

WE DEFINE  
FUTURE IMPACT

TECHNOLOGY  
SOFTWARE  
CONSULTING

E-MOBILITY  
DIGITAL  
INFRASTRUCTURE



**P3 BUSINESS  
AS UNUSUAL**

**P3** Charging Index

## Preread

**Created for:**

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UNECE EV fast- & smart-charging (F&SC) cluster

**Created by:**

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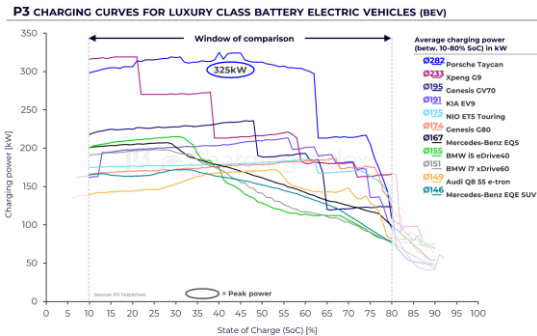
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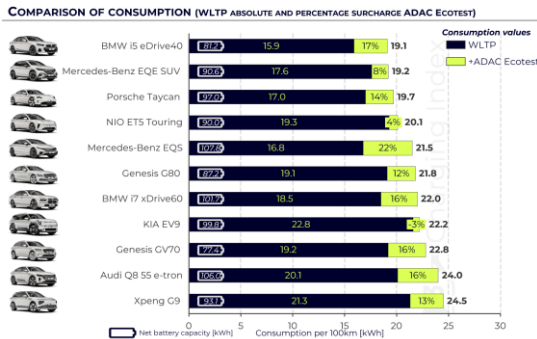
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# The P3 Charging Index target value of 1.0 shows the ability of EVs to recharge to 300 km of range within 20 minutes starting from 10% SoC.

## Delivered amount of energy in 20 minutes of charging (kWh)



## Divided by consumption per 100 km (ADAC Ecotest)



Recharged range within 20 minutes

Real recharged range [km] in 20 minutes

300 km

The **target value of 1.0** corresponds to a range of 300 km recharged within 20 minutes

**P3** Charging Index =

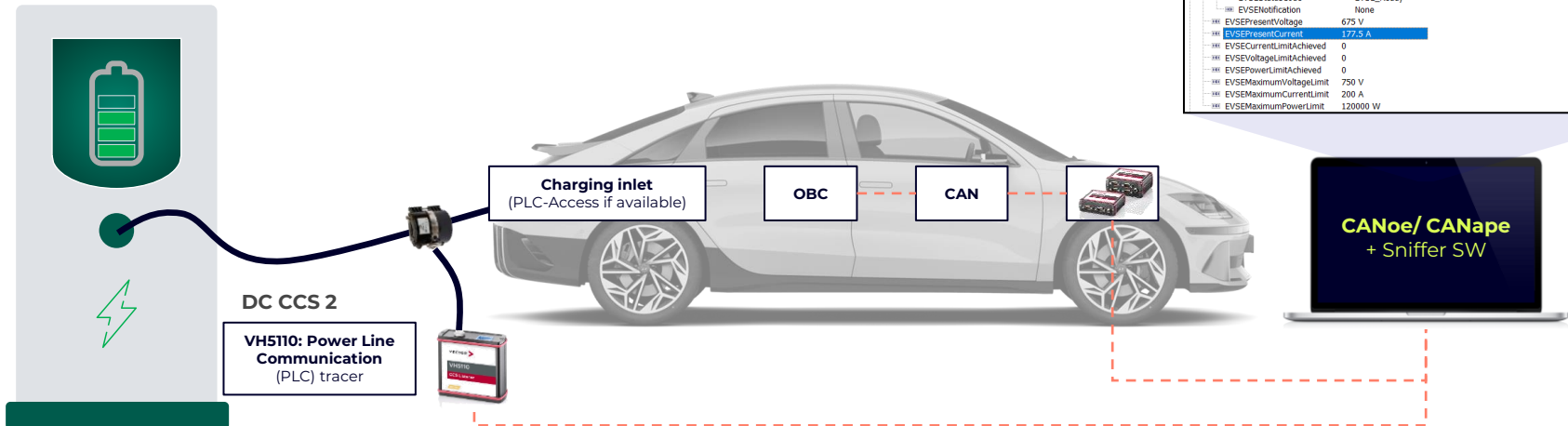
The P3 Charging Index was introduced in 2019, where the target of OEMs was to gain 300 km recharged range within 20 minutes, which equates to a P3 Charging Index of 1.0. Since then, electric mobility has evolved rapidly, with an increasing number of vehicles being able to charge up more range within this amount of time, which results in values greater than 1.0.

# The P3 setup is modular and covers relevant aspects of measuring the charging process with all details, allowing a detailed analysis of errors and their impact on EV & customer.

## Technical focus points

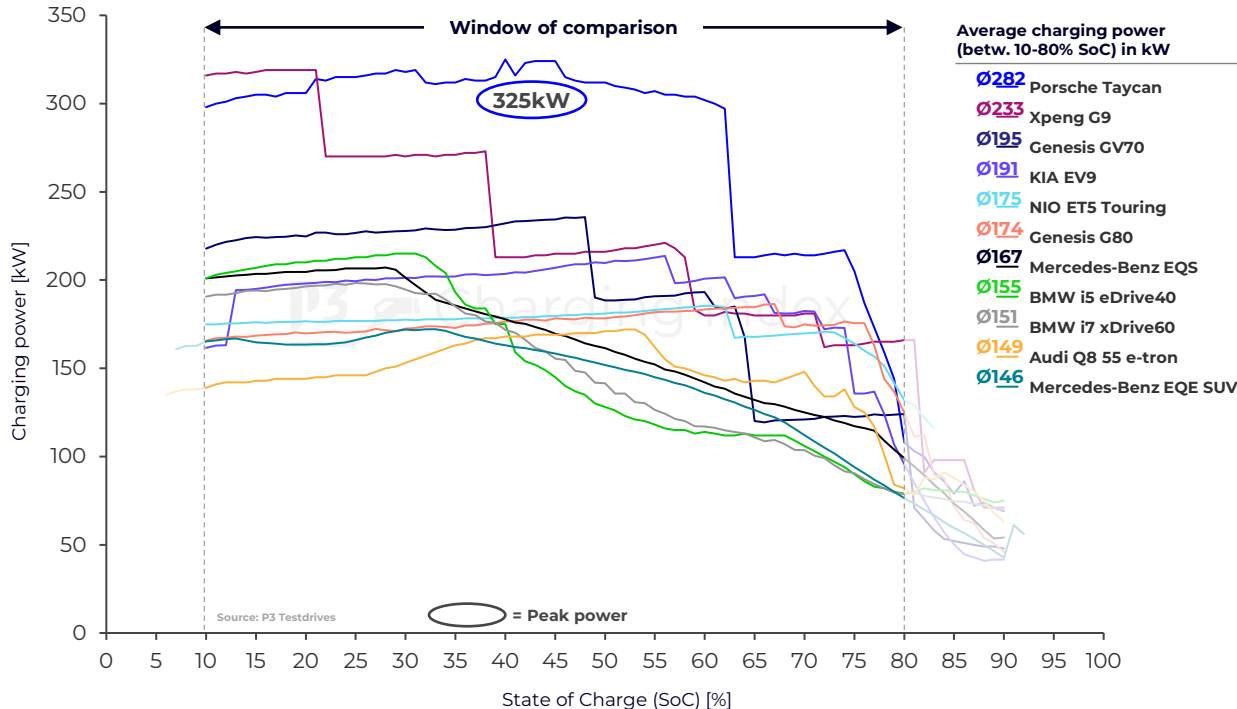
- Charging communication (PLC, Powerline Communication) is recorded using the Vector **VH5110 CCS listener** and the **inductive coupler**, placed around the cable
- EV-Internal Communication (CAN, OBC, ...) is measured with **Vector VN1630 / 1640**
- Vector CANoe** is used as the measurement software with a configuration generated by P3, which makes all recorded signals visible and thus enables them to be read out and analysed.  
The signals are transmitted with time stamps in order to track the transparent sequence of the charging communication setup and the start of the charging process (CableCheck, PreCharge, CurrentDemand, ...).

213.573118		Eth 1	Current Demand Request
Session ID	4839504F4E31504D		
DC_EVStatus			
EVReady	1		
EVcabinConditioning	0		
EVRESSConditioning	0		
EVErrorCode	NO_ERROR		
EVRESSSOC	62		
EVTargetCurrent	200 A		
EVMaximumVoltageLimit	722.4 V		
EVMaximumCurrentLimit	369 A		
BulkChargingComplete	0		
ChargingComplete	0		
RemainingTimeToFullSoC	2340 s		
RemainingTimeToBulkSoC	600 s		
EVTargetVoltage	722.4 V		
213.575632	Eth 1		
213.655675	Eth 1		
213.655675	Eth 1		Current Demand Response (OK)
Session ID	4839504F4E31504D		
ResponseCode	OK		
DC_EVSEStatus			
NotificationMaxDelay	0		
EVSEIsolationStatus	Valid		
EVSEStatusCode	EVSE_Ready		
EVSENotification	None		
EVSEPresentVoltage	675 V		
EVSEPresentCurrent	177.5 A		
EVSECurrentLimitAchieved	0		
EVSEVoltageLimitAchieved	0		
EVSEPowerLimitAchieved	0		
EVSEMaximumVoltageLimit	750 V		
EVSEMaximumCurrentLimit	200 A		
EVSEMaximumPowerLimit	120000 W		



The Porsche Taycan took overall & luxury class victory with an average charging power of 282kW and peak power of 325kW. The Xpeng G9 SUV achieved a strong average of 233kW.

### P3 CHARGING CURVES FOR LUXURY CLASS BATTERY ELECTRIC VEHICLES (BEV)

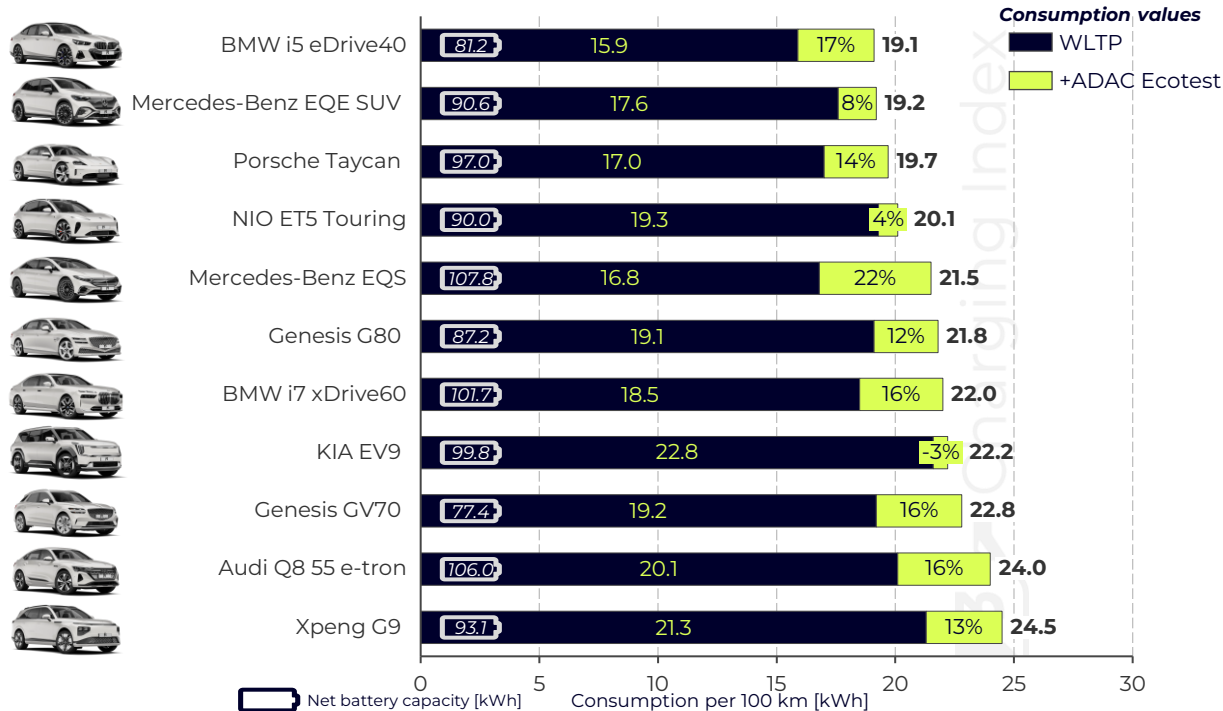


### KEY FINDINGS

- With a peak of **325kW**, the **Porsche Taycan** achieves the **highest charging power** across all vehicles and **maintains its peak plateau** of more than 300kW up to **over 60% SoC**. Compared to the **previous version**, this represents a **significant increase in the peak plateau** of up to 275kW to 46% SoC.
- The China SUV **Xpeng G9** achieves **319kW** at its peak, but **drops below 300kW at around 20% SoC**. In comparison to the Porsche Taycan, **multi-stage plateau charging (plateau charging)** is recognizable here. Instead, the Porsche is charged via an end-to-end plateau.
- With the **KIA EV9** and the **Genesis G80**, two vehicles from the Hyundai-Kia Group impress with their consistently high charging power. The high charging plateau covers a large SoC window, although this **deviates from the familiar charging curves of the E-GMP platform**.
- Like the **NIO ET5**, the **BMW** and **Mercedes-Benz** vehicles are **limited** by their **400V architecture** and a **maximum possible charging current of 500A** at around **200kW**. By reducing the charging power from approximately 40%, BMW and Mercedes still have **lower charging power on average** than the NIO ET5 Touring.
- With the Porsche Taycan, **only one vehicle from Europe is positioned ahead of the competitors from Korea and China**.

The BMW i5 has the lowest energy consumption in both the WLTP and the ADAC Ecotest. The WLTP value in particular is outstanding, but is equalized in real-world consumption.

### COMPARISON OF CONSUMPTION (WLTP ABSOLUTE AND PERCENTAGE SURCHARGE ADAC ECOTEST)

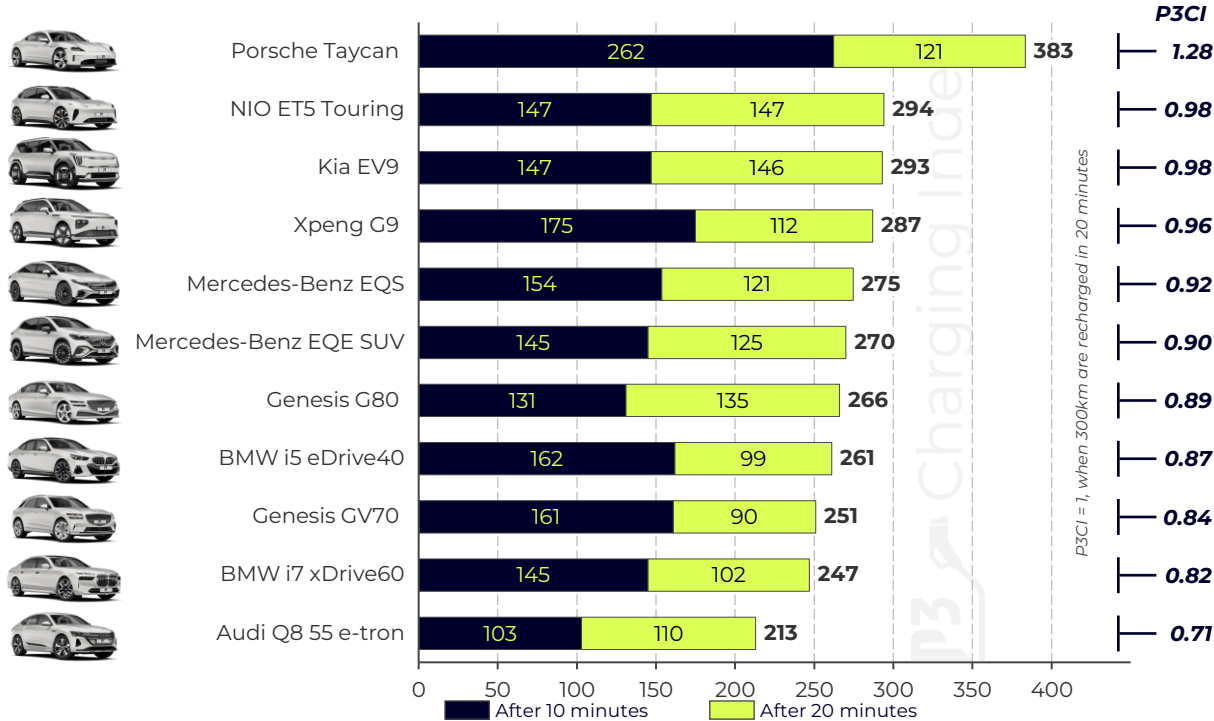


### KEY FINDINGS

- **Larger batteries** are generally found in luxury-class vehicles. The energy content of the vehicles tested ranges from 77kWh (Genesis GV70) to 108kWh in the Mercedes-Benz EQS.
- The **real consumption** over 100km of the vehicles also **differs widely** and varies **between 19.1kWh** in the **BMW i5 eDrive 40** and **24.5kWh** in the **Xpeng G9**.
- **BMW** has developed an **efficient overall drivetrain** in the i5 eDrive40. The business sedan has the **lowest fuel consumption in the luxury class** in both the WLTP and the ADAC Ecotest.
- An **important factor influencing electric consumption** is the **wind resistance** of the vehicle, which is specified as the cW value. Sedans with **low cW values have an advantage** here, while **large SUVs are at a disadvantage**.
- An exciting **exception** is the **Mercedes-Benz EQE SUV**, which with a **consumption of 19.2 kWh/100 km** is **almost on a par** with the **BMW i5**. This is **due to the efficient motors** of the electric powertrain and auxiliary consumers such as the heat pump and air conditioning. Only the **larger frontal area typical of SUVs** leads to **slightly higher consumption**.

## The Porsche Taycan charges 383km in 20 minutes at the charging station. Thanks to its 800V system, a strong 262km are possible after 10 minutes.

### RECHARGED RANGE WITHIN 10 & 20 MINUTES CHARGING TIME (START @10% SoC)



### KEY FINDINGS

- The **Porsche Taycan** wins in the **luxury class** category of the P3 Charging Index and can recharge a range of **262km in 10 minutes**. In total, the sedan **recharges 383km in 20 minutes**. The Taycan thus proves what **high charging performance** and **good consumption** can achieve together.
- A Chinese car manufacturer secures 2nd place in the luxury class category at the first attempt, despite the 400V architecture. The **NIO ET5 Touring Long Range** recharges **294km of range in 20 minutes** and is also the only vehicle with a battery swapping system. This enables a fully **automatic battery swap** in around **5 minutes** and would mean a recharged **range of 362km** and a **CI of an extrapolated 4.23**.
- The **KIA EV9** and the **Xpeng G9** follow close behind with similar ranges. Given the dimensions (size and weight) of the vehicle, this is a **very strong result**.
- The **majority of luxury-class vehicles** are powered by a **NMC battery**, which enables a **higher energy density in a smaller installation space**. The high capacities allow for higher charging power, which are **optimized by intelligent battery and thermal management** and at the same time **ensure a long battery life**.

**With the P3CI, an independent benchmark has been created that demonstrates how state of the art EVs can be handled and what the challenges are when benchmarking those EVs.**

