A Tale of Two Metropolises

The Future for EVs in London and Metro Manila

March 2022

Introduction

Exawatt and Verne Energy Solutions have collaborated to produce a white paper in which we will investigate electric vehicle (EV) adoption trends. The aim of the series is to compare the electrification challenges facing two metropolises– one in the developed world and the other in a developing country– and to examine the various enablers that can accelerate EV adoption. We believe that the first movers in the EV transition in Europe, China, and the US will offer useful lessons for decision makers in developing countries, but caution that cities in developing countries may also face very different challenges to adoption that may need unique solutions.

This short paper is split into five chapters. The first chapter will provide an overview of today's EV market and future trends. The second will aim to provide an overview of what we believe are the key building blocks for EV adoption. Chapters three and four are case studies: one focused on EV adoption in a developed metropolis (London), and the other in a developing metropolis (Metro Manila). The final chapter will draw together some high-level conclusions for stakeholders looking to electrify.

CHAPTER 1

Pathways to EV Adoption

Major economies are coming to ambitious new targets to curb climate change emissions, including phasing out the sale of vehicles with internal combustion engines (ICEs). For example, Norway is aiming to completely eliminate ICE sales by 2025; in 2021 approximately 86% of cars sold in Norway were electrified. In the 2020 the UK brought forward its ban of ICE passenger cars from 2040 to 2030. During 2021 over 6.4 million passenger electric vehicles (EVs) were sold globally, about 9% of passenger car sales, representing an increase of 30% year-on-year. Of these, 4.5 million (71% of the EV total) were battery electric vehicles (BEVs)– in other words, fully electrified vehicles– while the remainder were hybrid vehicles that augment internal combustion engines with varying degrees of battery electrification.

Although decarbonisation is a global goal, EV adoption today is strongest in Europe, China and the US, with these regions accounting for 82% of EVs sold in 2021. By contrast, EV ownership is negligible in many parts of the developing world; in the Philippines, for example, less than 1% of cars are electrified in any form. This gap in EV ownership is partly because the vehicle market more generally is comparatively small in developing nations, but also because these countries face greater political and logistical barriers to EV adoption.

In the developed world, Exawatt believes the EV market will soon be dominated by BEVs, and that the hybrid vehicle, in its various forms, will be a relatively short-term transitional technology, for the following reasons:

1. BEVs, in general, provide a superior driving experience relative to their hybrid cousins; they are quieter in operation, simpler and more enjoyable to drive, and in many cases offer higher performance than hybrids (as exemplified by the Tesla Model 3).
2. BEV operating costs are lower than those of hybrid vehicles, in terms of both fuel/electricity costs and maintenance costs.
3. In the longer term, BEV manufacturing costs and selling prices will achieve parity with ICE/hybrid vehicle costs, as battery manufacturing costs fall and powertrain efficiencies improve. Relative to hybrid vehicles, BEVs have the advantage of not requiring both an electric drivetrain and an ICE (and associated systems).
4. BEVs offer a better route for vehicle manufacturers to meet increasingly strict fleet emissions standards where applicable, e.g. in Europe.

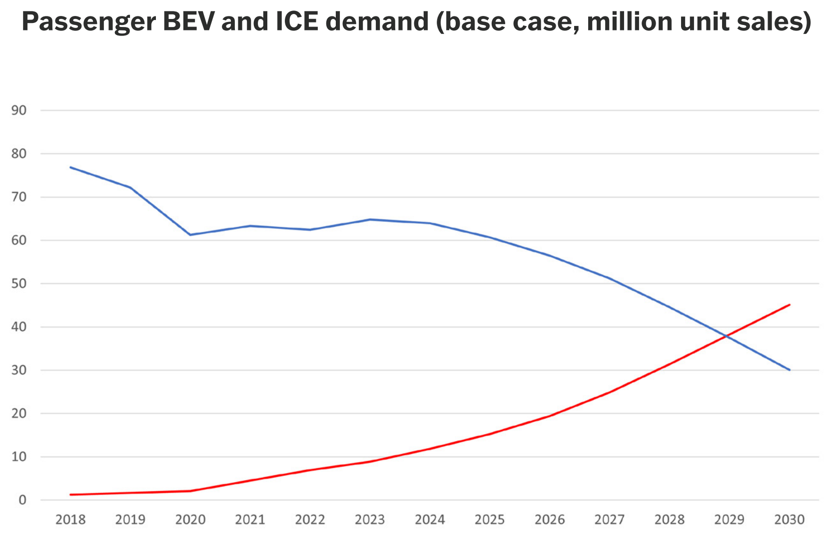


Figure 1.1
Annual ICE demand vs annual demand for passenger BEVs

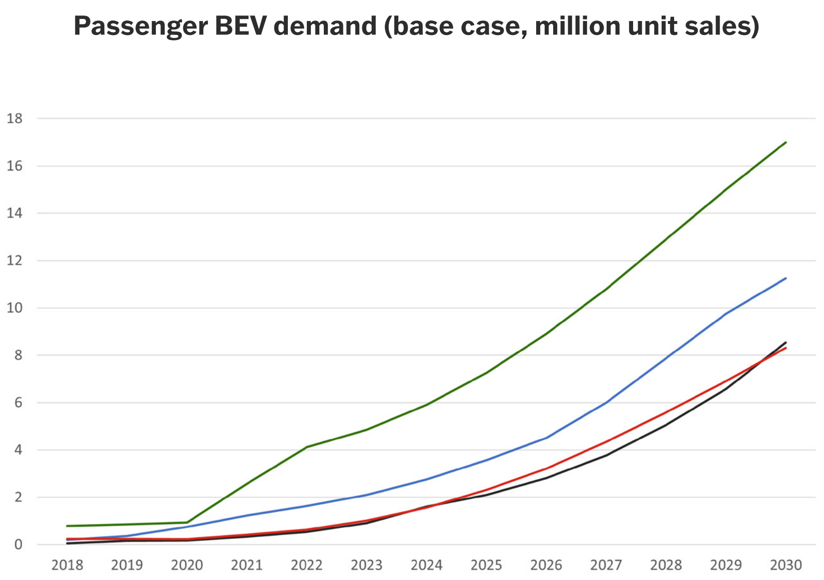


Figure 1.2
Annual passenger BEV demand by region

In the developing world, however, our confidence in the prospects for BEVs is not so strong, as BEVs require significant developments in EV charging and grid infrastructure. While electrifying road transport will improve local air quality, it will only make meaningful inroads into reducing global CO_2 emissions if the EV infrastructure is backed by a sufficiently large, robust and renewable-rich electricity supply.

The graphs show Exawatt's global forecast for passenger BEV demand to 2030, compared with demand for ICE vehicles. Note that we expect to see a sharp decrease in ICE demand toward the end of the 2020s, in line with proposed bans on ICE vehicles. Additionally, we expect BEV sales to grow strongly in China, Europe and the US far ahead of growth in the rest of the world.

In the next chapters, we will discuss in more detail the factors affecting EV adoption in the developed and developing world, and we will examine the particular challenges facing urban vehicle electrification, with a focus on London and Metro Manila.

CHAPTER 2

Critical building blocks for EV adoption

As the world moves towards the electrification of passenger vehicles, it is important to consider the essential factors to achieving broad EV adoption. Aside from the availability of EVs themselves, we have identified the following as some of the essential building blocks: charging infrastructure, grid readiness, regulatory frameworks and financial incentives, and EV expertise. These key factors will be discussed below, and we will explore them in the coming chapters in the context of two different metropolises, Metro Manila and London.

Charging infrastructure

Perhaps the single most critical challenge facing EVs is battery range, and the cost associated with increasing it. Range anxiety makes people want cars with batteries that, for most purposes, are far bigger than they need to be for daily use. The average vehicle in the UK travels 6,800 miles annually.

BEVs today are too expensive. Why? Because their batteries are expensive– because they are too big. And lithium prices are increasing as supply of lithium struggles to keep up with rising demand for BEV production. This is important in the western world because of the supply/demand balance– there just isn't enough lithium coming through the supply chain in the mid-2020s for everyone to have a BEV with a big battery. But it is critical in developing countries and urban areas such as Metro Manila, where high battery costs will mean that cars with large batteries are, and will remain, prohibitively expensive for all but a few buyers.

At home, low-speed chargers on the user's premises, or nearby, are generally acceptable for overnight charging (these are sometimes referred to as "Mode 2" chargers). From an infrastructure perspective, Mode 2 chargers are free. They simply plug into a standard AC power outlet and typically charge at up to 2.4kW– in other words, enough power to fully charge a 40kWh Nissan Leaf in 17 hours. So-called "Mode 3" chargers provide a charging speed upgrade– usually ranging from 3.6kW to 22kW, and typically in the 7kW range. These chargers require modest infrastructure upgrades, in the form of a small wall-mounted charging unit, and are generally used in residential and small business environments. At 7kW, that same 40kWh Leaf could be fully charged in about 6 hours, making this kind of charger well-suited to commuters who can charge up at the office during their working day.

But on the road, for those occasional long trips, rapid chargers will be critical to enable cars with small battery packs to be driven anxiety-free. So-called "Mode 4" chargers (higher-powered charging stations) generally take the form of larger cabinets with thick charging cables that enable higher charging speeds. Typically, rapid charger powers start in the 40kW range, but Mode 4 charging stations can go up to 350kW.

When it comes to reducing battery sizes and decreasing EV costs, it is the volume and distribution of these rapid chargers that we believe will make the most difference. On a long journey, that driver of the 40kWh Leaf needs to know that if they have 20 miles left in the battery, they can stop and charge at a moment's notice, and for a short time. Having more chargers of different types distributed evenly will form the basis of a good charging infrastructure.

Grid readiness

The main challenge the grid faces is meeting electricity demand. While many people think the greatest challenge is at a national level, in reality it tends to be more pronounced on a local level where EVs can overload parts of the local grid.

In the UK, overall demand for electricity has fallen slightly over the past two decades, due to a combination of increases in energy efficiency and a decline in the relative importance of energy-intensive industries. Demand for electricity peaked in 2002, and has since fallen by about 16%; the UK National Grid estimates that even if the nation were to switch entirely to EVs, overall electricity demand would only grow by about 10%. And with renewable energy sources providing an ever-increasing proportion of the UK's electricity supply (43% in 2020), the stage is set at national level for widespread growth of EVs.

The versatility and robustness of grid infrastructure at local level will determine how well the grid can cope with local demand fluctuations. However, not all parts of the world benefit from the same infrastructure quality. While the UK is likely to be better equipped to deal with fluctuations in the grid, developing areas like Manila lack critical grid resources. This can make life much harder for EV owners, as they may plug in their car in hopes of an overnight charge, only to encounter a power cut. This lack of "charging security" can be frustrating and is an impediment to EV purchase and use.

Vehicle to X (V2X) technology is one solution to keeping the grid balanced when there are unpredictable fluctuations. V2X technology would allow idle vehicles to return energy to the grid (or to another destination such as a car or home) when needed. This "power-sharing" approach provides local resilience, allowing the mass of idle vehicles to act in effect as a large distributed battery, and may help to reduce the incidence of power cuts. The average vehicle in the UK spends 95% of its time sitting idle.

In addition to V2X technology, regulating customer charging behaviour can help to keep the grid balanced. Having "grid-friendly" charging incentives will mean not everyone will plug their EV to charge at the same time. EV-owning commuters today are most likely to charge their cars immediately after coming home from work, but having incentives in place to encourage groups of customers to charge during specific times, perhaps based on their location in a city, will allow local distributors to dispatch supply and demand at the right times.

Regulatory frameworks and financial incentives

While balancing the grid and putting more charging infrastructure in place are two technological solutions to increasing EV adoption, it is important to consider the wider societal side. Policies and financial incentives also play an important role in how quickly EV adoption can take place.

Norway is a good example of how using policy and financial incentives can accelerate the deployment of EVs. In 2017, the Norwegian Government introduced a programme to finance the construction of at least two multi-standard fast charging stations every 50km on all main roads, and provided generous financial incentives to car owners for the purchase and use of EVs. These innovations have led Norway to achieve the highest EV adoption rate in the world: EVs accounted for 78% of the automotive market in Norway at the time of writing.

A concern most car buyers and owners have is the high up-front cost of the vehicle. With financial incentives in place that can lessen the effects of the high up-front costs, buyers are more likely to consider buying EVs, so EVs can compete with ICEs on price. Here again, Norway provides an example of well-designed and fairly implemented financial incentives, including the elimination of annual road tax and purchase VAT, discounts on road tolls and the provision of access to bus lanes. Over time, such incentives will reduce as more EVs take to the road, but for the time being they are crucial to opening the door to widespread EV adoption.

EV expertise

Finally, the shortage of qualified EV technicians is also a barrier to EV adoption, with most car recovery services currently not equipped to deal with EV breakdowns. As an example, EVs have high-voltage components compared to ICE's, which can be lethal to mechanics who lack the proper training; most car mechanics at the moment are trained to fix only ICEs. This can be a contributing factor to consumers being hesitant about purchasing EVs which in turn slows down EV adoption.

If an EV "breaks down" in the UK by running out of energy, the vehicle often cannot be towed and most breakdown recovery vehicles today are not equipped to solve this challenge. This extreme case of range anxiety provides an incentive for EV owners to buy longer-range vehicles with larger batteries. However, one UK recovery service reported that more than one-third of its call-outs to EV owners were due to tyre damage related to the heavier weight of an EV– a problem exacerbated by larger batteries.

The Institute of the Motor Industry (IMI) estimates that by 2030, the UK will need 75,000 EV-trained mechanics to fill the shortfall of technicians qualified to work with high-voltage systems. Currently only 6.5% of the UK automotive workforce is qualified to work on electrified powertrains. Without a push to train more qualified technicians, the costs faced by EV owners could increase, as there will be a premium on skills that will only contribute to the high cost of EV ownership.

CHAPTER 3

London case study – barriers and enablers to EV adoption

Transporting its citizens from place to place has always been a major infrastructure and economic challenge for London, a city that has grown to a population of over 9 million people. More than 14 million people live in the wider metropolitan area and up to 1 million commute into the city every day for work. Despite having a well-developed public transport system, and lower rates of car ownership than in the UK as a whole, over 2.5 million passenger cars are registered in London, with congestion and vehicle emissions having long been a challenge for the city. The transition to EVs offers a major opportunity to address vehicle pollution, as well as to ensure the necessary reductions in greenhouse gas emissions to meet climate goals and avoid the worst impacts of global warming.

London has taken a lead within the UK for EV adoption and developing EV infrastructure. While only approximately 40,000 in Q3 of 2021 of the vehicles registered in London are battery electric vehicles (BEVs), about 1.5% of all vehicles in Q3 of 2021, this is the highest percentage of any UK region and is rapidly growing. In September 2021, UK BEV sales reached 9.8% of all vehicle sales on a trailing-twelve-month basis. Despite this, there is a long way to go to eliminate ICE vehicles from London's roads, and several challenges remain, alongside some of the enablers that can support the transition.

BARRIERS

Congestion

Despite the various environmental benefits, a transition to EVs does not solve the vehicle congestion problems faced in London and many large cities. London introduced the Congestion Charging Zone in 2003, covering central London, to reduce vehicle usage; this zone currently exempts certain low-emission vehicles such as EVs from fees, but the system may become unsustainable as EV adoption increases, and this would necessitate further restrictions on vehicle usage.

Parking, and the physical space required to charge vehicles, also remains a problem in densely populated and developed urban areas. This has the potential to slow down charging infrastructure deployment and therefore EV uptake.

Finally, investment in public transport or other travel options, such as cycling, walking or car sharing schemes, remains a significant policy aim in London and elsewhere to reduce congestion. These offer an alternative option to pushing EV adoption by reducing vehicle ownership and use, potentially slowing down EV uptake.

Vehicle cost

As long as EV costs are greater than those of comparable ICE vehicles, then the demand and uptake for BEVs will be limited. Consumers are less likely to make the switch without incentives or subsidies when costs remain higher. In addition, despite London's overall wealth, income inequality remains an issue within the city. Ensuring all sections of society can afford to switch to BEVs or more environmentally friendly modes of transport remains a challenge.

Local grid impact

A major constraint for the rollout of EV charging infrastructure is the impact on local power distribution grids. It is generally accepted that national-scale grid and power demand can be met with grid balancing and increases in renewable energy capacity. Furthermore, Exawatt's basic modelling based on 100% EV adoption (assuming no change in overall car ownership) implies an increase in annual electricity demand in London of only about 12%. However, the impact on local distribution grids at the street/neighbourhood level is potentially a barrier. Most existing local distribution is sized for domestic usage, with older infrastructure that may not be able to handle the power demand from multiple home charging systems. Upgrading this infrastructure for existing properties in dense urban areas such as London is a significant financial and engineering challenge. Some solutions have been proposed, including DC microgrids and the integration of decentralised renewable energy production (e.g. solar PV), but these are a long way from mass uptake.

Home charging infrastructure

A major limitation for charging infrastructure is the ability to charge at home, given limited access to off-street parking in many areas in London. This can be as high as 30%-40% of car owners in some London boroughs and is more of an issue in central areas. This challenge can partially be addressed by public charging infrastructure; however, this also requires either

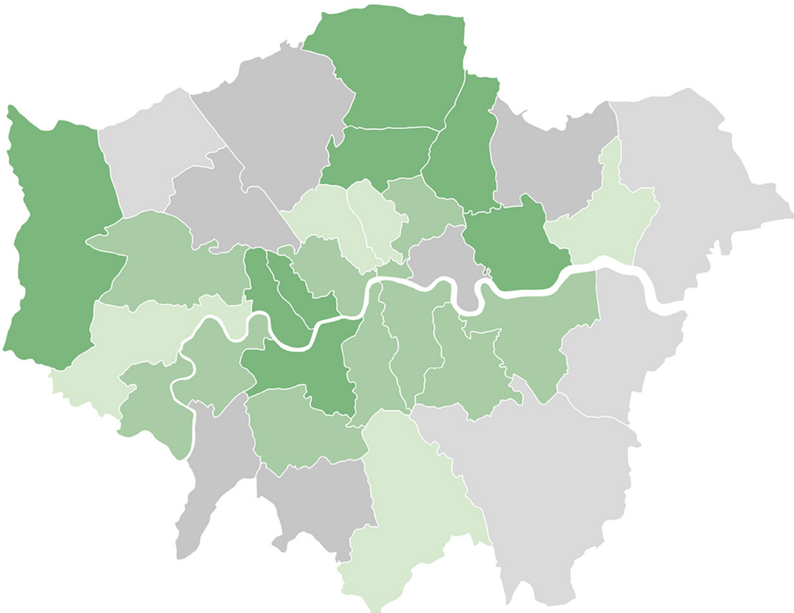


Figure 3.1
Percentage of London households who have a car but with no off-street parking, across boroughs

Source: London Electric Vehicle Infrastructure Delivery Plan, 2019

- 10-15%
- 15-20%
- 20-25%
- 25-30%
- 30-40%

kerb-side or off-street parking space. Reliance on public charging infrastructure may also limit uptake as consumers prefer the flexibility and guaranteed availability of having their own dedicated charger. A lack of home-charging infrastructure will also limit the ability for wider use of grid balancing and so-called "smart charging" when tariffs are cheapest, as vehicles may not be able to be left plugged in for extended periods of time. Public charging rates are also usually more expensive than domestic rates, adding a further barrier to adoption when home charging is not feasible.

ENABLERS

Incentives

The UK Government currently offers grants of up to £1,500 (US$2,000) for vehicles with a sale price of less than £32,000 (US$43,000), covering most non-luxury and small- to medium-sized BEVs). Tax breaks are also available for company-owned vehicles, alongside grants for home and work charge point installation. If continued into the future, these grants will continue to help reduce the initial purchase costs for BEVs and support BEV uptake.

In London specifically, BEVs and other low-emission vehicles are exempt from congestion and emissions zone charges, while a small number of boroughs also offer free or discounted parking fees for EVs. While these offer significant perks to some EV owners, they only benefit those that drive in certain areas of the city. They are also likely to be scaled back as the number of EVs increases to maintain reductions in congestion and limit lost revenue from charges and parking fees– the very reason they were introduced in the first place.

Air pollution

London has long suffered from air pollution issues, caused in a large part by ICE passenger vehicles on congested roads. Particulate and nitrogen oxide (NOx) pollution levels have regularly exceeded legal and recommended health limits, which has led to the introduction of several initiatives to attempt to reduce car pollution in previous years. This includes the T-charge (Toxicity-charge, introduced in 2017, largely replaced by the ULEZ), Ultra Low Emissions Zone (ULEZ, introduced in 2019, covering the same area as the Congestion Charging zone, and expanded in October 2021) and the London Low Emissions Zone (LEZ, covering all of London, for commercial vehicles only, and introduced in 2019). The zones limit the types of vehicles or charge a fee for polluting vehicles to enter certain areas of the city. London's attempts to reduce vehicle pollution can be accelerated with high adoption of EVs; legal limits and public pressure to address the issues are a significant enabler to push policy and consumer adoption of EVs.

Public charging infrastructure

London already has one of the highest rates of public charging infrastructure in the UK, which helps support its position as the region with the highest uptake of BEVs. As of mid-2021, London had a total of 7,697 public charge points, at 102 public chargers per 100,000 population. This is over twice the average of 42 per 100,000 for the UK. However, of this, 8.0 per 100,000 are rapid chargers (greater than 43kW), putting London behind several other UK regions and only just above the GB average of 7.7.

The figures below show the distribution of chargers relative to EV ownership by borough. This is a significant enabler for adoption but is still a long way off the number expected to be required. The London EV Infrastructure Taskforce (led by the Mayor of London and Transport for London) estimates that 33,700 to 47,500 charge points are needed by 2025, while the International Council on Clean Transportation (ICCT) estimates 23,000 to 54,000 chargers will be needed, a 3-8x increase relative to 7,865 in October 2021. The ICCT also identified a large variation in the progress towards these targets among London boroughs, several, mainly in central London, far ahead of other areas.

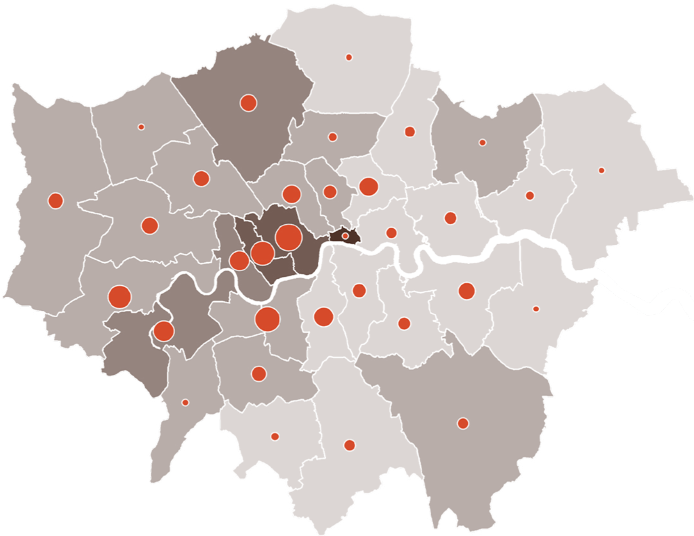


Figure 3.2
Public charging concentration and electric vehicle uptake in London as of early 2020

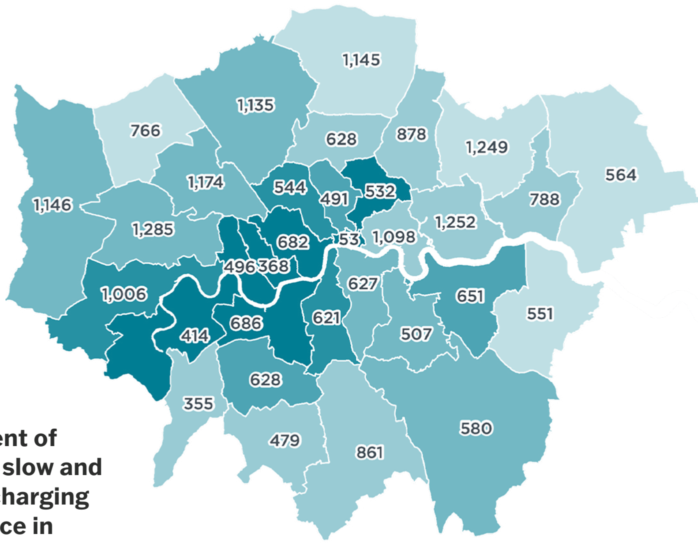
Source: The International Council on Clean Transportation, 2020

Public chargers

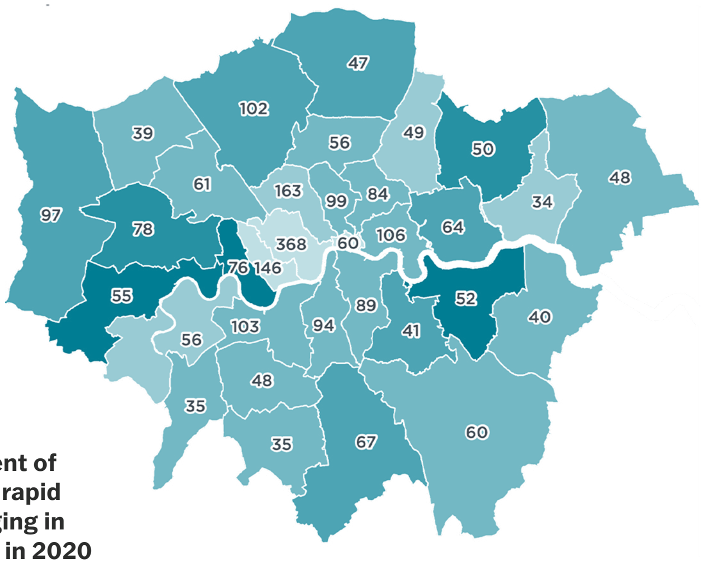
- 10
- 100

Electric vehicles per million population

- <2,500
- 2,500-5,000
- 5,000-7,500
- 7,500-10,000
- >10,000



Percent of 2025 slow and fast charging in place in 2020



Percent of 2025 rapid charging in place in 2020

Figure 3.3
Projected public EV chargers in 2025 by borough (labels) and percentage of 2020 charging needs in place already (blue shading)

Source: The International Council on Clean Transportation, 2020

- <5%
- 5%-10%
- 10%-20%
- 20%-30%
- 30%-40%
- >40%

Vehicle lifetime cost

Vehicle cost is also included as an enabler, as we believe the lifetime costs of owning a BEV will soon be comparable or cheaper than those of an ICE vehicle, due to lower running costs, falling battery costs, and improvements in BEV technology and efficiency. We believe that in some cases, lifetime cost parity has already been achieved for BEVs compared to ICE vehicles, but once this occurs more widely, we expect BEV adoption will grow rapidly as the economic hurdle is eliminated. We expect this to occur when battery pack costs reach approximately US$80/kWh, with reductions in average battery pack sizes also enabled by technology and efficiency innovations such as the use of silicon carbide (SiC) power semiconductors in traction inverters. The impact on relative manufacturing costs is shown below, with further savings for BEVs enabled due to lower running costs.

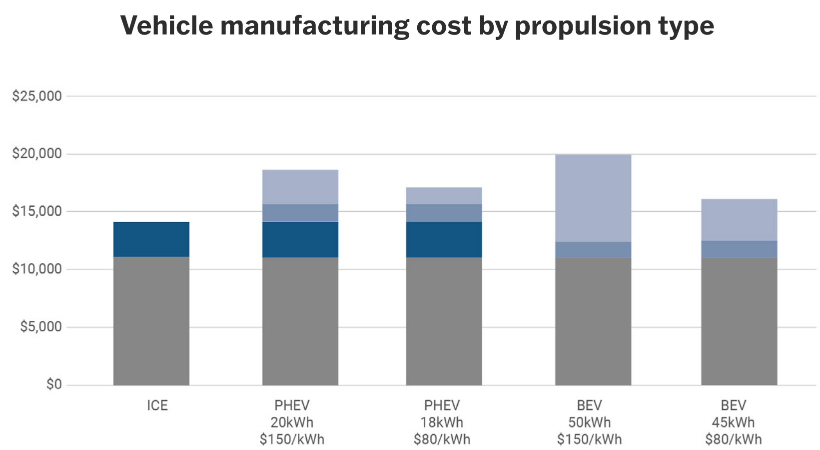


Figure 3.4
Manufacturing costs estimates by vehicle type for varying battery pack capacities (kWh) and battery pack costs (US$/kWh)

Battery pack size reductions assume a switch from silicon-based to silicon-carbide-based inverters

Source: Exawatt EV Cost Model

- Battery pack
- BEV/hybrid powertrain
- ICE powertrain
- Common components

CHAPTER 4

Metro Manila case study – barriers and enablers to EV adoption

The transport sector is considered a key driver of economic growth for the Philippines. Despite the government's massive investments in transportation infrastructure such as roads and bridges, there has been negligible progress in establishing a market for EVs. In the capital of Metro Manila, a staggeringly small total of just 11 individual passenger EVs are on the roads out of 1.4 million passenger vehicles as of 2020. In the discussion that follows, we will elaborate on the barriers and enablers for the electrification of passenger vehicles in Metro Manila.

BARRIERS

Sluggish policy implementation for EV adoption

In terms of passenger EVs, several policies lay the groundwork for EV adoption. Current incentives from the Philippine Department of Trade and Industry (DTI) involve zero tariffs, excise duty exemptions, and VAT exemption for raw materials, parts, and capital equipment for EV manufacturing. However, the government has remained a laggard in encouraging the growth of passenger EVs. The personal EV market is limited to less than 1% of the total EV market, with the small number of private EVs belonging to the upper social stratum. In order to register an EV, one must also go through a lengthy and difficult process through various government agencies, providing a powerful disincentive to prospective EV owners.

High investment and ownership costs

The biggest barrier in expanding the EV industry in the Philippines is the high cost of investment and ownership. A 2020 cost-benefit analysis found that the savings from refueling and maintenance costs will not be enough to offset high vehicle purchase costs. Among the eight electric car models available in the Philippines, the cheapest vehicle costs ₱1.9 million (US$38,000), while in the United Kingdom, a wider set of electric vehicles gives the buyer options as low as £12,000 (US$16,600), with an average price of about £45,000 (US$61,000).

Electricity prices also pose a hindrance. The Philippines has one of the highest domestic electricity prices in the world, at about 14 US cents per kWh. An increase in the share of EVs in the transport sector would have a significant effect on the distribution of the national electricity supply. A growing demand for EVs may increase power prices and thus increase ownership costs.

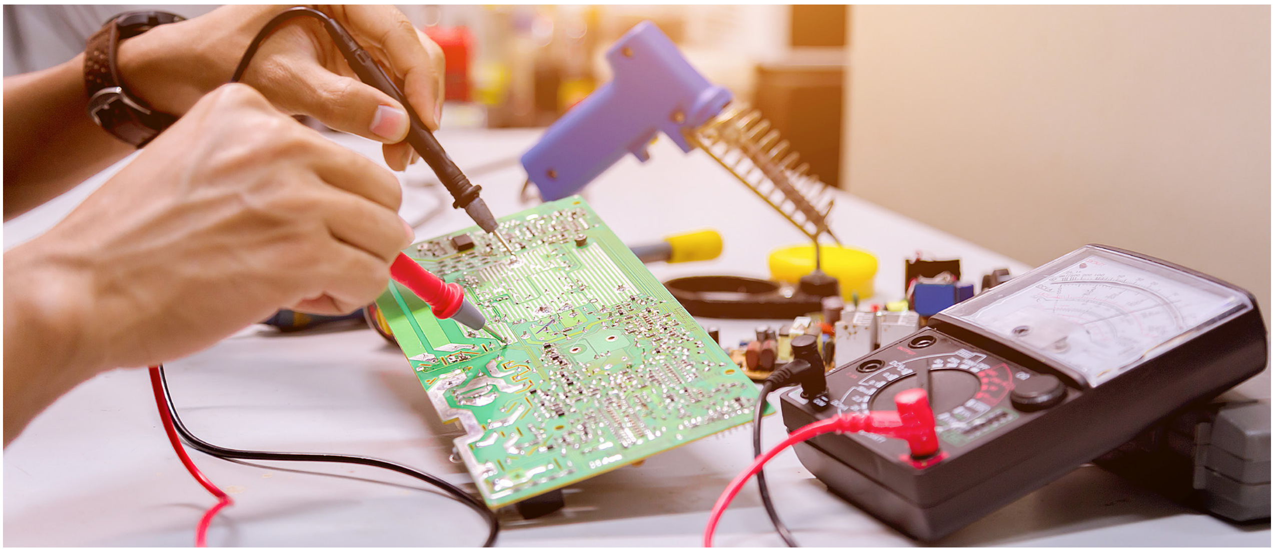
Low technology utilisation and lack of infrastructure

The absorptive capacity of new technology of Philippine companies is alarmingly low, with 79% of firms categorized as having “very low” to “low” levels of technology utilisation. Similar to other developing countries, the Philippines faces the barrier of having little to no national experience in industrial-scale automotive technology research and development. Technology readiness will be crucial in determining whether the Philippines can successfully house manufacturing facilities for EVs.

In terms of infrastructure, the availability of public charging stations is a main concern, with a total of just 19 charging stations in the country. Additionally, these charging stations are dedicated to electric public utility vehicles (ePUVs) and are not available for use to the general public. With a foreseen increased demand in EVs in the short to medium term, the planning of charging infrastructure, as well as repair stations and availability of EV parts in mechanic shops, will affect the viability of EV adoption in Metro Manila.

Fossil-fuel dominated power industry

A common argument against the widespread adoption of EVs in the Philippines centres on the generation portfolio of the electricity industry. EV infrastructure that relies on a coal-based grid, for example, provides few, if any, decarbonisation benefits. Coal power has grown annually in the Philippines over the past decade to dominate the power sector. Environmental and sustainability concerns over an EV industry effectively powered by coal may prove to be a barrier. However, RE technologies worldwide have begun to displace fossil fuels while significantly driving down power costs. Thus, a domestic renewable energy transition would transform the power industry from a major barrier to an enabler of EV adoption.



ENABLERS

Experience in automotive and electronics manufacturing

A key Philippine national strength is the country's manufacturing capabilities in auto-electronic, electronic component manufacturing, semiconductor manufacturing and automotive assembly, all of which are highly relevant to the EV industry. Furthermore, the presence of major automotive software companies in Metro Manila is indicative of a potential base for EV software development. Partnerships already exist between local automotive companies and foreign EV firms, which could serve as channels for exchange and transfer of technology, capital equipment, and expertise. All of the aforementioned could be leveraged to expand the EV industry in the Philippines. We expect that once local manufacturing of EVs makes sufficient headway in terms of scale, EV uptake will also follow a similar trend as costs become more manageable.

Prospective policy and legal drivers

The 46 players within the Philippine EV industry are classified as small and medium enterprises (SMEs). The industry, bolstered by policy, is expected to grow rapidly within the next few years. Senate Bill 1382, or the Electric Vehicles and Charging Stations Act, lays down a whole-government approach to EV growth and development. The prospective law is expected to scale up the industry by providing additional incentives for manufacturing, charging infrastructure, and regulations. Incentives within the bill take the form of production assistance and consumer subsidies for EVs, which would reach a total of US$1.65 billion for at least 10 years from the implementation of the Act.

Expansion of foreign and local enterprises towards the EV industry

The DTI envisions the Philippines as a regional hub for EV manufacturing in the immediate future. Major automobile brands, including Mitsubishi, Nissan, and Hyundai, are gradually bringing their EV models to the Philippine market. The Ayala Group of Companies, the country's oldest and largest conglomerate, entered the EV industry as a manufacturer in 2021. The DTI has also announced the construction of an EV manufacturing facility by a Philippine electric car manufacturer based in China. The rapid growth of the Philippine EV industry is imminent. The global trend for transport electrification, as well as the global demand for EVs, signifies the country's opportunity to become part of the global EV value chain.

CHAPTER 5

A Tale of Two Metropolises–London and Metro Manila's EV Pathways

	Metro Manila	London
Demographics		
Population [a]	13 million	9 million
Area [a]	620 km²	1,569 km²
Population density [a]	21,765 / km²	5,701 / km²
Macroeconomics		
National GDP [a]	US$361.5 billion	US$2.708 trillion
Regional GDP [a]	32%	22%
Per-capita regional GDP [a]	US$8,200	US$10,100
Transportation		
Total registered vehicles [a]	1.1 million	3 million
Registered passenger cars [a]	0.4 million	2.6 million
New car price floor [b]	US$10,000 (Sedan)	US$29,000 (Sedan)
New passenger BEV price floor [b]	US$38,000 (Sedan)	US$58,000 (Sedan)

Table 5.1
Comparison between Metro Manila and London

Conversion Rate
US$1 = £0.76 = ₱51.21

[a] 2020
[b] 2022

The collaboration between Exawatt and Verne Energy Solutions allows for an ongoing understanding of the needs and opportunities of the emerging EV industries of both London and Metro Manila. To enable an environment for massive EV adoption, we highlight the following recommendations, which require a whole-government approach and harmonized collaboration with key stakeholders in the private sector:

1. Push the modernization of transportation by incentivising existing car owners to shift to EVs. EV uptake will then no longer be a possible contributor to congestion, as the target market will not be public transport users, but current ICE vehicle owners. The objective is to replace combustion cars, not increase the number of vehicles on the roads of London and Metro Manila.
2. To prepare for increased adoption of EVs, the government and private sector must work together in mobilizing capital, both financial and operational, to ensure local grids can manage the shift towards an electrified community of vehicles.
3. In the long term, we foresee cost parity between EVs and ICEs in the UK and the Philippines once the ideal scale in production has been achieved, within the context of a market that is highly adapted towards EVs rather than ICEs and that has a culture of sustainable transportation.

We must acknowledge that London and Metro Manila have different economies and political climates. When we speak about development, in terms of either income levels or well-being, the Philippines takes the catch-up role as a lower middle-income country. It also lags behind the UK in terms of human development, with an HDI rank of 107, compared to the UK's rank of 13.

What do these differences have to do with EV adoption? Everything. While London moves towards a more EV-friendly transport system in the personal vehicle market, Metro Manila is still struggling to modernise its public transport system. As the Philippine economy continues to catch up with more advanced economies, we expect that its transition to a more sustainable transport system will face greater challenges. Because many of the policies, incentives, and market conditions for EV adoption are already in place in London, this city will have a relatively more accelerated path towards passenger vehicle electrification.

There is a notable contrast between London and Metro Manila with regard to pollution and greenhouse gas emissions as factors in the shift to sustainable transportation. In the UK, the push toward greener vehicles is seen as necessary to address vehicle pollution. The outgoing administration of the Philippines, on the other hand, has made it clear that the environment and sustainable development are the least of its priorities. Therefore, as a practical matter, these cannot be the main principles behind EV adoption for Metro Manila. As the Philippine government pursues its goal of becoming a manufacturing hub for EVs– leading to a higher share of EVs for car owners– vehicle cost and efficiency, and manufacturer profitability, must be the primary factors in its campaign for EV industry growth. Improved environmental and public health will be the by-products.

From a power-generation perspective, the ongoing energy transition towards renewable energy (RE) will continue to serve as a strong tailwind for vehicle electrification. Reduced energy prices, decentralized and sustainable energy, and the need for demand-side management will all serve to push vehicle electrification to the forefront of the industry. We foresee this emergent RE industry continuing to grow, and in the case of the Philippines, to ultimately transition from a barrier to an enabler.

Overall, it is within the realm of possibility for both London and Metro Manila to overcome barriers to, and capitalize on enablers for, a massive increase in passenger vehicle electrification. The challenge is still significant, but a coordinated and collaborative effort across policy-makers, industry, and consumers can ease the transition to vehicle electrification.

To help accelerate the transition it is important to understand how to construct an enabling environment for electric vehicles. Verne Energy Solutions and Exawatt are leading experts in this field. For more information on vehicle electrification and sustainable energy, contact us using the details listed below:

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March 2022