ECG
Business Intelligence

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Accelerating Demand For EVs & PHEVs In 2020 and Beyond.

Impact Upon Production Locations, Trade Flows & Finished Vehicle Logistics

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Table of Contents

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1. Overview: Growing European Demand for Electrically Charged Vehicles

1.1 Electric vehicle rise in sales in a dire market

Overall passenger vehicle sales in Europe have witnessed a disastrous fall this year in the wake of the coronavirus crisis, with sales dropping more than 38% year-on-year in the first half according to ACEA data. But there has been at least one area that is gaining momentum almost as dramatically as the rest of the market has lost it. Sales of new electrically charged vehicles (ECVs), which include battery electric vehicles (EVs) and plug-in hybrid electric vehicles (PHEVs), have jumped by more than 40% year-on-year during the first half of 2020.

Although government incentives are playing a role this year, this growth is not an anomaly. Annual rises in Europe have been even more dramatic over the past three years, albeit from a low base. In some ways, the coronavirus crisis – and government responses to it – may even be accelerating the shift to electric vehicle sales. We expect this growth to continue, with EV sales in particular rising sharply in the coming years.

This growth raises challenges for the supply chain both in the short and medium term. Order-to-delivery cycles are currently under pressure, with evidence of extended waiting times for electric vehicles compared to internal combustion engine (ICE) models. With more incentives in place in some markets, that is making supply chain planning and vehicle logistics more of a competitive advantage for OEMs to gain market share.

Vehicle trade and shipping flows are also shifting. Most carmakers are increasing their EV and PHEV product lines in Europe but have not yet added or converted enough production capacity to meet demand from regional plants. Some brands have been meeting the growth through imports from other regions, notably from the US, Japan and South Korea. China, which had so far exported relatively few ECVs, looks set to export more to Europe. European brands like BMW, for example, have started to use Chinese manufacturing bases to export EVs, while new brands such as Polestar, owned by Zhejiang Geely Holding, also the owner of Volvo Cars, have begun to ship to European markets from China.

However, European production of ECVs will rise strongly, with a growing pipeline of products, dedicated electric vehicle platforms, battery and production lines. Markets that had been relative laggards in EV production and trade – including Germany, France and Italy – are set to grow.

These increases will not compensate for the overall declines and stagnation in the European vehicle market – we only expect new vehicle sales in the EU, UK and EFTA to reach pre-crisis levels towards the end of the 2020s. But the surge in electrified vehicle market share will require vehicle logistics providers to adapt capacity and networks to meet demands. That will mean keeping up with changing vehicle trade patterns, investing in necessary charging and handling equipment, as well as keeping up to date on changing regulatory requirements. And it will also mean adjusting to provide new services, or even adapt to new business models.

1.2 Powertrain Terminologies

Electric vehicle (and especially all shades of hybrid electric vehicles) have a wide array of names and terminologies, which can at times be confusing. We have focused on the term 'ECVs' within this report because it includes all electric vehicles that require charging from an external source, namely fully electric vehicles (EVs), which have no internal combustion engine, and also plug-in hybrid electric vehicles (PHEV), which have an ICE engine as well as a smaller battery to reduce emissions.

We have chosen to focus on EVs and PHEVs because they both require more significant adjustments to supply chain, production, logistics and infrastructure than do hybrids with small batteries. Of the two electric powertrains, however, fully electric vehicles are a more significant change to vehicle platforms, production and logistics than are plug-in hybrids.

Table 1.1 Explanation of Different Powertrain Terminologies

Grouping	Terminology	Description
Electrically Chargeable Vehicle (ECV) that require charging from an external source	**EV or BEV**	A 100% battery electric vehicle, which typically includes a 50kwH-battery pack and motor.
	PHEV	Plug-In hybrid electric vehicle, which typically includes an ICE engine plus typically a 10KwH-battery and motor.
'Self-charging' hybrids'	**MHEV**	Mild hybrid electric vehicle, which typically includes a 0.1-0.5KwH-battery and motor.
	HEV 'Full Hybrid'	Hybrid electric vehicle, which typically includes a downsized ICE engine plus 1-1.5KwH battery and motor.
Hydrogen or Fuel Cell Vehicle	**FCEV / FCV**	A type of vehicle that runs on electricity generated by burning hydrogen and oxygen in a fuel cell.
Internal Combustion Engine	**ICE**	A 100% petrol or diesel engine.

Source: Automotive by Ultima Media

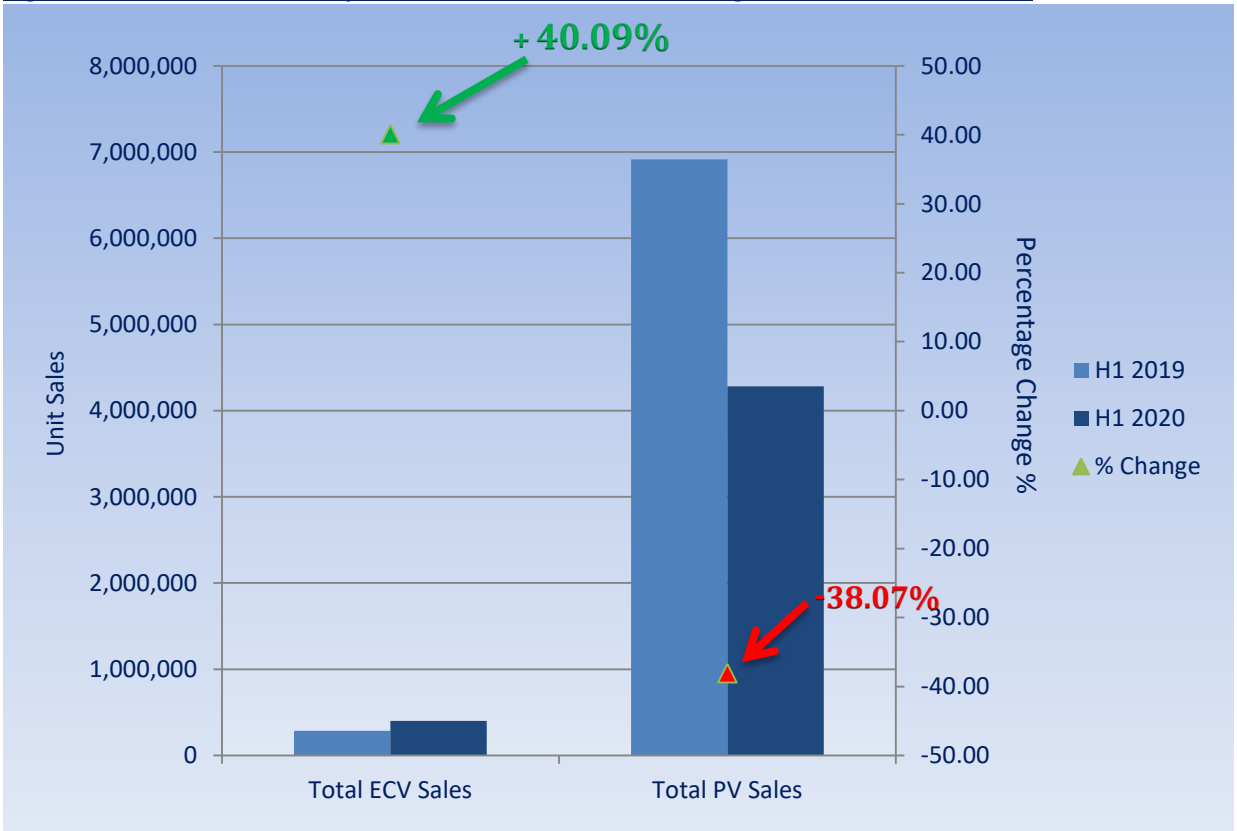
1.3 Accelerating shifts in market share

According to data collated by ECG Business Intelligence from country-specific industry bodies, in the first half of 2020 a total of 399,421 ECVs were sold across the European region including the EU, the UK and the European Free Trade Area (EFTA), up from 247,248 sold in the same period in 2019. We forecast that pure electric passenger vehicle sales will exceed 500,000 units in Europe in 2020, a year-on-year growth of 27.5%, with PHEVs rising more than 26% to 250,000 units (excluding other types of hybrid powertrains including mild hybrids).

In volume terms, of course, the levels remain low when compared to ICE vehicles. However,

ECVs are seeing a notable increase in market share, set to double this year compared to 2019, at 4.21% of European sales for EVs, and 2.11% for PHEVs. In 2017, EVs represented just 0.87% of the total European market with PHEVs at 0.98%.

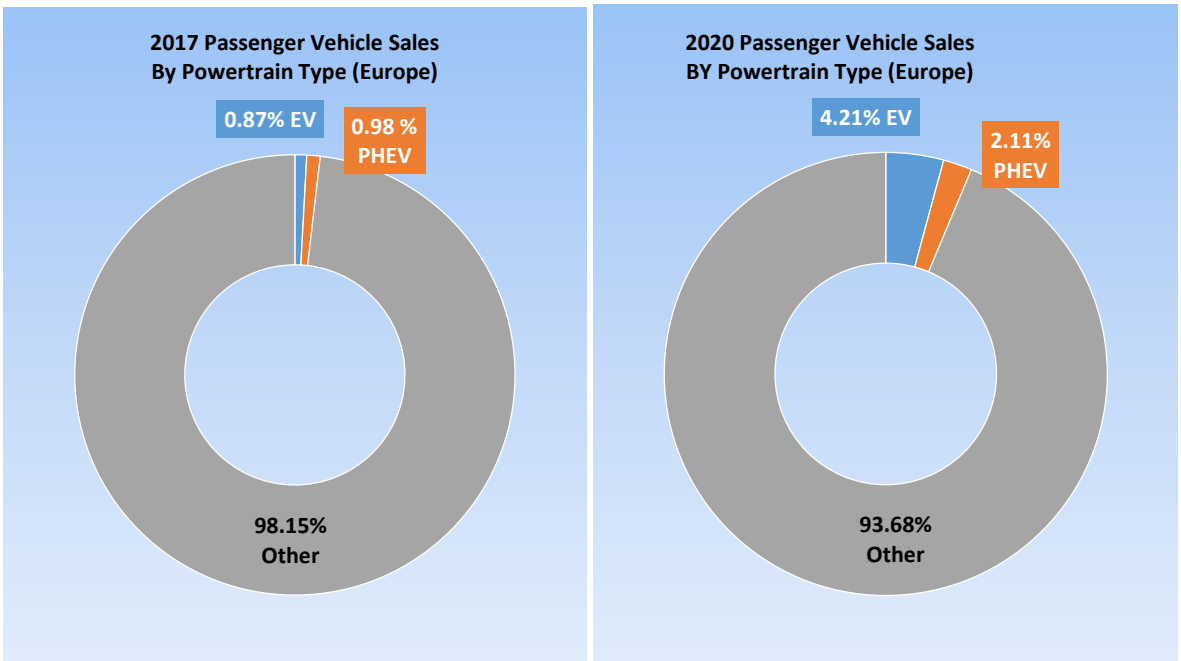
Figure 1.1 Sales of ECVs Jump In H1 2020 But Overall Passenger Vehicle Sales Decline



Source: ECG Business intelligence

*ECV includes battery electric and plug-in hybrid vehicles but does not include other hybrid powertrains

Figure 1.2 European Electrically Charged Vehicles Market Share Change 2017-2020



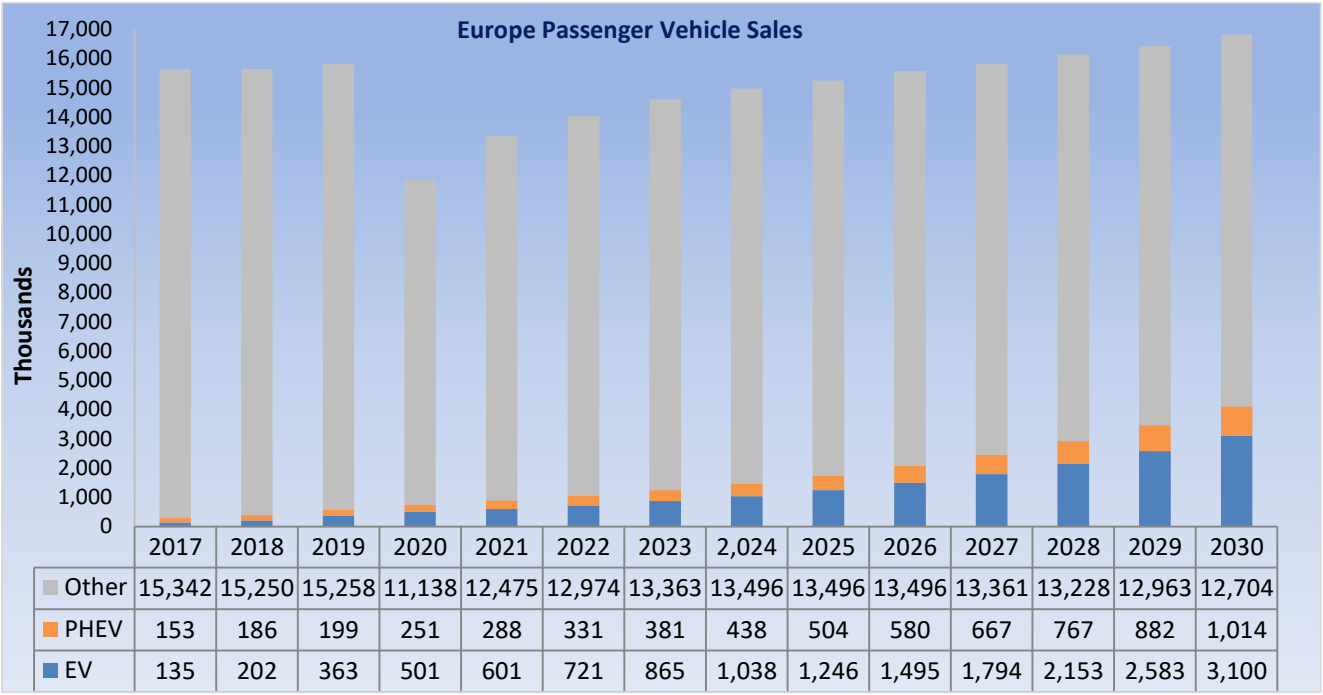
Source: Automotive by Ultima Media

*ECV includes battery electric and plug-in hybrid vehicles but does not include other hybrid powertrains

ECV sales had already been rising in Europe in recent years, particularly in smaller markets with favourable tax and incentives, notably Norway, the Netherlands, Sweden and Belgium. In crisis-hit 2020, however, shifts in government policies and economic stimulus have contributed to growth in larger European markets, such as Germany, France and the UK. Other markets where the share of ECV sales had been much lower, such as Italy, are also seeing dramatic increases.

While incentives are playing a key role, other factors also point to further rises in ECV sales across Europe in the coming years, including stricter emissions policies, OEM investments and changing consumer patterns. We forecast compound annual growth rates of around 20% for EVs throughout the 2020s, and around 15% for PHEVs. By 2030, we expect total ECV sales in Europe to reach 24.46% of the market, surpassing 4m units, of which pure battery electric vehicles will account for 3.09m units.

Figure 1.3 European Passenger Vehicle Sales Forecast for EV, PHEV and Other 2020-2030



	2017	2018	2019	2020	2021	2022	2023	2,024	2025	2026	2027	2028	2029	2030
Other	15,342	15,250	15,258	11,138	12,475	12,974	13,363	13,496	13,496	13,496	13,361	13,228	12,963	12,704
PHEV	153	186	199	251	288	331	381	438	504	580	667	767	882	1,014
EV	135	202	363	501	601	721	865	1,038	1,246	1,495	1,794	2,153	2,583	3,100

Source: Automotive from Ultima Media/ECG Business Intelligence

1.4 European policies and stimulus support shift to ECVs

Multiple factors have been driving the increase in ECV sales in Europe over the past three years, including more environmentally conscious consumers, a more competitive choice of product, as well improving battery technology and charging infrastructure. However, most evidence would suggest that the main driver has been government legislation and incentives. Tighter emission regulations, including higher fines for high-polluting vehicle fleets across the EU starting in 2020, were leading OEMs to offer more low-emission vehicles well before Covid-19, for example.

The crisis appears to have accelerated this shift. As governments eased lockdown restrictions, many introduced automotive stimulus programmes that increased subsidies or reduced taxes to purchase ECVs, including ambitious programmes in Germany, France and Spain. Such initiatives are supporting EV and PHEV sales growth even as sales of ICE vehicles have declined steeply and are set to recover more slowly.

However, the coronavirus crisis could have other impacts that affect the longer-term outlook for European ECV sales. EU member states, for example, have in most cases sought to align stimulus measures to low carbon objectives, including commitments made in the Paris Climate Agreement and as part of the European Commission's proposed Green Deal legislation (see ECG Business Intelligence report on the Green Deal). Germany and Spain, for example, have included increased investment in charging infrastructure as part of their recovery plans. In the recently passed EU budget, meanwhile, around one-third of additional crisis stimulus measures have been allocated to low-carbon initiatives, including infrastructure investments.

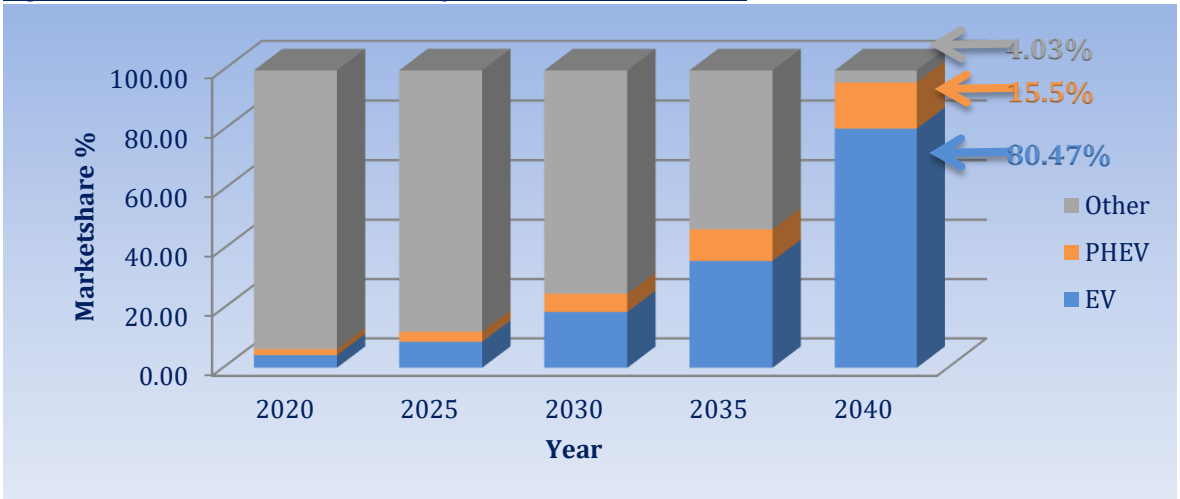
Manufacturers are playing active roles in the shift. Many are offering additional incentives to encourage buyers to turn to ECVs, whether lower prices or extras such as home-charging accessories. Meanwhile, online vehicle purchases and delivery – which have also accelerated whilst physical dealership channels were closed during lockdown – tend to represent a higher share of electric vehicles than other powertrains (see ECG Business Intelligence report on online vehicle sales).

The crisis may also herald shifts in consumer behaviour that favour electrified transport. There is evidence of rising appreciation and awareness of air quality and cleanliness since the start of the pandemic, although this is hard to quantify in the short term.

More striking so far is how concern over using public transport may be pushing more consumers towards personal mobility, including in urban areas, whether cycles, scooters or private vehicles. In many parts of Europe, car use and traffic levels are back at pre-crisis levels despite declines in commuting and other travel. Should this trend persist over the longer term, it could lead to higher demand for new and used vehicles – with growth in ECV transport necessary to meet emission targets. International bodies such as the International Energy Agency (IEA) and the OECD have encouraged governments to ensure that policies and stimulus packages do not lead to dangerous increases in transport emissions.

This combination will support further EV sales and production growth in the 2020s. And beyond that, we expect legislation to choke off ICE vehicle sales even further. By 2040, we expect that ECVs will represent 95% of the market, with EVs alone 80% of European sales.

Figure 1.4 ECV Market Share in Europe Set to Soar 2020-2040



Source: Automotive from Ultima Media/ECG Business Intelligence

2. Tracking the Change in Market and Product Mix

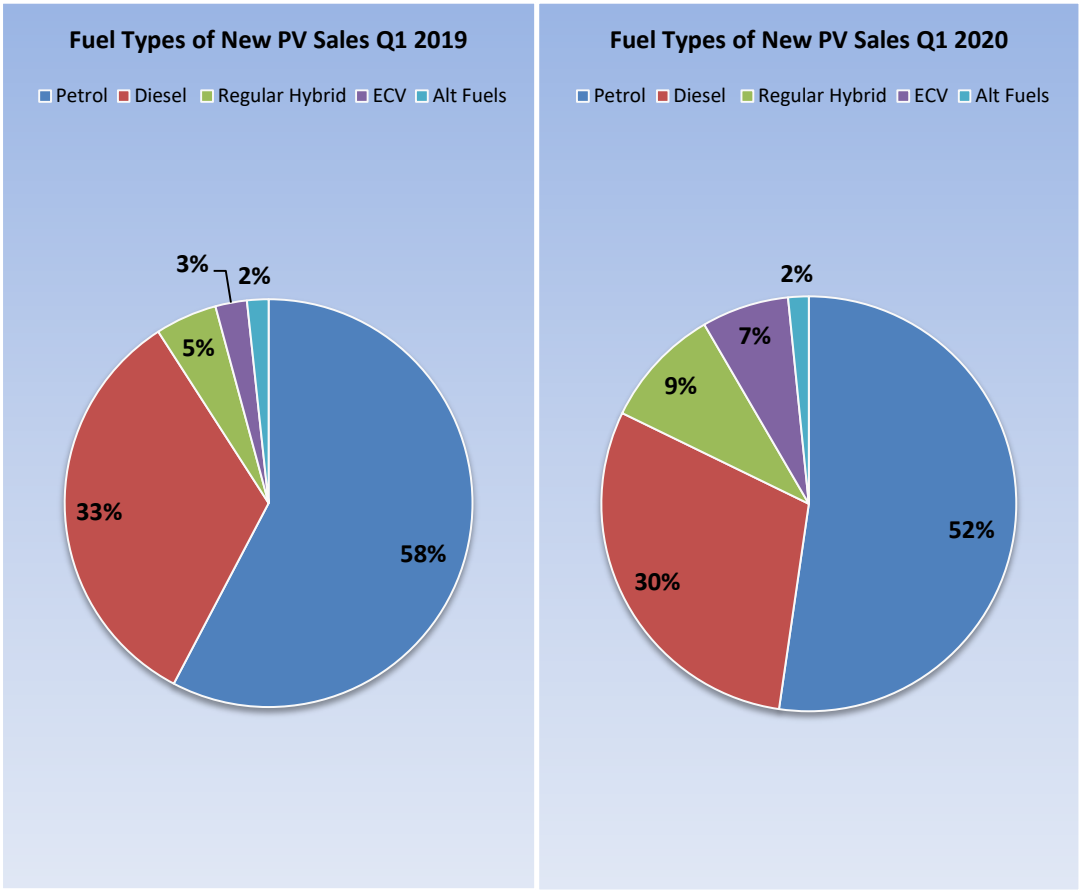
2.1 ECVs gain share in large European vehicle markets

The European passenger vehicle market had been seeing a shift in powertrain over the past five years, especially with the decline of diesel. But 2020 is showing a more radical shift in market share to ECVs, with EVs in particular starting to gain more ground.

In the first quarter of 2020 alone, as the crisis was starting to hit, EVs and PHEV vehicles saw gains in market share year-on-year of 4 percentage points at the expense of petrol and diesel, which lost 6 and 3 points, respectively. Other alternative fuel vehicles, such as LPG, natural gas and hydrogen fuel cell vehicles, have seen market share stay constant.

These shifts are stabilising somewhat as markets return to a level of normality; however, we expect an ongoing rise in market share for ECVs to continue.

Figure 2.1 Fuel Type of Passenger Vehicle Sales Q1 2020 vs. Q1 2019

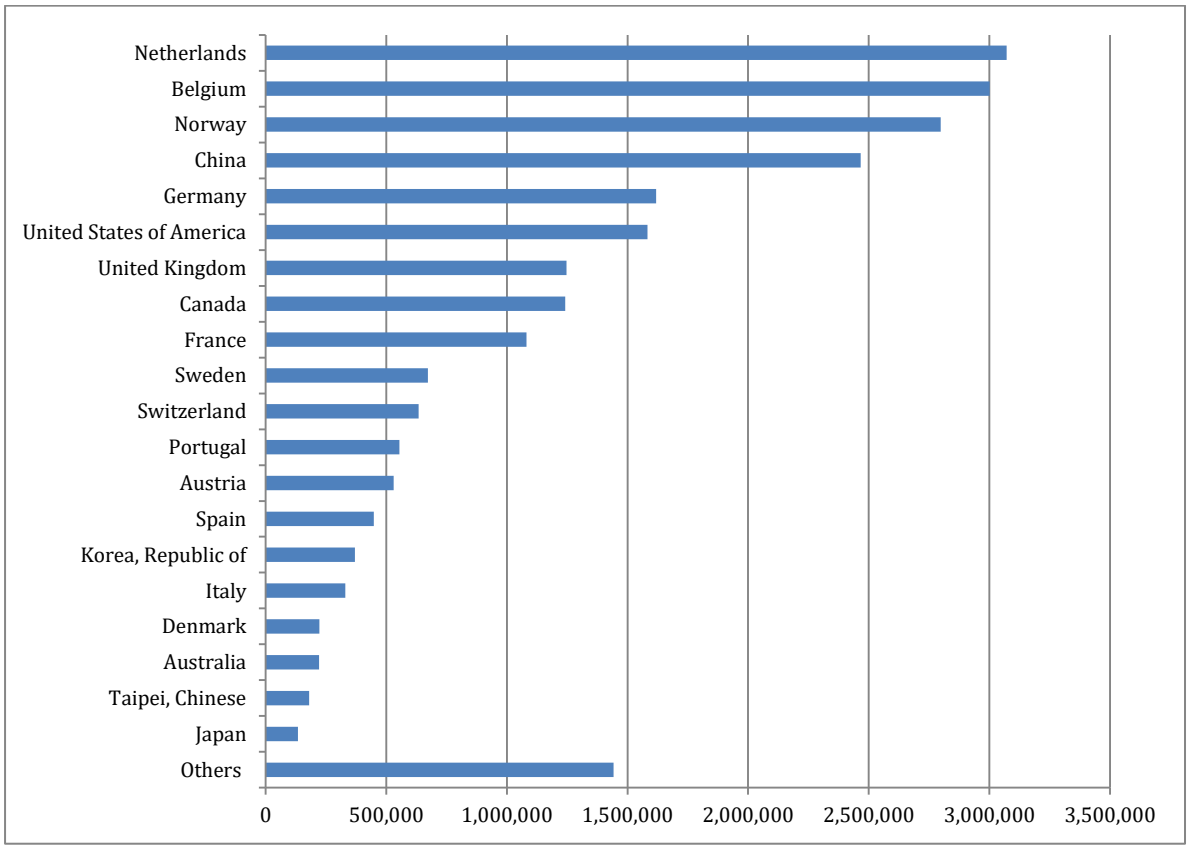


Source: ACEA, Automotive from Ultima Media

Sales and trade patterns are also starting to change. Up to 2020, ECVs had the biggest

market share in smaller markets with favourable taxes and incentives, such as Norway and the Netherlands. Globally, in fact, small European countries have until recently imported the highest value of electric vehicles measured in dollar terms, with the Netherlands, Belgium and Norway ahead of China, Germany and the US. The strong standing is not only because of high sales, but a strong market share in those markets for premium electric vehicles, notably Tesla and, since 2018, the Audi e-tron.

Figure: 2.2 Top 20 EV Importing Countries 2019 by US dollar value ($1,000)



Source: International Trade Center / ECG Business Intelligence

However, 2020 has started to see ECV rises in larger markets. Norway, which had been the second biggest ECV market in Europe after Germany by volume, actually saw a small decline in such vehicle sales year-on-year in the first half of 2020 to 40,571 units, slipping into fourth place.

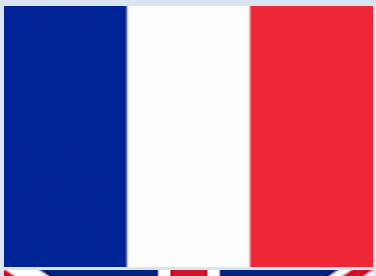
Germany, where the overall market declined 25% year-on-year in the first half of 2020, was the largest European market for ECVs with 93,848 units in the first half of 2020, including a 40% year-on-year jump in EV sales to 43,000 units, and a 190% surge in PHEV sales to 47,000 units, according to data from VDA, the German automotive association.

The second largest market for ECVs was France at 69,160 units, a rise of 108% year-on-year in the first half compared to a 39% drop in the overall passenger vehicle market. The UK was a similar story, with ECV sales rising 86% year-on-year to 50,465 units compared to a 48.5% decline in the overall vehicle market in the first six months.

We expect this change in market share within larger markets in Europe to continue, with further changes in vehicle trade flows too, especially as EV and PHEV production rises in large European markets.

Table 2.1 Top European Markets See Growth In ECV sales, H1 2020

Germany is by far the strongest market for electric chargeable vehicles in Europe and its market share in the region has risen to 23.5% in the H1 period of 2020, up from 19.3% in the same period a year ago with sales volume reaching 98,981 units, up 97.1% from 47,684 in the same period a year ago.



France has risen phenomenally to gain second position from Norway. ECV sales in France rose by 125.3% in the H1 period of 2020 to 65,215 units compared to the first half in 2019 when sales were just 28,942 units. France now accounts for 16.3% of the European electric chargeable vehicle market.

The **United Kingdom** has also seen a significant jump in sales of electric chargeable vehicles, with an 86.1% surge in the H1 2020 period to 50.465 units, up from just 27,111 sold in the same period in 2019. The UK now accounts for 12.9% of the electric chargeable market in Europe.

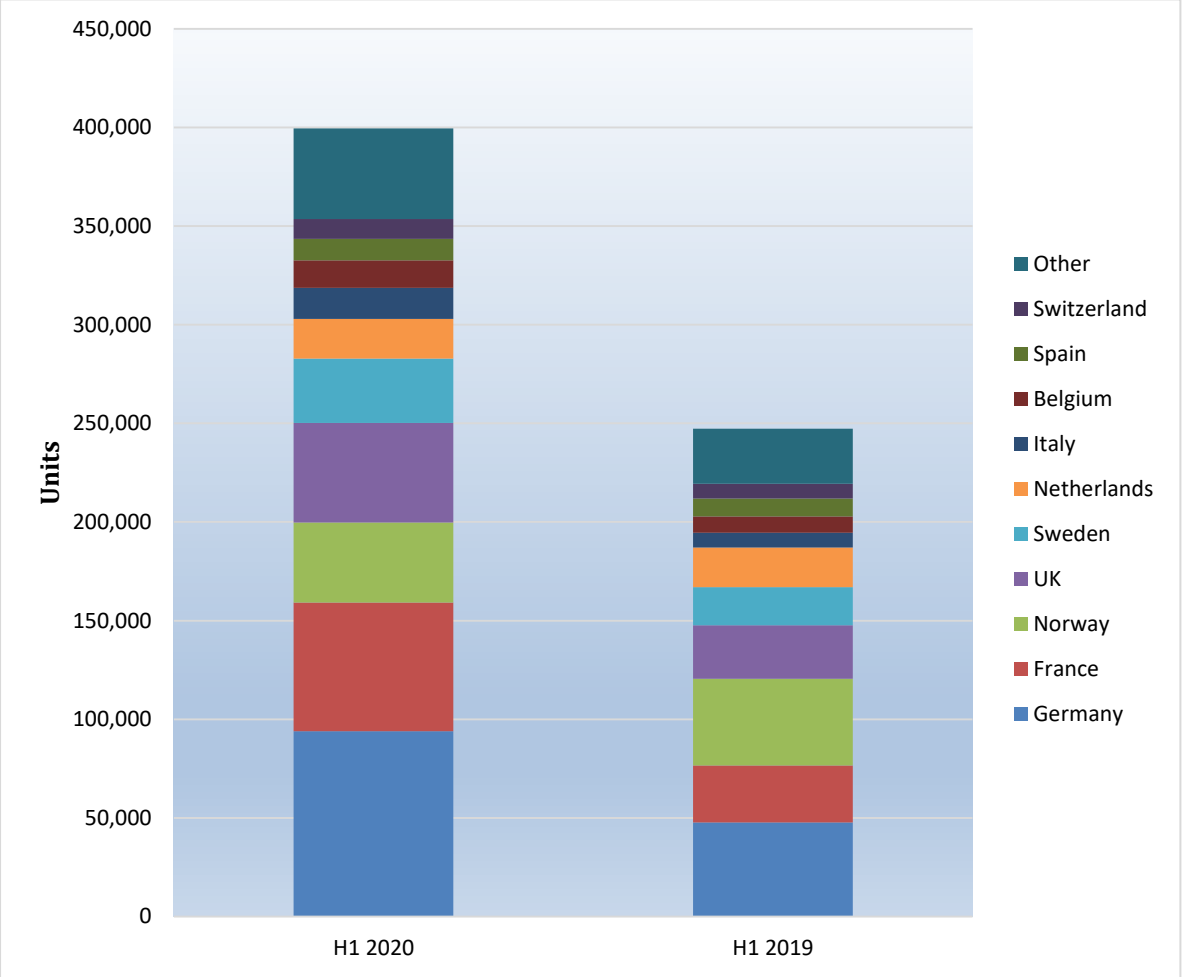
Norway, an early adopter of ECVs, actually saw sales slide by -7.7% year-on-year in H1 in an overall market down only slightly in the same period compared to 2019, and with fewer new incentives to encourage ECV sales. Still Norway has a market share of 10.2% of Europe's ECV market though this is down from 17.8% in the same period a year ago.

Sweden also saw a solid jump with sales of electric chargeable vehicles up 69.5% to 32,558 units in H1 2020 compared to the same period in 2019. The country now controls 8.2% of the overall European electric chargeable vehicle market.

Italy saw the largest jump in sales of electric chargeable vehicles in the first half of the year, with sales rising 108.6% y/y to 15,740 units up from just 7,547 units sold in the first half a year ago. Still, the low volume means Italy only controls 3.9% of the European ECV market.

Source: ACEA, ECG Business Intelligence

Figure 2.3 Top ECV Sales By Country In Europe H1 2020 vs. H1 2019 (Units)



Source: ACEA, ECG Business Intelligence

2.2 Measuring the impact of incentives

Incentives have played important roles in encouraging ECV sales in Europe, as seen by sales in recent years in Norway, the Netherlands and Sweden. Research conducted by the European Commission's Joint Research Centre found that, as of 2017, incentives in Norway for EVs ranged from 39-67% of the net price for the vehicle, while for PHEVs the incentives ranged from 17-23%. Overall these incentives made Norway the cheapest country in Europe to own an ECV.

The impact on the country's vehicle fleet has been substantial. As of 2019, CO_2 emissions in Norway hit just 59.9 grams per kilometre for new passenger cars, making it by far the cleanest in terms of vehicle emissions in Europe. The next lowest emission level was the Netherlands with CO_2 emissions per kilometre of 98.4 grams for new passenger cars. That compares to 131.2 grams for Germany, 127.7 grams in the UK and 121.3 grams in Spain.

In 2020, it is countries with far higher new vehicle CO_2 emissions, and larger sales markets,

which have accelerated their incentive schemes. These have in part coincided with stricter EU regulations on new vehicle fleet emissions, with heavy fines applicable to OEMs who surpass targets starting this year.

Following lockdowns, many countries have since implemented stimulus measures that are aimed to spur demand, with most programmes targeted specifically or primarily at low-emission vehicles, with particularly generous increases in incentives in Germany, France, Spain and Italy. In other countries, such as the UK, there were no specific stimulus measures aimed at vehicle sales, however there are still generous reductions in tax and VAT for zero-emission vehicles.

These incentives, while not the only driver of EV and PHEV sales, will play a large role in moving market share for new vehicle sales away from petrol and diesel vehicles.

Table 2.2 Incentives For ECV Purchase: Top ECV Markets (Europe)

Country	Government Incentives	Tax Benefit for Private Owners	Tax Benefit for Company Cars	Purchase Incentives
Germany	1 July 2020 to 31 December 2020 VAT reduction from 19% to 16% including for vehicles.	Exempt from vehicle tax for 10 years for battery electric vehicles and fuel cell vehicles registered until end 2020.	Reduction of the taxable amount for EVs and PHEVs (from 1% to 0.5% of the gross catalogue price per month). Additional reduction of the taxable amount for EVs with a gross list price of up to €60,000 (from 1% to 0.25% of the gross catalogue price per month)	Until 31 December 2021, an **'innovation bonus'** temporarily increases the environmental bonus for new and used EVs, PHEVs and FCEVs. Applies to all eligible vehicles registered from 4 June 2020. **Bonus** for cars with net list price ≤€40,000: €9,000 for EVs and FCEVs. €6,750 for PHEVs. **Bonus** for cars with net list price >€40,000: €7,500 for EVs and FCEVs. €5,625 for PHEVs.

Country	Government Incentives	Tax Benefit for Private Owners	Tax Benefit for Company Cars	Purchase Incentives
France	Regions provide an exemption (either total or 50%) for alternatively-powered vehicles (i.e. electric, hybrid, CNG, LPG and E85).		Exemption from CO_2-based tax component ('TVS') for vehicles emitting less than 20g CO_2/km.	**Bonus** to buy cars or vans with ≤20g CO2/km: €7,000 for households, vehicle price ≤€45,000. €5,000 for legal persons, vehicle price ≤€45,000. €3,000 for households and legal persons, vehicle price between €45,000 and €60,000. €3,000 for FCEV vans and cars or vans with price >€60,000. **Scrappage scheme** for purchase of second-hand or new vehicles with ≤50g CO_2/km, price ≤€60,000. Cars: €5,000 for households, depending on income. €2,500 for legal persons. Vans: €5,000 (for households or legal persons). By mid-July 2020 the scrappage scheme had reached its 200,000-vehicle cap, but the French Ministry of Ecological Transition announced a new scheme applicable from 3 August for **consumers trading in vehicles**. Dependent on income €5,000 for EVs or €2,500 for PHEVs.
UK	Exemption of VAT tax for zero-emission vehicles.	Exemption for zero-emission vehicles EVs pay £0 vehicle excise duty (VED)	Minimum rate for zero-emission vehicles: 0% in 2020-2021. 1% in 2021-2022. 2% in 2022-202	**Government grants** (through dealers) for: Zero-emission passenger cars up to £3,000, if price is <£50,000. Eligible vehicles in other categories include Vans: £8,000. Taxis: £7,500. Trucks: £20,000. In addition, £350 towards cost of **installing a home charger**.
Sweden		Reduced annual road tax (SEK 360) for zero-emission vehicles.	Reduction for EVs and PHEVs of 40% (up to SEK 10,000).	**Climate bonus**: SEK 60,000 for new zero-emission cars and light trucks. SEK 10,000 for PHEVs with ≤70g CO_2/km. **Bonus** for purchase of new electric buses and trucks
Nether-lands	Exemption for zero-emission cars.	Exemption for zero-emission cars.	Minimum rate (8%) for zero-emission cars with catalogue price of up to €45,000 (no price limit for FCEV cars).	**Subsidy scheme** for private individuals to buy or lease a new or used EV. **Environmental investment deduction** for EV and FCEV light commercial vehicles and EV taxis. **Arbitrary depreciation** of environmental investments scheme for FCEV cars or taxis and EV cars equipped with solar panels.

Country	Government Incentives	Tax Benefit for Private Owners	Tax Benefit for Company Cars	Purchase Incentives
Italy		Five-year exemption for electric vehicles from the date of first registration. After this period, 75% reduction of the tax rate applied to equivalent petrol vehicles.		Bonus-malus scheme. **Bonus:** a one-off amount (max €6,000 for cars emitting ≤70g CO_2/km and a price less than €50,000 (excluding VAT). **Malus**: up to €2,500 for cars emitting more than 250g CO2/km.
Spain	Exemption from 'special tax' for vehicles emitting up to 120g CO_2/km. Canary Islands: VAT exemption for alternative-powered vehicles (i.e. EVs, FCEVs, PHEVs, EREVs, HEVs, CNG, LPG) emitting up to 110g CO_2/km.	Reduction of 75% for EVs in main cities (e.g. Madrid, Barcelona, Zaragoza, Valencia).	-	**Incentive scheme** (MOVES Plan): Cars: €4,000-€5,000 for EVs and €1,900- €2,600 for PHEVs for private individuals, depending on whether a vehicle older than seven years is being scrapped. Vans and trucks: between €4,400 and €6,000 for private individuals, depending on scrapping.

Source: ACEA, Government Websites

2.3 Europe's best-selling electric vehicles

The growth in ECV sales has led to surprising gains by some models in the first half of 2020 that may signal longer-term trends. The top-selling models this year include a mixture of new models and variants of ICE models with electric powertrains. The compact Renault Zoe has taken the top spot, with sales jumping 50.3% to 36,506 units sold in the first six months of the year in Europe, up from 24,288 units sold in the same period in 2019. It surpassed the Tesla Model 3, which saw a year-on-year decline of 12% in the first half. **See Figure 2.4.**

So how did the humble little Renault Zoe manage to take the top spot away from the comparatively premium Tesla Model 3? A variety of factors at play, notably government and OEM incentives, vehicle availability and delivery times, battery technology improvements –

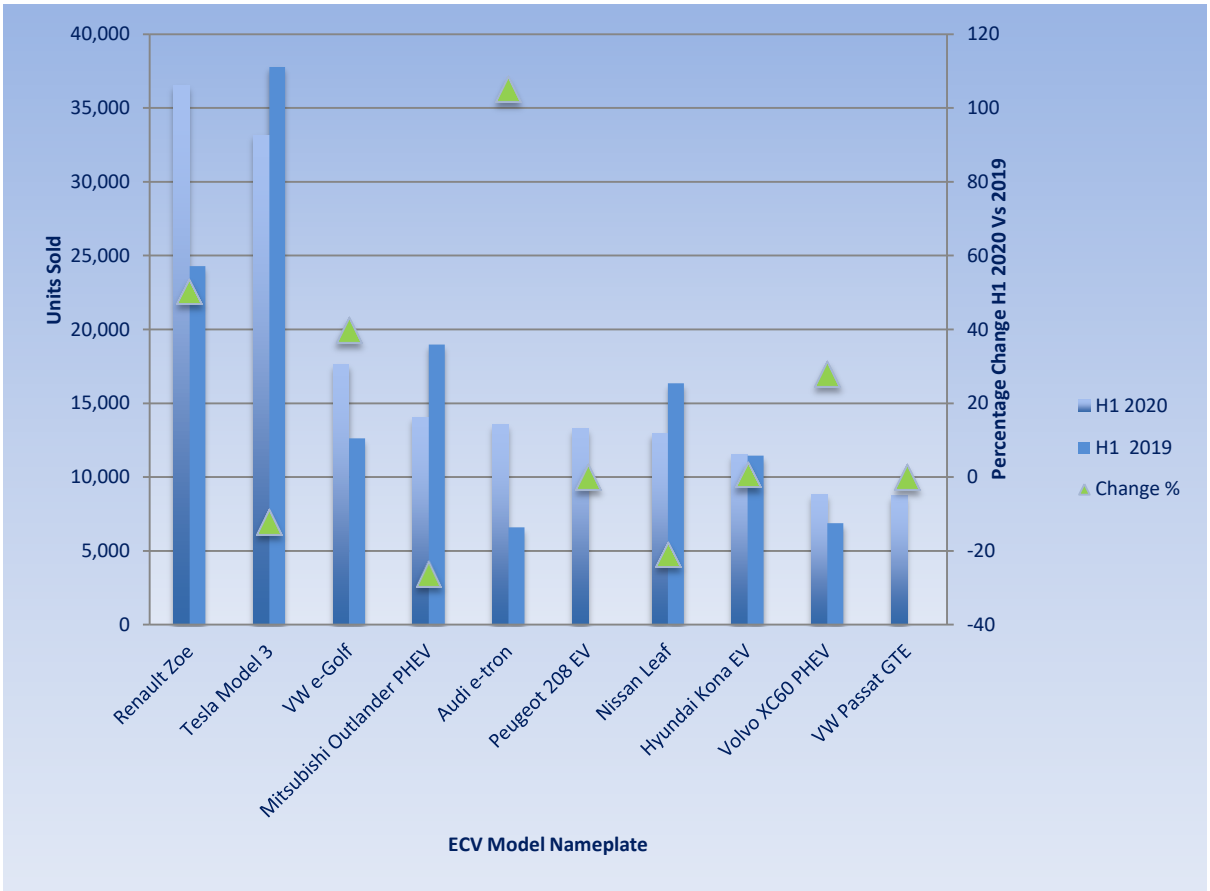
as well as some possible changes in urban mobility and consumer awareness.

The Zoe is an interesting case study in all these areas. Zoe was already price competitive compared to the Model 3. Renault tweaked the model to bring out a fresh variant in 2019 with a revamped interior and a more powerful battery giving it 245 miles (390km) of range. It starts at around €32,000 compared to around €49,000 for the more luxurious and technology-laden Model 3.

At that level, most buyers of the Zoe would qualify for higher government incentives in major European markets, notably France and Germany. In France, for example, buyers trading in older models in June and July could have seen the price of the Zoe fall to as little as €20,000, while the Model 3 and other more expensive models qualify for smaller incentives. French sales of the Zoe rose nearly 100% year-on-year in the first half of the year, accounting for nearly half of the model's sales across Europe.

Carmakers like Renault have also been offering customers additional benefits, such as free wallboxes with free installation at their homes.

Figure 2.4 Top Selling Electrically Charged Vehicle Sales in Europe, H1 2020 Vs H1 2019



Source: ECG Business Intelligence

But incentives don't tell the entire story, especially as government support did not increase in most countries until June or July. A number of other small electric models, including the Volkswagen e-Golf and the Peugeot 208 EV have also seen rises. This shift to smaller EVs is down in part to urban driving for convenience, declining range anxiety and environmental concerns.

With the current crisis keeping more people off public transport, we expect further increases in personal mobility solutions. However, as later chapters show, smaller EV sales may soon be outpaced by an expanding array of electrified SUVs and premium models. The growth of the Audi e-tron SUV, for example, is a strong signal of demand for such segments.

Such a fast-developing market highlights that the supply chain should not be underestimated, including material and production capacity, as well as vehicle inventory and delivery times. Those OEMs able to balance this supply chain look likely to have competitive advantages in the coming years, including gaining greater economies of scale in production and supply, higher local production, as well as strategic import trade lanes.

3. Order-To-Delivery Times for Electrically Charged Vehicles

3.1 Long wait times for EVs

The availability of models and waiting times can play a key role in buying decisions, especially when time-limited incentives are a factor. And there is evidence that some OEMs have faced bottlenecks in ECV supply. That has included challenges in inbound supply chains – including lithium-ion battery supply – while others have not been able to scale up production and distribution fast enough. Inventory management strategies for EVs especially are also playing a role.

ECG Business Intelligence conducted research into waiting times for ECVs and found evidence that such models have average waiting times around 40% longer than for ICE vehicles from factories – and substantially longer than 'off-the-lot' vehicles, of which there are usually fewer available for EV and PHEV. This could be a further stumbling block for the sector unless automakers fast track production and delivery of ECVs across Europe. We also found evidence that the wait time for electric vehicles in the UK are typically longer than in continental Europe.

Our figures are a snapshot rather than a complete survey of waiting times for ECVs. This summer we contacted dealerships posing as buyers, checked OEM and dealer websites and scoured research materials. Our findings point to an approximate average estimated time of delivery (ETD) of 10.28 weeks for an EV or a PHEV in Europe in H1 2020.

Comparing this ETD to ICEs is not entirely straightforward. In our research, dealers were much more likely to have a higher inventory of ICE vehicles that could be driven off the lot than they would ECVs. But comparing models that required factory orders still showed an average ETD for ICE models of about 7 weeks, depending on overall order supply, plant and delivery locations. Higher-spec and premium models were more likely to have waiting times.

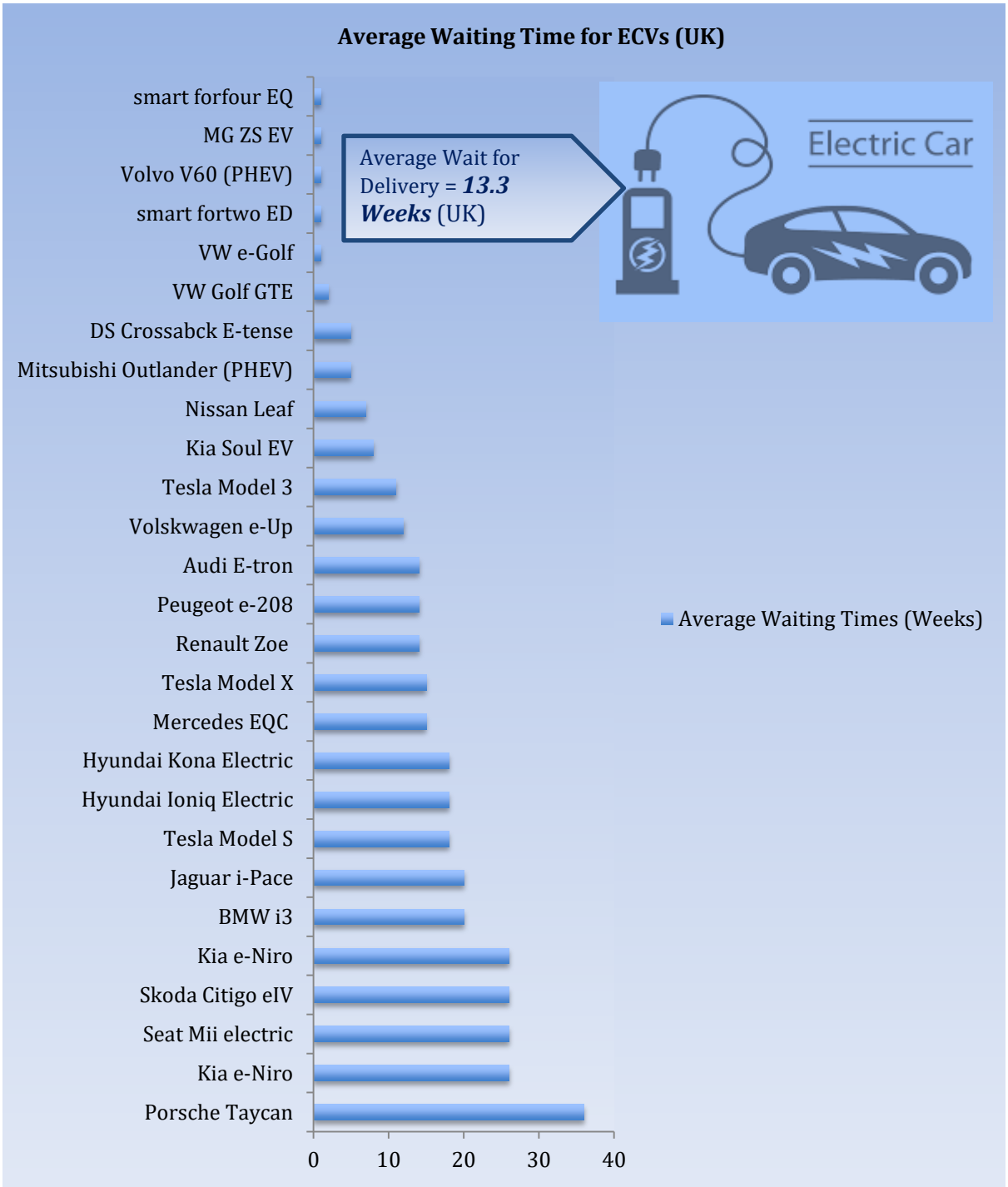
Table 3.1 Top 10 ECV Sales in H1 2020 in Europe with Estimated Time to Delivery (ETD) – Summer 2020

Nameplate	Sales H1 2020	ETD (in Weeks)
Renault Zoe	36,506	14
Tesla Model 3	33,164	10.8
VW e-Golf	17,639	0.8
Mitsubishi Outlander PHEV	14,009	4.8
Audi e-tron	13,538	14
Peugeot 208 EV	13,266	14
Nissan Leaf	12,925	6.8
Hyundai Kona EV	11,527	18
Volvo XC60 PHEV	8,801	0.8
VW Passat GTE	8,743	18.8

Source: ECG Business Intelligence, Dealerships, Forums, OEM websites

Our snapshot survey found that ECVs in the UK averaged 13.3 weeks. Our research suggested that lead times appear to be longer because dealers stock relatively low inventory of ECV models and have less room to offer options off the lot. They order more vehicles from factories, more of which are in continental Europe. Imports from Asia, meanwhile, may be imported and consolidated first in European ports before shipping to the UK.

Figure 3.1 Comparison of ECV Models in the UK with Estimated Time till Delivery (ETD) in Weeks June/July 2020



Source: ECG Business Intelligence, Dealerships, Forums, OEM websites

Table 3.2 ETD of factory-ordered ICE Models from Major European brands (UK) – June/July 2020

Brand	ETD (Wks)	Stock Available
Audi	6.3	Yes
BMW	6.4	Yes
Dacia	5	Yes
Ford	4.5	Yes
Jaguar	10	Yes
Land Rover	5.6	Yes
Mercedes	7.75	Yes
Skoda	7.6	Yes
Toyota	10.5	Yes
Volkswagen	7.28	Yes

Source: ECG Business Intelligence, Dealerships, Forums, OEM websites

3.2 Production and battery supply bottlenecks

These longer waiting times indicate a possibility that electric vehicle deliveries may have also been held back by limits in supply. Tesla, for example, has faced inventory issues following the extended shutdown at its factory in California, and the delayed effect from long shipping times. In July 2020, for example, the carmaker saw a precipitous decline in European sales, dropping 76% year-on-year across Europe as it waited to replenish supply.

Porsche, meanwhile, is struggling to meet lead times following the closure of dealerships during the pandemic. On owners' forums, those who have reserved a Porsche Taycan report having to waiting months, with reports of cars in ports and dealers unable to get access to stock.

Other models have sold faster than expected. In the UK, for example, the annual allocation for the country of the Skoda Citigo-e had sold out in April.

There have also been reports of battery cell supply issues. In February, production of the Audi e-Tron SUV ground to a halt in Belgium due to battery shortages. Herbert Diess, chief executive at VW Group said it would not be an ongoing problem, as the group had access to adequate lithium-ion cell supply till the end of 2023.

However, other OEMs have reportedly faced similar issues. Before the coronavirus crisis, Jaguar Land Rover paused production of the electric I-Pace SUV at the Magna Steyr contract manufacturing plant in Austria, while Mercedes had to stall production of the EQC with issues at both carmakers allegedly linked to shortages in key ingredients such as lithium and cobalt. Reports claimed that Daimler had cut the sales targets for its EQC in 2020 due to battery supply chain issues, however company officials have denied this stating that targets are on track for 50,000 EQC models to be produced this year.
Overall, the industry is divided about causes for disparity in ETD between ICE and ECVs.

Some experts have suggested there is no significant difference. In December 2019, Mike Hawes, chief executive of the UK's Society of Motor Manufacturers and Traders (SMMT) stated that average wait times for a new plug-in car ordered from the factory was "comparable to traditional, premium and other vehicles".

And while Tesla customers have complained that waiting times can be over five months, others refer to previous times before the pandemic hit when ETD could be up to two years.

While automakers are keen to underplay the issue of bottlenecks holding up ETD, rapid developments within the lithium battery sector in Europe are proof that OEMs are working fast to gain greater control over the production and sourcing of key ingredients for their battery packs. This includes a mixture of OEM-controlled battery cell production, as well as established and startup battery manufacturers adding local production in Europe.

OEMs are also ramping up EV and PHEV manufacturing and distribution in Europe in a bid to capture market share, increase economies of scale and reduce lead times. Hyundai, for example, is increasing output of the electric Kona at its Czech plant as well as in South Korea to help mitigate ETD issues in Europe. The automaker stated that it aims to see waiting times drop from up to four months to just a week.

The most ambitious plans are from the Volkswagen Group as it converts several factories into EV production sites – although software issues that delayed delivery of the company's flagship ID.3 model demonstrate the challenges of introducing new technology on a wide scale. Tesla's new factory under construction near Berlin will substantially increase electric vehicle and battery capacity in the region. Other brands, however, are set to continue relying on and increasing imports from other regions, including South Korea, Japan and China.

With demand rising, the EV arms race is likely to heat up further, with more focus on capacity and delivery times. And for some OEMs, it is clear that the current crisis has led to delays in plans to launch a number of key EV and PHEV vehicles in Europe.

4. EVs And PHEVs In The Pipeline

4.1 Europe's OEMs plan electric vehicle offensive

Almost every global automaker is ramping up the number of EVs and PHEVs in their production and distribution pipelines and the list is growing almost daily. The pipeline of models not only demonstrates growing competition across electrified models, but also more sophisticated technology and model variation. Many of the new models will be electric and PHEV SUV variants, for example, as OEMs roll out more premium, profitable electric vehicles. These include the BMW ix3 later this year, the Mercedes-Benz EQ range and Volkswagen ID.4 next year.

The new batch of models are also expanding from electrified versions of existing petrol or diesel models and are increasingly based on dedicated modular platforms, providing more flexibility and economies of scale across the supply chain. The launch of the Volkswagen ID.3, which is set to reach customers this autumn and is priced in a range to qualify for bigger incentives, will be a significant advancement on the e-Golf thanks to a dedicated EV platform and more European manufacturing capacity.

Over the next five years, the PSA Group will shift from two multi-energy platforms for ICE and electrified models, to two entirely electric platforms. That will include the electric vehicle modular platform (eVMP), which will be a basis for electric sedans and SUVs across Peugeot, Citroën, DS, Opel and Vauxhall models, and help to expand electrified models and production across the group's supply chain.

None of this is a guarantee that these carmakers will be successful in expanding ECV sales – but it highlights how OEMs are scaling up production and distribution in Europe.

Table 4.1 Snapshot of OEM Electric Vehicle Model Launches in Europe 2020-2021

**Please note that with the volume of models planned, this table below serves as a snapshot and does not aim to be a definitive guide.*

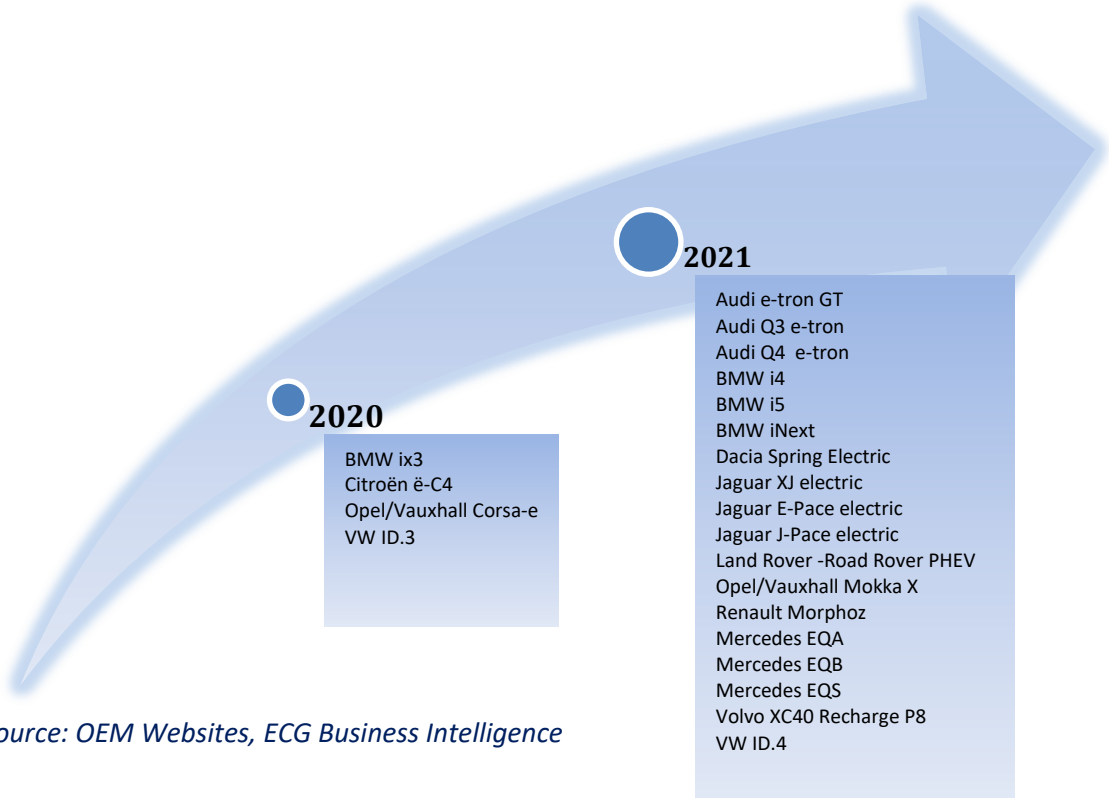
Volkswagen Group	**Audi**: Following the success of the **e-tron** electric SUV launched in 2018, Audi added production in early 2020 of the Audi **e-tron Sportback** at its plant in Brussels, Belgium. The **e-tron GT** will follow at its plant in Neckarsulm, Germany this year and then **e-tron variants** of the **Q3** and **Q4** models are expected to be built at Zwickau, Germany in 2021.
	Volkswagen: The **VW ID.3** small all electric car has commenced sales this year with online bookings starting across Europe in June and first delivery scheduled for September. Sales of the **ID.4**, a compact electric SUV, will launch after the global premiere at the end of September with deliveries expected in 2021; production started this past August in Zwickau. The Zwickau plant is being entirely converted to e-mobility with capacity to produce 300,000 EVs per annum based on the MEB platform as soon as 2021. VW is also converting its plant in Emden, in north Germany to an EV production base. By 2022 it will have capacity for 300,000 electric vehicles per year. The ID.3 will be produced in Dresden from 2021, while the Hannover plant will begin EV production from 2022. The company plans to release more than 20 all electric models by 2025.
	Skoda: The **Enyaq**, an electric SUV based on the MEB platform, was revealed in September 2020 with sales commencing later this year. Skoda plans 10 more electric models by end 2022, accounting for 25% of its total annual vehicle sales by end 2025. Skoda already sells the small electric **Citigo-e**.
	Seat: The **el-Born** is the first 100% electric Seat based on the MEB platform. The car will be manufactured at the VW Zwickau plant. The el-Born will initially be launched under the new **Cupra** sub-brand.
	Porsche: The carmaker launched the new all electric **Taycan** SUV this year to compete with Tesla, aimed at the higher end of the premium market.
BMW Group	**BMW**: The brand is already launching the **ix3** electric SUV later this year, following on from sales of the **i3**. In 2021 BMW is expected to introduce models such as the **i4**, **i5** and the **iNext**.
	Mini: The popular **BMW Mini Electric** is built at the company's plant in Oxford (UK) but by 2023 new electric models under the Mini banner will also be built in China under the JV with **Great Wall Motors**. One is likely to be the **Mini Rocketman,** a three-door electric hatch, while industry reports state the company may produce an electric MPV reviving the **Traveller** name.
Jaguar Land Rover	**Jaguar**: The next generation **XJ** sedan will be an all-electric luxury saloon produced at the UK's Castle Bromwich plant. However recent reports state that the model's launch has been delayed to the end of 2021. Plans for 2021 also include an electric variant of the **E-Pace** as well as a **J-Pace** all electric SUV. These follow the all-electric **I-Pace** built by Magna Steyr in Austria.
	Land Rover: The **Range Rover EV** is set to launch in late 2021 and has been dubbed Road Rover. The Jaguar J-Pace, the XJ and the Road Rover are all based on the JLR Modular Longitudinal Platform (MLA).

Daimler	**Mercedes**: The new Mercedes **EQA** all electric compact crossover is to be launched in early 2021. The model will be followed by a fleet of EQ electric models, the **EQB** SUV and the **EQS** saloon. Then in 2022 a more luxurious variant, the **EQE** sedan is expected. Mercedes already makes the **EQC** SUV in Europe and China, launching sales in 2019.
	Smart: In 2020 Smart launched the new Smart **Fortwo EQ** and **ForFour EQ** built at its plant in Hambach, France. But in 2022 new models will be launched under the JV with Chinese company **Geely.** Smart is reported to be entering the B segment sphere with larger models than the current range.
PSA Group	**Peugeot:** Following the launch of its **e-208** and **e-2008** compact SUV, the automaker has announced plans to electrify its entire range by 2023. Speculation has been rising as to whether the **e-Legend concept** car could become a production model. PSA's new electric vehicle platforms, including the eVMP, will cover a wider range of EV sedans and SUVs through 2025.
	Citroën: The French brand debuted the new electric **ë-C4**, a 100% electric SUV which will begin taking orders in Autumn 2020. It has also launched the **Ami**, a full electric small micro-car, with plans to electrify its entire range in the coming years. The automaker has currently pushed electric models in the light commercial vehicle range, such as the **Berlingo Electric**, the **Citroën ë-Dispatch** and the MPV, the **ë-Spacetourer**. **Opel/Vauxhall:** After launching the electric **Corsa-e** last year, Opel/Vauxhall has this year unveiled an all-electric version of the 2021 **Mokka X** SUV, and an electric van. The OEM will release an electric **Astra** by 2023, with more electric models across PSA's EV platforms.
	DS: The premium DS line has launched the DS **3 Crossback E-Tense** as well as a plug-in variant of the model, but from 2023 the brand will also use the new eVMP platform for future electric models.
Renault Nissan Mitsubishi Alliance	**Renault:** With its **Zoe** electric car at the top of the rankings in Europe so far this year, the automaker has plans to launch an electric SUV in 2021 based on the **Morphoz concept**. The new electric SUV is expected to be based on the CMF-EV architecture, which underpins the Nissan Ariya electric SUV. Meanwhile the **Kadjar SUV** is expected to be offered with an electrified powertrain option, when the second generation is launched later this year.
	Nissan: The **Ariya** electric crossover SUV will begin sales in 2021 but may not come to Europe until 2022, and follows the previous mass electric model, the Nissan **Leaf**. The Ariya is the first model to use the new CMF-EV platform. After the electric Ariya, the Japanese automaker is allegedly planning a larger all electric SUV, in the D-Segment. Nissan also offers the electric **e-NV200** option on its van.
	Mitsubishi: Following a negative profit forecast Mitsubishi is withdrawing from Europe and will phase out shipments of its popular **Outlander PHEV** as stocks are depleted.

Geely Group	**Volvo**: A new pure electric version of the Volvo XC40, the **XC40 Recharge P8**, will be launched in 2021. This will be the first of five pure electric models expected from the Swedish brand and the electrification of its entire range.
	Polestar: The **Polestar 2** electric sedan will initially be sold in Sweden, Norway, Germany, UK, Netherlands and Belgium followed later by Switzerland and the US. The first delivery to a European customer was made this summer in Gothenburg, Sweden. Global production of the model is in Luqiao (China) and started in March 2020. The **Polestar 3**, an electric SUV will debut in 2022, and will be followed by the **Polestar 4**, which is expected to be a four door GT. The models are based on the Volvo SPA platform.
	LEVC: The London Electric Vehicle Company (LEVC) builds the electric **TX** model at its plant in Coventry in the UK alongside the new electric **VN5** van. By 2022 LEVC aims for 60% of production to be exported. The plant currently has annual production capacity for 20,000 units.
FCA	**Fiat:** Fiat has launched sales of the **500 La Prima** electric variant with the all-electric **500e** to launch sales later in 2020. The **500C**, the convertible variant will also be offered in 2021 as a full electric model. The **Panda** electric model is set to arrive in 2022 and is expected to be the production version of the **Centoventi concept**.
	Jeep: FCA will launch electric Jeep models under the new **4Xe**, with all Jeep models to offer electrified variants by 2022.
Tesla	Tesla says it is on track to begin production in July 2021 at its giga-factory currently under construction in Brandenburg, outside Berlin, Germany. The plant will initially produce the **Model Y**, an all-electric luxury compact SUV.

Source: OEM Websites, ECG Business Intelligence

Figure 4.1 Snapshot of Major OEM ECV Model Launches 2020-2021



Source: OEM Websites, ECG Business Intelligence

4.2 EV production and supply chain overview

ECG Business Intelligence forecasts that ECV market share in Europe will grow from 6.2% of the light vehicle market in 2020 to 12.18% of the market in 2025, or a rise from around 739,000 ECVs per year to 1.87m by the middle of the decade. Supply chain strategy will play a key role in EV and PHEV growth in Europe, including where manufacturers build and source vehicles, and how they manage vehicle supply and distribution.

Our analysis points to a significant increase in EV and PHEV production in Europe, led by the Volkswagen Group, as well as European brands including Mercedes-Benz, Renault, PSA Group and Volvo. Tesla is the most significant non-European brand to invest in a regional supply chain for EV production.

These market shifts will have impacts for supply chain and logistics, including outbound vehicle distribution. Many ECV flows will be integrated with those of traditional ICEs, although a number of regulatory, capacity and handling processes will need to be considered (see next chapter).

As ECV production increases, many OEMs are consolidating EV production across fewer platforms co-located across regions, notably Europe, China and North America. Other brands are also aiming to serve more demand locally to reduce lead times. Tesla has currently exported almost of all its vehicles to Europe from the US (using a small facility in the Netherlands for assembly only), while its new plant in Germany will have significant battery and vehicle capacity.

However, the benefit of economies of scale especially in battery production mean that OEMs will maximise plant assets wherever possible. We expect more OEMs to strengthen vehicle homologation standards at plants to supply models globally, or in some cases to supplement European production where needed.

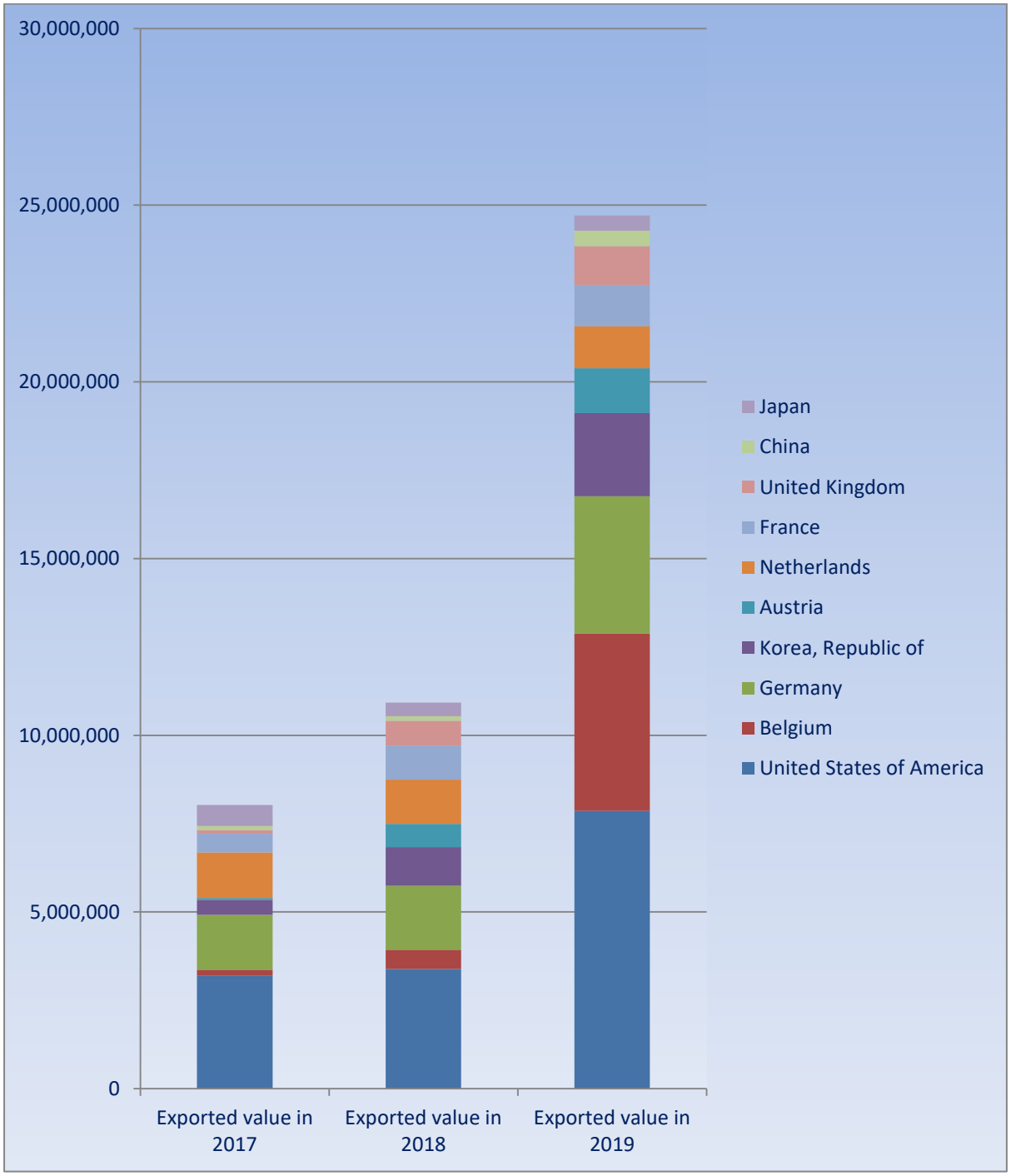
For example, while Hyundai is building the electric Kona in the Czech Republic as well as South Korea, its sister brand Kia has so far not confirmed plans to produce EVs at its plant in Slovakia and will continue to import models from Korea (it has recently launched PHEV models at its European plant).

Nissan, one of the first OEMs to build EVs in Europe with the Leaf in the UK, will import its new Ariya from Japan. Japanese brands such as Honda, Mazda and Mitsubishi (until its planned exit from the European market) will continue to import EVs from Asia. And while Ford plans to produce vehicles based on VW's MEB architecture in Europe, it has imported EVs including the Mustang Mach-e from Mexico, and the electric Ford Ka from India.

Just as EV sales are now growing faster in large European markets, production and exports of EVs are also set to rise. Before 2020, production of key models had driven export flows and value, with relatively niche production locations like Belgium and Austria relatively high

in the rankings. While those regions should still see growth – Belgium, for example, will see Volvo Cars add new ECV models at its Ghent plant – the next phase will start to see a large increase in exports from Germany, France and China.

Figure 4.2 Top EV Exporting Countries—2017-2019 (US$ 1,000s)



Source: ITC, ECG Business Intelligence

China is not only the world's largest market and production centre for EVs, but its emissions targets and standards are more closely aligned to Europe. Some European brands are already set to use Chinese capacity for Europe, such as BMW and Smart, along with a host of Chinese startups. And the scale of capacity that OEMs like Volkswagen Group, Daimler and

Tesla are building up for EVs across their Chinese joint ventures and plants could also lead to more use of global capacity.

However, global exports of EVs from Europe look set to rise. Despite facing ramp up problems and later battery supply issues earlier this year, Audi is increasing e-tron production in Belgium as well as in Germany. Volkswagen's ID.3 and ID.4 production, along with further Audi electric SUVs, are also likely to drive global exports.

Premium brands like Porsche, Mercedes-Benz and Jaguar Land Rover, meanwhile, will continue to ship globally from Europe as they expand their EV and PHEV range. Tesla's factory will eventually have capacity to build 500,000 EVs per year and is likely to also serve as an export centre.

4.3 Electric OEM in focus: Volkswagen Group

The Volkswagen Group has become Europe's largest investor in electric vehicle models and production capacity. The Volkswagen brand alone has said that it expects to produce 1m electric vehicles globally by 2023 and 1.5m by 2025. By 2029, the Volkswagen Group expects to launch 75 fully electric vehicles as well as 60 PHEVs. Most Volkswagen Group brands will produce regionally for different markets, however this expansion in EV output will also drive supply chain and vehicle flows across regions, especially for premium brands like Audi and Porsche.

In Europe, Volkswagen's main EV production hub has become Zwickau in Germany, which will have an annual capacity to produce 330,000 units per annum following an investment of €1.2 billion. The ID.3, a pure electric hatchback, began production in October 2019. Following software issues, deliveries begin to customers this autumn. The ID.4 has also begun series production at Zwickau with the official world premiere set for September with deliveries expected at the end of the year or early 2021.

From 2021, six electric models of three group brands, VW, Audi and Seat, will be produced at Zwickau using the group's MEB platform, according to the automaker.

Volkswagen's plant in Emden, in northern Germany, is currently being fitted with a new assembly hall purely for electric vehicle production, slated to commence output in 2021. The Emden plant's location next to the port of Emden, Europe's third largest port for vehicle shipments, makes it a strategic location for European and global vehicle exports (handling most exports from Volkswagen Group's German plants). The Emden plant is also expected to produce other ID. models, including a small EV from mid-2022 with sales commencing in 2023, though full details are not yet available. Emden already produces the electric Passat GTE in addition to various ICE models. VW will also produce the ID.3 in Dresden starting early 2021 after production ends of the e-Golf.

Audi's production of the e-tron in Brussels, Belgium, which reached 43,000 units in 2019, has already made Belgium the third largest exporter of electric vehicles by dollar value

behind the US and Germany. It added the e-tron Sportback this year at the plant, and will later this year produce the Audi e-tron GT in Böllinger Höfe, an extension of Audi's plant in Neckarsulm, Germany, in the same hall where the R8 is produced, lending to rumours that the next generation of the R8 will be electrified and launched in 2022. Audi has also confirmed that the production model of Q4 e-tron concept will be built in Zwickau.

VW is also refurbishing its light commercial vehicle plant in Hannover, and will produce the all-electric minivan, the ID.Buzz, in 2022.

The new Skoda electric Enyaq iV SUV, which was unveiled in September, will be built at the plant in Mlada Boleslav, Czech Republic and is also based on the MEB architecture.

Porsche has invested around €700m to build a new factory for the production of electric Porsche models in Zuffenhausen. The plant began production in September 2019 of the Porsche Taycan and in 2021 will be joined by the Porsche Taycan Cross Turismo. The automaker originally planned for 20,000 unit per annum capacity at the new Zuffenhausen EV plant.

This expansion and transformation of VW's European production network will lead to new dimensions for its logistics and delivery network. Production of the MEB models is expected to be substantially less expensive than existing EV models such as the e-Golf, while logistics providers are now likely to handle a higher volume of EV models across transport modes.

Using the MEB platform, the VW group also aims to make mass production of EVs possible globally, building the platform in Europe, China and later also the US.

In China, for example, Volkswagen is building electric vehicle models across its SAIC-VW and FAW-VW joint ventures. The German automaker has capacity to produce 300,000 vehicles at its Anting plant, 30km outside Shanghai, where production of the ID.4 commenced in August. The automaker also has 300,000 vehicle per annum capacity at its electric vehicle plant in Foshan under the FAW-VW joint venture.

Audi is also expected to produce the Audi e-tron electric SUV at another FAW-VW JV plant in Changchun, in northern China, with the e-tron Sportback expected to be built in Foshan.

Volkswagen has invested further in Chinese vehicle brands. This year, it took a 50% stake in Anhui Jianghuai Automobile Company, the parent company of OEM JAC. VW also increased its stake in its JV with JAC to 75%. The VW-JAC JV, which produces vehicles under the SOL brand, currently produces the E20X, an all-electric SUV crossover. The plant in Anhui will be scaled up to produce 250,000 units per annum as soon as 2023 when two models on the MEB platform are expected to be launched, and five models by 2025.

Although Volkswagen has not revealed plans to export EVs from its JVs in China to Europe, the carmaker's growing capacity in the country could help support meeting global demand.

VW will also produce electric vehicles at its Chattanooga site in the USA, beginning in 2022 with the first model an SUV, expected to be the ID.4.

Globally, the group will have eight plants producing models based on the MEB platform by 2022, with 27 MEB-based models by 2025. The scale and scope of this production network will drive considerable component and vehicle trade across the carmaker's supply chain.

Table 4.2 Snapshot of VW Group ECV Production

PLANT	SOP	Model
Zwickau (Germany)	2019 2020	VW ID.3 ID.4 Audi Q4 e-tron SEAT el-Born
Wolfsburg (Germany	2014 2021	VW e-Golf Golf GTE PHEV Seat Tarraco PHEV
Dresden (Germany)	2014 2021	VW e-Golf ID.3
Hannover (Germany)	2022	VW ID. Buzz
Emden (Germany)	2015 2022	VW Passat GTE PHEV Small ID.
Neckarsulm/Bollinger Höfe (Germany)	2019 2020 2022	Audi A6 PHEV A7 Sportback PHEV A8 PHEV e-tron GT R8 electric
Stuttgart-Zuffenhausen (Germany)	2019 2021	Porsche Taycan Taycan Cross Turismo
Bratislava (Slovakia)	2019	SEAT Mii, VW e-Up!
Mlada Boleslav (Czech Republic)	2020	Skoda Enyaq iV
Brussels (Belgium)	2018 2020	Audi e-tron e-tron Sportback
Martorell, Spain	2020 2021	Seat Leon PHEV Cupra PHEV Cupra Formentor PHEV
Chattanooga (USA)	2022	VW ID.4
Anhui (China)	2023	VW ID (small version)
Anting (China)	2020	VW ID.4 (China version)
Foshan (China)	2020	VW ID Audi Q2L e-tron VW ID.Roomzz

Source: VW Group, ECG Business Intelligence

4.4 Electric OEM in Focus: Renault Nissan Mitsubishi Alliance

The brands across the Alliance have each had some degree of success in EV and PHEV models, although much of this has been separate until recently. For example, Renault and Nissan independently developed and produced the Zoe and Leaf EVs, respectively, while the Mitsubishi Outlander PHEV has been a key seller in the plug-in segment in Europe.

With each brand struggling financially, the carmakers are working more closely together, with further integration across the supply chain. For example, Renault and Nissan jointly developed a new dedicated electric vehicle architecture, the CMF-EV, which will underpin a range of fully electric SUVs and crossover SUVs, including the forthcoming Nissan Ariya, which will be imported to Europe from Japan by late 2021. Renault models including a production version of the Morphoz will also be built on the platform in Europe.

According to the companies, the CMF-EV will reduce production, battery and supply chain costs by around 30% compared to previous platforms.

Mitsubishi, meanwhile, will withdraw from the European market. Its Outlander PHEV has been popular and was still the fourth best-selling ECV in Europe in the first half of 2020, although sales of the model had declined by 26% in the period year-on-year. The carmaker will sell remaining stocks of the model and others until they no longer meet emission requirements in Europe. Nissan has said that it plans to use Mitsubishi's PHEV technology. Renault especially is set to expand EV and PHEV production in Europe, although there are questions over whether it may shutter or consolidate production at some plants to battle under-capacity utilisation. It builds the best-selling Zoe in Flins, France, northwest of Paris, though reports earlier this year suggested that vehicle production there could be phased out. Nevertheless, from 2021 its plant in Douai, in northern France, will also start producing an all-electric SUV based on the CMF-EV platform. The model, internally called the BCB, is based on the Morphoz concept. An electric variant of the Kadjar is also expected to be produced at the Douai plant from 2022.

Renault's plant in Maubeuge, France, meanwhile, currently builds the Kangoo ZE electric vehicles, and there are reports that it could build the Nissan eNV200 van after the Japanese carmaker sells or closes its plant in Barcelona, Spain.

Meanwhile, Renault has this year also launched PHEV variants of the new Clio E-Tech Hybrid, the Captur E-Tech Hybrid, the Megane E-Tech Hybrid and the Twingo ZE. Renault will produce the E-Tech engines in Turkey at its engine and vehicle production facility in Bursa, where it is also building the Clio E-Tech along with Renault's plant in Slovenia.

Although Renault is mainly focused on Europe, it has expanded aspects of its global network for EV production. The small two-seater Renault Twizy began life in Valladolid, Spain but was moved to Busan in South Korea, where it is built by Renault Samsung. Production began in September 2019, with annual capacity of 5,000 units aimed at the local Korean and global markets.

The carmaker had also produced the City K-ZE electric car in China under the eGT New Energy Automotive Company, a joint venture with Chinese partner Dongfeng Motor Group, and there had been reports that Renault would also ship the K-ZE to Europe from China. However, Renault pulled out of the JV in April after disappointing sales.

Nissan, while one of the pioneers in moderns EVs with the launch of the Leaf a decade ago, is set to see its production footprint shrink in Europe, with its growth in EV output somewhat uncertain. The carmaker has announced that it will end production at its plant in Barcelona, which includes the eNV200. It still builds the Leaf at its Sunderland plant in the UK but will import the new Ariya from Japan. Meanwhile, a plug-in version of the Qashqai compact SUV built in Sunderland was scheduled to launch later this year but is now reportedly delayed until 2021.

Table 4.3 Snapshot of RNM Alliance ECV Production

PLANT	SOP	Model
Flins (France)	2012	Renault Zoe
Douai (France)	2021 2022	Renault CMF-EV model Renault Kadjar E
Batilly (France)	2020	Renault Master ZE
Maubeuge (France)	2020	Renault Kangoo ZE
Novo Mesto (Slovenia)	2016 2019	Smart for four Renault Clio E-Tech PHEV
Valladolid (Spain)	2011 2020	Renault Twizy Renault Captur PHEV
Mioveni (Romania)	2020	Dacia Spring
Bursa (Turkey)	2019	Renault Clio E-Tech PHEV
Sunderland (UK)	2011	Nissan Leaf
Barcelona (Spain)*	2014	Nissan e-NV200
Busan (S. Korea)	2019	Renault Twizy
Yokohama (Japan)	2021	Nissan Ariya
Shiyan (China)**	2019	Renault City K-ZE

* Nissan will close or sell plant by 2021 , ** Renault pulled out of China JV in April 2020

Source: RNM Alliance, ECG Business Intelligence

4.5 Electric OEM In Focus: BMW Group

BMW has maintained a highly flexible production and supply chain strategy for electrification. It was also an early mover in electric vehicle and plug-in hybrid production with the i3 EV and i8 PHEV at its plant in Leipzig, Germany. BMW continues to adjust its European plants to produce models across multiple powertrains, including petrol, diesel, hybrids and electric, in some cases on the same assembly line.

It is, however, now also ramping up plans for electric vehicle output. By the end of 2021, BMW Group will offer more all-electric vehicles including the Mini Cooper SE, the BMW ix3, the BMW iNext and the BMW i4 (the current i3 will not be replaced). Meanwhile, BMW is now offering PHEV versions of the 5- and 7-series and will also rollout pure battery electric options. By 2023 BMW Group aims to have 25 electrified models of which half will be all-electric vehicles.

After adding PHEV variants across its German plants, it will start production of the electric iNext in Dingolfing and the electric i4 in Munich, Germany, plants that will both produce vehicles across all powertrain types. An electric Mini is already built in the UK (though with electric components and drivetrains built in Germany).

More than almost any other European brand, BMW has leveraged its global production network to serve European demand for both PHEV and EV models. The first PHEV version of a major BMW vehicle was the X5 SUV in 2015, built in Spartanburg, South Carolina and exported to Europe. It 2019, the plant launched a new version of the X5 PHEV and also started output of a X3 PHEV at the plant.

The carmaker is now also making use of its large footprint in China. BMW begun production this year of the ix3 at its BBA joint venture in Shenyang, which will be the global production base for the new all electric SUV, including exports to Europe. The first deliveries are expected to arrive in Europe from China by the end of 2020.

The BMW JV will produce all electric variants of the 3-Series and 7-Series sedans, as well as 2 SUVs – leaving the potential that it could further use Chinese capacity for other models.

China is also set to be a global production centre for the Mini brand. While the UK plant is assembling the electric Mini Cooper SE, BMW has established a new joint venture with China's Great Wall that will be called Spotlight Automotive, with plans to develop and build future Mini models to supplement production in the UK and at a contract manufacturing plant in the Netherlands. Two SUVs will be built for the global market under the JV, including an ICE and an electric SUV.

The JV is currently building a plant in Jiangsu Province, west of Shanghai along the Yangtze River, which will have capacity for 160,000 units per year of electric Mini and other Great Wall models; production is expected to start in 2022.

Table 4.4 Snapshot of BMW ECV Production

PLANT	SOP	Model
Munich (Germany)	2018 2021	BMW 3 Series PHEV i4
Dingolfing (Germany)	2020 2021 2022	BMW 5 Series PHEV 7 Series PHEV iNext, 7 Series E
Leipzig (Germany)	2013 2015	BMW i3* 2 Series PHEV
Graz (Austria) *Contract*	2017	BMW 5 Series PHEV
Born (Netherlands) *Contract*	2016	Mini Countryman PHEV
Oxford (UK)	2020	Mini Cooper SE
Spartanburg, SC (USA)	2015 2019	BMW X5 PHEV X3 PHEV
Zhangjiagang (China)	2022	Mini EV models Great Wall models
Shenyang (China)	2020	BMW ix3

*i3 will not be renewed; i8 PHEV production ended in June 2020

Source: BMW, ECG Business Intelligence

Table 4.5 Overview of OEM ECV production plans for Europe

OEM	Plants	Models
Daimler	Sindelfingen, Germany	PHEV variants of Mercedes S-Class, E-Class, EQ range (forthcoming)
	Bremen, Germany	Mercedes C-Class PHEV, EQC
	Rastatt, Germany	Mercedes EQ range (forthcoming)
	Hambach, France*	Smart, Mercedes EQ range
FCA	Mirafiori, Turin, Italy	Fiat 500e, Maserati GranTurismo EV, GranCabrio (2021)
	Melfi, Italy	Jeep Renegade PHEV
Ford	Valencia, Spain	Ford Kuga PHEV
	Kocaeli, Turkey	Ford Transit Custom PHEV
	European factories	Ford-based on VW MEB (2023)
Hyundai-Kia	Novosice, Czech Republic	Hyundai Kona
	Zilina, Slovakia	Kia Xceed PHEV, Kia Ceed PHEV
Jaguar Land Rover (JLR)	Magna Steyr in Graz, Austria	Jaguar I Pace
	Castle Bromwich, Birmingham, UK	Jaguar XJ
	Solihull, UK	Land Rover, PHEV variants of Range Rover, Range Rover Sport, Range Rover Evoque, Discovery Sport
	Nitra, Slovakia	Land Rover Defender PHEV
PSA	Trnava, Slovakia	Peugeot e-208
	Vigo, Spain	Peugeot e-2008
	Mullhouse, France	Peugeot 508 PHEV, DS7 Crossback PHEV
	Poissy, France	DS3 Crossback E-Tense, Opel/Vauxhall Mokka X PHEV and EV, Citroën E-Mehari
	Rennes-la-Jannais, France	Citroën E-Mehari, Citroën C5 Aircross
	Eisenach, Germany	Opel/Vauxhall Crossland X PHEV
	Zaragoza, Spain	Opel/Vauxhall e-Corsa
Tesla	Tilburg, Netherlands (final assembly only)	Model S, Model X
	Grunheide, Berlin, Germany	Model Y (2021)
Volvo	Torslanda, Gothenburg, Sweden	PHEV variants of V60, V90, XC60, XC90
	Ghent, Belgium	XC40 PHEV, XC40 EV

*Daimler is in discussions to sell the plant

Source: Company websites, ECG Business Intelligence

4.6 China as a growing export centre for Europe

China, the world's largest market for electric vehicle sales and production, still remains a small exporter of electric vehicles and plug-in hybrids. In 2019, it ranked as the 11th global exporter of ECVs by dollar value, for example, just ahead of Slovakia. Chinese EV shipments are set to grow, however, with Europe one of the key market targets. And with US-China trade increasingly politically sensitive and difficult, more OEMs in China are also focusing on serving Europe sooner than entering the American market.

Some European OEMs are set to use China as an export centre for key EVs, for example, notably BMW and Mini. Smart will also see future EV models built and exported from China. Polestar, jointly owned by Volvo Cars and Geely, started shipments of its Polestar 2 EV this summer to Europe from China. Another Volvo and Geely JV in China, Lynk & Co, is also planning to export vehicles to Europe after cancelling earlier plans to build a model at Volvo's plant in Ghent, Belgium.

Table 4.6 European OEMs Using China Production To Serve Europe

BMW	BMW will begin sales in Europe of the **BMW ix3** this autumn, an SUV built in China by BMW's joint venture with **Brilliance Automotive**. This is the first pure electric model that the Munich-based automaker is bringing to Europe from its plant in Shenyang in China. Deliveries are expected by year end. BMW will also use its new production base with its joint venture in Tiexi, China to build 150,000 EVs a year.
Mini	**Spotlight Automotive** is a joint venture between **BMW** and Chinese automaker **Great Wall Motor.** The JV will produce electric vehicles and ICE vehicles under the **Mini** brand for sale predominantly in China, but BMW has also said it would supplement UK production with global exports.
Smart	**Mercedes-Benz** and Chinese automaker **Geely** have this year established a global joint venture for the production and sale of **Smart** brand electric vehicles for Chinese and global exports.

Source: OEM press releases, ECG Business Intelligence

Other Chinese brands are also aiming to break into Europe as its electric vehicle market rises, with some seeing modest success. MG, owned by SAIC, has seen sales rise in the UK, and has also expanded in other European markets such as Norway, France and Italy. Other Chinese brands with plans to export EVs from China to Europe include Nio, Aiways and JAC (whose owner Volkswagen now owns 50%).

Table 4.7 Chinese ECV Start-Ups Planning to Sell Into Europe

AIWAYS	This start-up was formed in 2017 and recently began exports of its Aiways U5, all electric SUV, with deliveries recently arriving at the port of Bremerhaven, Germany. After starting sales in Germany this year, Aiways plans to sell in France, Norway, Switzerland and the Netherlands.
WM Motor	Weltmeister (WM) is the brainchild of veteran automotive executive Freeman Shen. The emerging electric vehicle company was formed in 2015 and currently has two EVs on sale, the EX5-Z and the EX6. In 2019 the automaker formed an alliance with Thai conglomerate PTT Plc for the production of WM models in Thailand and for exports.
XIAOPENG	Founded in 2014, Xiaopeng, or Xpeng, is backed by Chinese ecommerce giant Alibaba, as well as Foxconn and IDG Industries. It has raised substantial funding and has global export ambitions. Xpeng already has a US-based subsidiary in California, where it holds a permit for testing autonomous driving technology. The automaker currently builds two models, an electric SUV, the G3 and an electric sedan, the P7. So far, its vehicles have only been privately exported to European markets.
NIO	Nio, whose Chinese name is Weilai, means Blue Sky Coming, has continued to raise substantial funds. Nio currently sells three models, the ES8 and ES6 electric SUVs with the third, the EC6 coupe SUV launched in February 2020. Nio aims to enter Europe in 2021. It already has operations in Europe, including a design centre in Munich, while its London team is responsible for the NIO Formula E program.
NEVS	Formed in 2012 from the remnants of Swedish OEM Saab, the **New Energy Vehicle Sweden (NEVS)** was registered in Sweden by Chinese owner Kai Johan Jiang. The start-up builds an electric car based on the Saab 9.3 platform, the 9.3 EV, at a plant in Tianjin. In May 2020 a fleet of NEVS 9-3 EVs were imported into Walhamn Port for testing approval in Sweden. NEVS also employs 800 engineers at Saab's former Swedish plant in Trollhatten.

Source: ECG Business Intelligence, Company Websites

5. Overcoming Finished Vehicle Logistics Barriers For ECVs

5.1 Certification, charging and carrying challenges

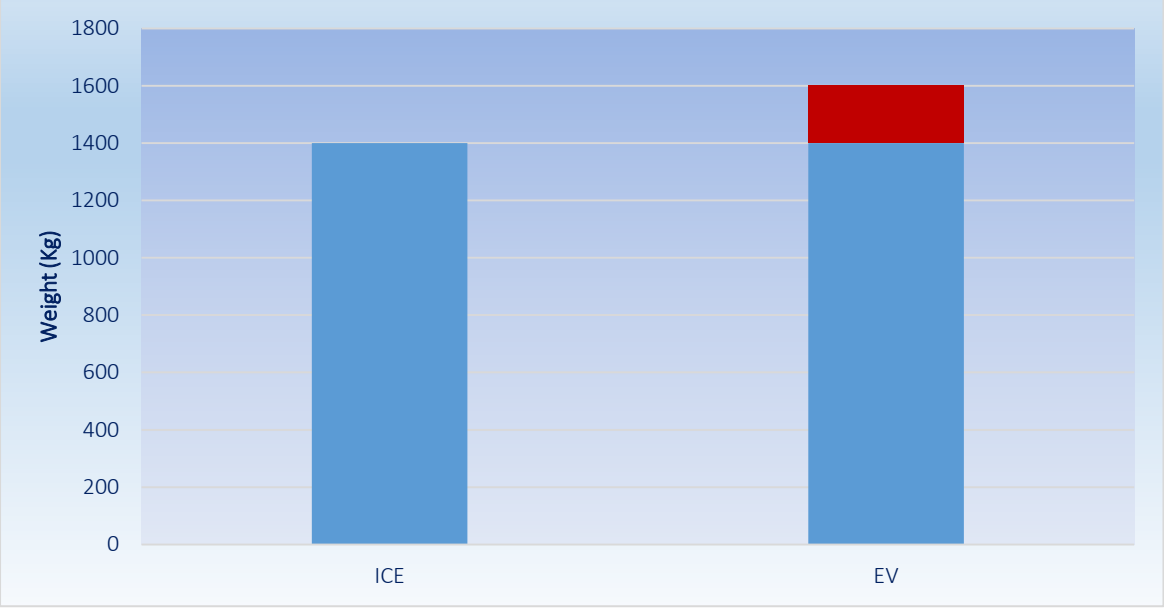
The rise in EV and PHEV sales, production and trade for the European market means that OEMs and their suppliers must also contend with a number of bottlenecks and hurdles. But this growth creates opportunities for finished vehicle logistics service providers in serving new and established markets, as well as potentially creating new services to OEMs and retailers.

The challenges for shipping electric vehicles come down largely to what we call the 'three Cs': certification, carrying and charging.

Certification is in some ways the most complex. In comparison to transporting lithium-ion cells, components and batteries, electric finished vehicle logistics do not face as many restrictions in legislation. In most cases, while requiring specific declarations, electric vehicles are not considered the same class of dangerous goods as battery components. It is therefore less of an issue what transport mode or in what condition vehicles are stored.

Vehicle logistics specialists face other challenges when it comes to carrying vehicles, however. Large batteries mean that EVs (and to a lesser extent, PHEVs) are heavier than ICEs and can lead to reduced loading capacity in road transport. According to our research, the average weight of the top-selling EVs is around 1,600 kg compared to 1,400 kg for the weight of the most popular ICE vehicles. As PHEVs have smaller batteries than EVs, the weight difference to ICEs is less notable.

Figure 5.1 Average vehicle weight: top-selling ICE vs EVs in 2019 (Kg)



Source: Automotive by Ultima

Logistics providers are also usually responsible for charging vehicles within the delivery chain, often to higher states of charge ahead of final handover than when they left the

factory. Increasingly, logistics specialists are therefore adding charging infrastructure across distribution facilities.

There are a number of other standards, processes and training required as well to handle EVs and deal with battery maintenance. Each of these challenges is generally manageable for OEMs and their providers. However, with volumes of EVs set to rise, and with inventory and products in some categories facing shortages, it will be important that logistics and delivery issues don't block the path to further growth. Logistics providers therefore need to stay on top of changes – as well as look for opportunities for new services.

5.2 Defining Dangerous Goods (DG) for ECVs by transport mode

The 'hidden issues' in the overall electric vehicle supply chains are often related to the fact that lithium is considered a 'dangerous good' and is subject to special classification according to the United Nations Economic and Social Council's UN Recommendations on the Transport of Dangerous Goods (DG).

Table 5.1: UN Dangerous Goods (DG) Classification

UN Class 1: Explosives in solid or liquid form
UN Class 2: Flammable and non-flammable gases
UN Class 3: Flammable liquids
UN Class 4: Flammable solids
UN Class 5: Oxidizers and organic peroxides
UN Class 6: Toxic and infectious substances
UN Class 7: Radioactive material
UN Class 8: Corrosive substances
UN Class 9: Miscellaneous dangerous substances

Source: ADR, UN

Finished vehicle logistics providers need to follow the legislation for the transport of DGs as laid down by the UN definitions, and in addition providers need to comply with legislation from bodies that manage the transport of goods via road (ADR), sea (IMO), rail and air (ICAO).

All 'hazardous materials' are designated a four-digit UN number, with the initial number the code for the type of DG. Lithium is considered within Class **3**. The code for EVs containing lithium batteries is **UN 3171** while the code for PHEVs containing both an internal combustion engine and lithium batteries is **UN 3166**.

Despite coming under hazardous goods categories, in most instances transporting electric vehicles in Europe is a matter of providing the right documents. Businesses that transport DGs on a regular basis must appoint a Dangerous Goods Safety Advisor (DGSA), whose role includes advising on the potential security and safety aspects of goods transport and adhering to the right regulations and paperwork depending on origin and delivery country. Regulation for moving dangerous goods in Europe is under the European Agreement

concerning the International Carriage of Dangerous Goods (ADR), which requires declarations for carrying hazardous goods. Following an amendment to the ADR in 2017 (known as special provision 666), EV and PHEV vehicles moved by road are generally not subjected to the ADR provisions, and so the transport document is not required except under specific circumstances.

However, moving vehicles by other transport modes does typically require specific declarations for Class 9 products. In the UK, for example, the Department for Transport requires that electrified vehicles moving by ship or rail require a multimodal dangerous goods form among other documentation. Similarly, in France, a specific form specific to dangerous goods must be filled out for transporting electric vehicles by rail, known as the RID (*Règlement concernant le transport international ferroviaire des marchandises dangereuses*).

Shipping vehicles in ro-ro ships, furthermore, requires a number of procedures and checks to ensure against fire risks. This includes further documentation, as well as a number of checks and diagnostics by shipping lines.

Air transport is the most restricted, as no product containing more than two grams of lithium can be held in the cargo areas of aircraft. Batteries need to be removed and shipped using specific DG protocols for lithium-ion batteries. While air is a highly niche mode for vehicle logistics, it is sometimes used for premium models for certain customers, and more often for vehicle launches and shows, and so the rules can complicate shipping plans.

In the great majority of cases when shipping ECVs in Europe, however, the documents are relatively straightforward and do not hinder transporting EVs by road, sea or rail. An exception to this is China, which is not part of the ADR agreement. China generally still applies restrictions on carrying electric vehicles in containers by rail. This has some implications for goods transported between Europe and China by train, which has seen growth in recent years, including for vehicles. This regulation was expected to change by the end of 2019, but experts at European logistics companies report that it is still not possible to move EVs by rail in China.

These variations suggest why it is imperative that finished logistics providers are up-to-date with the latest regulations for the transport of ECVs. While countries within Europe are likely to follow the same regulations, it is important to clarify regional and global requirements when shipping vehicles.

Table 5.2 Transport Modes Compared Regarding Movement of Lithium-Ion Batteries

Road: The European Agreement regarding the International Carriage of Dangerous Goods by Road (ADR) was created in Geneva on 30 September 1957 under the United National Economic Commission for Europe, and this was further amended and released on 19 April 1985.

In 2017 the ADR legislation was amended for electric vehicles: 'Dangerous goods that they (the vehicles) contain that are necessary for the operation of their equipment are not generally subject to the requirements of ADR, with the exception of lithium batteries which must meet the requirements of 2.2.9.1.7.' Details of the requirements for lithium batteries can be found under the 2.2.9.1.7 classification in the ADR manual.

Sea: Similar laws exist for the transport of dangerous goods for sea shipping issued as outlined by the International Maritime Dangerous Goods Code, which uses the International Maritime Dangerous Goods Code. These do require some extra precautions and monitoring of fire risks, including extra documentation. These regulations, which are amended almost every two years, do not pose significant challenges for transporting finished electric vehicles.

Rail: Rules are set in the Technical Instructions for the Safe Transport of Dangerous Goods by Rail, issued by the Intergovernmental Organization for International Carriage by Rail. While rail services in Europe allow the transport of ECVs with the right documentation, certain other countries – notably China – continue to have legislation in place that does not allow products containing lithium to be transported. In 2019 the Chinese government stated that it would lift the restrictions on the transport of lithium batteries by rail, and this includes products which contain lithium-ion batteries such as ECVs. According to various vehicle logistics providers this restriction was to be lifted by Q4 2019 allowing then for the export of ECVs from China by rail. But with the current Covid-19 situation, it is understood that this lifting has likely been delayed.

Air: Rules are laid out in the Technical Instructions for the Safe Transport of Dangerous Goods by Air, issued by the International Civil Aviation Organization. Current regulations state that no finished products containing lithium ion batteries can be held in the cargo area of aircraft. EVs therefore must be shipped by air without batteries, which must then follow strict guidelines. No products containing over two grams of lithium can be held in the cargo areas of aircraft.

Source: ADR, IMO, ICAO, ECG Business Intelligence

5.3 Charging EVs and PHEVs in the supply chain

The average vehicle charge of an EV is becoming more of an issue for vehicle logistics providers due to the difference between the average charge when the vehicle is collected from the production plant, and the charge the dealer expects when selling a vehicle.

When the EV is collected, its battery is often charged between 30-50%. Batteries are drained partly during final assembly, testing and yard activities, and later again during transport operations. However, handovers to customers typically require vehicles to be charged to at least 80%. Whilst dealers are adding more charging facilities, in many cases logistics providers take responsibility for charge and maintenance of batteries whilst in transport and storage. Logistics operators and vehicle processers are adding more electric vehicle charge points at ports and storage yards, for example.

There are questions as to whether ports and vehicle compounds will have enough chargers to make sure all ECVs are adequately charged as volumes rise. The time it takes to charge vehicles and fleets is also a consideration. A shortage of charging facilities could lead to delays in loading times.

In 2019, the port of Zeebrugge increased charging facilities at its vehicle terminals to handle increased volumes of the Tesla Model 3. The port installed 300 EVBox chargers in a newly prepared 4,000 square metre parking lot adjacent to the dock, which could charge the arriving Model 3 electric cars up to 80% before being forwarded to the dealer for delivery to the customer.

Further issues also remain around training port staff to learn how to safely charge a multitude of different electric vehicles. This is increasingly an issue as many EVs are now capable of much faster rapid charging at 50Kwh or even 100Kw, and this inevitably increases the heat dissipated by cables and the battery itself.

Table 5.3 The three Cs of electric finished vehicle logistics

Certification

Finished vehicle providers are expected to make sure that the ECVs being transported are correctly classified and that the correct documentation is completed. A certified Dangerous Goods Safety Advisor is expected to be part of the logistics team. While the documentation varies depending on the type of transport being used, the following information needs to be provided:

- UN Classification Four Digit Number
- Proper Shipping Number
- Logistics Provider Name
- UN Class and Possible Risk
- Total number of packages or volume of DGs
- UN Packing Group

The DSG also then needs to ascertain the best way to transport the ECVs, complying with the regional regulations and documentation for road, rail, sea or air.

Charging:

Finished vehicle logistics providers must also ensure proper charging of ECVs, notably to ensure customer expectations are met. The battery in an ECV is generally charged up to 50% when the vehicle leaves the production factory. But at handover, customer expectations are that batteries are charged over 80%. This difference now means that logistics providers need to have a facility where vehicles are charged. Providers are thus introducing charging infrastructure at storage yards in ports, compounds and distribution centres. But issues will arise as the volumes of electric vehicles increase, and the lack of abundant charging infrastructure can lead to lengthy wait times.

Carrying:

A further issue for carriers is the extra weight of EVs compared to an ICE vehicle because of their batteries. EU Regulations set a 40-tonne limit for road transporters; carrying electric vehicles can therefore reduce load factors per transporter, requiring extra journeys and capacity compared to ICE vehicles.

Source: ECG Business Intelligence

6. Conclusions: Charging Ahead with Change

6.1 Electric vehicle opportunities for vehicle logistics

The high rate of growth in electric vehicle sales and production in Europe despite the health and economic crisis that the region faces is a strong sign of rapid change in the market. While the end of some incentives and further uncertainty may well temper annual growth rates, our forecast is for the strong shift towards ECVs to continue in Europe. The coronavirus crisis appears to have accelerated this change rather than slow it down.

With increased incentives in the mix, competition is getting fiercer. Extended waiting times for a number of EVs and PHEVs, and potential inventory shortages for some models, will mean that some companies risk missing out on sales growth. And with technology improving and range anxiety abating for some customers, more will be looking for the most competitive offers.

To that end, the supply chain is increasingly a competitive advantage, as OEMs push to ensure they can meet demand as well as get important new products out to market in time. For some OEMs, the extended lockdowns in the spring have led to lingering delays in model changeovers and even battery supply. Those able to deliver product in good time are sure to gain advantages.

While EV and PHEV volumes are still relatively small in comparison to ICE vehicles, the increasing launch of new models and a ramp up of production in Europe will lead to meaningful growth as well as shifts in electric vehicle trade and market patterns. While Norway and the Netherlands are likely to remain strong EV markets relative to their size, major markets such as Germany, France and the UK are set to see the biggest increases.

Likewise, while a few production plants have thus far driven exports of electric vehicles in Europe, such as Audi e-tron output in Belgium, the next phase will see significant shipments from Germany in particular. That will include Volkswagen Group's transformed EV plants in eastern Germany, Tesla's new factory outside Berlin, Mercedes-Benz's EQ range output and more electrified models from BMW. PSA Group and Renault are also set to ramp up EV output in France and Spain.

Trade will remain complex. With Chinese vehicle emissions rules becoming more closely aligned with Europe, the prospect of using China as an export centre is likely. BMW has already begun this with the iX3, whilst shared vehicle platforms across the European and Chinese production networks of Volkswagen Group, Daimler, Tesla and Volvo Cars could see more exchanges in both directions between the regions.

These are significant developments across the European and wider market, and the shifting currents will have implications for vehicle logistics. Transporting EVs and PHEVs presents regulatory hurdles in dangerous goods regulations that require companies to stay updated on changing requirements. Operational issues around load factors, charging infrastructure,

battery handling and training certification are also important for vehicle logistics providers.

Logistics providers also need to be prepared for ongoing changes in sales and market channels. Online vehicle sales are already on the rise, and almost all OEMs sell a higher share of electric vehicles online than other models. Brands such as Volvo are planning to simultaneously increase ECV offerings and online sales options.

Although also not likely to happen overnight, this could ultimately change delivery patterns to include more direct distribution of finished vehicles to customers or to alternative destinations than dealer lots. There could also be scope for more value-added services in both expediting delivery and managing aspects of the customer handover process.

It is also worth noting that the forthcoming European Green Deal will strongly incentivise transport and logistics companies to push freight services, including vehicle logistics, as much as possible away from road and onto sea and rail to reduce emissions. This could lead to further changes to European vehicle logistics networks in the coming years.

Most of these changes will of course be incremental, and many aspects of ECV sales and distribution will be part of existing networks. However, the shift to electric is becoming more inevitable, with EV and PHEV market share set to rise from just over 6% this year to nearly 25% by the end of the decade, with EVs gaining the largest share. But even that rate of change is set to increase further when we look further out. By 2040, we expect EVs to account for 80% of the European new vehicle market, with non-electrified vehicles at less than 5%. Within a few model cycles, the vehicle logistics sector needs to be ready.

7. Glossary

ADR	European Agreement regarding the International Carriage of Dangerous Goods by Road
BEV	Battery Electric Vehicle
BMW	Bayerische Motoren Werke AG
BYD	"Build Your Dreams", one of China's leading EV and battery companies.
CO_2	Carbon Dioxide
DS	Premium Brand of PSA Group, in French it means Different Spirit or Distinctive Series
ECV	Electrically Chargeable Vehicle, which includes battery electric and plug-in hybrid vehicles
EU	European Union
EV	Electric Vehicle
FCA	Fiat Chrysler Automobiles
FVL	Finished Vehicle Logistics
GDP	Gross Domestic Product
H1	First half of the year
H2	Second half of the year
HEV	Hybrid Electric Vehicle
HS	Harmonised System of trade
ICAO	International Civil Aviation Organization
ICE	Internal Combustion Engine
IEA	International Energy Agency
IMO	International Maritime Organization
Kg	Kilograms
LSP	Logistics Service Provider
OECD	Organisation for Economic Co-operation And Development
OEM	Original Equipment Manufacturer
PHEV	Plug-In Hybrid Electric Vehicle
PSA	Peugeot SA Group Comprising Peugeot, Citroen, DS, Opel and Vauxhall Brands
Q1	First Quarter of a year
Q2	Second Quarter of a year
RNM	Renault Nissan Mitsubishi Alliance
RO-RO	Roll-on Roll-Off
SUV	Sports Utility Vehicle
UPA	units per annum

8. Appendix

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