Mission E

30/07/2018 Breaking new ground and promptly taking the lead. Doing everything differently yet still decisively stamping classic Porsche virtues on the electric era. The world expects no more and no less of the first purely electric Porsche when it makes its debut in 2019. A dossier on the subject of electromobility.

800 V
The new generation of charging stations is designed for 800-volt technology. But it's also downward-compatible for all vehicles on the market with 400-volt technology.

15 minutes
The Taycan is ready for the next four hundred kilometers in roughly fifteen minutes.

10 inches
The large touch display is designed to allow optimal readability even in bright sunlight.

CCS
Porsche employs the Combined Charging System as the standard in Europe and the US for alternating

current (AC) charging and direct current (DC) charging. For Japan and China, Porsche will offer the local standards.

The situation

Great distances between charging stations, no standard payment model, competing connection systems, inadequate power grids—the simple matter of getting new energy into empty batteries is anything but. International standards for adequate geographical coverage with modern charging stations for millions of electric vehicles? Still in the works. There's a fundamental distinction between conductive and inductive charging. With conductive charging, energy is transmitted between the vehicle and the power grid through charging cables and a plug system. With inductive charging, the energy is transmitted between the vehicle and the power grid without cables through electromagnetic induction.

With conductive charging, or charging with a cable, a distinction is made between alternating current (AC) charging with a conventional 400-volt plug connection, with charging capacities of up to 22 kW, and direct current (DC) charging, with charging capacities of up to 350 kW. AC charging is normally used at home or at the workplace, while DC charging is used for fast charging on the go. For AC charging, a permanently installed wallbox or a suitable charging cable is required as the connection between the power socket and the vehicle. At public AC charging stations, a special cable with a CCS connector suffices.

The additional energy needs through 2025 will likely remain modest. Estimated increases in energy demand due to electromobility will be moderate in the different regions, with substantial jumps in demand only expected in the period through 2035. The primary reason: development in China.

The challenges

Step out of the car, open the tank cap, fill up, pay—and get back on the road in a few minutes. That's been the drill for drivers until now. The technology required for charging electric vehicles is in fact already in place, with the expansion of a charging infrastructure already in the works across Europe. But enabling an uncomplicated and fast-charging procedure for electric vehicles on motorways and urban areas requires international coordination and agreements—no easy task, to be sure. Policy answers are needed. The spottily available rapid-charging stations that currently exist seldom offer more than fifty kilowatts. It takes roughly an hour of charging time to deposit enough electrons in the battery to power the next stretch of 250 kilometers. The operative questions, therefore: How can we charge faster? How can we get enough universal charging points? And how can we strengthen weak power grids?

The Porsche way

It'll take years to build a comprehensive charging network for electric vehicles. To speed up the process, Porsche is rolling up its sleeves. "Faster charging will only work with a higher charging capacity; that was clear from the outset," says Fabian Grill, who's working on the expansion of the charging infrastructure for Porsche. His colleagues had already established one important prerequisite: the Taycan, the first purely battery-powered Porsche sports car, works with an 800-volt battery. In order to be able to make use of these technical possibilities in the public sphere, Porsche is pushing the expansion of a fast-charging infrastructure.

The company is pursuing three options: First, charging at home—possible with a charging station or inductively via a base plate in the floor. Second, charging in cities—possible through existing infrastructure. And third, charging along the main traffic arteries in Europe. The joint venture Ionity was formed to do just that. Together with the BMW Group, Daimler AG, the Ford Motor Company, and the Volkswagen Group with Audi, Porsche is laying the groundwork for the establishment of a powerful fast-charging network for electric vehicles in Europe. The construction and operation of some four hundred fast-charging parks by 2020 are important steps toward making electromobility viable for long-distance routes as well and thus establishing itself on the market. Every Ionity fast-charging park will have multiple charging points. They ensure that a vehicle can be charged every 100 to 150 kilometers along the European road network. As the number of electric vehicles grows, so too will the infrastructure. Thus by 2020, customers will gain access to thousands of brand- and capacity-independent "high-power charging" (HPC) points. The charging capacity of up to 350 kilowatts per charging point enables accordingly designed vehicles to achieve significantly shorter charging times compared to the systems available today.

"Plug in and charge fast" is the motto. Payment is completely automatic. Porsche and its development subsidiary Porsche Engineering are pursuing a modular in-house concept for ultra-fast charging parks. Whether it's individual stations in the countryside or dozens of charging stations along highways: the solution is an intelligent system with practically unlimited scalability. And that's important to making charging parks efficient and profitable. For Porsche customers, the main priority is being able to charge their vehicle rapidly even where the local power grid is weak. That's now possible thanks to intermediary buffer batteries, which always have enough capacity on hand. Specifically, this means fast charging in about fifteen minutes for a range of four hundred kilometers at every Porsche charging point. Operation of the charging stations via touch display is roughly as intuitive as an ATM and just as secure. The expansion of the charging infrastructure is moving forward in the USA and China as well.

The solution from Porsche can, incidentally, be used universally for any electric vehicle. The control electronics detect what type it is and reduces the charging current if the model isn't designed for fast charging. With this infrastructure, a pioneering spirit is translated into reliable practicality and range security.

The Taycan is still a confidential undertaking. Yet the purely electrically powered sports car from

Porsche is already out and about on public roads—on intensive testing tours in extremely hot and bitterly cold regions of the world. One station: the western part of South Africa. More than sixty Porsche developers were on hand with twenty-one camouflaged prototypes—with daily high temperatures of around 40 degrees Celsius proving a challenge for the team and the machine in equal measure. All in all, some forty thousand kilometers were banked on the trip. By the time the Taycan hits the market in late 2019, the total will run into the millions of kilometers. The first electric sports car from Porsche, after all, should run like clockwork in even the toughest conditions.

Those who work there know the Porsche Taycan inside and out before the rest of the world ever lays eyes on it: the prototype construction department in Zuffenhausen is the birthplace of every new Porsche model. The 800-volt technology of the first purely electrically powered Porsche, its battery system, the complex cooling system: what the designers imagine for the Taycan is translated into initial test cars by the specialists in the closely guarded prototype construction department. At the same time, they lay the groundwork for series production, because they test and perfect all the necessary assembly and logistics concepts. They also train their colleagues from the assembly teams to ensure an optimal preparation for the Taycan's series production.

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Dr. Ing. h.c. F. Porsche Aktiengesellschaft
Porscheplatz 1
70435 Stuttgart