CHARGE-V
HAPPY CHARGING

Whitepaper

Electromobility - Fast-charging infrastructure for your customers

Content

Electromobility in full swing

It is primarily government subsidies in the form of environmental bonuses and the efforts of car manufacturers to reduce the CO_2 emissions of their own fleets that are causing sales of electrified cars to rise. Plug-in hybrids and pure electric cars are recording strong growth rates in all vehicle classes. 13.5 % of all new registrations in Germany in 2020 had an electric drive (plug-in hybrid, electric cars with battery or fuel cell). Compared to the previous year, plug-in hybrids increased by 342 % to 200,469 units, pure electric cars by 207 % to 194,163 new registrations. (Source: KBA) The extended subsidy for electric cars in the form of the eco-rebate until 2025 and a large number of new models in the manufacturers' portfolios will continue to drive the market. The forecast by the KBA and Autohaus confirms this thesis. While in 2020 only 1.2% of cars will have an electric drive, by 2025 the share will already be 11.1%. By 2030, a further increase of 13.3 % is expected. This would correspond to a total of 11.55 million vehicles in absolute terms. (Source: KBA, Autohaus)

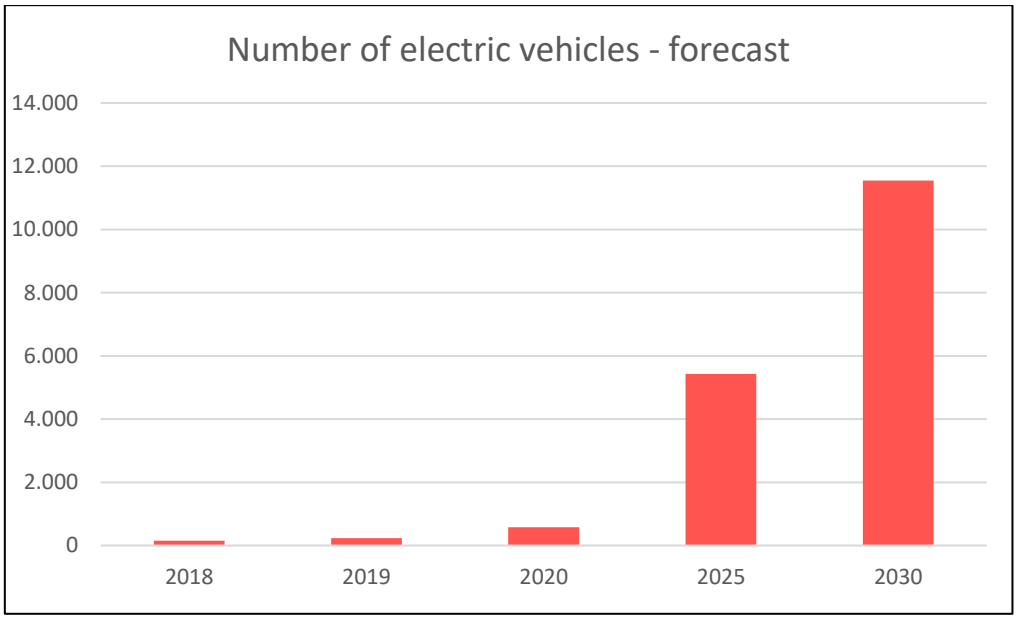


Abbildung 1: Development of the stock of electric vehicles, source KBA

This growth in registrations of electrified and purely electric cars among private and commercial customers poses further challenges for the charging infrastructure.

Your offer for customers and / or employees

Since electric cars need to be charged regularly, operating a plug-in hybrid only makes sense if the hybrid is also regularly parked at a socket, wallbox or charging station. Because only when the vehicle is on the road electrically as often as possible can it fully exploit its advantages in reducing CO_2 emissions through the lower consumption of fossil fuels.

When setting up a charging infrastructure in a company or as an offer for customers, it is important to consider the different charging systems:

CHAdeMO

The ChAdeMo plug is a standard for charging with direct current that is particularly widespread among Japanese electric cars and allows charging powers of up to 400 kW. The advantage of this CHAdeMO system is the possibility of bidirectional charging. The electricity can therefore be fed into the grid from the batteries of electric cars. Due to the low supply of vehicles with a corresponding charging connection, the CHAdeMO standard will continue to play a niche role in Europe.

Type 1 plug

The type 1 plug is a single-phase plug for alternating current (AC) charging. The maximum charging power is 7.4 kW. It is of little relevance to the European market and is mainly used in Asian countries.

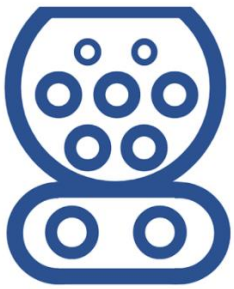
Type 2 plug

The type 2 plug is considered the standard in Europe for charging electric cars with alternating current. Three-phase charging at a corresponding charging station or wallbox is possible with up to 22 kW power. Many electric cars have an on-board charger for single-phase charging. This means that these vehicles can charge electricity at a maximum of 7.4 kW at a 22 kW charging station or wallbox.

Due to the smaller batteries, most plug-in hybrids only have a type 2 connection, which is why fast charging with direct current is not possible. Regardless of the type of vehicle, charging columns or wallboxes with a type 2 plug are particularly suitable for longer periods when the cars are stationary, e.g. during a working day or for charging a company vehicle overnight.

While charging stations for CCS and / or CHAdeMO provide the customer with a separate cable for the connection with the electric car, a separate cable is required when charging alternating current via the type 2 plug.

CCS



CCS (Combined AC / DC Charging System) is the standard widely used in Europe for fast charging with direct current. Corresponding fast charging systems serve the needs of customers at e.g. motorway service stations and petrol stations. It also makes sense to invest in fast-charging columns with CCS at the depot of a local transport company or a courier company.

Individual electric cars can achieve a charging power of up to 270kW at a fast charging station. Such a value represents the maximum possible charging power for a short period of time and is also achieved, among other things, by preconditioning the battery (by entering the quick charging point in the navigation system). As a rule, fast charging stations with outputs of 100 to 200 kW are sufficient to cover general demand.

Tesla Supercharger via Type 2 plug

Tesla vehicles intended for the European market can also be easily charged with alternating current (AC) at the Type 2 charging points widely used in this country. An internal switch in the vehicle allows DC fast charging via the Type 2 plug using the Tesla Supercharger.

The basic question: AC or DC charging?

Electric cars can be charged at charging stations, which can be divided into AC charging stations (normal charging stations) with an output of up to 22 kW and DC charging stations (fast charging stations) with an output of over 22 kW. While in the case of alternating current (AC) the current is converted into direct current with the help of the vehicle's on-board charger, in the case of a DC charging station the conversion into direct current takes place with the help of a built-in rectifier in the charging station. For this reason, DC charging stations create power above 150 kW, known as hypercharging (HPC). This allows the battery of an electric car to be charged more quickly and avoids unnecessarily long idle times. Thus, DC fast charging systems make sense for journeys with only short stops, ensuring high availability. However, if longer standstill times are planned (e.g. overnight or during working hours), an AC charging station with a lower charging capacity is perfectly adequate. Many plug-in hybrids also do not have the option of accepting direct current via a CCS connection.

The charging infrastructure provided should therefore always be oriented towards the needs of customers and / or employees. Are the cars parked on the company premises for a short time and should be supplied with the maximum amount of electricity during this time? Or are the parking times longer because, for example, employee vehicles are to be charged during a working day?

A needs analysis helps to make the right decision here. The different charging times of some example models illustrate this:

	Opel Mokka-e	VW ID.3 Pro	Porsche Taycan	Mercedes e-Vito
Battery capacity (gross)	50 kWh	58 kWh	Up to 93,4 kWh	100 kWh
Charging capacity DC	Up to 125 kW	Up to 100 kW	Up to 270 kW	Up to 110 kW
Charging time DC 0-80% battery charge	Approx. 25 minutes	Approx. 30 minutes	22,5 minutes	45 minutes
Charging capacity AC	11 kW (three-phase)	11 kW (three-phase)	11 kW (three-phase)	11 kW (three-phase)
Charging time AC 0-100% battery charge	6 hours 15 minutes	5 hours 15 minutes	9 hours	10 hours

Checklist: AC or DC?

- How long do customers' and / or employees' vehicles park on site?
- For vehicle fleets: Which fast charging port do the cars hold?
- How much do fast charging points and the infrastructure cost compared to DC charging points?
- For what type of charging columns are there (higher) local subsidies?

Requirements for fast charging systems

Building permit

In private as well as semi-public areas, the installation of charging columns for charging electric cars does not require a permit (source: Federal Ministry of Transport and Digital Infrastructure).

However, depending on the location, different regulations of individual federal states and / or municipalities apply. An enquiry with the administrative authority responsible for the respective location is therefore strongly recommended.

Local electricity grid

In addition to the authority, the basic supplier, a so-called power supply company, should also be contacted. The possibilities of a power line and its connection to the local power grid should be examined.

Wallboxes or charging columns with a charging capacity of more than 11 kW generally require approval from the local grid operator. For a maximum output of 11 kW, all that is required is a corresponding notification.

Funding opportunities

In 2016, the government adopted a "Market Incentive Programme for Electric Mobility" (source: Federal Ministry of Transport and Digital Infrastructure BMVI). This also regulates the promotion of publicly accessible charging points. Depending on the performance of the charging points or wallboxes, there are different funding options.

The BMVI and the commissioned National Charging Infrastructure Control Centre under the umbrella of NOW GmbH are currently working on an extension of the funding guideline for public charging infrastructure.

A corresponding funding programme for fast charging points is also to be developed and published for employers and fleet operators in the course of 2021 (source: NOW GmbH).

With the passing of the Fast Charging Act, the BMVI has created the legal basis for a call for tenders for 1,000 publicly accessible fast charging hubs. This is intended to promote medium- and long-distance mobility with purely electric cars. According to the draft law, the locations for the fast charging points must be publicly accessible around the clock. The charging capacity must be at least 150 kW.

With the location tool of the federally owned NOW GmbH (standorttool.de), not only can current locations and funding measures be displayed, but also a forecast of charging requirements up to the year 2030 can be called up. This can be used to support planning for the construction of charging locations.

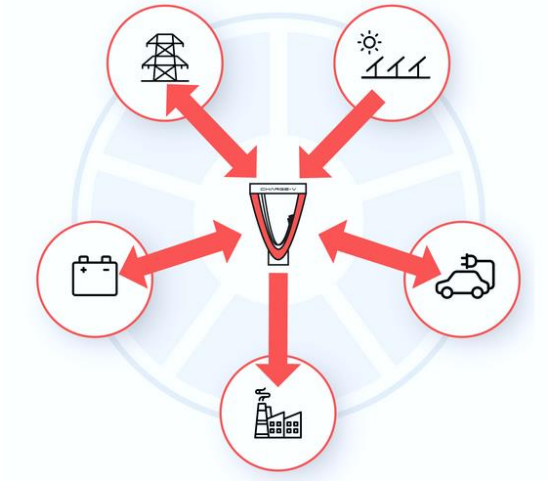
Charging with green electricity

What is green electricity?

Green electricity or "green power" is generated from renewable energies. These include wind and water power as well as electricity generated by sunlight in photovoltaic systems. Plants that process biomass also supply green electricity, which can be used to charge electric vehicles.

The electricity supplier feeds the electricity from renewable energy sources into the public grid, which ensures that customers are supplied with green electricity. Public funding measures are usually tied to the use of green electricity for the charging infrastructure to be funded. If there are questions regarding the electricity supply, the responsible local authority can be contacted.

The more electricity from renewable sources is used for charging electric cars, the lower the CO_2 emissions of these vehicles in the "well-to-wheel" consideration. This means that the advantage in emissions compared to diesel models or cars with petrol engines can be extended even further.



Operate charging stations yourself?

Fast charging stations for direct current and / or alternating current are a contemporary and future-oriented additional benefit for your own employees and / or customers. Among other things, this gives the company a competitive advantage over the competition and also promotes customer and employee loyalty. However, the installation of the charging points is associated with high investments as well as a certain planning effort, which is why close cooperation with a planning office is recommended.

The alternative: First of all, it must be checked whether an external operator can set up corresponding charging points on the premises. The external operator (CPO) then takes care of the operation and maintenance of the charging points, while the billing modalities are usually handled by an MSP.

As an additional incentive, fleet operators can provide their employees with charging cards and/or discounted rates at charging stations of the respective partner.

Electricity price optimisation

For customers and/or employees, the offer of fast charging points represents many advantages, among other things due to the strongly increasing sales figures of electrified cars. As a provider of appropriate charging solutions, you can, for example, help customers make the switch to electromobility.

Now, at the latest, is the time to optimise your variable costs. Regularly check the optimal cost structure for your needs with the local energy supplier and its competitors. Possible basic prices and, of course, the energy price per kWh play a role here.

It is also important to consider the origin of the energy when choosing an electricity tariff. As a responsible company, you should opt for electricity from renewable energy sources. Depending on the structural conditions on site, photovoltaic systems can support your efforts to use resources responsibly. Another way to optimise electricity prices is to install a stationary electricity storage unit on site, combined with a photovoltaic system. Here, energy for the supply of vehicles can be generated, stored and released as needed.

Your opportunities

Electromobility has become part of people's everyday lives. Rising registration figures for purely electric cars and plug-in hybrids will continue to determine the statistics.

This makes the rapid expansion of a well-functioning charging infrastructure all the more important. Drivers of electric vehicles usually charge their cars at home overnight, if their living situation permits. "Lantern parkers" and frequent drivers, however, are dependent on fast charging points.

Employers can be just as attractive as operators of shopping centres, petrol stations or restaurants by providing charging points for their employees. These locations are particularly suitable for fast charging points due to the short standing times.

Take advantage of funding opportunities and the offers of possible cooperation partners to electrify your employees and your customers!

CHARGE-V is a competent partner for all questions regarding the establishment and expansion of a charging infrastructure.

CHARGE-V GmbH
Joseph-Dollinger-Bogen 28
80807 München

Email: info@charge-v.com
Tel: +49 (89) 45 24 50 000

CHARGE-V
HAPPY CHARGING