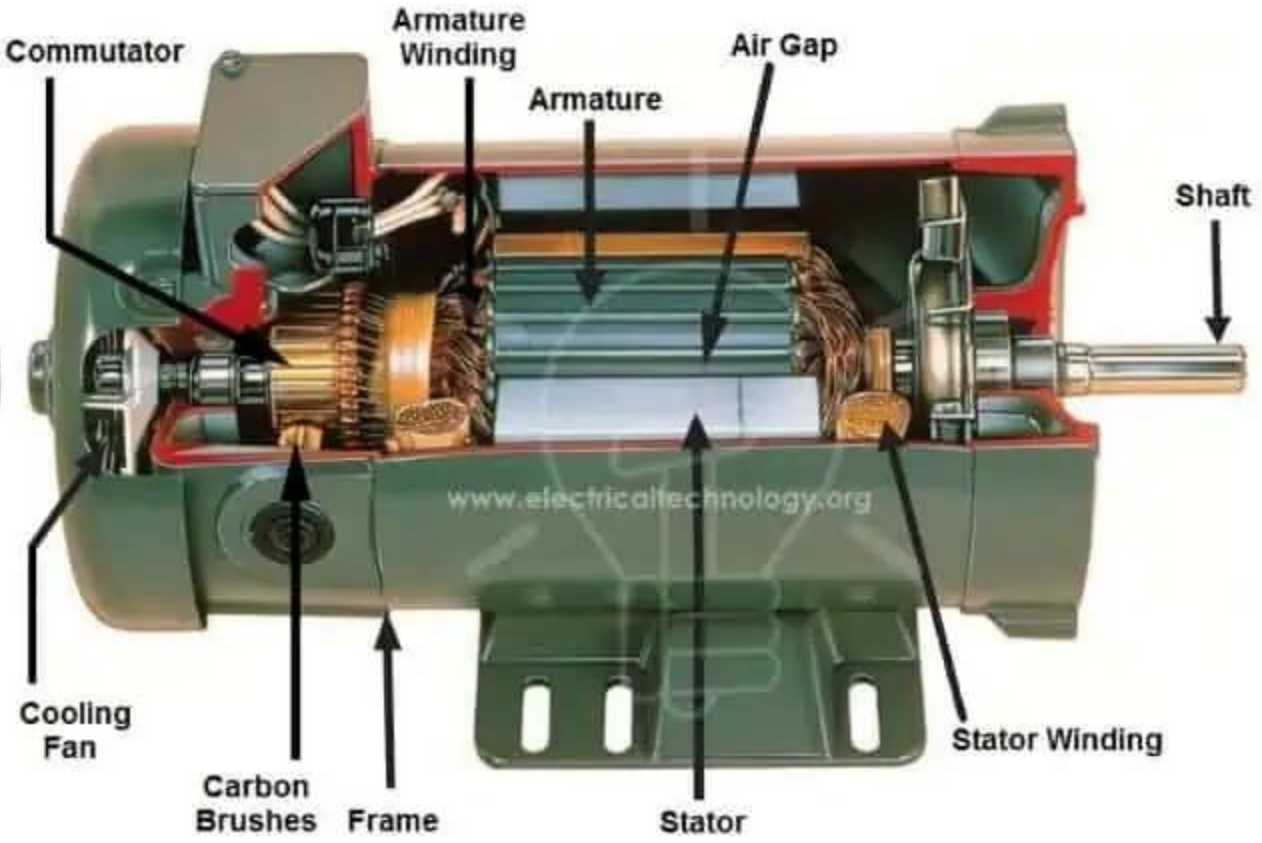
Compound Motor

Differences Between AC & DC Motors

AC MOTOR



DC MOTOR



BMW combustion engine

Tesla engine Model S

AC MOTOR

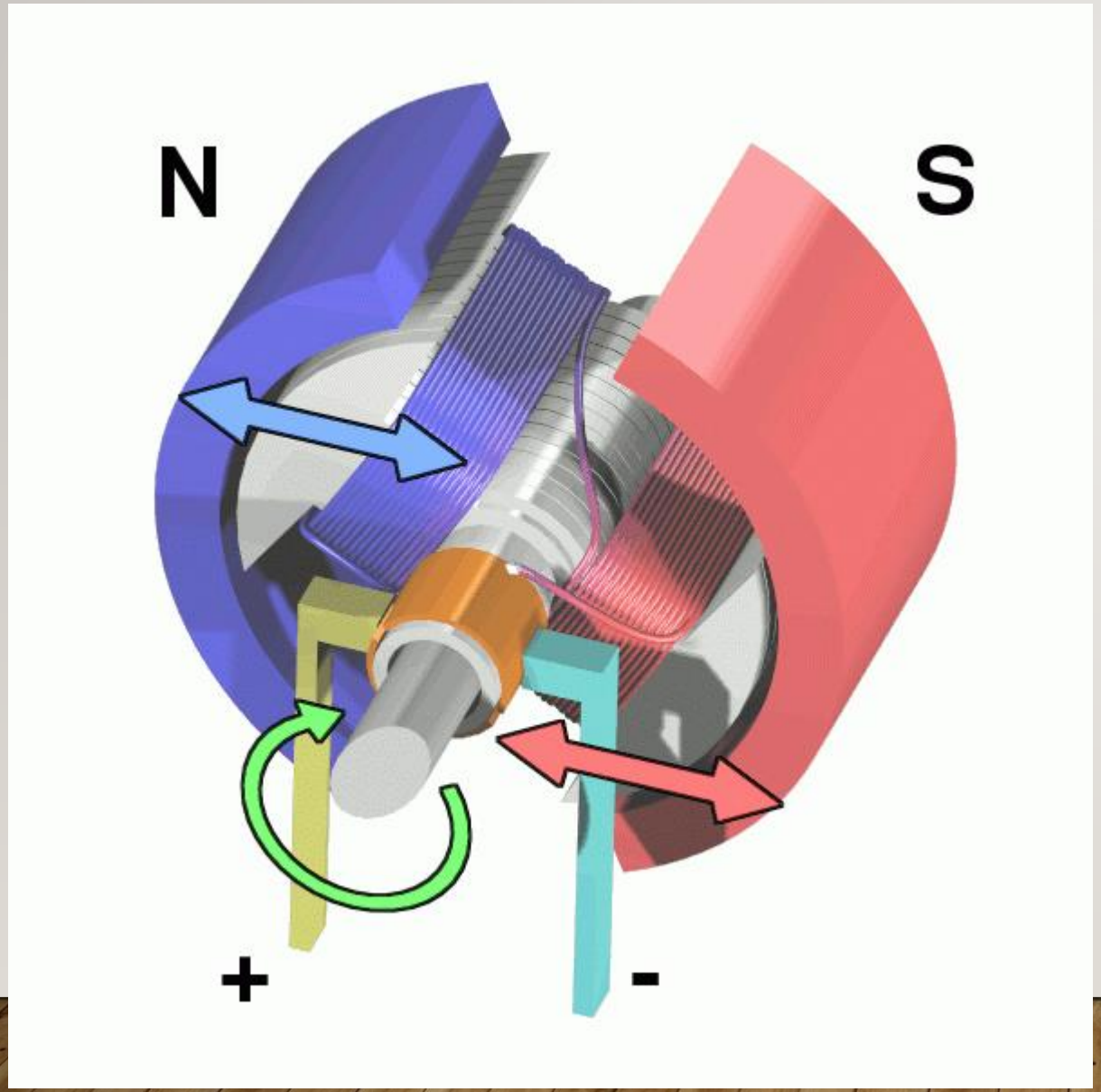
- AC motor:

- Induction motor: these motors work on the principle of electromagnetic induction and are widely used due to their simplicity and reliability. Single-phase induction motor: this motor is usually used in households. 3-phase induction motor: usually used in industrial applications. Synchronous motor: these motors rotate at a constant speed synchronized with the frequency of the applied AC

DC MOTOR

- Working principle of DC motor

- In the case of direct current (DC) motors, an additional mechanism involves the use of commutators and brushes. These components play a key role in reversing the current direction of the rotor windings as they rotate. This reversal is essential to maintaining a consistent and controlled direction of rotation of the motor. While there are variations in engine design and control mechanisms. The overarching principle of the interaction of a magnetic field with a current-carrying conductor remains a constant in the operation of electric motors. Commutator (in DC motor): If we look at the operation of a DC motor commutator plays a major role. Commutators are rotary switches that change the direction of the current in the rotor windings, ensuring continuous rotation. It consists of segments and brushes that maintain electrical contact with the rotor as it rotates. Brushes (in a DC motor): Brushes in an electric motor are made of carbon and are in contact with the commutator in a DC motor. They conduct electricity between the stationary and rotating parts of the motor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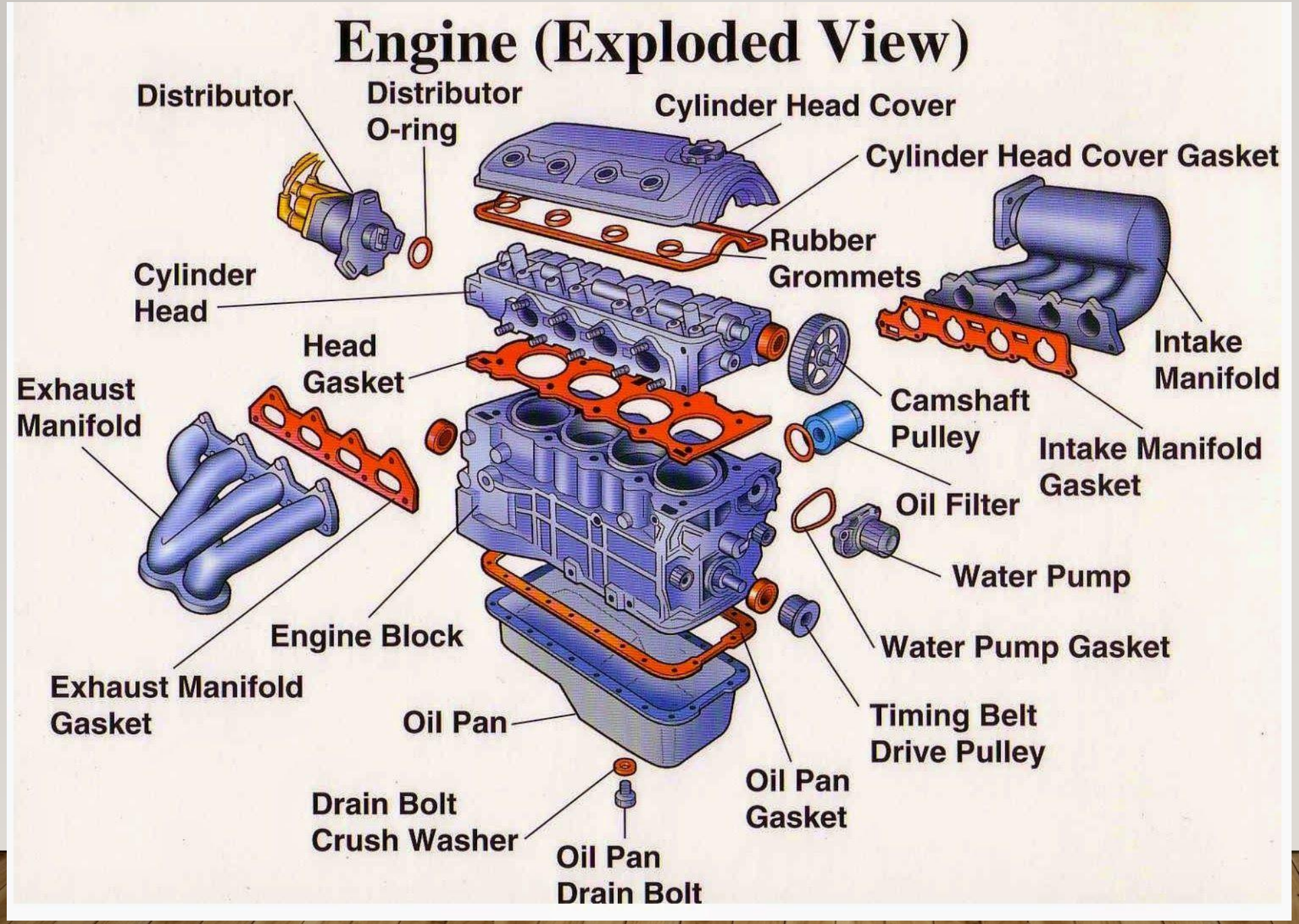
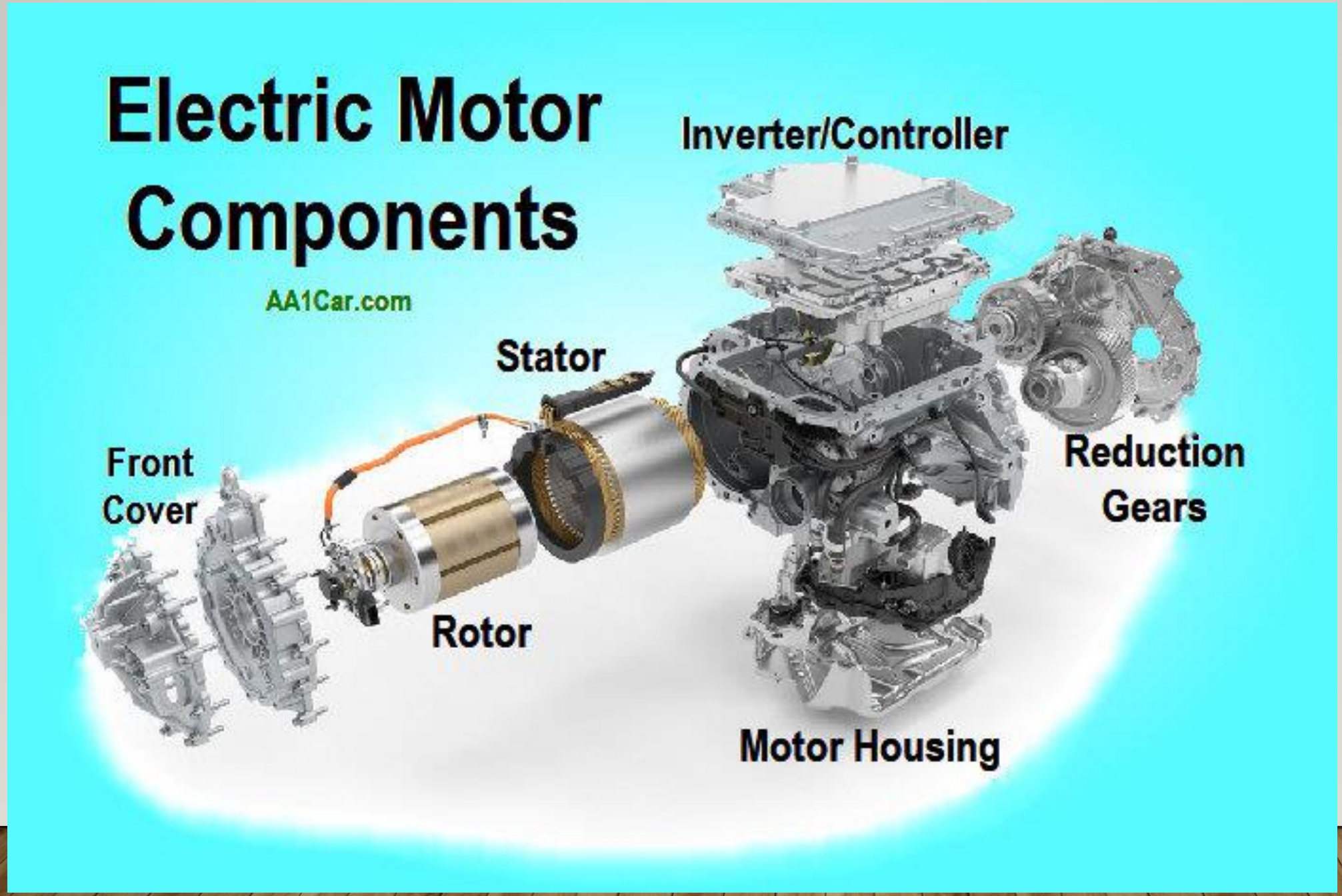

Engine (Exploded View)
Distributor
Distributor O-ring
Cylinder Head Cover
Cylinder Head Cover Gasket
Rubber Grommets
Cylinder Head
Intake Manifold
Head Gasket
Exhaust Manifold
Camshaft Pulley
Intake Manifold Gasket
Oil Filter
Water Pump
Engine Block
Water Pump Gasket
Exhaust Manifold Gasket
Timing Belt Drive Pulley
Oil Pan
Oil Pan Gasket
Drain Bolt Crush Washer
Oil Pan Drain Bolt


Electric Motor Components
AA1Car.com
Inverter/Controller
Stator
Front Cover
Rotor
Reduction Gears
Motor Housing

Internal Combustion Engine (ICE)

VS

Electric Vehicle Motor (EV)

AA1Car.com

Weight: 300 - 500+ lbs.
Power: 180 - 400+ HP
Max Speed: 6000-7000 RPM
Efficiency: 30 - 35%
Moving Parts: Many!

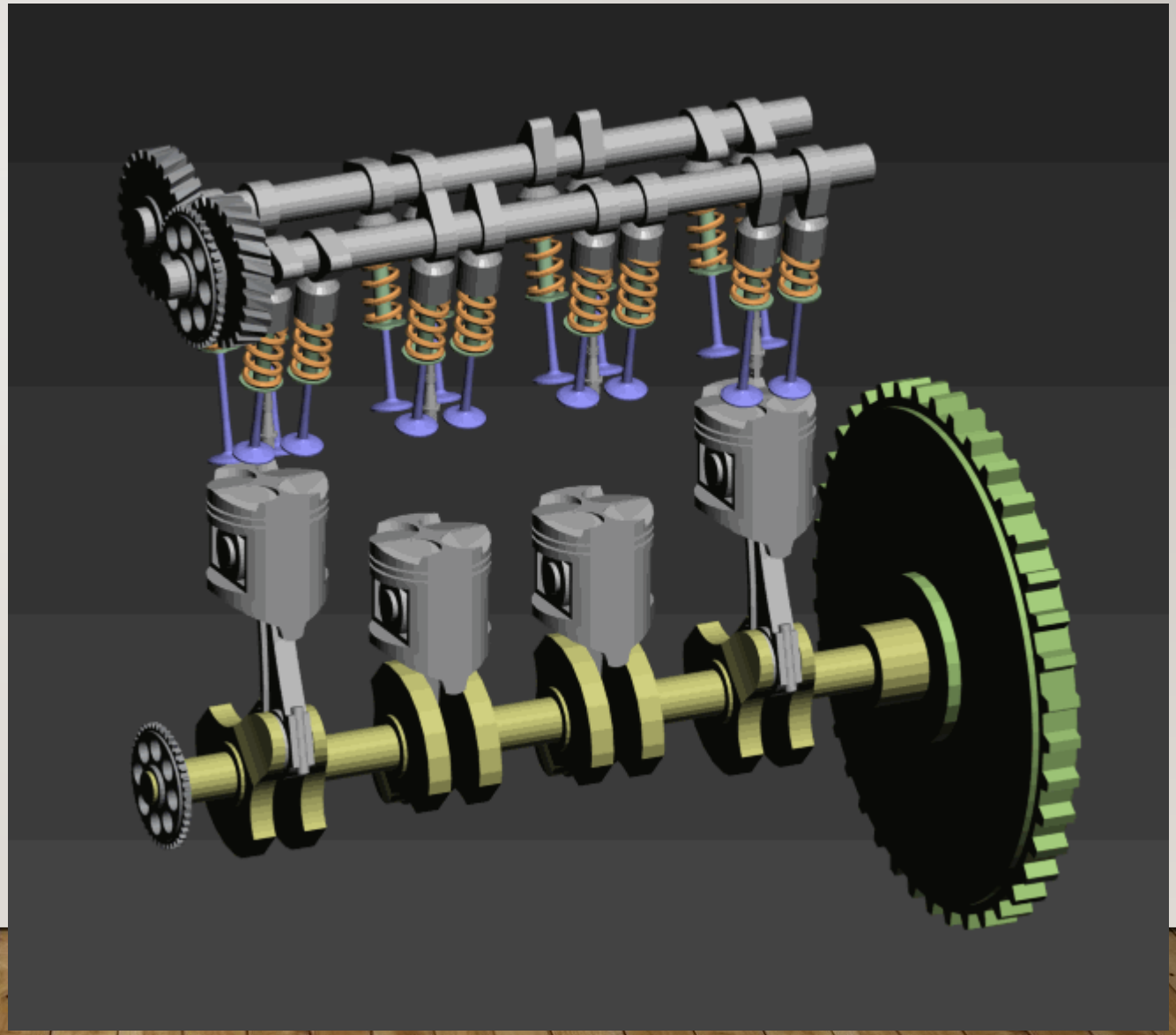
- 1 Crankshaft
- 3 to 12 Pistons
- 3 to 12 Connecting Rods
- 6 to 48 Valves
- 6 to 48 Valve Springs
- 6 to 48 Rockers/followers
- 6 to 48 Lifters & Pushrods
- 1 to 4 Camshafts
- 1 to 4 Cam Drives & Chains/belts
- 1 Oil Pump
- 1 to 2 Balance Shafts
- 1 Flywheel

Maintenance Required:
Oil & Filter Changes 5 to 12K Miles
Spark Plugs at 100k Miles
Timing Belts & Drive Belts 100K Miles
Coolant Changes 50-100K Miles
Emission Inspections 1 to 2 years

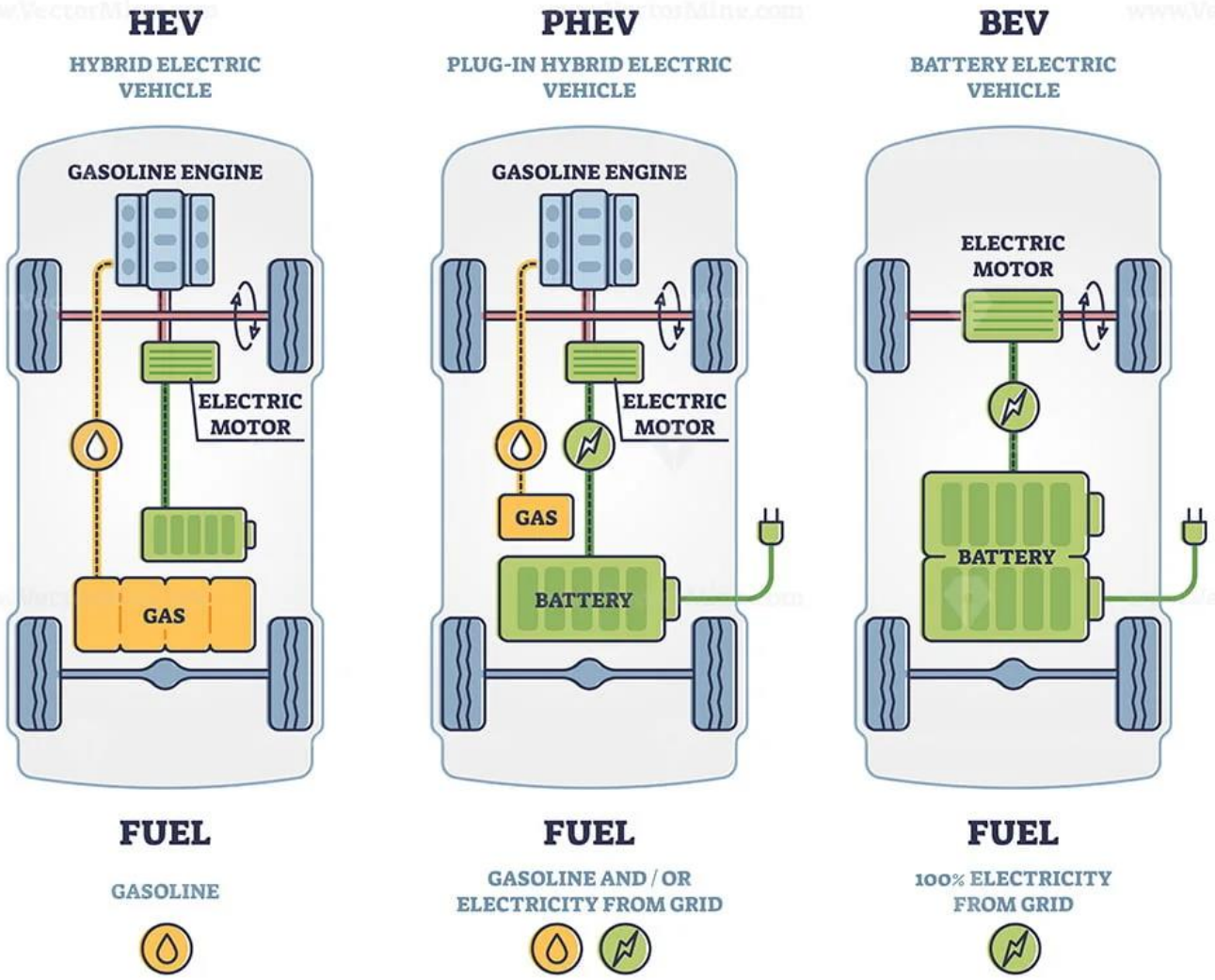
Weight: 100 - 200 lbs.
Power: 180 - 400+ HP
Max Speed:15,000-21000 RPM
Efficiency: 90 - 95%
Moving Parts: One

1 Rotor

Maintenance Required: Minimal
No Oil & Filter Changes
No Spark Plugs
No Timing Belts & Drive Belts
Coolant Changes maybe 50k+ Miles
No Emission Inspections



TYPES OF
ELECTRIC VEHICLES




PUBLIC TRANSPORT
ECO TRANSPORT
ELECTRIC BUS
ELECTRIC BICYCLE
ELECTRIC CAR

Electric Bus

Definition:

an electric bus is powered by electric motors rather than an internal combustion engine. Electric buses can store electricity on-board or be supplied continuously from an external source ...

Components:

there is no engine or fuel tank on an electric bus. Instead, the bus's electric motor acts as the engine and transmission, while the battery is essentially the "fuel tank" ...

Operating principle:

electric buses work by sending a signal to the powertrain system controller when they start. This signal activates the high-voltage battery, where chemical energy is stored, and converts it into electrical energy ...


xcelsior
CHARGE

Electric Scooter

Definition:

electric scooters are plug-in EVs with two or three wheels. Electric scooters with a standing rider are known as 'e-scooters' ...

Components:

electric scooters differ from motorcycles in that they have a step-through frame rather than a straddle frame ...

Operating principle:

power is supplied by a rechargeable battery that drives one or more electric motors. The batteries are at the heart of any electric vehicle. The overall efficiency of each type of scooter depends on voltage, charge, maximum distance, etc.

Electric Bike

Definition:

an ‘e-bike’ is a bicycle with an electric motor to help you along. You ride it much like a normal bike, but with less effort

Components:

e-bikes are powered by a rechargeable battery, but the rider still uses the pedals. However, when going uphill or needing a boost, the electric motor makes the ride easier

Operating principle:

the rider can adjust the amount of power provided by the engine using a twist grip. Pedaling increases the power (or torque) of the bike.

Electric Train

Definition:

an electric train is powered by electricity from a catenary, a third rail or on-board energy storage such as a battery ...

Components:

electric trains collect the high voltage current with a pantograph and use the power to run electric motors ...

Operating principle:

electric trains and trams are usually powered by a catenary. The catenary operates at high voltages of up to 15,000 V and up to 1,000 A to provide high power for the heavy train ...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RET