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Ultra-Fast-charging infrastructure - the "backbone of electromobility".

How private and public investments in charging infrastructure want to help push German e-mobility - and thus meet the requirements of the coalition government.

ENERGY TRANSITION, TRENDS

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A major international investor is putting 150 million euros into a Munich start-up so that it can install thousands of ultra-fast charging stations. The major corporations in the automotive and energy sectors are also investing heavily in the e-charging infrastructure with a focus on high-power charging. Many municipal utilities have also identified electromobility and the necessary infrastructure expansion as a growth area. SachsenEnergie, for example, will expand its current 500 public charging points by 100 additional HPC points and RheinEnergie is building 1,000 new charging points for the municipal utilities of Cologne.

Can the German government's climate protection goals be achieved thanks to such public and private initiatives? After all, instead of the 1.01 million full electric cars counted by the Federal Motor Transport Authority as of 1 January 2023, 15 million e-cars are to be put on the road by 2030 - in the hope of finally significantly reducing greenhouse gas emissions from car traffic.

Within seven years, the current number of 85,073 public charging points (Federal Network Agency, as of 1st March 2023) is to grow to one million. According to the budget law, 6.3 billion euros have been earmarked for the expansion of this charging infrastructure in public spaces by 2026 alone - with a strong focus on: fast charging infrastructure.

In any case, the federal government sees e-mobility as nothing less than the "key to reducing greenhouse gas emissions in the transport sector". But are these targets of the traffic light coalition even feasible - or even outdated since the Charging Infrastructure Master Plan II was agreed upon in autumn 2022?

Maurice Neligan, CEO of Jolt Energy, the Munich-based start-up that recently convinced investor InfraRed of its vision and describes itself as a "pioneer in battery-buffered ultra-fast charging stations in urban areas", explains: "Our ultra-fast charging stations with powerful battery storage are the missing link to accelerate the energy and transport transition in cities." JOLT's focus is on the urban motorist, who would like to contribute to climate protection but does not find ideal conditions for it, for example because they cannot install a wallbox in their city flat and charging at the public charging points takes too long to be integrated smoothly into their daily routine.

At the Ultra Chargers, which JOLT plans to install at 5,000 locations in European and North American cities, primarily at petrol stations and supermarket car parks, on the other hand, you can "fill up for 100 kilometres in just five minutes". This is made possible by the battery storage built into the charging station by developer of the charging system ADS-TEC. It is charged with the power of the existing grid, stores and transfers it to the vehicle ultra-fast during refuelling. In this way, the grid power - even the very low power from the low-voltage grid - can be increased to up to 320 kilowatts. In addition to their speed, Neligan also sees an infrastructural advantage in battery-based charging systems to the often more distant medium-voltage grid with transformer station, transformer and switchgear, as required by most HPC columns.

GLOBAL PLAYERS ARE ALSO INCREASINGLY OPTING FOR FAST-CHARGING CONCEPTS

By comparison: By far the most charging points in Germany (71,359 of 85,073) are still connected to the readily available low-voltage grid, but only achieve a maximum output of 22 kilowatts with alternating current (AC). It takes a while to refuel an electric car for a longer distance at such a charging station. The faster charging stations, which use direct current from the medium-voltage grid, achieve up to 149 kW. Not surprisingly, their share of the German charging infrastructure is growing much faster than that of AC charging stations.

However, more and more providers are focusing on ultra-fast charging with an output of up to 350 kW - from start-ups such as Jolt Energy or Numbat from Kempten to global players in the automotive and energy industry, including EnBW mobility, EWE, the carmaker alliance Ionity, Tesla, VW with its charging subsidiary Elli, Audi and Aral. With its sub-brand "Aral Pulse", the group intends to expand its ultra-chargers with up to 350 kW not only at its petrol stations, but also in other places of everyday use such as supermarkets or fast-food chains. At these owners of suitable plug-in hybrids and fully electric cars can achieve a range of up to 300 kilometres within ten minutes, according to Aral.

The political requirements are clear: Only in March 2023, the European Parliament agreed with the Council Presidency that within three years there must be a fast-charging station with a minimum capacity of 150 kW every 60 kilometres on the most important long-distance roads in the EU. The traffic light coalition, in turn, obliges the operators of larger filling stations in Germany to set up at least one fast-charging point within five years.

Carsten Wald also believes that the expansion of the ultra-fast charging infrastructure is "the backbone of electromobility, whether in urban areas or along major transport axes". The head of the electromobility department at SachsenEnergie explains, "We will concentrate our efforts and resources on HPC charging and in our grid area Dresden and eastern Saxony, we will add a hundred additional ultra-fast charging points to the more than 50 currently available." He shares with JOLT CEO Neligan the vision of "mobility hubs", which the conventional filling station will evolve into. While all kinds of cars can be refuelled here, from petrol cars to hydrogen vehicles and, of course, electric cars, drivers use the few minutes to drink an espresso, read emails on the stable W-LAN, drop off a return at the parcel shop, shop in the (unmanned) shop or snack in the restaurant.

"Things will happen, in the end we will be able to easily incorporate electric charging into our everyday lives," Wald is convinced. But only when the charging infrastructure in general and the range of HPC charging points have been sufficiently developed can e-car drivers literally "experience" that they are not at a disadvantage due to their climate-friendly vehicle. At present, there is still room for improvement in Saxony as far as the availability of charging points is concerned: Drivers in the State of Saxony have just 3,403 points at their disposal, compared to the leaders Bavaria (17,291) and NRW (15,552). In Hamburg, one of the eight "model regions for electromobility", drivers currently have 2,216 public charging points to choose from.

COLOGNE PUBLIC TRANSPORT OPERATORS RELY ON E-BUSES

In Cologne, in addition to the charging points of Tesla, Aral, Lidl, Aldi and EnBW, the municipal utilities and their subsidiaries already operate more than 630 charging points, which were not working at the capacity limit and thus still met the demand of the people of Cologne. Nevertheless, the fourth-largest city in Germany has decided to expand the range by 1,000 charging points by 2026, including ultra-fast charging points. Incidentally, green electricity flows at all the public utility charging points. The e-buses of the Cologne public transport company, which make up about a quarter of the entire fleet, also run on it. As spokesman Stephan Anemüller explains, the company relies both on slower depot charging, which puts far less strain on the batteries, and on ultra-fast charging at the final stops of the lines. During the driver rest periods, the vehicles monitored via the control centre get an energy boost for the next kilometres within five to seven minutes. "The driver presses a button, extends the pantograph, which docks with the charging bonnet and the bus battery is charged with up to 500 kW."

The Talako pilot project, which has been available to taxi drivers in Cologne since May 2022, seems just as practical: Near the main station, they can charge their e-taxis inductively without having to get out of the car. Aleksandar Dragicevic of Taxi Ruf, the Cologne cooperative of taxi drivers, says: "In total, six of our 1,100 vehicles are suitable for inductive charging. The drivers use the charging pads to fill up with electricity for 70 to 80 kilometres in the average waiting time of 40 minutes. In general, however, many drivers try to avoid e-cars in order to avoid queuing at the charging points. Time is money in taxis!"

German motorists, on the other hand, are tending more and more towards climate-friendly vehicles. According to the Federal Statistical Office, in 2017 only 0.12 percent of all passenger cars were electric (including plug-in hybrids), but their share in 2022 was already 2.6 percent and in the current year even more than 3.7 percent. By 2030, just under a quarter of German passenger cars are to be electric, which would correspond to 11.55 million vehicles and thus fall short of the German government's target of 15 million. Nevertheless, the rapid growth of the e-car market explains why charging systems are also being developed outside the charging station infrastructure, especially for high-density urban areas with densely populated urban districts with multi-storey residential buildings.

For example, Rheinmetall and the city of Cologne are piloting a kerbside charging project in the summer of 2023, "which is intended to blend almost invisibly into the street scene".

For Carsten Wald of SachsenEnergie, there is no question about it that the trend towards e-cars will continue. One assumes that the demand for wallboxes will increase significantly as early as 2027/28. Not only because charging at home is significantly cheaper than with diesel or petrol, but also because "there will soon be significantly more e-vehicles with a better price-performance ratio". As far as the public charging structure is concerned, SachsenEnergie has also recognised the great economic potential of ultra-fast charging points for itself. Carsten Wald: "Although the set-up costs including hardware, civil engineering, installation as well as grid connection are higher for an HPC charging pole, a significantly larger amount of green electricity can be sold with them." While a vehicle at a normal charging point with an average of eleven kW charges between 40 and 50 kWh in the legally permitted four hours of parking time, and on average a maximum of two to three charging processes take place per day, with HPC charging "even after 20 charging processes per day, it's still not over", according to the head of the electromobility department.

ULTRA-FAST CHARGING NETWORK UNSTOPPABLE

With regard to the federal government's target of one million charging points in Germany by 2030, Wald is sceptical: "I think we will miss the mark. But the question is whether such a high number will be necessary at all. After all for many drivers with a total distance of 4,000, 5,000 kilometres per year - the average of all registered passenger cars is 14,000 km per year - slow charging in the garage is sufficient. Even if the first e-cars prove their long-distance suitability and thus become more attractive for business travellers and frequent drivers, the charging technology is also developing very quickly and the ultra-fast charging network is already extremely efficient today. In other words: in the future, a HPC charging station will be used by a similar number of drivers as a conventional petrol station. And if the espresso at the mobility hub tastes good, Germany as a car country is probably heading in the right direction.