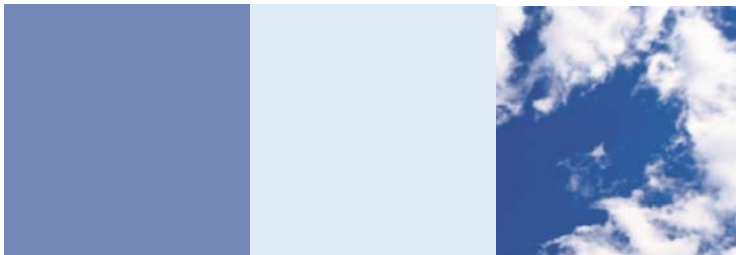




City of Westminster

Installation of Two On-Street Recharging Points for Electric Vehicles

December 2006



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Foreword

Tackling air pollution continues to be a top priority for Westminster. In 2001 we were the first local authority to publish an Air Quality Action Plan, having in 1999 pioneered the UK's first Air Quality Management Zone. We have also successfully campaigned for a London-wide Low Emission Zone. Despite all our efforts we and our central London neighbours continue to suffer higher levels of air pollution than anywhere else in Britain. Much of the cause for this remains emissions from the high levels of road traffic travelling in and around our city.

Electric vehicles produce zero tail pipe emissions. Westminster has been promoting their use since the 1990s with a number of initiatives including free on street parking and the introduction of recharging points in many of our car parks. Today however there are still a relatively small number of electric cars or vans on our city streets. Part of the reason for this is the lack of a suitable on-street recharging infrastructure. All electric vehicles have a limited range and when in need of recharging require a convenient location where the vehicle can be parked and left to take on its needed input of electricity.

This report tells the story of how we went about developing and implementing two on-street recharging points. This is the first time that any UK local authority has provided such a facility and we shall monitor the progress of our pilot scheme closely.

We hope that this initiative will open the door to a much more extensive network of on-street recharging points in Central London. This will then encourage more drivers to use electric vehicles for their convenience and economy as well as their acknowledged environmental benefits.



Cllr Alan Bradley
Cabinet Member for Street Environment

Introduction

Electric vehicles offer a clean and energy-efficient alternative to vehicles with an internal combustion engine. Despite the limited range of electric vehicles on the market, they are becoming increasingly popular. Technology improvements have expanded the range and speed of the vehicles and they are now becoming a more viable option for busy commuters.

Electric vehicles are powered by a battery supplying electricity to the motor. They produce no tailpipe emissions and no emissions at all when charged with green electricity from renewable sources, making them an environmentally friendly vehicle. Westminster City Council believes that switching from petrol vehicles to electric vehicles can help to improve air quality in Westminster. The main objective of this pilot project is to improve air quality by promoting clean vehicles through the development of an electric vehicle infrastructure.

As electric vehicles have only been widely available for the last decade, many people are unaware of their availability as an alternative to petrol cars. There is very limited choice of electric vehicles available to purchase and electric vehicles make up only a tiny segment of the car market. There is a lack of information available about electric vehicles, their performance, characteristics and eligibility for subsidies. There are also few locations in London where users can recharge their vehicles.

There have, in the past, been a number of practical problems with electric vehicles. They take a number of hours to recharge and have a limited range at about 60 miles between battery recharges. Electric vehicles have a lower top speed than their equivalent petrol/diesel vehicle but often comparable or better acceleration, which makes them ideal for city driving. On the whole electric vehicles need less servicing and maintenance than petrol/diesel vehicles.

Westminster City Council is one of the first councils in the United Kingdom to have introduced a range of financial incentives for electric vehicle owners. These incentives include free parking in Westminster pay and display parking bays and discounted resident parking. Westminster City Council hopes that the installation of two on-street recharging stations for electric vehicles in central London will further promote the use of alternatively fuelled vehicles in Westminster.

This report has been written for other local authorities and businesses that also wish to install on-street electric vehicle recharging points. It covers the context, research, planning and installation of the two electric vehicle recharging points in Covent Garden. It gives an overview of air quality issues in Westminster and the origin of the project to install electric vehicle recharging points. It assesses the models available in the United Kingdom and the number of electric vehicles in London. It outlines the choice of electric vehicle recharging points and the issues surrounding their installation. It sets out the rules of use for the electric vehicle recharging points, how these rules will be policed and the criteria for assessing the success of the project.

Context: Air quality issues in Westminster

Westminster has higher levels of air pollution than anywhere else in the United Kingdom, due to the volume and type of road traffic travelling into and through the borough on a daily basis.

There is growing evidence that links vehicle generated pollutants directly to human ill health including the incidence of respiratory and cardio-pulmonary disease, lung cancer and premature death. Although less serious, they can also cause everyday health problems such as headaches, coughs and sore throats.

The management of local air quality is subject to European and National standards because of its adverse impact on human health. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland sets standards for eight pollutants. Local authorities are required to address seven of these pollutants (the eighth being ozone which is being tackled on a Europe wide basis)¹. In areas where standards will not be met unless further action is taken, local authorities must declare an Air Quality Management Area and draw up an Action Plan to set out how they intend to reduce pollution and meet the national standards.

In Westminster, as is the case in most urban areas, there are two pollutants that will not meet the targets without further action these being nitrogen dioxide and fine particulates. Westminster City Council declared the whole of the borough an Air Quality Management Area in March 1999. The Westminster Air Quality Strategy and Action Plan, published in 2001, sets out the actions that the council will take to improve air quality.

One of the major initiatives that Westminster supports is the London Low Emission Zone. A Low Emission Zone (LEZ) will aim to reduce air pollution by discouraging the most polluting vehicles from driving in Greater London. These are generally older, diesel-engined heavy goods vehicles, buses, coaches, heavier vans and minibuses. Transport for London are developing more detailed plans for how to implement an LEZ and a further round of public and stakeholder consultation is planned for late 2006.

Congestion charging also has the potential to impact on emission of pollutants. The London Congestion Charging Scheme was introduced in 2003. Whilst the principal aim of the scheme was to reduce road congestion, it has also reduced pollutant emissions² within the Congestion Zone. It encourages the use of other modes of transport, including public transport and creates a better environment for walking and cycling.

Westminster City Council promotes the use of alternatively fuelled vehicles. Electric vehicles produce no tail-pipe emissions of harmful nitrogen dioxide or fine particulates, which are the main threats to human health. As described in the introduction, Westminster City Council is one of the first councils in the United Kingdom to have introduced a range of financial incentives for electric vehicle owners.

¹ Part IV of the Environment Act 1995

² Beevers S.D. And Carslaw D.C. (2005) the impact of congestion charging on vehicle speed and its implications for assessing vehicle emissions. Atmospheric Environment. 39. p6875-6884.

These measures include:

- Free parking in Westminster City Council car parks for registered holders of Masterpark Green Cards (an annual administration charge of £200 and other conditions apply).
- Free recharging is available to Masterpark green card holders at 45 recharging points in thirteen³ Westminster City Council car parks.
- Free parking in Westminster meter and pay and display bays (maximum stay applies)
- Discounted resident parking in Westminster.

This pilot project aims to promote cleaner vehicle technology and alternative fuels by installing on-street recharging points for electric vehicles in Central London.

³ Twelve recharging points in Harley Street car park; two in Knightsbridge car park; six in Park Lane/Marble Arch car park; seven in Leicester Square car park; three in Abingdon car park; two in St. John's Wood car park; three in Broadwick car park; four in Chinatown car park; three in Chiltern car park; one in Queensway car park; one in Pimlico car park and one in Trafalgar car park.

Electric vehicle use in London

Electric vehicles are powered by a battery that supplies electricity to the motor. Electric vehicles are very quiet but currently their range is limited to around 60 miles between battery recharges. They have a lower top speed than their equivalent petrol/diesel vehicle but often comparable or better acceleration, which makes them ideal for city driving. On the whole electric vehicles need less servicing and maintenance than petrol/diesel vehicles.

This section of the report describes the range of electric vehicles currently available in United Kingdom, vehicles soon to be launched and outlines the number of vehicles in London at present.

Electric vehicles currently available

There are currently six types of electric vehicles available for sale in the United Kingdom. There are three electric cars: the G-Wiz, the Mega City and the Electric Smart car. There are also four electric vans: the Modec, the Faraday, the Mega van and the Piaggio Porter electric van. There is also a high demand for second hand electric vehicles.

Below is a technical description of each vehicle, which has been provided by the vehicle manufacturers. For more details on the individual vehicles please refer to the websites listed.

G-Wiz



Manufacturer
Details

Reva Electric Car Company

In its "AC Drive" version, this car offers a top speed of 45mph with a range of up to 48 miles. It has central locking and an improved regenerative braking as standard and as optional extras one can have leather seats and air conditioning. It recharges using a 13 Amps plug socket.

Website

www.goinggreen.co.uk

Mega City



Manufacturer
Details

Aixam

It has a top speed of 40mph and a range of 50 miles. This car has an optional satellite navigation system that can guide you to the nearest recharging facility in town. It recharges using a 13 Amps plug socket.

Website

www.nicecarcompany.co.uk

Electric Smart



Manufacturer Daimler Chrysler/Zytek Group

Details This car has a top speed of 70mph and a range of 72 miles. It recharges using a 13 Amps plug socket. This car will be made available in November 2006 on a lease arrangement to selected United Kingdom corporate customers. The first 100 cars to be produced have already been leased⁴.

Website www.smartev.co.uk

Modec Van



Manufacturer Modec Vehicles Ltd

Details This van was launched in April 2006 at the Birmingham Commercial Vehicles Show and will be available in early 2007. It has a range of 100+ miles and a top speed of 50mph. Four hundred vehicles will be built in 2007 for the United Kingdom market and early sales have already exceeded 35 units⁵. Different versions are available, among them a chassis cab version, a standard delivery box version and an extended cab version. This is a heavy-duty vehicle that requires a separate charger unit and a 64 or 32 Amps socket to be recharged.

Website www.modec.co.uk

Faraday Van



Manufacturer Smith Electric Vehicles

Details This vehicle was launched in November 2005. It has a range of 100+ miles and a top speed of 50mph. The van can be customised to any specific commercial applications (rubbish collector, refrigerated version). This is a heavy-duty vehicle that requires a separate charger unit and a 64 or 32 Amps socket to be recharged.

Website www.smithelectricvehicles.co.uk

Mega Van



Manufacturer Aixam

Details The Mega Van has a range of 60 miles, a top speed of 30mph and is available in a range of standard and customised bodies including a refrigerated van. Goinggreen and the NICE Car Company sell the van in the United Kingdom. The Mega van can be recharged using a domestic 13 Amps socket.

Website www.nicecarcompany.co.uk or www.goinggreen.co.uk

⁴ Updated information provided by Jeremy Simpson, consultant for Daimler Chrysler Smart EV Project, August 2006.

⁵ Updated information provided by Geoff Reyner, sales director at Modec, October 2006.

Piaggio Porter electric van



Manufacturer Piaggio

Details

Piaggio

The Piaggio Porter electric van has a range of 60 miles and a top speed of 45mph. It is available in a range of standards and customised bodies. Two silent operation motor options are now available: the 84V model and the 96V model. The electric powered Piaggio Porter is equipped with special software that allows diagnostics and electronic settings to be reset remotely via a modem.

Website

www.piaggioporter.co.uk

Electric Scooters

There are also a number of electric scooters on the market. The range and speed of different models can vary significantly. Examples of electric scooters are listed below:



- The Vectrix Maxi Scooter has a top speed of 62mph and a range of 68 miles. The scooter can accelerate from 0-50 mph in 6.8 seconds. This bike is recharged using a 13 Amps plug socket. More information is available at www.vectrix.co.uk or www.nicecarcompany.co.uk

- Powabyke make a number of electric scooters (including the EVT 168 the EVT 4000e) that have a speed of up to 28mph with a range of 20-25 miles. More information is available at www.powabyke.com
- Zipee bikes also have an electric scooter on the market. Their website is: www.zipeebikes.co.uk
- Further information is also available at: www.scootelectric.co.uk

Electric bikes

Electric bicycles are capable of speeds of up to 15mph on a reasonably flat road and have a range of somewhere between 20 and 30 miles on a single charge. If the electric bike is manually assisted (by pedalling) the distance travelled can be much greater. The battery occupies a space on the cross bar and charges overnight from a standard 13 Amps socket. Further information on electric bikes is available from the following websites:

- Powabyke: www.powabyke.com
- 50 Cycles: www.50cycles.com
- The Urban Mover: www.urbanmover.com
- Sakura Electric Bikes: www.sbsb.co.uk

Electric vehicles soon to be launched in the United Kingdom

There are two others electric vehicles that will be available in the United Kingdom in 2007-08, the Cleanova and the Toyota Amberjac 'Plug in' Prius.

Cleanova



Manufacturer Societ  des Vehicules Electriques (a French joint-venture between Dassault and Heuliez).

Details The Cleanova uses lithium-ion battery technology. The car is based on a Renault Kangoo and can also be found in a van version. It has a range of 120+ miles and a top speed of 85mph. The vehicle can be fitted with a range extender (powered by ethanol) acting like a generator to recharge the batteries while driving. A demonstration vehicle will be available in the United Kingdom in 2007. The car is recharged using a 32 Amps socket, but it can also use a 13 Amps domestic socket (although recharging takes longer using a 13 Amps socket).

Website www.cleanova.com

Toyota Amberjac 'Plug in' Prius



Manufacturer Amberjac Project Ltd

Details The "Plug in" Prius is a converted version of the Toyota hybrid Prius. Production will start in November 2006 and ten cars will be built. "Plug-in" hybrid cars are built around their original model with an enlarged battery pack. This will allow the converted Prius to do 35 miles on pure electric mode and returns 100+mpg. They will be recharged using a standard 13 Amps domestic socket.

Website www.amberjacproject.co.uk

Think City Car



Manufacturer THINK Global

Details The Think City Car has a top speed of 62mph and a range of 100+ miles. It seats two adults and has air conditioning. It recharges using a 13 Amps plug socket in approximately 10 hours.

Website www.think.no

Discontinued electric vehicles

There are two electric vehicles that have since been taken off the market in the United Kingdom, the Ford Think and the Citroen Berlingo. Details of these cars are below.

Ford Think

Manufacturer Ford Motor Company Limited

Details The Ford think was a two seater car powered by nickel cadmium batteries. It was designed to have a 10-year life. Its top speed was 56mph and its range 53 miles.

Citroen Berlingo



Manufacturer The Citroen Group

Details The Citroen Berlingo supported a fast recharging process using a 150 Amps charger thereby enabling the vehicle to recover 80% of its battery capacity in about twenty minutes. These vehicles have an onboard electronic charger unit that can electronically manage fast recharging cycles by monitoring battery temperature and charging progress. The Citroen Berlingo also used a Nickel Cadmium battery. The Citroen Group has since discontinued production of the Electric Berlingo.

Numbers of electric vehicles in London

It is difficult to determine the exact number of electric vehicles in London. A survey undertaken by Royal Borough of Kensington and Chelsea found only 49 electric cars registered in Greater London in June 2003. However in March 2005, the Department for Transport, produced an analysis of model and vehicle type for electric vehicles. They found that there were 1,278 electric vehicles licensed in Greater London as at March 2005. Half of these electric vehicles were 'milk float' type vehicles used by councils to collect rubbish and carry out street works. The remaining electric vehicles were privately owned, predominately the Citroen Berlingo, Peugeot Partner and Peugeot 106.

Since then the new G-Wiz electric car has come on the market and has proved popular. This car is now a common sight in central London, where over 500 cars have been sold.

Choice of recharging point

This section of the report focuses on the factors that Westminster City Council considered when deciding which electric vehicle recharging point to install. It outlines the electric vehicle recharging points available on the United Kingdom market and the specifications of the recharging point that Westminster City Council chose.

Criteria for choosing an electric vehicle recharging point

The three main issues that were highlighted as being important in determining Westminster City Council's final choice of recharging point were:

1. Compliance with the Westminster Way street design guidelines
2. Suitability of the points for disabled users
3. Compatibility with the majority of electric vehicles used in London.

Westminster Way Street Design Guidelines

Westminster has a unique legacy of buildings and spaces that combine to create an unrivalled concentration of historic streets and squares. This heritage has evolved over hundreds of years and is fundamental to the very being of the place. To safeguard the architectural and historic character of Westminster and provide an inclusive environment, Westminster City Council has produced the Westminster Way Code of Street Design Guidelines.

The principles and rules included within the Westminster Way Code advocate and seek to achieve a minimalist approach and a "clutter free" street environment. This approach aims to deal with the single biggest combined issue facing street management: providing ease of movement and inclusiveness of access to the public realm for all while creating attractive spaces free of obstacles and visual obtrusion.

The guidelines when choosing items to be placed on the street in Westminster are as follows:

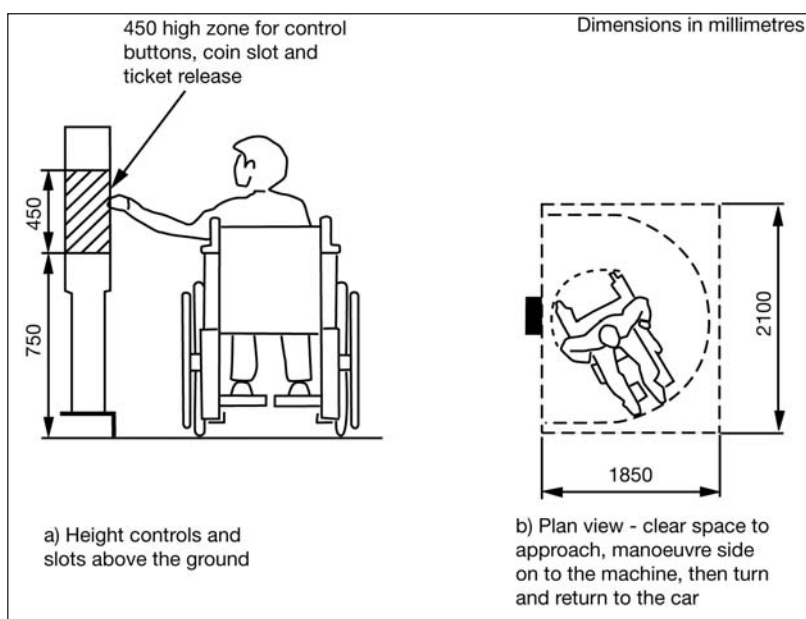
- **Quality:** Westminster's public realm requires high quality furniture components, materials, scheme design, implementation and detailing.
 - **Durability:** The choice of material must reflect the anticipated demands of the high levels of use and ensure long term, sustainable solutions can be implemented.
 - **Character:** The city's distinctive black livery should be adopted for all street furniture items, unless specifically identified as an established exception to this rule.
 - **Clutter Free:** Minimise the occurrence of street furniture obstruction, by removing obsolete items, co-locating elements where appropriate and only installing new items where considered necessary. This will ensure ease of pedestrian movement and the delivery of a truly inclusive public realm.
 - **Continuity:** Where appropriate, the replication of historic street furniture should be accurate both in terms of its fabrication and setting.
 - **Containment:** The established pattern of geographically distinct street furniture items should be respected and continued.
-

- **Context:** Choice of street furniture items and materials should be informed by the character and traditions of its context.
- **Co-ordination:** Items of furniture should as a rule be part of a co-ordinated suite.
- **Consistency:** Replace like for like unless part of a regeneration/street improvement strategy, or unless replacing like for like would be contrary to the other policies of the code.
- **Cherish:** Protect, preserve and maintain listed and other noteworthy items of street furniture in situ.

Suitability for disabled users

Westminster City Council aims to remove all barriers that it reasonably can for disabled people (while not creating any new barriers, unless they are necessary for another purpose or unavoidable). The Disabled Discrimination Act 1995 requires that disabled people are treated reasonably based on an organisation's policies, practices and procedures.

The design of the electric vehicle recharging stations therefore needed to comply with the regulation on the design of buildings and their approaches to meeting the needs of disabled people (BS8300 2001).



In general, the height above ground of the controls for ticket dispensers and slots for coins or cards that need to be operated from a wheelchair should be at least 750mm and not more than 1200mm as shown above. For non-wheelchair users, the height of controls may be between 1000mm and 1400mm.

The space in front of a meter or a ticket dispenser associated with a

designated parking space, or designated parking spaces, should be level, free from obstruction, and of the dimensions shown in the figure above. The plinth below a ticket dispenser or car park barrier control box should not restrict the ability of a wheelchair user to operate the equipment. However, for maximum accessibility the plinth should not project beyond the face of equipment.

Universal compatibility with electric vehicles in London

The recharging infrastructures needed to be compatible with the majority of the current models of electric vehicles on the market and also any future models that are soon to come on the market. These electric vehicles are described above in the section on electric vehicle use in London.

Electric vehicle recharging points available

This table shows the electric vehicle recharging points that were available for Westminster City Council to purchase.

Company name	Re-charging point description	Costs ⁶	Specifications
SGTE Power (France) www.sgte-ies.com	BRN Citys Currently installed in Paris, Bordeaux, Monaco	Circa £1,000	<ul style="list-style-type: none"> • Can recharge four vehicles per bay. • Compatible with all electric vehicles. • User friendly (manual key or electronic card for access).
DBT (France) www.dbt.fr	BVE Currently installed in Paris, Stockholm, Madrid, Milan and Bruxelles	Circa £2,500	<ul style="list-style-type: none"> • Can recharge four vehicles per bay. • Compatible with all electric vehicles • User friendly (manual key or electronic card for access). • Solar panels optional, that would contribute to the power supply.
	LRH Currently installed in Paris	Circa £1,500	<ul style="list-style-type: none"> • Can recharge one vehicle per bay. • Low maintenance. • Compatible with all electric vehicles. • User friendly (manual key or electronic card for access). • “Pop up” mechanism is a potential trip hazards.
	Enseigne Lumineuse + BR Currently installed in Paris, Bordeaux and Lyon	Circa £1,500	<ul style="list-style-type: none"> • Can recharge one or two vehicles • Illuminated sign on the front • User friendly (manual key or electronic card for access). • Only compatible with Citroen, Peugeot, Cleanova, “Plug-in” Prius electric cars. • Design most suitable for indoor applications (wall mounted in against in underground car parks).
Transtex International (France)	Veldis Currently installed in Paris, Bordeaux and Estoril (Portugal)	Circa £1,500	<ul style="list-style-type: none"> • Can recharge two vehicles. • User friendly (manual key or electronic card for access). • Only compatible with the Citroen, Peugeot, Cleanova and “Plug in” Prius electric cars.
Elektromotive (United Kingdom) www.elektromotive.com	Elektrobay	Circa £4,500	<ul style="list-style-type: none"> • Recharges one vehicle at a time. • Compatible with all electric vehicles. • User friendly (electronic key with control screen). • Electronically monitored.
Ciant (France)	Evora Currently installed in Bordeaux	Circa £2,500	<ul style="list-style-type: none"> • Can recharge two vehicles at one time. • Fast recharging cycle available. • Only compatible with Citroen, Peugeot, Cleanova and the “Plug in” Prius.
Spie-Trindel (France) www.spie.com	BRN	Circa £1,500	<ul style="list-style-type: none"> • Can recharge up to ten vehicles per bay. • Compatible with all electric vehicles. • User friendly (manual key or electronic card for access). • More suitable for indoor applications.

⁶ Prices are excluded of VAT. Exchange rate is 1.48 for one pound. For more information see www.finckconsulting.com

Shortlisted electric vehicle recharging points



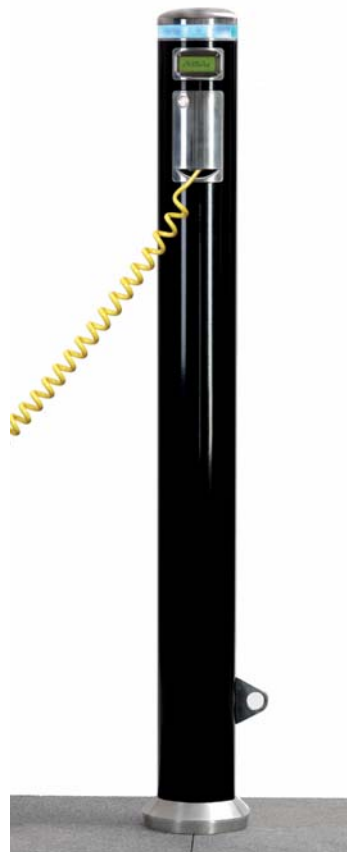
BRN Citys
manufactured by SGTE Power



BVE
manufactured by DBT



LRH
manufactured by DBT



Elektrobay
manufactured by Elektromotive

Choice of recharging point

All of the recharging points are made to comply with European and domestic legislation⁷. Each recharging point would need to be attached to the national grid through an underground cable. The exception is the BVE station from DBT that can be fitted with solar panels.

The Enseigne Lumineuse (manufactured by DBT), the Veldis (manufactured by Transtex International) and the Evora (manufactured by Ciant) recharging points were all ruled out on the basis that they are only compatible with the Citroen, Peugeot, Cleanova and “Plug in” Prius electric cars. The BRN recharging point (manufactured by Spie-Trindel) was also ruled out as being more suitable for recharging indoors.

This left the following four recharging points:

- the BRN Citys (manufactured by SGTE Power),
- the BVE (manufactured by DBT),
- the LRH (manufactured by DBT), and
- the Elektrobay (manufactured by Elektromotive).

All of the four short-listed recharging points are user friendly. Users gain access to the power supply through a manual or electronic key or an electronic card.

The BRN Citys recharging point the was thought to be more suitable for mounting onto a wall as it is a large bulky structure (it measures height 340mm width 450mm and depth 200mm). This model can recharge four vehicles at one time.

The BVE recharging point the can also recharge four vehicles per bay. It has the added advantage of being able to include energy from solar panels which would contribute to the power supply (this is optional), however additional electricity would be needed. This recharging point is large and would be a bulky item on the pavement (height 1800mm, width 600mm and depth 360mm).

The LRH recharging point is only able to recharge one vehicle at a time, it is a smaller recharging point, however there were concerns that the post itself could be a trip hazard. (Height 855mm and width 324mm (it is circular)).

The Elektrobay also only recharges one vehicle at a time. The cost of the Elektrobay is higher than the other models, but it has a control screen and can be electronically monitored using GPRS (General Packet Radio Service) technology. The Elecktrobay is much slimmer than the other recharging points and is similar in shape to a traditional parking meter (height 1409mm, width 189mm, and depth 146mm).

The final decision on what recharging point to choose came down to which recharging point would best comply with the principles of the Westminster Way street design guidelines. The Elektrobay by Elektromotive was chosen as it was seen as having a

7 The Low Voltage Directive 73/23/EEC, the Electromagnetic Compatibility EMC Directive 89/336/EEC, the European Environmental Law ENV 502 75.2 (part 1 and 2) and the International Law (part 1.22 and 1.23)⁷. Under these regulations it is mandatory for the recharging infrastructure to be fitted with a RCD Type AC 30 mA.

high quality design and the black Elektrobay fits in with Westminster City Council's black livery. As the Elektrobay is similar in shape to a traditional parking meter, it will also provide consistency in street design and will not create any additional clutter.

Specifications of the Elektrobay

The Elektrobay is made from a recycled aluminium structure. The recharging socket is 120cm above the ground. The Elektrobay is connected to the national grid by a feeder pillar.

The Elektrobay can be operated one handed by a person in a wheelchair. It can be installed at a 45 degree angle from kerb to enable wheelchair access and its screen can be easily seen from below.

To access the Elektrobay the driver uses an electronic key that communicates wirelessly to the unit. When a valid key is read the Elektrobay automatically opens the weather-proof access panel, where the recharging lead from the vehicle can be inserted. Once closed the access panel locks securely to prevent unauthorised removal of the cable and the power is turned on.

The unit is fitted with an active display that shows the status of the charging post and is programmed to notify the user when their Elektrobay access is about to expire. It will also show the registration number and can be programmed to function as a parking meter.

To end a charging session the user presents their electronic key to the Elektrobay. When the access panel is re-opened the power is automatically cut to allow safe removal of the charging lead. As a security feature, only the key that is used at the start of the recharging session can stop a charging session and open the Elektrobay. There are maintenance override keys to stop, disable and reset all Elektrobays. These maintenance keys can be used at anytime.

The use of electronic keys enables all of the usage data to be stored. This includes who, when and how much power has been supplied. This information can then be used for billing, statistical analysis, efficiency and maintenance calculations. The keys can be programmed to have a finite life e.g. 6 or 12 months, or can be programmed to meter the usage in a "pay-as-you-go" credits method. The payment methods have been designed to be "cash-less" for efficiency.

Elektrobay complies with international and European legislation (Low Voltage Directive 73/23/EEC, the Electromagnetic Compatibility EMC Directive 89/336/EEC, the European Environmental Law ENV 502 75.2 (part 1 and 2) and the International Law (part 1.22 and 1.23)).

Installation of the recharging points

This section of the report describes the installation of the recharging points, the choice of location, the process for installing the recharging points and how the recharging points are maintained.

Choice of location

It was decided early on in the project to install the recharging points where an existing traditional parking meter (coin-fed) was located. This would help to minimise street clutter as is necessary to comply with the Westminster Way street design guidelines.

As the pilot project was co-funded by Transport for London through the Clear Zones section of the Borough Spending Plan, the recharging points also needed to be installed within the part of Westminster inside the Clear Zone (as illustrated in the Map: Westminster section of the TfL Clear Zone). The London Clear Zone is an area adopting sustainable transport measures and innovative technology to reduce congestion and air pollution.

It was agreed that both facilities will be installed within the Clear Zone Area because the Zone is fairly small and that the presence of both infrastructures within such a small, but high profile area will increase awareness among the general public.

A survey of the existing electric vehicle recharging points (mainly in Masterpark carparks in Westminster) was carried out, so as not to place any of the on-street recharging points too close to them. As you can see on the map (Electric Vehicle recharging points in Masterpark car parks), none of the Masterparks carparks are within the Clear Zone.

Westminster City Council also considered whether there was any difference in air quality within the Clear Zone. It was determined that, due to atmospheric conditions, traffic volumes and cross-boundary movement of pollutants, that air quality levels were equivalent throughout the Zone.

Eight possible street locations were selected:

- St Martin's Lane (eight possible parking bays),
 - Garrick Street (seven possible parking bays),
 - Henrietta Street (five possible parking bays),
 - Southampton Street (seven possible parking bays),
 - Tavistock Street (six possible parking bays),
 - Wellington Street (twelve possible bays),
 - Long Acre (eight possible bays),
 - Catherine Street (eight possible bays).
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When making the final decision on where to put the recharging points, the council considered:

- The proximity of the bays to bicycle ranks, (to create a ‘sustainable transport corner’)
- Trying to maximise the visibility of signs with information that electric vehicles are recharging.
- Busy locations to provide electric vehicles with public exposure to maximise public awareness
- Avoiding streets that have a lot of ‘street furniture’ to minimise street clutter and trip hazards

Taking these factors into account, three possible locations were chosen; Wellington Street, Garrick Street and Southampton Street. Garrick Street was later ruled out when a trial hole found that sufficient clearance could not be achieved due to a basement below. The final locations were therefore Wellington Street and Southampton Street.

The Wellington Street site (parking bay M5073) is located at the corner of Wellington Street and Exeter Street. It is adjacent to a bicycle rank. The corner bay will provide opportunity for road and pavement signs to be seen easily.

The Southampton Street site (parking bay M4491) is located halfway along Southampton Street. The parking bay is also adjacent to a bicycle rank and the signs should be visible from both sides of the street.

Installation process

After the trial holes had been successfully drilled thereby finalising the locations, the first step in the installation process was to remove the traditional parking meters.

A “foundation post” was then cast into concrete, for the Elektrobay to be fixed to. To aid ease of installation the foundation post features a “location plate”. The location plate enables the anchor to be positioned vertically with a wide tolerance of 20mm. The location plate is designed to slightly protrude up from the ground level a distance of 10-30mm (10mm is the preferred distance). In addition, the locating plate must not be below ground level and during installation the horizontal upper surface must not be covered with concrete or asphalt as this face mates with the base of the Elektrobay.

The recommended method to install the foundation post is to cast the post into a hole 0.6m² (L 0.6m x W 0.6m x D 0.6m) using “PAV1” concrete (a specific type of concrete that is best suited to this type of installation) with an “S2” slump (a measure of consistency for the concrete). As the foundation post is square in section there is no need for anti rotation bolts. A foundation of this recommended size will result in a mass of approximately 500kg, this will reduce the chance on the foundation being displaced from either vehicle collision or human intervention.

The power company then runs a cable from the national grid to a “feeder pillar”. The use of a feeder pillar will enable the site to be isolated in emergencies and take energy meter readings independently of Elektromotive. In addition to this, upon isolation the Elektrobay will automatically release the door latch to enable the removal of a vehicle in an emergency or if the vehicle needs to be towed-away.



In some instances the power company providing electricity to the Elektrobay may insist on fitting a power meter and residual current device (which prevents any electric shocks if the charging cable is damaged) along with the MCB (or fuse). Elektromotive recommends that both the power meter and the residual current device be fitted to the supply. It is not a design requirement as the Elektrobay has an internal residual current device rated at 30ma. If a secondary residual current device is fitted it is recommended that the rating is 50ma (or greater) and not 30ma.

The power requirements to supply the Elektrobay are as follows:

- UK Specification 240 VAC @ 16 Amps supply minimum
- Euro Specification 240 VAC @ 20 Amps supply minimum

A subcontractor (West One) connected the feeder pillar to the foundation post. Power is supplied to the unit through the armoured supply cable that runs down the centre of the post. The cable can be fed either up the centre of the entire length of the post or through cable cutouts that enable the cable to be fed perpendicular to the vertical axis of the anchor.

The electrical supply to the Elektrobay must be TN-S (separate neutral and earth), a suitable earth must be provided from the feeder pillar to the unit via a separate conductor aside from the metallic armour sheath.

The designated cable required to feed the Elektrobay is XLPE/SWA/PVC 3 core 6mm² armoured cable. The cable is retained via an SWA type cable gland with the insulated cores terminated inside the Henley SNE (Separate Neutral and Earth) 54715-03 Fused (16 Amp for the UK and 20 Amp for Europe) street light cut out. It is a design requirement that the power cable is fed from an independent feeder pillar (or point) that can be isolated via a MCB (or fuse). This MCB (or fuse) fitted to the supply must be a higher rating than that installed into the cut out.

Elektromotive commissioned the final installation of the unit by connecting to the fused cut-out located on the Elektrobay foundation post. A rigorous process of testing was carried out by Elektromotive to ensure the recharging points were working correctly.

Minimising any trip hazard potential

During the course of the project it was identified that the wire between the charging lead and the recharging point could become a trip hazard. Two solutions were found to minimise this risk. The first solution was to include a side panel attached perpendicularly to the recharging point Elektrobay towards the kerbside. That solution will allow room for advertising or promotional message. This solution was dismissed because it was thought that the side panel itself could constitute a trip hazard.

The second solution was to provide users of the scheme with a high quality, durable, industrial grade bright yellow coiled mains lead. Because the mains lead is coiled it will avoid trailing cable on the pavement and creating a trip hazard. The lead would also have a bright yellow coating, so that it could be seen easily.

Westminster City Council decided that the yellow coiled mains lead was the best option for reducing the potential for trip hazards. A condition of use for the recharging points will be that users must recharge with the yellow coiled mains lead supplied by the council. Users will be required to put down a refundable £50 deposit.

Maintenance

Westminster City Council has an annual maintenance contract with Elektromotive, who are supplying the recharging points. The Elektrobay recharging points will need to be tested four times a year to ensure they are functioning correctly.

Westminster City Council was concerned that the posts might attract stickers, fly posters and graffiti as Elektrobay has a smooth surface and will be located in Covent Garden (where this is common). Following a technical trial with the different paints available, Elektrobay uses anti-graffiti clearcoat and curing agent, as well as a graffiti remover specification (provided by Cromadex) in order to minimise these risks.

There has also been some concern that as the electric vehicle recharging points are a new piece of 'street furniture' vandals could target them. The Elektrobay is designed so that if a vehicle backs onto it, the station will bend with minimal damage to its base structure, to minimising replacement costs. It has also been designed with a shear point at the base to enable peak impact loads to be avoided if it is struck by a vehicle.

While the recharging cable is locked into the recharging socket, not all cars have the ability to lock the point at which the cable enters the car. Therefore antisocial people could pull out the cables from these cars preventing them from recharging. This has been identified as a risk for this pilot project. Car manufacturers are working to address this problem and future vehicles should have 'locking' vandal proof cable sockets.

Use and enforcement

This section of the report outlines the strategy for finding users for the recharging points and how the regulations governing their use will be created. It also details how the success of this project will be measured.

Recruiting users for the recharging points

Westminster City Council runs an Eco-Mark club for people with alternatively fuelled vehicles. This Eco-Mark club keeps people up to date with useful information and invitations to exclusive events. Registering for the Eco-Mark club can be done online at: www.westminster.gov.uk/ecomark

Any electric powered vehicle with an electric Westminster Eco-Mark will be eligible to use the recharging points, however for the pilot project the number of users is to be capped at 100. If there are more than 100 users then there would be too much demand on the two recharging points.

All vehicles registered with an electric Westminster Eco-mark that wish to use the recharging points will be able to request a wireless key and information pack directly from Elektromotive. Elektromotive will supply the key, yellow cable, full instructions for use and a number to call if they have technical problems or queries. Users will be required to pay a £50 deposit for the yellow cables.

Whether the Plug-in Hybrid vehicle will be able to use recharging points will have to be considered once the vehicles have been launched. At the moment, a plug-in hybrid car is not included in the Westminster City Council's definition of an electric vehicle.

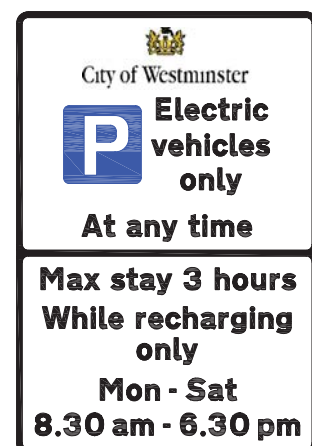
New signs and road markings

As the electric vehicle recharging bays are new to London, new signs and road markings needed to be approved by the Department for Transport. The Traffic Signs Regulations and General Directions 2002 do not currently cover signs for electric vehicle recharging points.

Westminster City Council (through its contractors West One) prepared drawings of the proposed signs and road markings. This included a plan indicating where the traffic signs are to be erected or the road marking will be laid and the scale. A completed copy of the application form and checklist for the authorisation of non-prescribed traffic signs and road markings was also sent to the Department for Transport.

The council was given approval in principle to the design and location for the new signs and road marking and then final approval followed.

The authorisation process took three months. Full details of this authorisation process are available at: www.dft.gov.uk



Charging points rules of use

In order for the recharging points to operate effectively, and to allow multiple users in one day, Westminster developed a number of rules for usage of recharging points. These rules are listed below, with an explanation in italics.

1. Vehicles must use the yellow coiled cable provided by Westminster City Council. This is to ensure that any trip hazards are minimised as described in the section on minimising any trip hazard potential.
2. The bay is only for use by vehicles that are actively recharging. This rule is designed is to encourage turnover and maximise the number of vehicles able to recharge in one day.
3. The maximum time period for charging is 3 hours. This is to allow more than one vehicle to recharge in a day.
4. After charging for 3 hours a vehicle must leave and cannot return within that 8.30am to 6.30pm period. This is to prevent one vehicle monopolising the recharging point for an entire day.
5. Between the hours of 6.30pm and 8.30am from Monday to Saturday the bay remains exclusively for the use of electric vehicles but outside the hours unlimited charging can occur. It was wanted to keep the rules for the electric vehicle parking bay similar to that of a traditional parking bay overnight. It would also be difficult to enforce parking infringements overnight.
6. The bay is only for use by electric powered vehicles displaying an Ecomark sticker. Ecomark is Westminster City Council's alternatively fuelled vehicles club. It is free to join this club and it provides a means to administer the programme (www.westminster.gov.uk/ecomark).

The rules for use of the re-charging points will be reviewed after the six month trial period.

There has been a concern that if a person was to rely on the recharging points to be available in order to top up their vehicle before driving home, then they could have to wait for three hours to use the recharging points. Increasing the number of recharging points could perhaps solve this in the future or an online booking system could be created, similar to that used by car sharing clubs.

Traffic Management Order

In order for the council to be able to create regulations for the recharging points, a Traffic Management Order was needed. A Traffic Management Order is the legal procedure, which all councils have to comply with, to effect new or amendments to traffic management and parking schemes, emergency road closures or temporary restrictions within their borough boundaries. The effects of the Traffic Management Order is often indicated by signs and lines marked on the highway surface.

The Traffic Management Order to implement the electric vehicle recharging bay covers:

- Citation and commencement
- Interpretation
- Designation of recharging points
- Vehicles for which recharging points are designated
- Contravention at recharging points
- Period for which a vehicle may be left at a recharging point
- Interval before a vehicle may again be left at a recharging point
- Manner of standing at a recharging point
- Power to suspend the use of a recharging point
- Restriction on the use of a recharging point
- Restriction on waiting by a vehicle at a recharging point
- Manner of waiting at a recharging point
- Removal of a vehicle from a recharging point
- Movement of a vehicle at a recharging point in an emergency
- Installation of recharging posts and placing of traffic signs
- Schedule- Areas on streets designed as recharging points

Traffic Management Orders provide the means by which consultation is carried out with statutory consultees (police, emergency services, and representative organisations) as well as the general public. Westminster City Council sent a draft order detailing the scheme to the statutory consultees on the 12th October 2006 and an advertisement was placed in the local paper on the same day.

Following publication of the advertisement there was a period of 21 days in which anybody could make an objection or representation against the published proposals. Only one submission was received from a person supporting the project. The council confirmed the Traffic Management Order and placed another advertisement in the local paper.

Contravention Codes

For Westminster City Council to be able to enforce the rules created by the Traffic Management Order it was necessary to make sure that there are appropriate contravention codes available for Traffic Wardens to use.

Parking tickets issued by Westminster City Council are called 'Penalty Charge Notices'. They require payment of a penalty, and do not result in a criminal record or points on a driving licence. Penalty Charge Notices are issued when a driver parks a vehicle in contravention of the regulations. In addition the vehicle may also be removed to the car pound.

Penalty Charge Notices include a contravention code and a description of the offence. As electric vehicle re-charging bays are a new concept, it was necessary to understand how people could be issued with a parking ticket for not obeying the rules of use. Below are infringements on the rules that could occur and the Contravention Code that would apply.

- Electric vehicles only - all other vehicles to be issued with Contravention Code 23 (vehicle parked in a parking place or area not designated for that class of vehicle). This bay is for purely electric vehicles only, not hybrid cars that use petrol and battery power.
- Overstaying longer than the three hour limit - vehicles should be issued with Contravention Code 30 (vehicle has been parked for longer than permitted).
- Every part of vehicle within the recharging point bay - enforce using Contravention Code 24 (vehicle not parked correctly within the markings of the bay or space).

Contravention Code 19 (vehicle parked in a parking place without clearly displaying the required permit or pay and display ticket) could apply to users of the recharging points that do not display an Eco-mark. This code is in a draft of forthcoming codes from London Councils (formerly the Association of Local Government), who are the body that issues Contravention Codes.

There is currently no Contravention Code for vehicles that are not recharging while parked in the bays. Contravention Code 25 (vehicle parked in a loading place during restricted hours without loading) is very similar to what is needed. Westminster City Council has requested a Contravention Code from London Councils for vehicles "parked in a charging place during restricted hours without charging".

Evaluating the project

As this is a pilot project, Westminster City Council has decided to review it after six months. The key indicator of success will be the extent to which the recharging points are used. This can be measured by the number of people who register to use the recharging points (though this will be capped at 100) and by looking at the information gathered by the Elektrobays on their usage. It is also planned to send a questionnaire to the users of the recharging points so that they can provide some feedback on how easy they found the points to use.

It will also be important to measure the technical success of posts, whether they require maintenance and if there are any problems with use of them. A log book will be kept by Elektromotive and Westminster City Council on any problems that arise.

The final indicator will be whether the recharging points raise the profile of electric vehicles. This is more difficult to measure, but could be indicated by the amount of press coverage that the pilot project receives.

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