PwC Germany eMobility Check 2023

How is Germany’s transition towards zero-emission mobility coming along?

September 2023

As a result of the war in Ukraine, the cost of electricity has become increasingly volatile. Meanwhile, governmental incentives for new BEV purchases have been reduced.

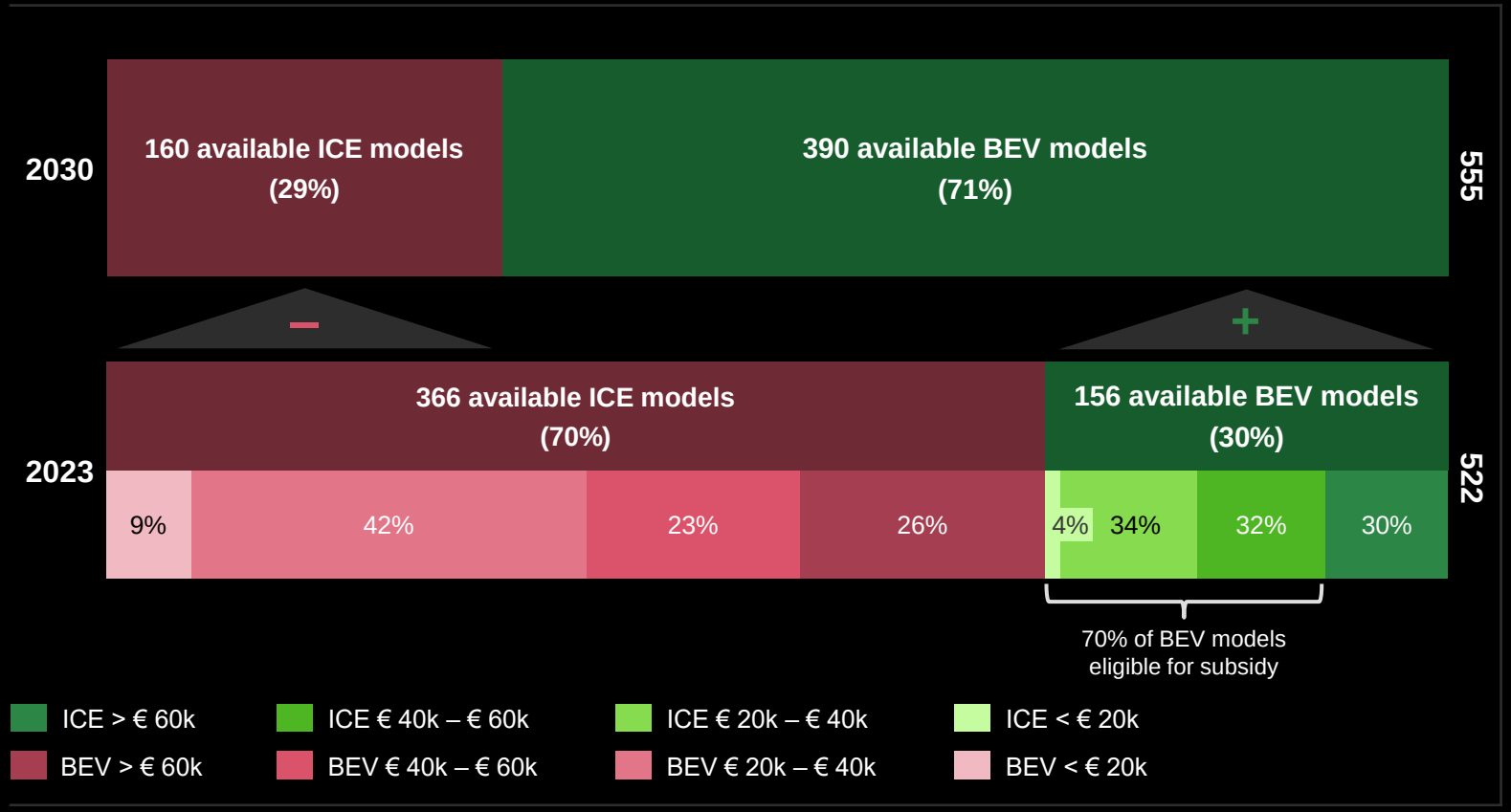
Will this widen the gap between the goal of 15M BEV by 2030 and the realistically achievable number?

What are the effects on charging infrastructure demand? Is the current infrastructure roll-out speed sufficient to serve future demand?

PwC has updated its forecasts on BEV adoption and charging infrastructure demand to account for the many developments surrounding electric mobility in Germany over the last 12 months.

BEVs are catching up: by 2030, over 70% of all available passenger car models in Germany will be fully battery-electric

Available Petrol and Battery Electric passenger car models for 2023 & 2030 in Germany



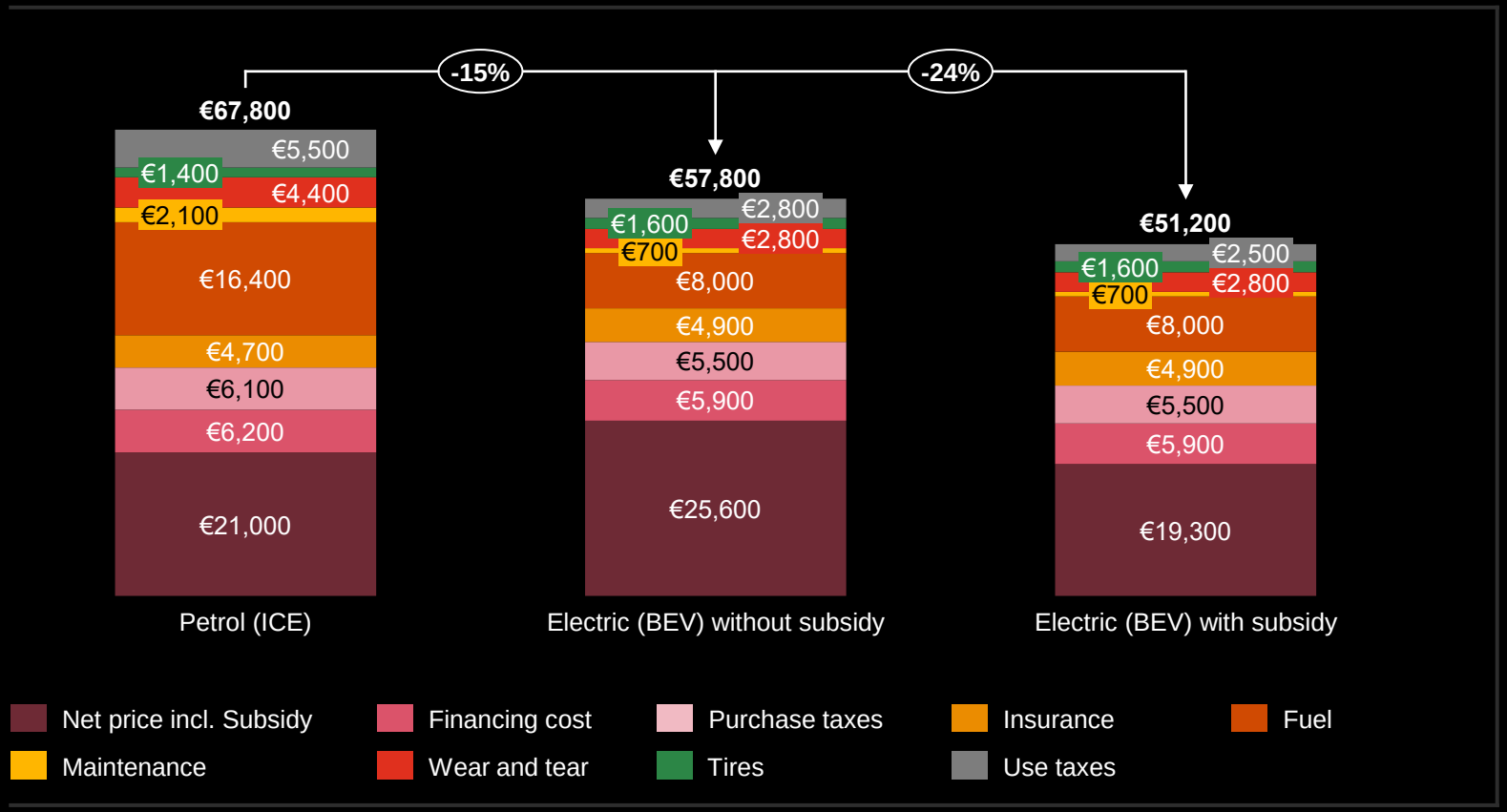
Essential Statements:

- More ICE than BEV models available in 2023 – but after just 7 more years, the market will have turned
- Increasing availability of new lower-price entry-level models due to
  - Decreasing manufacturing costs from economies of scale
  - New, lower-priced market-entrants especially from China
  - Increasing competition and the battle for market share among established and upcoming BEV-manufacturers
- Subsidies remain an attractive Incentive for BEV-adoption

ICE = Internal Combustion Engine / Petrol Vehicle | BEV = Battery Electric Vehicle | 1) Price distribution not yet available for 2030
Sources: PwC Analysis

Despite volatile electricity costs, switching from ICE to BEV has become economically attractive in Germany – with and without subsidies

Average Total Cost of Ownership (TCO) of passenger cars over 5 year and 150,000 km in Germany[1)]



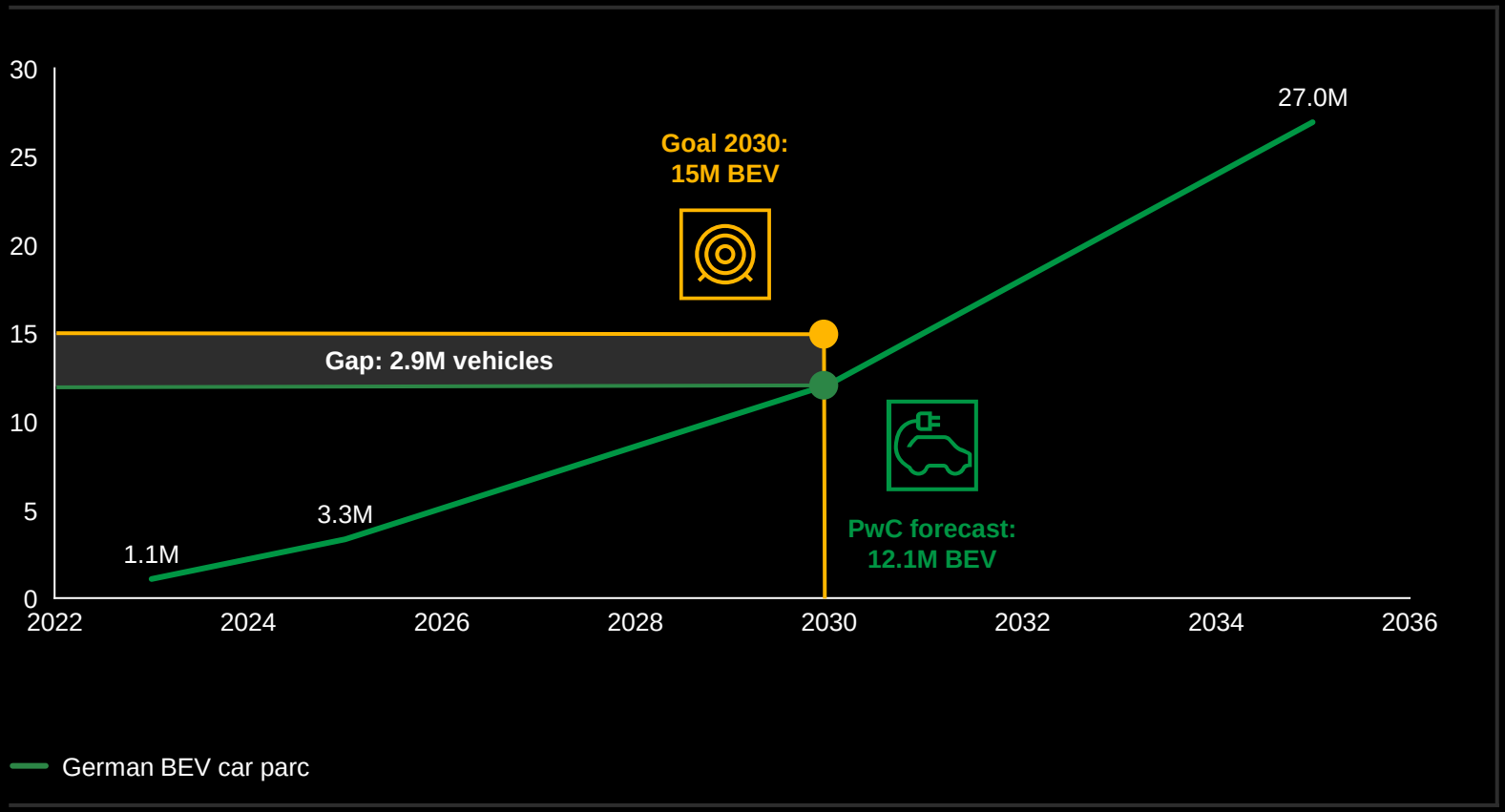
Essential Statements:

- Average total cost of ownership of Battery Electric Vehicles (BEV) 24% lower than Internal Combustion Engine (ICE) Vehicles
  - Maintenance & Repair Cost: BEV 36% below ICE
  - Fuel Cost: BEV 51% below ICE
  - Unsubsidized Purchase Cost: BEV 22% above ICE
- Low Acquisition costs due to current government subsidies and tax incentives
- Improved residual values of BEV relative to petrol vehicles

1) Average values derived from BEV = BMW iX3, Citroen e-C4, Cupra Born, Mercedes-Benz EQA, Mercedes-Benz EQB, Opel e-Mokka, Peugeot e-2008, Renault Megane E-Tech, VW ID.3, VW ID.4; ICE = BMW X3, Citroen C4, Mercedes-Benz GLA, Mercedes-Benz GLB, Opel Mokka, Peugeot 2008, Renault Megane, VW Golf, VW Tiguan | Source data: Autovista (12/2022)
Sources: PwC Analysis

Germany’s transition from ICE to BEV continues to accelerate despite volatile energy prices and reduced subsidies

Expected BEV passenger car park in Germany until 2035 (in millions)



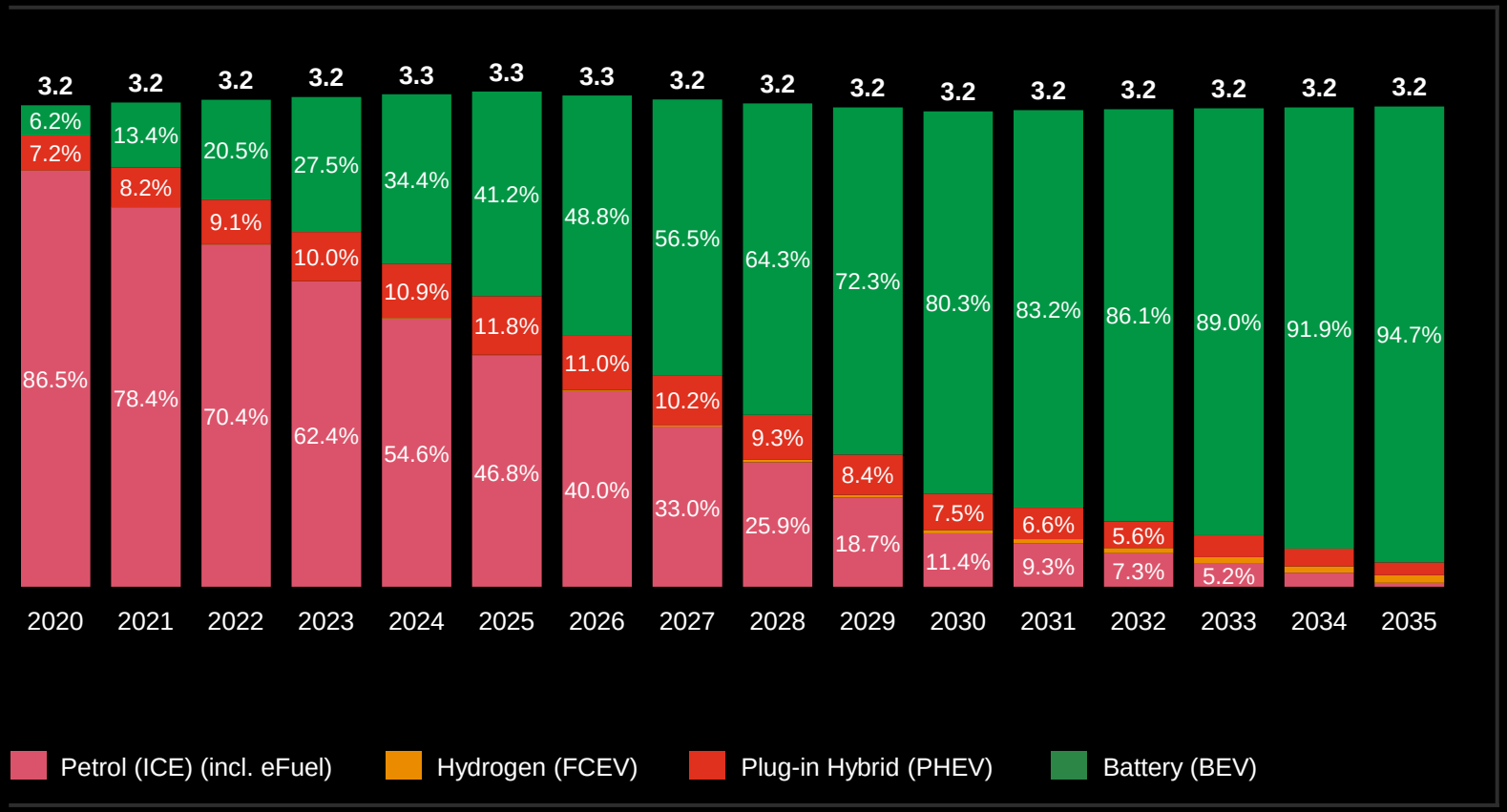
Essential Statements:

- The pace of BEV adoption in Germany has continued to accelerate in 2022 and 2023
- Continued robust BEV sales in Germany in 2023, despite reduced subsidies and many “pull ahead” BEV purchases in late 2022
- Fleet operators continue to demonstrate significant demand for new BEVs
- Improved charging infrastructure roll-out aids BEV adoption
- Increasing availability of lower-priced entry-level BEV enables new customer groups to switch to electric mobility
- PwC expects over 12M BEVs to be registered in Germany by 2030
- The governmental target of 15M BEV by 2030 remains unlikely to be met

Sources: PwC Autofacts Mobility Demand Model, S&P Global Mobility

Over the next decade, over 90% of all passenger vehicle sales will be fully electric, independent of a EU ICE ban

Share of drive trains for total passenger & light vehicles sold in Germany until 2035



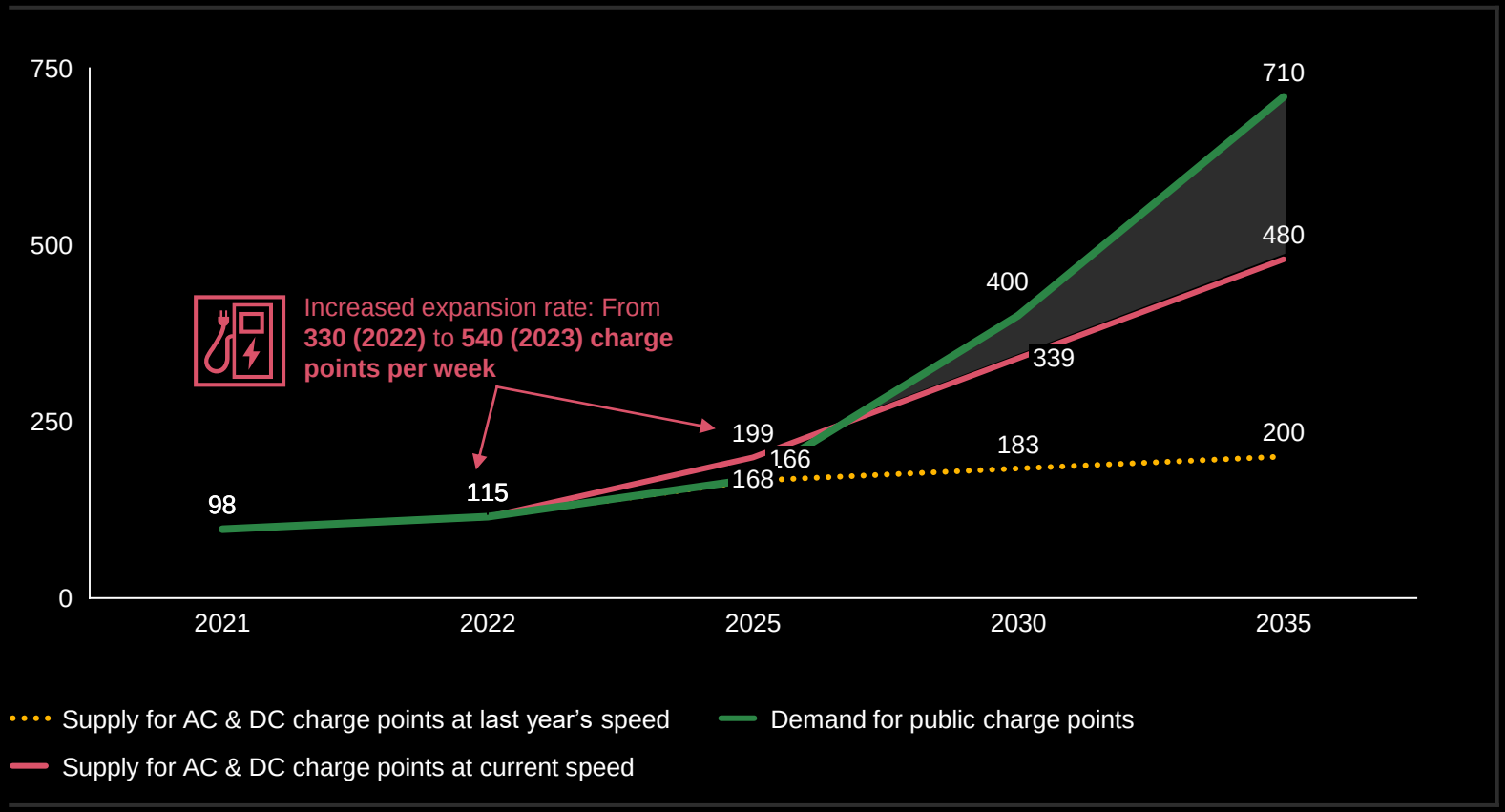
Essential Statements:

- By 2027, BEV will have a market share of greater than 50% of new passenger & light vehicle sales (3.2M in total sales)
- By 2034, electric vehicles will have a share greater than 90% of all new vehicle sales
  - The “bridge technology” PHEV increasingly loses importance
  - Hydrogen passenger and light vehicles will remain a niche product as sales will remain at approx. 1% of total sales
  - ICE cars will quickly loose market share due to their rising TCO and manufacturers’ commitments to phase out the combustion engine

Sources: PwC Autofacts Mobility Demand Model, S&P Global Mobility

Increased expansion rate in the mid-term insufficient to keep up with rising BEV numbers: further efforts are required

Public Charge Point Demand vs. Availability in Germany until 2035 (in thousands)



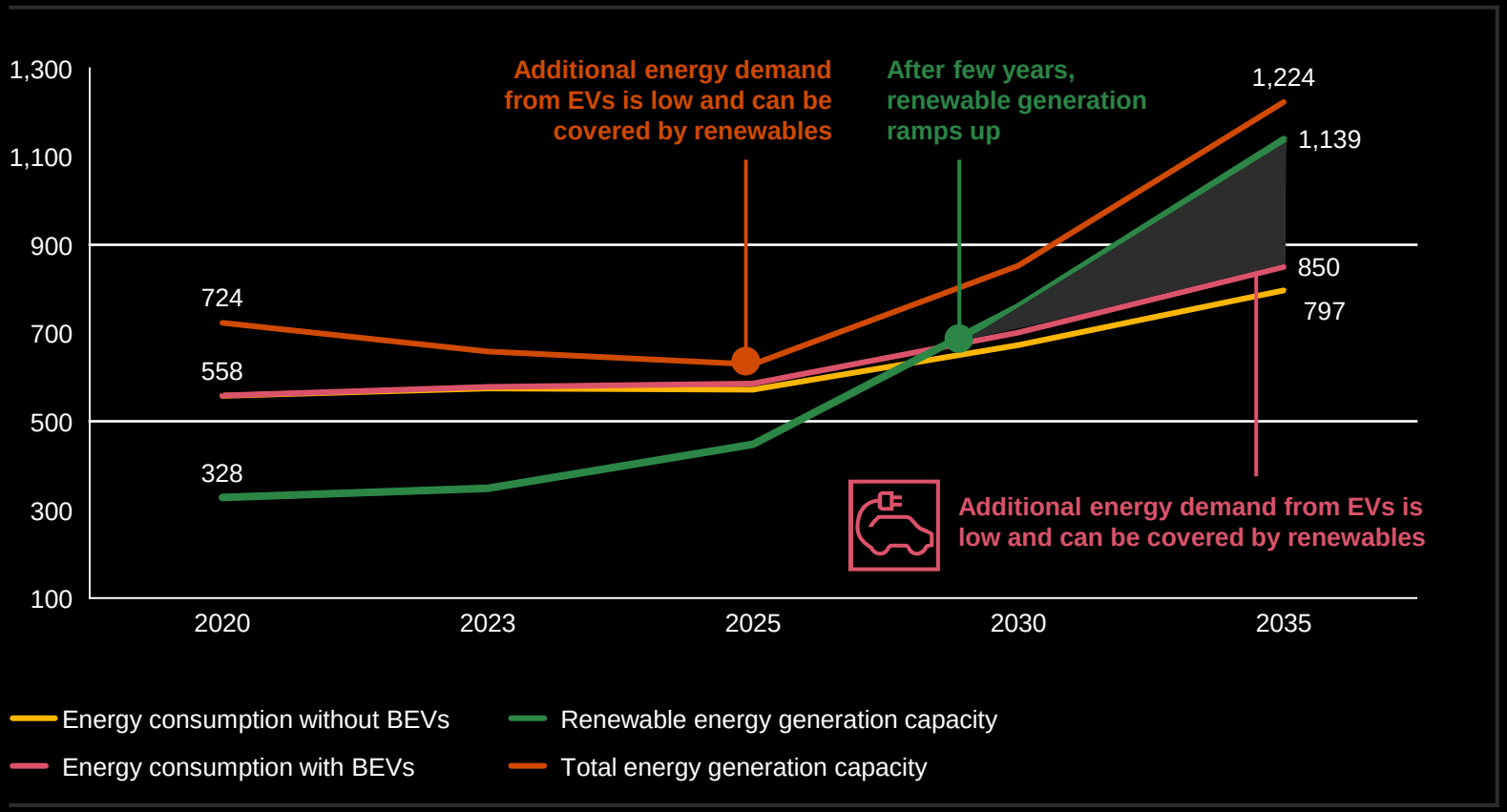
Essential Statements:

- Within one year: roll-out rate has risen from 330 to 540 public charge points per week
- The current roll-out speed will provide sufficient public charging infrastructure in Germany to meet demand until 2026
- By 2025 role out speed for public charging infrastructure of 1,000 charge points per week required to keep up with rising demand
- Further HPC capacities key lever to close the demand gap
- In 2023 approx. 8% of all charging attempts fail, often due to usability issues which require improvement

HPC = High Power Charging
Sources: PwC Analysis, "Nationale Leitstelle Ladeinfrastruktur"

Climate-friendly BEV's: by 2030, renewable electricity supply fully covering demand – all BEV to be powered with zero-emissions electricity

Energy generation vs. demand – with and without BEV in Germany until 2035 (in TWh)



Essential Statements:

- Electricity demand will not surpass supply – even with increasing numbers of BEVs
- Even millions of BEVs will only add little to the overall electricity demand in Germany
- Increased availability of renewable energy sources will lead to 100% green electricity supply for the BEV car park

Theoretical energy that can be generated within Germany by the existing power plant park in years under consideration.
Assumption of existing frame conditions for an emission-free electricity sector and high self-sufficiency (e. g. controllable loads, further ramp-up of storage, Vehicle-to-grid). European electricity trade (import-export) not taken into account.
Sources: PwC Analysis, BMWK (2023), NEP 2027/2045, Agora Verkehrswende (2021)

The mobility transformation towards net zero continues. Battery electric vehicles sustain their cost advantage, despite a rise in energy cost and decreasing governmental incentives. In only a few years, BEVs will have taken over the market, independent of an EU-wide ban on the combustion engine or the increasing availability of eFuels.

Over the next few years, Germany will witness exponentially increasing charging demand and the roll-out speed for public charge points will need to double. Policymakers should focus their subsidy budgets on boosting infrastructure investment, esp. for underdeveloped geographies.

The public sector must rapidly simplify, standardise and digitise planning and permitting processes, to reduce infrastructure lead time. Grid capacity and connection data must become transparently available to investors of charging infrastructure.

Charge Point Operators and eMobility Service Providers must generally improve charge point uptime.

Heiko Seitz, PwC eMobility Leader

To the point

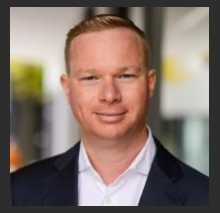
Electric vehicles
... will continue to take over the market in 2023 despite reduced subsidies and more challenging market circumstances. This trend will continue. BEVs will dominate the passenger car sales market.

Internal combustion vehicles phase out
... will accelerate over the next decade as more and more vehicles reach the end of their life-cycle. OEMs will announce fewer new ICE models – culminating in the official end of ICE in 2035.

The charging infrastructure roll-out
... has increased over the previous 12 month. This leads to a better availability in the short run, but is still insufficient to cover future demand once more BEVs are on German roads.

Green Energy supply
... sufficient to cover the demand of all BEV on Germany's streets by 2030. BEV can then be powered 100% by renewable energy, enabling the true decarbonisation of energy generation by V2G technology.

Let’s connect



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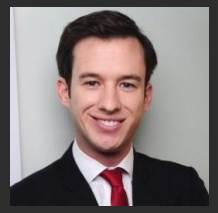

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