

With the expertise of the Formula E World Champion: the Cayenne Electric

05/11/2025 When it launches the Cayenne Electric, Porsche will not only bring another all-electric model series to the market – it will also transfer a piece of motorsport technology into series production. Numerous innovations are based directly on developments from Formula E, where Porsche is the reigning world champion in both the Teams' and Manufacturers' championships. With the Cayenne Electric, the sports car manufacturer is demonstrating that its journey towards electric mobility does not begin on the drawing board, but on the racetrack.

The new Cayenne Electric benefits greatly from the sports car manufacturer's experience in Formula E.Some of the technology in the fully electric SUV originate from the Porsche 99X Electric. Among other things, both cars use direct oil cooling of the electric motor and have a recuperation capacity of up to 600 kW. "Formula E is our development lab for the electromobility of tomorrow. This is where we gain valuable insights for our road-going sports cars," says Dr Michael Steiner, Member of the Board of Management for Research and Development. "The new Cayenne Electric shows how quickly such a

technology transfer takes place at Porsche and how relevant our commitment to the electric racing series is to series production."

Formula E as development lab for electromobility

"In Formula E, success depends on who can make the most of the available energy. This principle also shapes the Cayenne Electric," continues Florian Modlinger, Director Factory Motorsport Formula E and team principal of the factory Porsche Formula E team. "Efficiency is not only the focus in terms of the vehicles themselves; the agile working methods proven in racing can also help to shorten development times and accelerate the transfer of technology."

The heads of motorsport and series development sit close together in Weissach. This promotes the exchange of knowledge between projects. What is tested on the racetrack inspires what happens in series production – and vice versa: the racing car also sometimes learns from the road car. Charging is probably the most striking area for technology transfer; the sockets and plugs of the 99X racing car and the electric Porsche sports cars are completely alike. The underlying CCS (Combined Charging System) technology is not only the standard on the road but also in Formula E.

Direct cooling for less cooling effort

A prime example of technology transfer from motorsport to series production is direct oil cooling. Here, all current-carrying components of the electric drive system are cooled directly by a specially developed liquid, which significantly improves efficiency and sustained, continuous performance. Porsche has been using this innovative technology in Formula E since the start of the project – with an increasing degree of integration. From 2023, the GT4 e-Performance test vehicle also trialled direct oil cooling on the racetrack. Now it is entering series production, used in the rear motor of the flagship Cayenne Electric.

While in conventional electric motors the coolant flows through a jacket outside the stator, with direct cooling the coolant flows directly along the copper conductors via stator grooves. This allows the heat to be dissipated directly where it is generated. To achieve the same output, a motor cooled by a water jacket would also have to be about 1.5 times larger. Thanks to direct cooling, it was possible to choose a design for the Cayenne that enables an efficiency of up to 98 per cent. The competition variant in the 99X achieves an even higher value.

Extremely high recuperation power of up to 600 kW

Recuperation significantly increases the efficiency of both vehicles. Energy recovered during braking is fed into the battery and can then be used again for propulsion. More recuperation therefore allows for longer ranges and ultimately smaller batteries – the key to greater performance for both sports and

racing cars. In Formula E, the amount of energy available is deliberately limited: the 99X Electric is allowed to start a race with a maximum of 38.5 kWh of usable energy in the battery. If it recovers more energy during braking than its competitors, it then has more energy available to push for the finish line.

"The challenge of recuperation is highly complex," says Modlinger. "When braking, we want to recover as much energy as possible while reducing speed as quickly as possible. Depending on brake pressure, we also engage the front wheel brakes. The car's balance should match the driver's preferences – it contributes to their confidence in the car and, as a consequence, to performance. On the road, it's also a matter of driving safety. To bring all this together, a variety of software functions are active during braking — a huge area for potential knowledge transfer."

Up to 600 kW of recuperation power is possible in the Cayenne, depending on speed, temperature and the charge state of the battery. This means that the SUV achieves the same peak value as the 99X Electric. In the Cayenne, too, high-performance recuperation remains active during dynamic driving. In everyday driving situations, about 97 per cent of all braking manoeuvres are purely electric, without the need for mechanical disc brakes to assist. Depending on the driving manoeuvre, recuperation can continue until the vehicle comes to a standstill. It is only when deceleration exceeds the recuperation limit that the friction brakes on the front and rear axles intervene imperceptibly to the driver – a perfect interplay of efficiency and driving comfort, inspired by motorsport.

Fast recharging and robust fast charging processes

Since last season, Formula E has introduced fast charging pit stops known as Pit Boosts. A 30-second charge with a charging capacity of 600 kW provides the battery of the 99X Electric with a 10 per cent energy boost. The Cayenne Electric is also designed for fast pit stops; it takes less than 16 minutes to charge its battery from a 10 to 80 per cent state of charge (SoC).

It's not just in races that things get heated. Temperatures fluctuate greatly in everyday driving too. Porsche's philosophy is that high charging performance must be achieved even under adverse conditions across a wide SoC range. The DC charging power of the Cayenne is up to 400 kW. Fast charging is possible from a battery temperature of 15 degrees Celsius. Up to an SoC of about 55 per cent, the charging power is more than 350 kW – so the fast-charging processes are very robust. Within 10 minutes of charging at a suitable station, more than 300 km of range can be added.

Formula E is also a test laboratory and showcase for fast charging: "The drivers push the cars to the limit – sometimes in scorching-hot cities, such as Jakarta. When we come into the pits to charge, the system temperatures are often very high," says Modlinger. "At the same time, we want to keep the cooling requirements on the racing car as low as possible, because cooling consumes energy and, depending on the hardware, increases weight. So, during Pit Boost pit stops, we demonstrate an energy supply with enormous charging power under extreme conditions."

In Formula E, Porsche invests its available budget primarily in those vehicle components that are also

relevant for road use. According to the regulations, these components are located beneath the bodywork. Modlinger: “Our technical challenges are not visible from the outside. But they are considerable and, in many areas, they are similar to those we face in our electric road-going sports cars.”

MEDIA ENQUIRIES



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Consumption data

Cayenne Turbo Electric (WLTP)*: Electrical consumption combined: 22.5 – 20.4 kWh/100 km; CO_2 emissions combined: 0 g/km; CO_2 class: A

*Further information on the official fuel consumption and the official specific CO_2 emissions of new passenger cars can be found in the "Leitfaden über den Kraftstoffverbrauch, die CO_2-Emissionen und den Stromverbrauch neuer Personenkraftwagen" (Fuel Consumption, CO_2Emissions and Electricity Consumption Guide for New Passenger Cars), which is available free of charge at all sales outlets and from DAT (Deutsche Automobil Treuhand GmbH, Helmuth-Hirth-Str. 1, 73760 Ostfildern-Scharnhausen, www.dat.de).

Video

https://newstv.porsche.com/porschevideos/newstv.porsche.com_327274_en.mp4

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