



Future residual values of battery electric vehicles benefit from increased range

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New car market switches to battery electric

Battery electric vehicle (BEV) sales in Europe are on the rise. Boosted by emission regulations, government incentives and increasing supply, the share of BEVs in total new car sales doubled to 2% in the first quarter of 2019. BEVs are attracting attention from the market as barriers to electric driving are rapidly disappearing. Batteries are improving, while costs are falling. Meanwhile, a fast charging network is extending across Europe.

As fleet of BEVs rises rapidly, residual value becomes increasingly important

With increasing numbers of BEV models appearing on the market, the share of BEVs is forecast to rise rapidly. The growing fleet of BEVs in Europe will influence the evolution of residual values, which will be a key consideration for both private buyers and fleet owners.

BEV residual values are unknown territory

As BEVs are still relatively new to the market there is little historical information to fall back on. This allows uncertainty regarding residual risks to continue. However, we do see BEVs have matured from the pioneer models that hit the market earlier this decade. The question is whether these new BEVs are good enough to attract used car buyers and sustain their value? And how will their residual values compare with petrol and diesel cars?

Vision on BEV residual values towards 2025 in North-West Europe

This publication analyses supply and demand trends for BEVs to help estimate future residual values. Specifically, we look at five-year residuals of new cars sold in 2020. In other words, what will the used value be in 2025 of BEVs sold in 2020. Our focus is on developments in three markets, the Netherlands, Germany and Belgium. Residual value is defined as the lowest trade-in value (dealer purchase value).

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Executive summary – Used car buyers plugging in

Supply of used BEVs is forecast to rise...

Battery electric vehicles (BEVs) are improving rapidly: Average range is moving towards 400 kilometres as batteries get better. Charging speeds are on the rise and fast charging infrastructure is being rolled out. Large scale production pushes battery costs down and increases BEV competitiveness. All these improvements are set to stimulate the share of BEVs in new car sales in the Netherlands (13%), Germany (4%) and Belgium (3%) in 2020. With average ownership duration estimated at five years, these cars will stimulate used BEV supply in 2025.

...but growth in demand is expected to exceed supply...

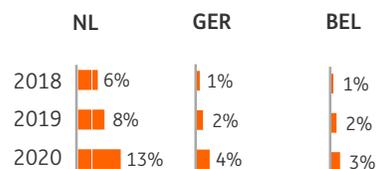
Although more BEVs arrive on the used car market in 2025, their share of the total used car market will still be modest. But what will demand look like? ING surveys indicate that improvements in range and charging will meet the requirements of a growing number of people. Based on this we expect that in 2025 at least a quarter of used car buyers will consider buying a used BEV. As a result demand is forecast to exceed supply.

...pushing future residual values of used BEVs up

Average used BEV residual values currently trail those of used petrol cars, but are higher than used diesels. Exceptions to this are high(er) range BEVs, such as those from Tesla, for which residual values already exceed those of both petrol and diesel competitors. With a future increase in used top of the range BEV supply and an even greater rise in demand, we expect used BEV residual values to pass those of used petrol cars in 2025.

BEV market share in new car sales grows...

Expected market share of BEVs in new car sales



...and stimulates supply of used BEVs in 2025



Used BEV supply in 2025

But demand increases more...

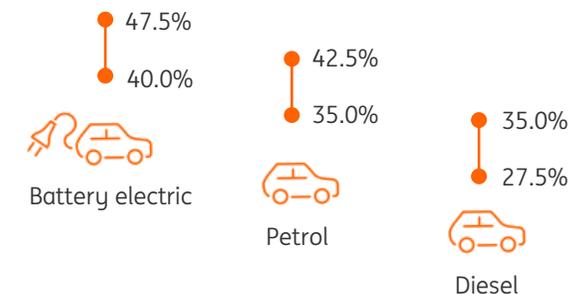


Used BEV demand in 2025

Higher range and faster charging attracts demand

...pushing BEV residual values past petrol and diesel

Five-year residual value range as a % of new (2020) price for C segment cars (f.e. VW Golf)

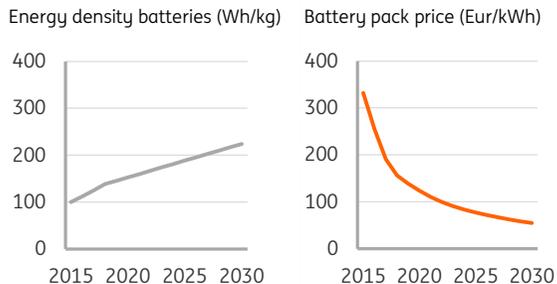


1. BEVs more attractive as batteries and infrastructure improve

Battery development to improve BEVs

In an earlier report, [Breakthrough of EV threatens European car industry](#) (July 2017), ING showed price, range and charge to be the main barriers for people considering buying BEVs. Battery suppliers and car manufacturers are working to increase energy density of batteries. Furthermore, upscaling of production is pushing battery costs down.

Battery energy density improves and costs go down



Source: Bloomberg New Energy Finance

More range at same or lower price

Battery improvement enable manufacturers to supply longer range BEVs for the same or less money. Examples are the Nissan Leaf and BMW i3. Early models featured ranges (in real world conditions) of 100km to 150km. The latest models will now get close to 300km (WLTP range) at the same price level. Most new BEVs target a minimum range of around 300km, with average range moving towards 400km. Cars such as the Tesla Model 3 and the upcoming VW ID.3 can offer such ranges, while also competing on price with ICE (internal combustion engine) rivals.

Charging network expands

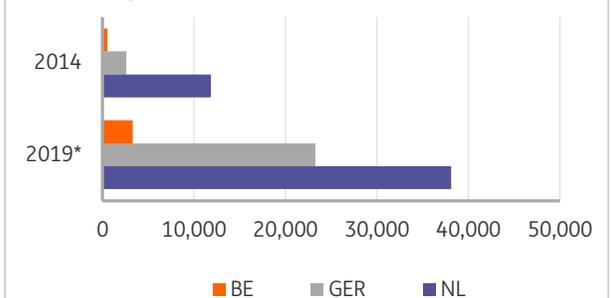
The more range, the less need to charge frequently. But when charging is required, BEV drivers can choose from a growing number of charging points. Having started from scratch ten years ago, there are now more than 150,000 public charging points in Europe. The number of private charging points is estimated at a multiple of this.

Fast charging adds to BEV usability

The growth of public fast chargers (> 22 kW) has recently exceeded the growth in normal charging points (<= 22 kW). Some 15% (23,000) of public charging points are fast chargers. This adds to the usability of BEVs. In the near future, charging speeds are set to increase. While early BEV models often charge at speeds of 50 kW, most new models for 2020 will be built for 100 kW + charging speeds. This adds close to 100km of range for every 10 minutes of charging.

Large jump in public charging infrastructure

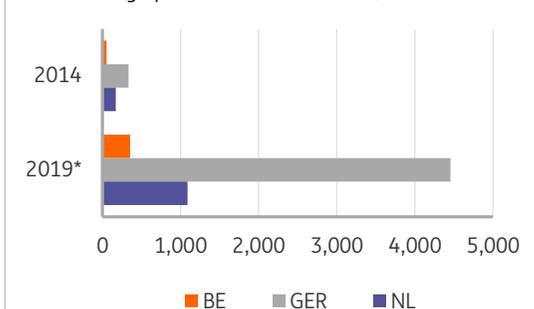
Public charge points (normal <= 22kW) NL, BE, GER



Source: EAFO, *data based on early 2019

Fast charging infra becoming more important

Public charge points (fast > 22kW) NL, BE, GER



Source: EAFO, *data based on early 2019

2. Used BEV market to evolve from growing supply

Manufacturers expanding production of BEVs

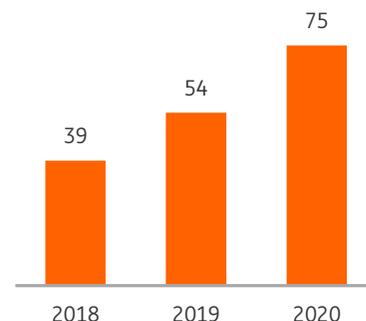
As the market switches to battery electric cars, manufacturers are preparing supply chains and plants to expand production capacity for BEVs. This enables them to increase the number of BEV models in their portfolio. In 2019 and 2020 a number of models will target mainstream segments. Examples are the Seat El-Born, VW ID.3, Peugeot e-208 and Mercedes EQA.

Breakthrough in new BEV sales

As a result, new BEV sales for Belgium, Germany and the Netherlands are forecast to rise:

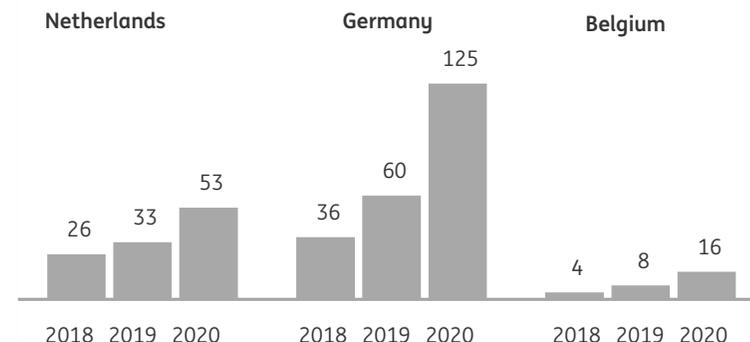
- **The Netherlands** is a frontrunner. Fiscal incentives for company car drivers, well developed charging infrastructure and new BEV models result in a double-digit share forecast of 12.5% for BEVs in the Netherlands in 2020.
- The large **German** market was a slow BEV adapter but is now catching up. With German brands committed to new BEV models and an extension of incentives, electric cars will receive a sales boost in 2020. Market share of BEVs is estimated close to 4% in 2020.
- **Belgian** BEV sales are lagging. The country's charging infrastructure is also developing slowly. However, we expect Belgium to move forward in BEV sales, albeit at a lower level than Germany and the Netherlands. The share of BEVs in new car sales is forecast at 3% in 2020.

Number of BEV models increasing... Total models available in Europe



Source: BNEF

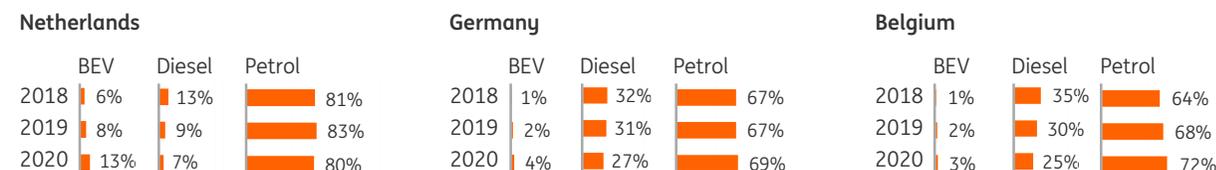
...boosts BEV new sales forecast for 2020 Forecast new sales x 1,000



Source: 2018 figures from ACEA, 2019 and 2020 forecast ING Economics Department

Share of BEV rising

Expected market share (rounded) of new sales by fuel type. Petrol includes hybrid and plug-in hybrid cars.



2020 new BEV sales are 2025 used BEV supply

We expect business sales to count for the majority of new BEV sales and assume average first ownership duration of five years. This implies that a large part of 2020 new BEV sales will transition into 2025 used BEV supply. The share of BEVs in new car sales presents an indication of used BEV supply in 2025.

Source: 2018 figures from ACEA, 2019 and 2020 forecast ING Economics Department

3. Demand for used BEVs expected to exceed supply in 2025

Improvements expand potential of BEVs in used car market

The supply of used BEVs in 2025 will consist of cars sold in 2020, featuring improvements in range and charging speeds. ING surveys (ING Question of the day) with on average over 48,000 respondents from the Netherlands suggests these improvements are sufficient to attract interest from at least 25% of used car buyers.



Used BEVs get better...

- Used BEVs will feature ranges (WLTP) between 300km and 600km. We expect average range of used BEVs at 400km.
- Most will be able to (fast) charge at 100 kW (150-200km extra range per 20 minutes). Some cars might feature speeds up to 350 kW (150-200km range in 5 to 6 minutes).
- A vastly expanded network of fast chargers across Europe benefits all BEVs.
- BEVs have low maintenance needs and high reliability due to a low number of drivetrain parts.
- Battery degradation is minor looking at data on Tesla and Nissan (Leaf). Nissan reports batteries can last over 20 years.
- Electricity costs are much lower than fuel costs, especially when charging at home.
- As more BEV models arrive, we see a wider variety in design. However, petrol and diesel cars still have an advantage.

...attracting interest from buyers

- Only 7% of people are satisfied by a 200km electric range. A 400km range increases this to 32%.
- On long distances we expect 20 minute charges needed for most used BEVs during stops. This is acceptable to 20% of people.
- Slightly faster charging cars can expand their potential. A 15 minute charge would satisfy 40% of people.
- Besides the purchase price of a car, people consider the following items important when shopping for a car (in order of priority): reliability, fuel/energy consumption, design and safety.

Quarter of market to consider BEV

Even though charging times might still represent a barrier, the rapid growth in fast charging infrastructure will help satisfy more people. With average daily driving distances at 36km (Netherlands), 38km (Germany) and 41km (Belgium), we expect purchasers to increasingly view BEVs as an interesting option. Combining improvements in range, charging and charging infrastructure we expect a quarter of the used car market to consider BEVs. Furthermore, based on strong competitive features, we expect many people considering used BEVs to actually purchase such a car.

2025 used BEV demand supports residual value

Looking at the estimated supply of BEVs (page 5), we expect 2025 demand to exceed supply in the Netherlands, Germany and Belgium. This stimulates an upward price trend of used BEVs and thus supports future residual value of BEVs.

Source: ING Question of the day

4. Increase in range helps improve BEV residual values

BEV residual values ahead of diesel but behind petrol

Future demand looks favourable for used BEV values. Current indications point to BEV residual values already being ahead of diesels, but still trailing those of petrol cars. This is illustrated by the example of the C-segment sales leader, the VW Golf. After five years, the e-Golf (BEV) is able to sustain a greater part of its original value than the diesel Golf, but less than the petrol Golf.

Extra range can help BEV residual value pass petrol

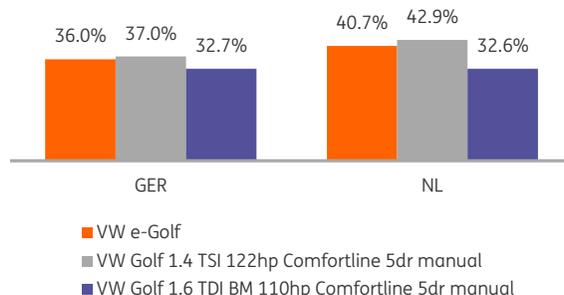
There clearly seems to be a positive relation between range and residual value. For example, the Tesla model S shows significantly higher five-year residual values than its petrol and diesel competition within the E-segment. The Model S 85 with a range of over 400 kilometres holds its value exceptionally well.

Current estimates show upward trend

As more BEVs with longer ranges enter the market, estimates on residual values rise. Dutch Autotelex sees five-year residuals values for the new Tesla Model 3 ahead of BMW, while the Nissan Leaf beats VW Golf residual values.

VW Golf BEV residual ahead of diesel, trailing petrol

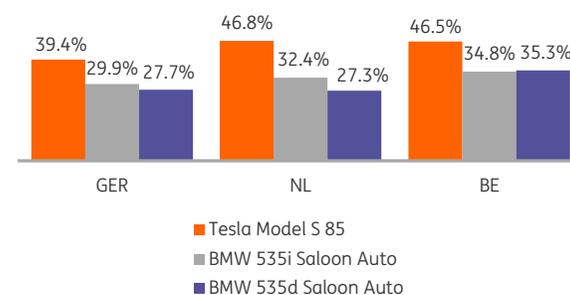
Residual value (trade-in value) in 2019 as a % of 2014 new price. Five-year residual after 100,000 km



Source: ING based on ANWB, ADAC, DAT. Belgium excluded, e-Golf was unavailable in Belgium in 2014

Tesla residual ahead of petrol and diesel

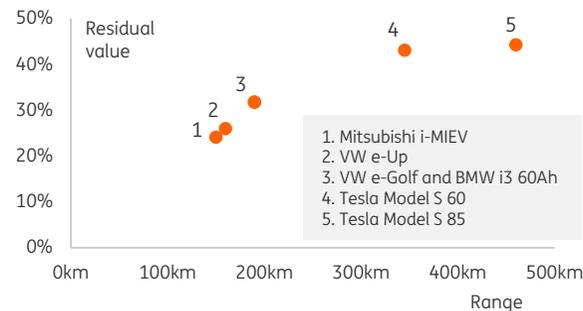
Residual value (trade-in value) in 2019 as a % of 2014 new price. Five-year residual after 150,000km



Source: ING based on ANWB, ADAC, DAT, Autogids.be, wijkopenauto's.be

Residual value increases with battery range

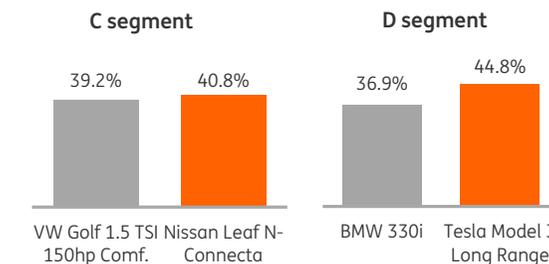
Residual value (trade-in-value) in 2019 as a % of 2014 new price (Germany). Five-year residual 125,000km vs. range.



Sources: DAT, ING

BEV residuals new models show improvement

Current five-year (2024) residual estimate (125,000km) as a % of new price in NL. (Tesla has 560km WLTP range, Nissan 270km)



Source: Autotelex

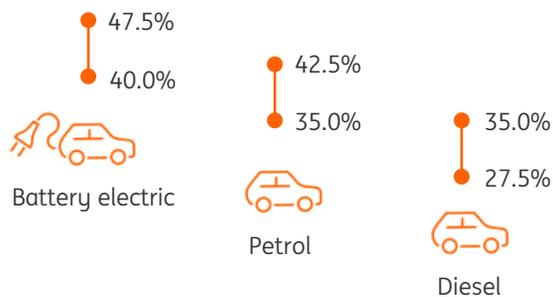
5. BEV residual values in 2025 outperform petrol and diesel

BEVs have highest residual values in market in 2025

Future BEV residual values thus stand to benefit from the increase in range of new BEVs as well as the expectation that 2025 demand for used BEVs will exceed supply. We expect five-year residual value (as a percentage of new price) of new 2020 BEV models to move upwards and range between 40% and 47.5% within the important C-segment (such as VW Golf, Ford Focus). As petrol and diesel residual values remain relatively stable, we expect BEV residual values to come out on top.

Forecast of five-year residual value range for new 2020 cars: BEV passes petrol and diesel

Residual value range (trade-in) in Netherlands, Belgium and Germany in 2025 in % of 2020 new price for C segment cars (f.e. VW Golf)



Source: ING Economics Department. Range indicates various models, variations per country and differences in mileage (100,000-150,000km)

Government policy can influence BEV residuals

Within the forecasted range for five-year BEV residuals there is both upwards potential and downward risk.

- + Favourable government policies, for example higher taxes and driving restrictions on petrol and diesel and/or incentives on used BEVs, stimulate BEV demand and increase BEV value.
- + Low maintenance, strong reliability and long warranties strengthen confidence in used BEVs.
- High incentives on new cars, such as proposed in the Netherlands from 2021 onwards, can distort residual values of used BEVs.
- Battery technology is constantly developing. A large and unforeseen jump in battery technology has the risk of devaluing current BEVs.

Future petrol residuals relatively stable

Although BEVs will gain share of the used car market, petrol cars remain the popular choice for buyers in 2025. Their values remain relatively stable, though there is some downward risk.

- + Used petrol cars benefit from being available in a wide range of models.
- + Petrol cars have taken significant steps in fuel efficiency. Mild hybrid technology is expected to help further reductions in fuel consumption and decrease operating costs.
- Petrol cars face increasing operating costs as governments are likely to impose higher taxes upon them (and on the fuel itself) due to the Paris Climate Agreement.

Diesel already adjusted downward

Diesel residuals have already taken hits. The market has adjusted downward but some pressure remains.

- + Mild hybrid technology will enhance diesel fuel economy.
- +/- New diesel sales have decreased. Some manufacturers are even pulling away from this segment. This limits the risk of future oversupply of used diesels, but the question remains whether all three markets have adjusted sufficiently.
- Export markets for used diesels, such as Eastern Europe, have become more saturated.
- Just like petrol cars, diesels face increasing operating costs as governments are likely to continue to impose higher taxes upon them (and on the fuel itself) due to the Paris Climate Agreement. Restricted driving zones also threaten diesel cars.

Would you like to know more?

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