

# Electric Vehicle (EV)/ Hybrid Terminology Glossary

Electric Vehicle  
Advisory Council

**TIRE INDUSTRY ASSOCIATION**



## A

### **AC motor**

A type of electric machine that converts electrical energy into mechanical energy, taking electrical power through alternating current, and converting this energy into mechanical rotation.

### **Acoustic foam**

A layer of specialized foam material placed inside the tire to reduce road noise and vibrations. It is designed to absorb and dampen sound waves generated by the interaction between the tire and the road surface. The foam strip helps improve driving comfort by reducing the amount of noise transmitted into the vehicle cabin, resulting in a quieter and smoother ride.

### **ADAS**

ADAS, or Advanced Driver Assistance System, refers to a set of technologies and features in a vehicle that are designed to enhance driver safety and improve the driving experience. ADAS utilizes sensors, cameras, and other advanced technologies to assist the driver in various aspects of driving, including collision avoidance, lane-keeping, adaptive cruise control, automatic emergency braking, and parking assistance. While ADAS features aid the driver, they are not fully autonomous and still require human supervision and intervention.

### **Autonomous vehicles**

An autonomous vehicle, also known as a self-driving car or driverless car, refers to a vehicle that is capable of operating and navigating without direct human input or control. It utilizes a combination of advanced technologies, such as sensors, cameras, radar, lidar, and artificial intelligence algorithms, to perceive its surroundings, interpret information, and make driving decisions. Autonomous vehicles are designed to autonomously handle various driving tasks, including acceleration, braking, steering, and navigation. They aim to provide a safe and efficient transportation solution while reducing the need for human intervention.

## B

### **Battery charge setpoint**

Battery charge setpoint refers to the desired or target level of charge that a battery should reach during the charging process. It is a predetermined value set by the battery management system or the user to optimize the battery's performance and longevity. The charge setpoint is typically expressed as a percentage or voltage value that represents the desired state of charge for the battery. Once the battery reaches the setpoint, the charging process may be terminated or adjusted to maintain the desired charge level, depending on the charging algorithm and system configuration.

## Battery cooling

The battery cooling system is responsible for dissipating heat from the battery pack during high-temperature conditions. It prevents the battery from overheating, which can lead to reduced performance, accelerated degradation, and safety concerns. The cooling system helps maintain the battery within the desired temperature range, optimizing its longevity and performance.

## Battery electric vehicle (BEV)

A battery electric vehicle (BEV) is a type of electric vehicle (EV) that is powered solely by an electric motor using energy stored in rechargeable batteries. It is also known as an all-electric vehicle or pure electric vehicle. Unlike hybrid vehicles, which combine an internal combustion engine with an electric motor, BEVs rely entirely on electricity for propulsion.

## Battery heating and cooling

Battery heating and cooling for an electric vehicle (EV) refers to the mechanisms or systems designed to regulate the temperature of the battery pack to maintain optimal operating conditions. The combination of battery heating and cooling systems in an EV ensures that the battery operates within the ideal temperature range, which is crucial for maintaining its efficiency, range, and overall health.

## Battery heating

The battery heating system warms up the battery pack during cold weather conditions. This helps to mitigate the negative impact of low temperatures on battery performance, ensuring efficient charging, improved power output, and overall better performance.

## Battery internal resistance

A measure of how easily or difficultly the battery can deliver or accept electrical energy. High resistance results in energy loss and less efficient charging, while low resistance allows optimal energy flow into the battery.

## Battery management system (BMS)

An electronic system that controls the charging of rechargeable batteries, protecting the battery from operating outside its safe zone, optimizing battery performance and health, and estimating the battery's operations state.

## Battery pre-conditioning

Raising the temperature of your battery to a suitable temperature prior to charging or driving. This optimizes charging and battery performance and prevents EV from limiting features to protect the battery. Helps increase range and keeps battery safe from cold conditions when charging.

## Battery safety systems

A battery safety system is a set of measures and technologies implemented to ensure the safe operation of batteries, such as mechanisms to prevent and mitigate potential hazards like overheating, overcharging, and short circuits. The system typically includes features like thermal management, voltage monitoring, current limiting, and protective enclosures to minimize the risk of fire, explosion, or other safety incidents related to battery operation.

# C

## CCS/SAE 1772 - CCS, or combined charging system

is a standardized charging protocol for electric vehicles (EVs) that combines both AC (Alternating Current) and DC (Direct Current) charging capabilities into a single charging connector and port. It is designed to provide flexibility and compatibility for EVs, allowing them to charge from a wide range of charging stations. The CCS connector typically features both AC pins for slower AC charging and additional DC pins for faster DC charging. This allows EVs equipped with CCS to utilize various charging infrastructure options, including Level 1 and Level 2 AC charging stations, as well as high-power DC fast charging stations. CCS supports different charging power levels, enabling EVs to charge at different rates depending on the available charging station's capabilities. This flexibility makes CCS a widely adopted charging standard, particularly in Europe and North America. The majority of EV manufacturers have announced that they will phase out the CCS charging standard and adopt the NACS (Tesla) charging standard.

## CHAdeMO

A charging standard specifically designed for EVs that allows for high-power DC fast charging. It was developed by the CHAdeMO Association, a consortium of Japanese automakers and charging infrastructure providers. The CHAdeMO protocol enables EVs to charge at power levels up to 50 kW, 100 kW, or even higher, depending on the charger's capabilities, allowing for faster charging times compared to traditional AC charging methods.

## Charge curve

Represents the variation in the speed at which your EV charges during a charging session.

## Charge port

The point of entry designed to connect the charging cable to the EV.

## Charge time

Duration it takes to fully replenish the energy in your EV battery. Can vary depending on the type of battery in your EV and the charging station you are using. Estimated charge time is typically tracked on your car's interface.

## Charger

is a device or system designed to provide electrical power to recharge batteries or devices.

## Charging connector

The connector on the end of the charge cable that connects with the charge port.

## Charging adaptor

A device that allows a charging cable to connect with the charging port that is different from the one the EV natively supports.

## Charging cable

The cable between the charging station and the charging connector.

## Charging network

A system of interconnected charging stations that enables electric vehicle owners to recharge their vehicles conveniently and efficiently.

## Charging rate

refers to the speed at which an electric vehicle (EV) or battery is replenished with electrical energy during the charging process, measured in kW.

## Charging station

A location equipped with electric charging infrastructure where electric vehicles can be plugged in to recharge their batteries.

## Cold weather range reduction

The decrease in driving range experienced by electric vehicles (EVs) in low temperatures. Factors contributing to this include increased battery internal resistance, lower battery capacity, increased energy consumption for heating systems, and reduced regenerative charging efficiency.

# D

## DC fast charging

High-power charging method for electric vehicles (EVs) that allows for significantly faster charging compared to standard AC charging. It converts AC power to direct current (DC) enabling EVs to replenish their battery capacity rapidly and extend their driving range in a shorter amount of time, making it ideal for long-distance travel and quick charging stops.

## DC motor

A type of electric machine that converts electrical energy into mechanical energy, taking electrical power through direct current, and converting this energy into mechanical rotation.

## Drive unit

The assembly or system responsible for transmitting power from the electric motor to the wheels. It typically includes components such as the transmission, differential, and drivetrain that work together to transfer torque and rotational motion to propel the vehicle forward or backward.

# E

## Energy consumption

Refers to the amount of electrical energy consumed by an EV to power its electric motor and other functions over a specific distance or period. Typically measured in kilowatt-hours (kWh) and represents the total energy required to propel the vehicle, operate auxiliary systems, and overcome other energy losses during driving. Energy consumption is influenced by factors such as driving

behavior, vehicle efficiency, environmental conditions, terrain, and speed. Monitoring and optimizing energy consumption is important for understanding the efficiency of an EV and maximizing its driving range.

## Electric motor

A device that converts electrical energy into mechanical energy to generate motion. It uses the principles of electromagnetism to produce torque, which drives the movement of the EV.

## Electric powertrain

Responsible for converting electrical energy from the battery into mechanical energy to drive the vehicle's wheels providing propulsion in an electric vehicle (EV). It typically includes an electric motor, a PCU or inverter, a battery pack, and a transmission.

## Electric vehicle tire

A tire that is optimized for electric vehicles. EV tires usually have higher load indexes to accommodate the additional weight, different tread compounds to account for the higher torque and lower rolling resistance to optimize range. They may have acoustic foam inserts to decrease tire noise.

## Electric vehicle (EV)

A broad term that refers to any vehicle powered partially or entirely by electricity.

## Electric vehicle battery thermal management system

Adapts battery power to external and internal temperature conditions and regulates optimal temperatures in battery packs, power electronics drives, and electric motors; optimizing range, performance, and the safety of an EV.

## Electric vehicle charging infrastructure

The network of charging stations and associated equipment that enables EV owners to recharge their vehicles. EV charging infrastructure is rapidly developing and strategically placed in public locations, workplaces, residential areas, and highways to provide convenient and accessible charging options for EV users.

## Electric vehicle efficiency

The measure of how effectively an EV utilizes electrical energy to propel the vehicle and cover a certain distance; typically expressed as a ratio of the energy consumed by the vehicle to the distance traveled. Low rolling resistance tires, healthy tread depth, and tire inflation can all increase the vehicle efficiency.

## Electric vehicle range

The maximum distance an electric vehicle (EV) can travel on a single charge before its battery requires recharging, usually measured in miles or kilometers. Tire tread design, rolling resistance, and air pressure all influence the overall range an EV achieves.

## Electric vehicle safety standards

A set of regulations and guidelines established to ensure the safety of EVs and their occupants. These standards cover various aspects of EV safety, including crashworthiness, battery safety, electrical systems, fire prevention, and occupant protection. They are developed and enforced by governments, automotive industry associations, and international standards organizations to ensure that EVs meet specific safety requirements and undergo rigorous testing and certification processes.

## Electric vehicle supply equipment (EVSE)

Commonly called charging stations or charging docks, they supply electricity to an EV to recharge the vehicle's batteries. EVSE systems include the electrical conductors, related equipment, software, and communications protocols that deliver energy efficiently and safely to the vehicle.

## EV battery

An EV battery is the rechargeable energy storage device used to power an electric vehicle. It is the primary source of electrical energy that drives the vehicle's electric motor(s). EV batteries are typically large, high-capacity lithium-ion battery packs composed of multiple individual battery cells. These cells store electrical energy and are interconnected to provide the necessary voltage and current to propel the vehicle. The EV battery pack is responsible for storing and delivering electrical energy to power the vehicle's motor, enabling it to drive for a certain range before requiring recharging. The capacity and energy density of the battery determine the vehicle's driving range and overall performance. The capacity of an EV battery is measured in terms of kilowatt-hours or kWh.

## G

### Gear box ratio

The ratio of the number of turns the input shaft makes when the output shaft turns once. A higher gear ratio provides more torque but less top speed, and increases tire wear. Lower gear ratios deliver less torque but higher top speeds and efficiency, decreasing tire wear.

## H

### High voltage battery pack

Large-scale battery system specifically designed to provide power for an electric vehicle. It consists of multiple individual battery cells connected in series and parallel configurations to achieve the desired voltage and capacity. These battery packs typically use lithium-ion or other advanced battery chemistries to provide high energy density and support the range and performance requirements of electric vehicles.

### High-voltage service disconnect

A device used to disconnect the electrical supply to high-voltage equipment or systems, typically installed in electric vehicle charging stations and on vehicles containing high-voltage systems (some service disconnect switches are low-voltage). The purpose of a service disconnect is to isolate

the electrical circuit, ensuring the safety of personnel and allowing for cautious maintenance, repair, or inspection of the high-voltage equipment with minimal risk of electrical shock or damage since the high voltage battery will still possess dangerous high-voltage.

## Hybrid electric vehicle (HEV)

A hybrid electric vehicle (HEV) is a type of vehicle that typically combines an internal combustion engine (typically fueled by gasoline or diesel) with an electric motor. The electric motor assists the engine during acceleration and low-speed driving, reducing fuel consumption and emissions. Unlike battery electric vehicles (BEVs), hybrid vehicles cannot be solely powered by electricity and still require fuel.

## I

### Induction motor

An induction motor is an asynchronous AC electric motor which converts alternating current electricity into the mechanical energy. It is called an induction motor because the electric current in the rotor circuit required to produce the torque is obtained through electromagnetic induction from the "rotating" magnetic field of the AC current flowing in the stator windings.

### Inverter

Provides an AC power from DC power sources such as taking DC power from the high-voltage battery and providing AC power to the electric motors. Likewise, the inverter can take AC power created during regenerative braking and provide DC power to recharge the high-voltage battery.

## K

### Kilowatt-hour (kWh)

A unit of energy commonly used to measure the capacity of electric vehicle batteries and the amount of energy consumed during charging or driving.

## L

### Level 1 charging

The slowest level of charging, typically using a standard household outlet (120 volts in North America). It is suitable for overnight charging and has a lower charging rate compared to other levels.

### Level 2 charging

A faster charging level that requires a dedicated charging station (240 volts in North America). It provides a higher charging rate and can fully charge an electric vehicle in a few hours.

### Level 3 charging (DC fast charging)

The fastest charging level available, typically using high-powered charging stations. It can charge an electric vehicle to a significant level in about 30 minutes.

## Lift Points/Jack points

Specific positions on the frame or unibody where the lift/jack contacts the vehicle. On EV's, using the incorrect lift points can damage the battery or endanger the technician.

## Lithium-ion battery

Advanced battery technology used in EVs that uses lithium ions as a key component of its electricity generation. They have one of the highest energy densities and capacities, are rechargeable, and can deliver high amounts of electricity.

## Low voltage battery

A battery that operates at a relatively low voltage (about 12-16 volts) compared to other high-voltage systems or components, commonly used in vehicles (including electric and hybrid vehicles) to power instrument panels, center consoles, lights, power windows/locks and other circuits.

# M

## Multi-speed transmission

A type of transmission providing multiple gear ratios to optimize the vehicle's performance and fuel efficiency across various driving conditions. Hybrid and PHEV's typically have transmissions with multiple gear ratios while BEV's usually have a gear box with 2 gear ratios.

# N

## NACS

The North American Charging Standard, or NACS, is the more general name for the Tesla charging network. The NACS charger uses 2 electric pins that can transmit either DC or AC current to an EV.

## National Electric Vehicle Charging Infrastructure Project (NEVCIP)

Provides funding to states to deploy electric vehicle (EV) fast chargers along designated electric vehicle corridors to establish an interconnected EV charging network across the state and nation.

# O

## On-board charger

An electronic device that regulates the charging process, monitors the battery's state of charge, and manages the charging rate based on the battery's capacity and charging capabilities. It is a vital component that enables the EV to recharge its battery pack when connected to a power source.

## Over the air (OTA) update

OTA refers to a method of updating software, firmware, or other digital content on an EV without requiring physical connections or manual intervention. It allows for the wireless delivery and installation of updates directly to a device over an internet connection, typically through a dedicated cellular connection in the vehicle.

# P

## Plug and charge

Plug and Charge is a feature for electric vehicles (EVs) that simplifies the charging process by enabling automatic authentication and payment at compatible charging stations. With Plug and Charge, EV drivers can simply plug their vehicle into a compatible charger, and the charging process begins automatically without the need for any additional steps.

## Plug-in hybrid electric vehicle (PHEV)

A hybrid vehicle that has a larger battery pack and can be recharged by plugging it into an external power source. It can run on electricity for a certain range before the internal combustion engine takes over.

## Plug connector

The device that connects the recharging station to the EV.

## Power control unit

An electronic device or system used in EVs to convert a battery's electric power from DC to AC and then supplies power to the motor.

# R

## Range anxiety

The fear or concern of running out of battery power before reaching the intended destination. It is more commonly associated with battery electric vehicles due to their limited driving range.

## Range-extended electric vehicle (REEV)

Overcome many of the short-comings of EVs by having a 'range extender' unit, which consists of an on-board fuel converter that converts a liquid fuel, such as gasoline, into electrical energy whilst the vehicle is driving.

## Regenerative braking

A technology that allows an electric vehicle to recover and store energy during braking or coasting. The electric motor acts as a generator, converting kinetic energy into electrical energy and storing it back in the battery.

## Run-flat tire

A type of pneumatic tire that allows a vehicle to continue driving for a limited distance at a reduced speed with little or no inflation pressure.

# S

## Scheduled battery charging

A feature in EVs that allows the user to set a specific time or schedule for when the vehicle's battery should start and stop charging. It enables the EV owner to take advantage of off-peak electricity rates, optimize charging times to coincide with renewable energy availability, or ensure that the vehicle is fully charged and ready at a specific time.

### Single-speed gear box

Relies on a single gear ratio to transfer power from the electric motor to the wheels. Does not have multiple selectable gear ratios like a traditional multi-speed transmission in ICE cars, as EVs can deliver efficient and ample torque at a wide range of speeds and can rev up to 20,000 rpms.

### Society of Automotive Engineers (SAE) J1772

SAE is a professional organization providing a forum for companies, research institutions, and government agencies to come to a voluntary consensus regarding technical standards applied to the automotive, aerospace, and commercial-vehicle industries. Automotive companies and government organizations came to the agreement to standardize J1772 chargers or “J” plug connectors across all auto makers.

### Solid polymer battery

A battery technology that uses solid electrodes and a solid electrolyte, instead of the liquid or polymer gel electrolytes found in lithium-ion or lithium polymer batteries.

### State of Charge (SoC)

The amount of energy stored in an electric vehicle’s battery, expressed as a percentage. It indicates the current battery capacity level versus when the battery is fully charged.

## T

### Tesla destination charger

A wall-mounted charging unit that use alternating current (AC) to supply power to your EV. You can charge your car for a few hours or overnight using a Destination Charger, be it at a restaurant, hotel, shopping mall, or other location.

### Thermal management system

The combination of battery heating and cooling systems in an EV ensures that the battery operates within the ideal temperature range, which is crucial for maintaining its efficiency, range, and overall health.

### Tire rolling resistance

The force that opposes or prevents a tire from rolling in a forward motion. Rolling resistance has a direct effect on EV range. In order to optimize range, low rolling resistance tires are normally recommended for EV’s.

### Tire pressure

Due to the additional weight of the batteries, EV’s may require higher inflation pressures. Always consult the tire placard on the vehicle for the manufacturer’s recommended inflation pressure.

### Tire wear

The increased torque and regenerative braking in an EV or hybrid results in higher rates of tread wear. Driving style plays a major role in the rate of EV or hybrid tread wear.

### Tesla supercharger

A high speed EV battery charger that uses high-power direct current (DC), unlike relatively low-power conventional AC chargers.

### Time of use battery charging

The differential rate electricity companies charge based on the time of day one decides to charge their EV. Provides lower pricing to incentivize use of renewables and lighten peak demand.

## V

### Vehicle-to-grid (V2G)

Technology that enables energy to be pushed back to the power grid from the battery of an electric vehicle (EV). With V2G technology, an EV battery can be discharged and give back to the power grid when it nears max capacity.

## W

### Wireless charging

The process of electrically charging battery-powered devices such as laptops, smartphones, and electric vehicles without the need for a wired connection.

### MOTOR TYPES:

#### AC induction

A motor that converts electrical energy into mechanical energy, producing torque through electromagnetic induction of the rotor due to a magnetic field created by AC windings in the stator.

#### DC permanent magnet

An advanced motor like induction motors that uses its own permanent magnet in place of stator windings. DC current flows through rotor windings to create rotation and torque.

#### Salient pole motor

An electric motor with poles that project outward on the rotor.

#### Hybrid

A type of motor used in hybrid vehicles, combining an internal combustion engine (ICE) with an electric motor for propulsion. The motor system intelligently switches between the two power sources to improve fuel efficiency and reduce emissions.

### VEHICLE AUTONOMY LEVELS:

**Level 0** (No Driving Automation)

**Level 1** (Driver Assistance)

**Level 2** (Partial Driving Automation)

**Level 3** (Conditional Driving Automation)

**Level 4** (High Driving Automation)

**Level 5** (Full Driving Automation)