The Value of **Electric Vehicle Charging Flexibility** in Great Britain

Baringa | EATON Powering Business Worldwide

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A foreword from Eaton

Wildly fluctuating energy prices, together with supply worries, have rightly focused public attention on the UK Government's strategy to manage energy costs and avoid shortages. Unprecedented volatility, the hallmark of 2022, looks set to continue for some time yet, but this turbulence should not be allowed to derail the equally vital imperative of reducing carbon emissions. On the contrary, the high price of energy makes it even more important to manage it carefully.

This new Baringa study, which we commissioned, sets out how electric vehicle charging can provide the energy system with some of the flexibility it needs to accelerate the shift away from fossil fuels towards renewable energy. The report shows how innovative policymaking could enable the grid to store renewable energy in EV batteries, while at the same time offering the owners of EVs and EV chargers the opportunity to monetise their assets. The many benefits of EV charging for homeowners, business owners and fleet managers are all examined in this study.

Making it easy for households and businesses to trade energy and services with the grid could result in substantial cost savings throughout the system, promote the energy transition, and yield large reductions in CO_2 emissions, too. It is an exciting prospect that, as this report shows, is eminently workable.

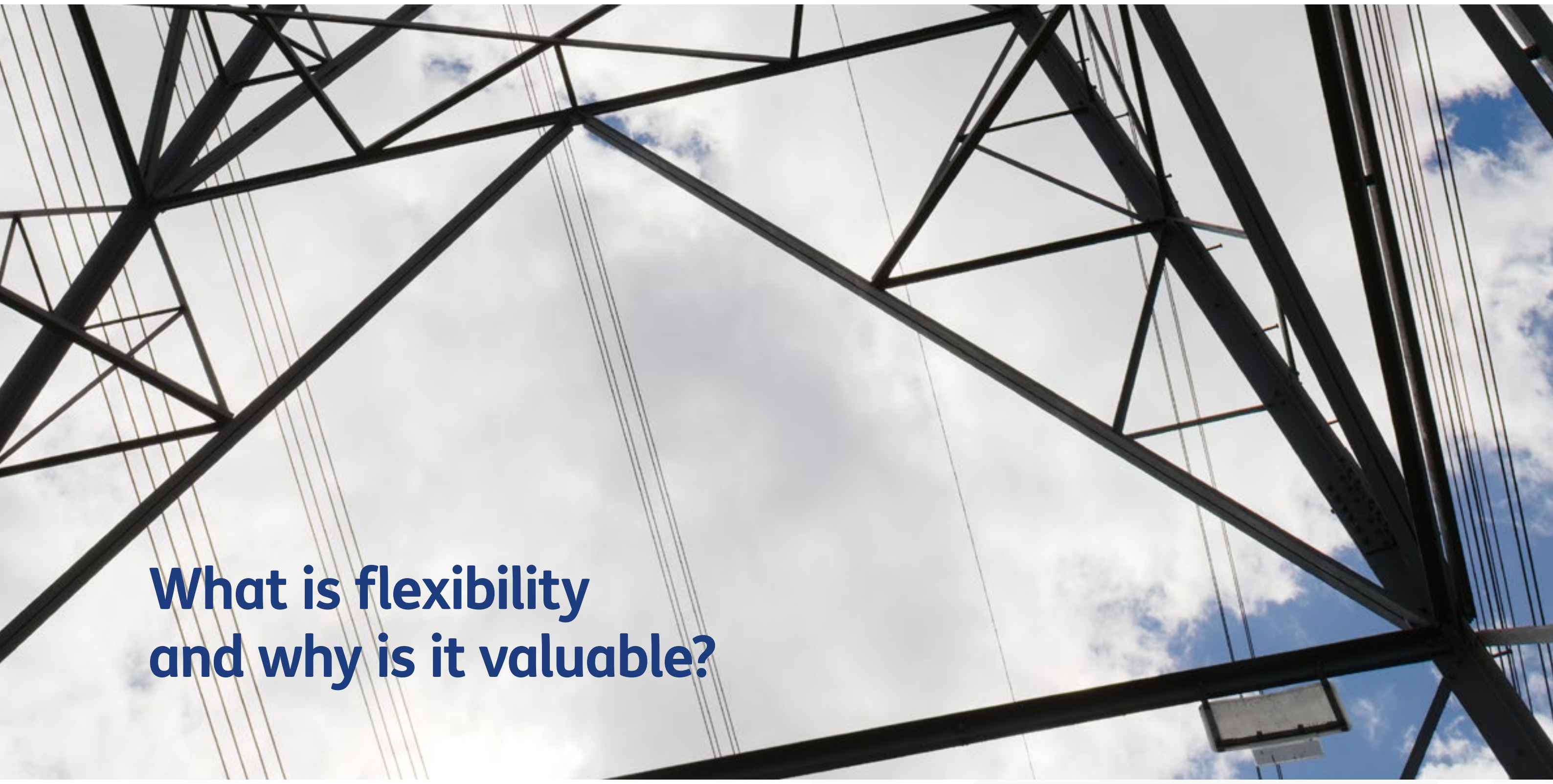
Siobahn Meikle
Managing Director, Eaton UK & Ireland

Executive summary

Energy systems are changing. As we continue to move away from fossil fuels, such as oil and gas, towards renewable forms of energy, such as wind and solar, we move from a situation in which the flexibility needed by the power system is provided by large power stations, to one in which we must manage variability in both generation and demand.

We can do this in the traditional way, with large grid-scale assets such as grid-connected batteries, but we can also do it in a decentralised way, through increased flexibility in end-user demand. One of the key opportunities resides in how we charge electric vehicles. EVs are an important part of the energy transition, enabling the decarbonisation of transport, particularly personal mobility, as they offer a drop-in replacement for petrol and diesel vehicles, with zero exhaust emissions. EVs also have the potential to generate added value through electricity flexibility.

This report details new Baringa analysis which shows that depending on how the EV is charged, the potential **flexibility value of an EV could top £1,000 per year for many homeowners**. In what we called our 'Standard' scenario, which is based on bidirectional charging in addition to smart charging, drivers could enjoy a flexibility value in excess of £700 per year even in the minimum case. For businesses that access flexibility value for fleet EVs, the benefits could be many times higher.



What is flexibility and why is it valuable?

In power terms, flexibility is based on the opportunity to give or take, greater or smaller amounts of electricity, to or from a power system (such as the National Grid), according to signals from that system. Flexibility in taking electricity from the grid is called demand flexibility; flexibility in giving electricity to the system is supply flexibility.

WHY DO WE NEED FLEXIBILITY?

Electricity is transmitted through the system straight from generators to users, not drawn gradually from a tank like petrol, and the system must, at all times, balance supply and demand. Furthermore, maintaining the electrical grid at a stable frequency is essential to avoid power outages or damage to equipment connected to the system. This means that whenever there is more demand for electricity, there must be more supply, and vice versa.

Normally, we turn on and off lights, kettles, and other sources of demand as we need them. The system then must provide enough electricity to meet demand. Demand side flexibility, also known as Demand Side Response (DSR) is about demand that is turned on or off, up or down, to help balance the system, rather than just because of user choice.

Supply flexibility is supply of electricity that is turned on or off, up or down, to help balance the system.

Whilst energy generation based on fossil fuels (e.g., in coal or gas-fired plants) can be generated in response to signals including, but not limited to, the price of electricity; renewable electricity from wind and solar, which is an increasing share of our energy mix, is generated according to the weather and is therefore somewhat intermittent. Although wind and solar plants can be turned off in the event of a surplus (wasting essentially free power) they cannot be turned up at will, and sometimes their output drops to zero due to lack of wind or sun (e.g. solar energy is not available at night), meaning that other sources of flexibility are required to maintain grid frequency at the required level.

There are many sources of flexibility, including pumped storage and gas turbines, with batteries being the fastest growing source of flexibility because they can be used anywhere and deployed relatively quickly.

HOW CAN EV OWNERS MAKE MONEY FROM FLEXIBILITY?

Today, there are approximately 2GW of grid-connected batteries in the GB power system[1]. These grid-connected batteries make their money from providing flexibility to the system. EVs similarly have the potential to provide flexibility (and to make money from this) precisely because of their batteries. There are three principal ways that batteries can capture value and make money from flexibility, which we have characterised as 'Value Pools' and applied to various 'Scenarios' – as follows:

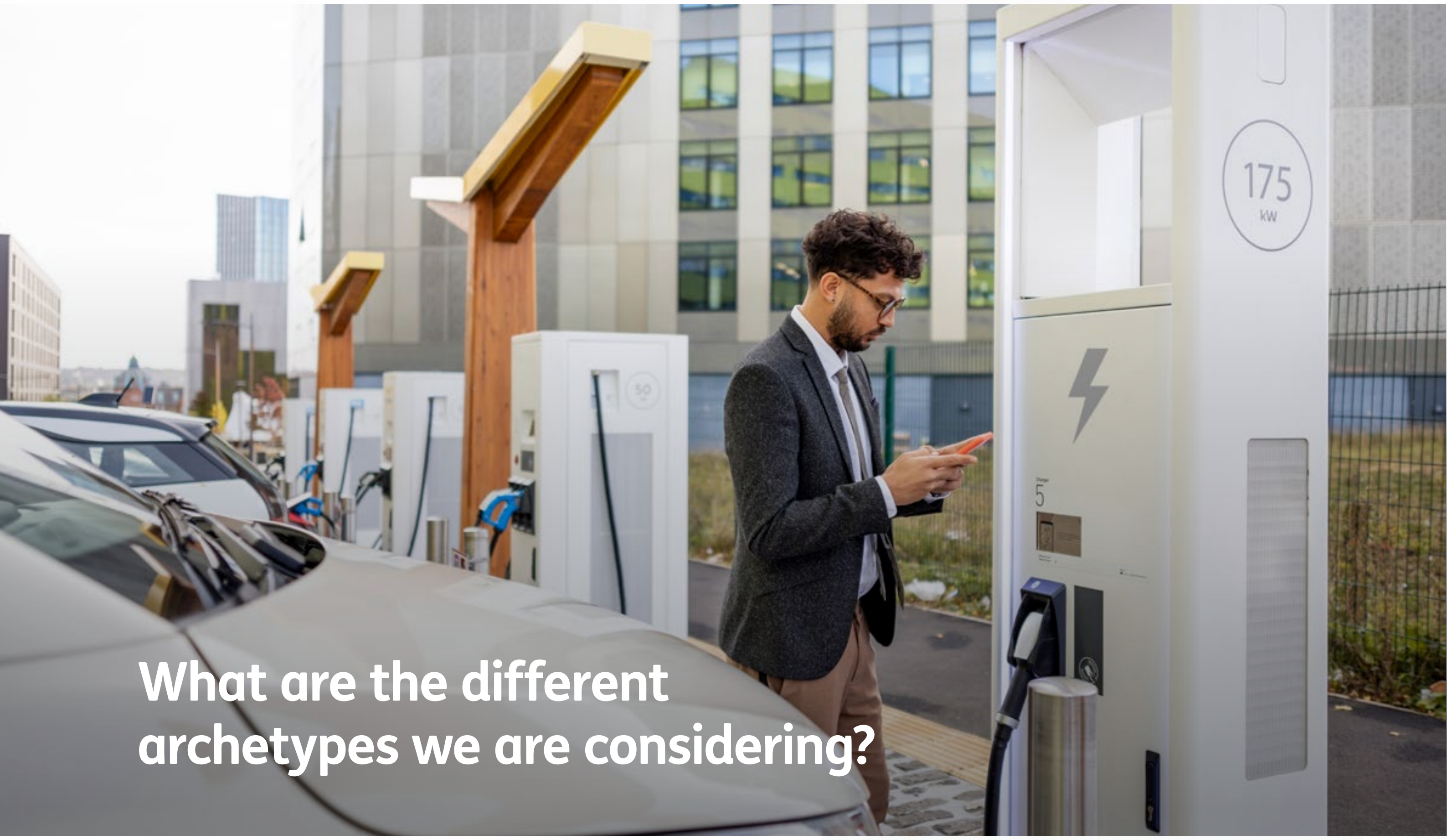
Table 1: **Value pool definitions**

Value Pool	Definition
A:	**Smart charging** Savings that can be achieved by smart charging at times of lower electricity prices (through Time of Use (ToU)/EV tariffs) vs the cost of "dumb" charging (i.e., charging only when the EV is plugged in).
B:	**Trading power** Revenues that can be generated by using the EV battery to store free or cheap power for uses beyond the needs of the EV, e.g. storing free rooftop solar power or cheap night-time grid power and supplying it back when prices are high, either on-site or back to the grid.
C:	**Providing system services** Additional revenues that can be generated by using bidirectional capabilities to provide services to the grid. This means the EV battery will, when connected, be available to act under instructions from the grid, either sending or receiving power according to grid needs. The grid pays for the provision of these services.

Table 2: **Value pools accessed per scenario**

Scenario	Value Pool			
	On demand charging EV charges when plugged in, regardless of price	**A: Smart charging** EV charges when power is cheapest (inc. from onsite renewables where available)	**B: Trading power** EV supplies power to the home or to the grid when power is more expensive	**C: Providing system services** EV is paid for providing on-demand system services
BASELINE	✓			
BASIC		✓		
STANDARD		✓	✓	
ADVANCED		✓	✓	✓

BASELINE ✓	In our **Baseline** scenario, the EV charges whenever it is plugged in, like any other appliance, such as a phone or a laptop, with the EV charger owner paying whatever standard electricity price is applicable at that time (prices are higher in the daytime and lower at night[2]).
BASIC ✓	In our **Basic** scenario, Value Pool A is accessed. This is only possible via a smart charger connected to the grid to receive Time of Use tariff signals, which means that rather than the car being charged up whenever it is plugged in, it is instead charged in response to signals that indicate electricity is available at a cheaper rate. This requires the user to sign up to a Time of Use (ToU) tariff for which price varies over time. Commonly for households, a ToU tariff means electricity is available at a higher price during the day and a lower price at night. Importantly, accessing this value requires only smart charging capability, not bidirectional charging capability, because energy flows only one way to the EV. For bidirectional charging to be possible, the vehicle must be capable of it, and the electricity distribution system operator must permit it. The benefit of our Basic scenario to the grid is that peak demand during the day is reduced. It flattens the load on the grid making it more possible to meet demand at peak times without relying heavily on energy from fossil fuelled power stations. Off-peak energy is largely from renewables, so it is both low-cost and low emission.
STANDARD ✓ ✓	In our **Standard** scenario, Value Pool B is accessed, as well as Value Pool A. This means that the car not only charges when electricity is cheapest, but also provides some of the power stored in the EV battery back to the household or the grid when electricity is expensive. Accessing Value Pool B requires bidirectional charging capability via a smart charger, which can take electricity from the EV, as well as supply it to the EV. When electricity is provided to the household to avoid peak pricing, this requires the charger to feed into the household's electricity supply. If electricity is also to be supplied to the grid, both the EV and the grid connection must permit bidirectional charging, and contractual arrangements with the energy supplier also need to change (similarly to how rooftop solar panels are used to supply the grid). Most EVs are not yet capable of bidirectional charging, and most UK distribution system operators are not yet ready to manage bidirectional energy flows from EV chargers. The benefits of our Standard scenario to the grid are that peak demand during the day is reduced and that the grid can access extra energy from the EV batteries to meet demand. This makes it easier for the grid to meet its supply requirements.
ADVANCED ✓ ✓ ✓	In our **Advanced** scenario, Value Pool C is accessed as well as Value Pools A and B. This means that the EV is enrolled in a programme to provide services to the grid, similarly to grid-connected batteries and other large-scale providers of flexibility services. Rather than just autonomously responding to price signals, when the EV is connected, the EV will also charge or discharge according to instructions from the grid. Again, this requires bidirectional charging and bidirectional energy flows to and from the grid. The benefits of our Advanced scenario to the grid are that peak demand during the day is reduced; the grid can access extra energy from the EV batteries to meet peak demand; and that in addition that the grid can access the charging and discharging capability of the EV batteries at will. This flexibility gives the grid reserves to solve large and small problems in the system caused by events such as surges in demand or supply or unexpected outages, supporting it to provide a stable and secure supply of electricity to users. In this scenario, the grid pays for access to flexibility because it is valuable for the grid to be able to control some supply and demand to achieve balance.



What are the different archetypes we are considering?

For the purposes of our research, we are considering **two main user archetypes for each of the Residential and Commercial sectors** defined as follows:

RESIDENTIAL SECTOR

Our **smart/retired professional archetype** is a smart worker, who works from home, or an 'early retired' person, who spends most of each day at home and lives in a house with driveway where they charge a mid-sized EV, such as VW ID3, with their EV charging station. They have one car, they may have solar panels on their home, but they have no energy storage capacity other than their EV battery. This person uses smart home technology and is keen to save on energy bills.

Our **weekday worker archetype** is a retail manager who works five days per week and drives a 25-mile return journey to their workplace every day in their mid-sized EV, such as VW ID3. The weekday worker charges the vehicle with the EV charging station on the driveway at their house in the evenings (c.70% of the time) and tops up by charging elsewhere (c. 30% of the time). This person may have solar panels on their house and is keen to save on energy bills.

For both these archetypes, we show results with and without rooftop solar panels.

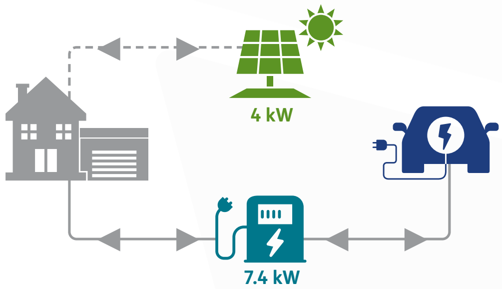
COMMERCIAL SECTOR

Our **medium-sized office archetype** is equipped with three EV charging stations and solar panels. This archetype offers EV charging to employees and visitors. All charging takes place during the daytime (9am – 6pm) and the vehicles that are being charged are cars.

Our **delivery depot archetype** is equipped with three EV charging stationsa, three batteries for energy storage, and solar panels. This archetype provides charging for a fleet of vans that make deliveries throughout the day and return to the depot to be recharged in the evenings.

RESIDENTIAL HOUSEHOLD (1 EV)

FIGURE 1:
EV flexibility savings vs EV power costs for residential households, by user archetype



CONSUMER ARCHETYPE: WEEKDAY WORKER

KEY CHARACTERISTICS		
	Mileage:	High
	Charging:	Mainly at home (c. 70%)
	Commuting:	Daily
	Weekend:	Moderate use

All values represent 2022-2024 averages per vehicle

		NO HOME SOLAR PV	HAS HOME SOLAR PV
EV CHARGING COST / YEAR Calculated as total electricity cost to meet demand in the baseline charging scenario	**Baseline:**	£1,790	£1,230
POTENTIAL SAVINGS / YEAR ON BASELINE CHARGING COST Savings are enabled by EV V2X[i] capabilities in the form of avoided costs from smart charging and V2H[ii] and revenues from V1G and V2G[iii] services. Savings are derived comparing the net cost (cost – revenues) in each scenario (Basic, Standard, Advanced) vs the total cost in the Baseline scenario where no V2X[iv] capabilities are available	**Basic:**	**£610 (34%)***	**£620 (50%)***
	Standard:	**£900 (50%)***	**£1,100 (90%)***
	Advanced:	**£1,200 (68%)***	**£1,410 (116%)***

CONSUMER ARCHETYPE: SMART / RETIRED PROFESSIONAL

KEY CHARACTERISTICS		
	Mileage:	Low
	Charging:	Mainly at home (c.95%)
	Commuting:	Working from home
	Weekend:	Moderate use

All values represent 2022-2024 averages per vehicle

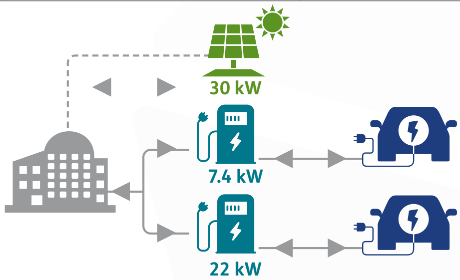
		NO HOME SOLAR PV	HAS HOME SOLAR PV
EV CHARGING COST / YEAR Calculated as total electricity cost to meet demand in the baseline charging scenario	**Baseline:**	£1,310	£720
POTENTIAL SAVINGS / YEAR ON BASELINE CHARGING COST Savings are enabled by EV V2X[i] capabilities in the form of avoided costs from smart charging and V2H[ii] and revenues from V1G and V2G[iii] services. Savings are derived comparing the net cost (cost – revenues) in each scenario (Basic, Standard, Advanced) vs the total cost in the Baseline scenario where no V2X[iv] capabilities are available	**Basic:**	**£250 (19%)***	**£260 (36%)***
	Standard:	**£700 (54%)***	**£720 (101%)***
	Advanced:	**£1,020 (80%)***	**£1,040 (148%)***

* The % value represents the level of potential savings, or revenue (if above 100%), in each scenario when compared to the Baseline charging cost.

i. **V2X:** Vehicle-to-everything: an umbrella term that combines a broad range of applications that look at an electric vehicle as a charging and/or discharging system.
ii. **V2H:** Vehicle-to-home: a V2X application where the vehicle can provide power to a home.
iii. **V1G:** Unidirectional Grid-to-vehicle: a V2X application where the vehicle can receive charging commands from the grid to increase or decrease its charge rate.
iv. **V2G:** Bidirectional vehicle-to-grid: a V2X application where the vehicle can charge and discharge energy into the grid.

BUSINESSES

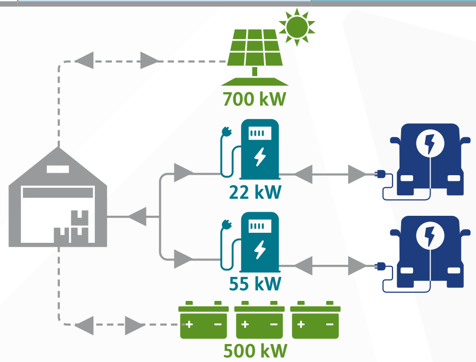
FIGURE 2: EV flexibility savings vs EV power costs for businesses, by business archetype



BUSINESS ARCHETYPE: OFFICE

KEY CHARACTERISTICS		
	EVs	4
	Charging:	Office hours (EVs charge mainly at home)
	Mileage:	High
	Weekend:	Empty

All values represent 2022-2024 averages per vehicle		NO SOLAR PV	HAS HOME SOLAR PV
EV CHARGING COST / YEAR Calculated as total electricity cost to meet demand in the baseline charging scenario	**Baseline:**	£2,230	£970
POTENTIAL SAVINGS / YEAR ON BASELINE CHARGING COST Savings are enabled by EV V2X[i] capabilities in the form of avoided costs from smart charging and V2H[ii] and revenues from V1G and V2G[iii] services. Savings are derived comparing the net cost (cost – revenues) in each scenario (Basic, Standard, Advanced) vs the total cost in the Baseline scenario where no V2X[iv] capabilities are available	**Basic:**	**£5 (0%)***	**£205 (21%)***
	Standard:	**£5 (0%)***	**£508 (52%)***
	Advanced:	**£275 (13%)***	**£783 (82%)***



BUSINESS ARCHETYPE: DELIVERY DEPOT

KEY CHARACTERISTICS		
	EVs	200
	Charging:	Mainly outside office hours (EVs only charge at depot)
	Mileage:	High
	Weekend:	All EVs present

All values represent 2022-2024 averages per vehicle		NO SOLAR PV	HAS SOLAR PV & BATTERY STORAGE
EV CHARGING COST / YEAR Calculated as total electricity cost to meet demand in the baseline charging scenario	**Baseline:**	£2,350	£1,500
POTENTIAL SAVINGS / YEAR ON BASELINE CHARGING COST Savings are enabled by EV V2X[i] capabilities in the form of avoided costs from smart charging and V2H[ii] and revenues from V1G and V2G[iii] services. Savings are derived comparing the net cost (cost – revenues) in each scenario (Basic, Standard, Advanced) vs the total cost in the Baseline scenario where no V2X[iv] capabilities are available	**Basic:**	**£1,700 (74%)***	**£1,150 (77%)***
	Standard:	**£1,700 (74%)***	**£1,150 (78%)***
	Advanced:	**£1,900 (82%)***	**£1,350 (90%)***

* The % value represents the level of potential savings, or revenue (if above 100%), in each scenario when compared to the Baseline charging cost.

i. **V2X:** Vehicle-to-everything: an umbrella term that combines a broad range of applications that look at an electric vehicle as a charging and/or discharging system.
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iv. **V2G:** Bidirectional vehicle-to-grid: a V2X application where the vehicle can charge and discharge energy into the grid.

IS THIS TECHNOLOGICALLY FEASIBLE NOW?

Our **Basic scenario** should be feasible for most people and businesses investing in an EV and charger now. Smart charger technology is available, and as of June 2022 it has been mandated in the UK that all EV chargers sold for private use in the workplace or home must have smart charging capabilities.

Our **Standard scenario** is feasible, but to trade power bidirectionally, the EV supply equipment (EVSE), and the EV itself, need to support vehicle-to-grid (V2G) charging. More vehicles are now coming on to the market with this capability, and the UK government is examining how V2G should be integrated into the electricity system.

Our **Advanced scenario** is technically feasible now, but this model, and the technology for it, is still developing. To provide system services, EVSE hardware may need to be of higher standard for additional security and time granularity, with additional capabilities to receive signals from the grid.

HOW WE ASSESSED THE SAVINGS OUR DIFFERENT ARCHETYPES COULD MAKE

It is important to note that the EV cannot access any value from flexibility until connected to a charger (typically on a building).

FIGURE 3: Types of EV owners and mechanisms of flexibility

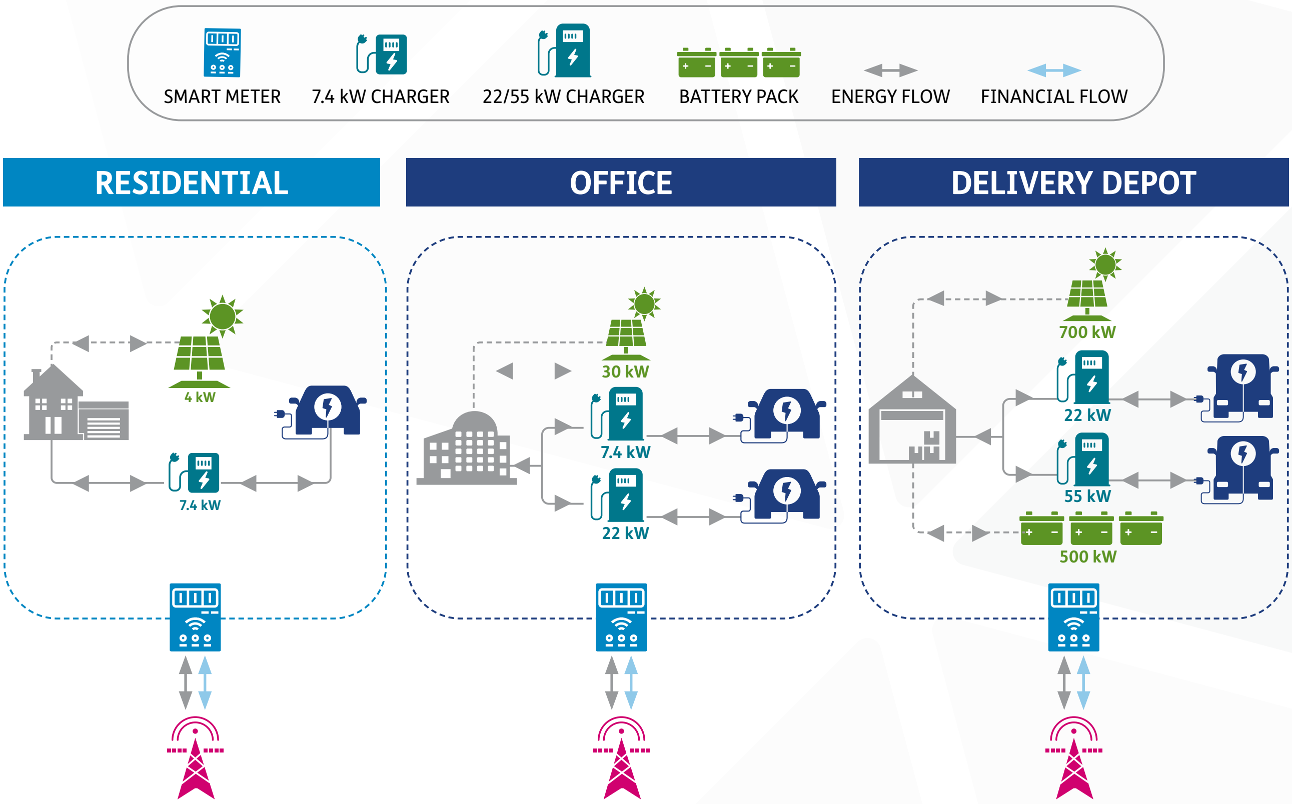


TABLE 3: Main sources of flexibility value

Category	Value sources	Description
Onsite generation		• Onsite renewables generate free energy – charging when this is available saves money and makes money if this energy is later resold
Value pools accessed		• Multiple streams of revenue drive more value
EV(s)	Size of EV portfolio	• Larger EV portfolios generate more flexibility value, so businesses with fleets can access more value compared to individuals with single EVs
	Size of battery	• A larger battery can hold a larger amount of cheap energy and offers more spare capacity to dedicate to accessing flexibility value
Charger	Time connected	• EVs only flexibly charge or discharge when connected to a charger • The tariff at the time of charging is important
	Power	• A higher power charger can transmit energy faster, enabling higher volumes of flexibility value to be accessed within a given time
Prices	Electricity price spreads	• Prices changing over the course of each 24-hour period is crucial for flexibility value, e.g., buying low and selling high
	Electricity price levels	• Higher prices increase flexibility value and lower prices reduce it, so flexibility is more valuable in periods of higher prices • Electricity prices also vary regionally, e.g., ± 4-8% for UK retail prices
	System services prices	• Demand for system services increases with renewables volumes, and supply decreases as thermal generators retire, driving up prices

The potential gain for an EV charger owner depends on access to onsite renewables (such as solar panels), which value pools they can access, the characteristics of the chargers and EV(s) available, and market prices (across electricity and flexibility services). Although mileage driven also has an effect, this can play both ways. More miles mean more savings from charging with cheap night-time electricity, but reduced opportunity to participate in other value pools.

How much money EV charger owners could potentially make from flexibility depends on the number of vehicles that use the charger, so businesses may have even more to gain than individuals.

Value sources vary between consumers and businesses, with businesses typically having larger portfolios of EVs and chargers available, chargers having a higher power, and in the case of a delivery depot, the larger vehicles having bigger batteries.

In the residential analysis, we examined two archetypes: one that we called a smart/retired professional, based at home most of the time; the other our 'weekday worker' who commutes to work regularly.

- For the smart/retired professional, the EVs are typically at home and have a higher charging availability throughout the day, allowing them to supply power to the home or grid when electricity is more expensive.
- As the weekday worker typically has a higher weekly mileage, they can achieve greater savings via smart charging to take advantage of the cheaper night-time periods.

In the commercial analysis, two business archetypes were analysed: an office and a delivery depot. Apart from scale factors, the time of day the charger is connected results in a large difference in the observed flexibility value.

- For the depot, the EVs are at rest and connected to the chargers outside of business hours, enabling cheap charging at night, and discharge at weekends and in peak evening periods.
- For the office, the EVs are only connected for a minority of their overall charging (most is at home) and during office hours they cannot access cheap off-peak electricity. The benefits remain of access to free onsite renewable generation, or from providing system services.

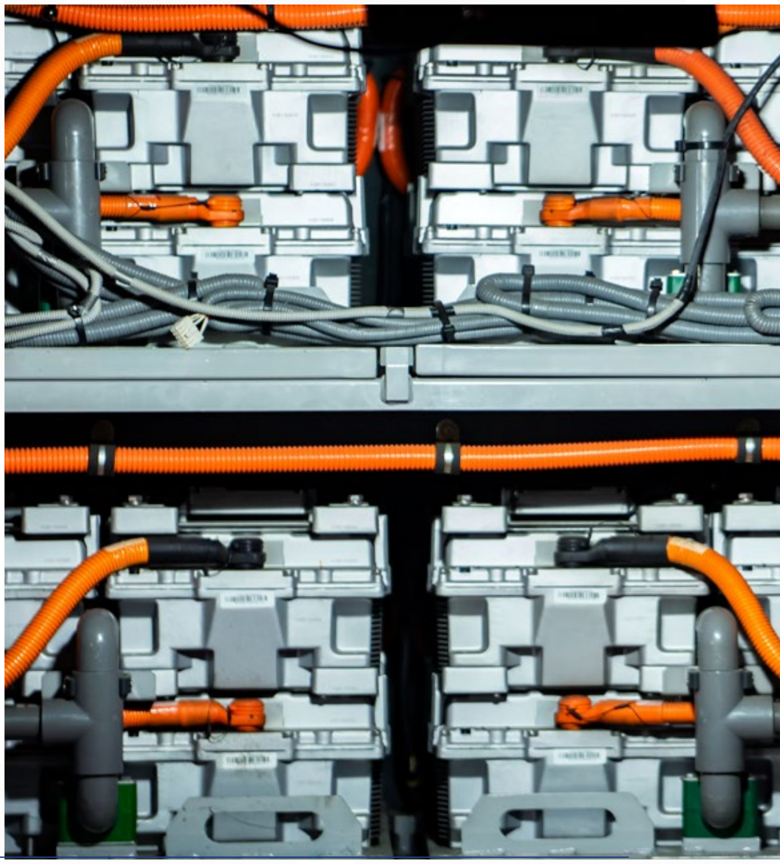
The analysis shows that offices have less to gain from flexibility than delivery depots, accessing relatively little value per vehicle unless they have onsite generation or energy storage and access to multiple value pools, as in the Standard or Advanced scenarios. With multiple EVs present, offices can make more money overall than a residential consumer with one EV, but the revenue per EV is lower.

Delivery depots on the other hand, generate higher value than households per EV, benefiting from vehicles with large batteries spending a lot of time charging (crucially straddling daytime and night-time, so high-price and low-price periods) connected to high-power chargers. This is not quite enough in any of the scenarios to offset all charging costs, but nevertheless represents substantial savings.

WON'T BATTERY DEGRADATION CANCEL OUT THE BENEFITS?

Batteries have a limited life and using them more can reduce it. Most electric vehicle batteries have an estimated 1,500-2,000 complete cycles lifetime, with each cycle considered a complete charge and discharge. Basic smart charging (Basic scenario) has little effect on charge cycles. However, accessing full flexibility value, by discharging the battery to provide system services, or for electricity price arbitrage, would increase the number of cycles for consumers substantially, with modelling suggesting up to a quadruple increase – although battery cycles remain generally below 100 cycles per year. This means that even a battery accessing full flexibility value would still have a 15+ year life, higher than the traditional average lifetime of a car[3], although EV lifetime expectations are evolving and battery degradation can be an important factor, as well as impacting the range of the car.

With average battery replacement costs estimated at ~£5,000-£6,000 plus labour[4] (£5,220 for a Tesla Model 3), value uplift in the region of £600-£800 per year for consumers moving from Basic flexibility to Advanced should offset the cost of battery replacement if it does become necessary long-term, although where owners pay more than average (as manufacturers have been known to charge much more than the cost of an independent battery replacement[5]) this may not be so. There is also an impact on driver experience of having a more degraded battery. For the office archetype, cycles double, but value uplift should still offset this financially, and whilst value uplift for the delivery depot is lower, battery cycles shift by only 0-30%, so degradation should again be covered.



What are the wider benefits?

As thermal power plants are retired from the grid and replaced with intermittent renewable generation, the need for flexibility increases.

The provision of zero-carbon flexibility can enable the grid to take on greater levels of renewable generation. This generates a carbon saving, as does the price arbitrage, because the carbon intensity of generation is generally lower at night than during the day, so charging at night also lowers emissions. Supplying some stored night-time electricity during the day to take advantage of higher prices will also lower carbon emissions by reducing daytime demand.

Whilst not fully quantified in the study, these effects should be significant: EV batteries (40-100kWh[6]) are much larger than the batteries of our everyday appliances such as torches (0.003kWh[7]), phones (0.010kWh[8]), or laptops (0.050kWh[9]). In fact, a typical EV battery[10] holds enough charge to supply a typical household with electricity for almost five days[11]. This is enough to make a real difference to our electricity system.

Using our modelling assumption of a standard 7.4kW charger, it would take around 530,000 cars (if half were connected to the grid at any one time) to double the current grid-connected battery capacity in GB.[12] There are already 900,000 plug-in vehicles on UK roads.[13] In total there are around 32.5m cars on UK roads,[14] enough to provide ~116GW of battery power (if half of them were connected to the grid at any one time). Therefore, mass participation of EVs in flexibility could be transformative for the electricity system, although deployment of EV flexibility at this scale could also have significant effects on the prices the system pays for flexibility, reducing the rewards to individual EV owners.

Conclusion

The value of EV flexibility for individual use cases is variable between modelled archetypes and would vary between individual cases, but it is clearly significant.

Whilst there are costs in terms of battery degradation, these depend on the degree of flexibility value accessed and may materialise slowly enough not to affect the lifetime of the car. Individuals will make their own trade-offs given impacts on EV range, but the price of a good value replacement battery should be offset financially by the value captured. Smart charging provides the first and most easily accessible savings and flexibility value; combined with additional measures this value can be enough to offset 70-100+% of EV charging costs, at the top end, comparable to having free fuel.

In the residential sector if those who own EVs and EV chargers can access all possible value, through bidirectional chargers, rooftop solar, and aggregated participation in system services markets, flexibility could be transformational for total EV ownership costs. This change will require innovative retailers, who can wrap all the facets of flexibility into a consumer-friendly package, innovative manufacturers, who can ensure the availability of the necessary hardware, and an innovative power system which welcomes a potentially enormous quantity of flexibility. The distribution of the share of value between EV and EV charger owners, and the companies who can enable this to happen, remains to be seen.

In the commercial sector, EV chargers owned by providers of office parking will not deliver significant revenues from flexibility as they are charged during the daytime, however EV chargers will be an important asset that could generate extra revenues on top of charging costs. They will do this through accessing flexibility value by taking advantage of the overlap between solar generation and office charging hours to maximise charging potential. For businesses running large fleets that return to base outside of working hours however, the value of flexibility could be significant. Businesses such as these are likely to be able to access this value sooner than residential consumers due to their scale. Again, this could be transformational for the total costs of EV ownership in the commercial sector, and hence the business case for shifting to EVs.

Power generation companies, energy distributors, regulators, as well as households and businesses that own EVs and EV chargers, should work together to enable all this value to be realised as soon as possible, particularly in an era of elevated electricity prices.

REFERENCES

1. Baringa Ref Case, Q2 2022
2. The study uses an average of real world tariffs available in GB in Q1 2022.
3. Car And Driver quotes an average of 12 years.
4. BookMyGarage
5. Electrek
6. Tesla Model 3 2021, Standard Range: 54kWh, from EVspecifications
7. Typical household daily usage of 11.5kWh from UKPower, versus 54kWh Tesla Model 3 battery.
8. Eon Energy
9. 2 × 2800 mAh rechargeable batteries at 1.2V
10. iPhone X, according to iFixIt; GSMArena
11. Lenovo Thinkpad P14S Gen 2
12. GB is a single electricity market. Northern Ireland is part of a separate all-island Irish electricity market.
13. UK Govt
14. CompareTheMarket; around 31.3m of these cars are in GB, and 1.2m in Northern Ireland.

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