

*Measure title:* **Electric Vehicle Charging Points**

~~*City:* **Brighton & Hove** *Project:* **Archimedes** *Measure number:* **2**~~

## **Executive summary**

This measure involved the installation of 8 electric vehicle charging points, on-street in Brighton & Hove, and was the first of its type in the UK.

The charging points are all powered by sustainably generated electricity.

The measure helped to realise the potential for densely located fuelling stations to impact on the take up of alternative fuels, and tested the belief that scarcity of supply is holding back the wider take up of electrically powered vehicles.

Research was conducted in summer 2009 which indicated there was only one company in the UK, Elektromotive Ltd, who had experience of installing on-street EV charging points.

Site visits were conducted to look for suitable installation points, primarily looking for sites with high visibility, easy access and safety for users while using the charging points, and the close proximity of an electrical power supply to the proposed site.

The first 4 charging points were installed in September 2009, with a further 4 in January 2011. Registration for membership of the scheme opened in February 2012.

Evaluation for this measure has predominantly focused on monitoring the usage of the scheme, and exploring social awareness and acceptance. Due to slow take-up of the scheme, and the relatively small scale of its impact, indicators on air quality, emissions, and modal shift have proved less significant compared to the social indicators. Calculations of carbon savings from the operation and usage of the scheme have been measured using actual electricity consumption data and conversions based upon national averages (these calculations have been made by Elektromotive).

- 35 registered users of the scheme
- 55% reduction in CO2 emissions (compared to the same usage with non-electric vehicles)
- 35% of registered users use the B&H charging points at least once a week
- 65% of registered users charge their electric vehicles at home, most often
- The shortage of charging points is the factor that registered users like least about electric transport

The importance of the placing of the charging points at locations where they are useful destinations for potential users and will therefore be regularly used.

- Allowing plenty of time for the electrical connections to be made by electricity network suppliers, as this can be the major factor in delaying their becoming live.
- Providing incentives to encourage joining the scheme and use of the charging points, such as free registration and free use of the facilities during the start up period.

## **A Introduction**

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### **AI Objectives and target groups**

#### **AI.1 Objectives**

The measure objectives are:

High level / longer term:

- To implement the first on-street electric charging points in the UK outside of London.

Strategic level:

- To encourage the take up of clean & energy efficient vehicles.

Measure level:

- To install 8 Green Electricity Vehicle Charging Points in order to test the belief that scarcity of supply of fuel is holding back the wider take up of electric vehicles.

#### **AI.2 Target groups**

The electric vehicle charging points have been located within the Civitas corridor of Brighton. The scheme, although based in this area has been opened to residents from other areas of Brighton & Hove, and also residents from other local authority areas who may wish to visit the city.

### **A2 Description**

This measure saw the installation of 8 on street electric vehicle charging points and was the first of its type in the UK. There had previously been a number of charging points installed around the country in car parks, business parks etc, but those in Brighton will be the first to be installed on-street, outside of London.

The charging points are all powered by sustainably generated electricity. The council's intention was to work closely with Car Clubs and EDF Energy to assist in delivering the project and help secure long-term viability.

The measure helped to realise the potential for densely located fuelling stations to impact on the take up of alternative fuels, and tested the belief that scarcity of supply is holding back the wider take up of electrically powered vehicles.



Figure No.1: Sites of the Electric Vehicle Charging Points (2 points at each site)

The charging points offer an easy and convenient way for electric vehicle users to charge their cars. They can be accessed by parking next to the charging point and simply plugging the car to the point, using an access tag to enable the charging (more details of how to charge in section B4). The average charging time for a substantial top-up would be 3 hours, however to fully charge a car which had no energy could take 8-10 hours.

## **B Measure implementation**

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### **B1 Innovative aspects**

- **New conceptual approach** – This measure was the first of its scale in the UK and intended to realise the potential for densely located fuelling stations to impact on take-up of alternative fuels.
- **New mode of transport exploited** – Electric vehicles
- **Targeting specific user groups** – By siting the fuelling stations in the city centre it was anticipated the target population would be city residents and others from outside the city that use cars/vehicles for both short distance commuting and general journeys around the city.
- **New organisational arrangements or relationships** – The council had planned to work closely with Car Clubs and EDF Energy to assist in delivering & securing long-term viability. – However, initial discussions with Car Clubs operating in the city met with little interest and it was not possible to progress this hoped for arrangement.
- **New physical infrastructure solutions** – the siting of fuelling stations in the city centre.
- **New policy approach** – Test the belief that scarcity of supply is holding back the wider take up of electrically powered vehicles.

### **B2 Research and Technology Development**

N/A

### **B3 Situation before CIVITAS**

There were no on-street electric charging points in Brighton & Hove prior to this measure, and indeed nowhere in the UK (except London) was there sufficient provision of publicly available charging points for electric vehicles before Civitas involvement. There were however a few residents with electric vehicles and therefore some private charging was taking place.

The objective of this measure was to test whether a scarcity of charging points was holding back take-up of electric transport; therefore it was not necessary that there was a pressing need for the provision within Brighton & Hove. As the technology develops and the price of electric vehicles comes down, it is expected that take-up will increase and it is therefore important to be 'ahead of the game' and have the means to charge these vehicles already in place. The measure appraises how take-up increased once the points had been installed, and charts the development of electric vehicles as a viable option of sustainable transport.

### **B4 Actual implementation of the measure**

The measure has been implemented in the following stages:

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### **Stage 1: Gathering information/planning (Oct 08 - May 09)**

*This stage involved gathering information, putting together the Project Initiation Document, the Project Plan, and the Risk Log.*

Research was undertaken on electric vehicle recharging schemes in this country, which at the time were all in London, and on similar schemes which had been set up in other countries. Following this initial research a Project Initiation Document, Risk Log and Project Plan were created.

### **Stage 2: Tender/Identification of locations (June 09 – Aug 09)**

*Tendering of contract for charging points, identification of possible locations, site surveys to ascertain suitability of use, initiate administration set up for scheme.*

Research indicated that there was only one company in the UK, Elektromotive Ltd, who had experience of installing on-street EV charging points. Following the city council's written procurement procedure an official waiver, allowing the placing of a contract with Elektromotive without seeking competitive tenders report, was agreed and signed off by the Director of Environment and the Cabinet Member for Environment.

The decision making process on the possible locations took as a starting point the need for them to be situated within the Civitas area of Brighton. Consultation and meetings were arranged with officers from Transport and other divisions within the city council to arrive at a number of possible locations. Following on from this process a list of recommended sites was compiled and site visits were arranged to assess their suitability. The sites visits primarily looked for high visibility, with easy access and safety for users while using the charging points, and the close proximity of an electrical power supply to the proposed site.

Elektromotive Ltd, the supplier of charging points to the project, also offered to act as the administrator for the scheme, for a fixed annual fee. Their service covers the processing of user applications, the issuing of equipment and dealing with routine enquiries from users. It was felt that this would be more efficient than using resources from within the council so this was the approach we followed.

### **Stage 3: Installation of charging points (September 09)**

*This stage involved the installation of charging points; publicity and press coverage of charging points and locations.*

Four charging points were installed in Brighton during September / October 2009. Two charging points installed in Bartholomews in central Brighton which is close to Brighton Town Hall, and two charging points installed in Ditchling Road which is opposite The Level.

There was an opening ceremony for the Bartholomews charging point location attended by Councillor Mary Mears, (Leader of the Council), and Councillor Geoffrey Theobald, (Cabinet Member for Environment). The opening ceremony attracted widespread publicity for the charging points, with articles appearing in both the local and national press and also on local television.

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The installation of four more charging points took place in January 2011. Two have been located in Madeira Drive which is on Brighton seafront by the pier, and two in Withdean Road just outside Withdean Stadium, which was until recently the home of Brighton & Hove Albion football club.

#### **Stage 4: Operation of scheme** (September 09 to September 2012)

*Administration of scheme, monitoring of usage and change in number of electric vehicles.*

The first four charging points were ready for use at the end of September 2009, but were not immediately available to users, as the details of the membership scheme were still being worked on. At the same time the contract with Elektromotive was being developed, and this went through a number of iterations with a number of changes being put forward for discussion by both sides. The contract with Elektromotive was finalised, and details of the user's membership scheme completed, in time to start signing up users to the scheme from February 2010.



Figure No.2: Charging Point in Bartholomews, Brighton



Figure No.3: Charging Points in Ditchling Road, Brighton

## Using the Charging Points

Below are the user instructions for charging an electric vehicle as detailed on the Elektromotive website

<http://www.elektromotive.com>

### To start recharging...



#### STEP 01

To begin recharging, find a vacant and active Elektrobay. A **BLUE** light on the top means the Elektrobay is available and ready for recharging.



#### STEP 02

Before accessing the Elektrobay, **PLUG YOUR POWER LEAD INTO YOUR CAR FIRST**. Then present your access tag to the right side of the Elektrobay where you will find the yellow touch point. Touch the centre of the yellow touch point at the same height as the user display panel.



#### STEP 03

The door will click open slightly allowing you to lift the door up to access the socket.



#### STEP 04

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Plug your power lead into the socket making sure you have **PLUGGED THE LEAD INTO YOUR CAR FIRST**.



## STEP 05

Now press the door closed until it **LOCKS IN PLACE** and the power will turn on automatically. The light on the top will change to **GREEN** showing that the Elektrobay is recharging. Should the light turn **RED** please see [explanation here](#).

### **Stage 5: Promotion and Dissemination (October 09 – onwards)**

*Promotional and information-sharing activities as part of the work programme, and those complimenting the work programme.*

Since the launch of the scheme there have been a number of promotional and dissemination activities in Brighton & Hove.

These include:

July 10 – Support for Electric Vehicles taking part in the Brighton to London ‘Eco-Rally’

September 10 – Support for Electric Vehicles taking part in the Brighton Speed Trials

October-November 10 – Support for electric Vehicles taking part in the Brighton to London ‘Future Car Challenge’ & photo shoot for an article about the business use of Electric Vehicle Charging Points.

February 11 – French TV filming programmes about Electric Vehicle Charging Points in Brighton & Hove & filming of the BHCC promotional video to engage the business community.

### **Stage 6: Evaluation (October 2009 – onwards)**

Evaluation of this measure began as soon as the first charging points had been installed, with monitoring of fuel consumption, number of charges, duration of charges etc.

An initial awareness/acceptance survey was conducted during in November 2009 to test whether residents were aware of the installation, and if they had any interest or motivation in using the provision. A similar survey was then conducted (July 2012 – the survey was kept open for longer than intended due to a low response) to see how these opinions have changed over time. A user survey was also conducted in July 2012 to assess awareness/acceptance of those registered to the scheme, as well as determining behaviour.

The social benefits of the electric vehicle charging points, such as the reduction in emissions/improvement of air quality, has been measured against the financial costs of the

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measure in order to conduct a cost/benefit analysis. Placing a monetary value on the benefits of improved air quality has been done using national values. This evaluation has been compared against the emissions and social benefits of standard motorised vehicles.

For full details of impact evaluation please refer to section C1

For full measure results/evaluation findings please refer to section C2

## **B5 Inter-relationships with other measures**

The measure is related to other measures as follows:

### **Measure No. 3 Emissions VMS**

Would support the objectives of VMS, and electric car emissions would register as 'good'.

- Air quality improvements surrounding designated schools
- Promotion of sustainable travel options via 'Good' rating

### **Measure No.31 Personalised Travel Plans**

Information about the electric charging points would be part of the Personalised Travel Planning information.

- Promotion of the scheme via doorstep interviews/general raising of awareness/profile of sustainable transport modes

### **Measure No. 54 Car Sharing Improvements**

The intention was to have worked closely with Car Club when considering their siting and fleet.

- The potential impact no longer remains as the project did not progress to implementation.

## **C Planning of Impact evaluation**

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### **CI Measurement Methodology**

#### **CI.1 Impacts and indicators**

##### **CI.1.0 Scope of the impact**

The indicators chosen in the table below were selected as directly related to the introduction of the measure. Brighton & Hove are the first UK city (outside London) to make on street electric charging points available and the indicators selected as both viable and intended to allow for monitoring over time.

The indicators relate to:

**Economy – Benefits:** operating revenues will only become an indicator later in the life of the project due to this element remaining free to users as an initial incentive (but for the foreseeable future). Economic costs will be recorded and measured against social and environmental benefits. They will also be compared to the economic costs of making the same journeys using a standard vehicle to test the economic benefits of electric transport.

**Energy –** current developments include increased efficiency of electric car batteries. National data can be used to compare fuel efficiency of electric vehicles against standard ones, and a calculation can be made based on the recorded energy usage of the charging points.

**Environment - Improved air quality & noise levels –** and consequently human health. The King Review of Low Carbon Cars (Part I) published in October 2007, reported that EV (& PHEVs) could make a significant contribution to reducing CO<sub>2</sub> from road transport, the conclusions of which were supported by the Government in November 2008. Measuring the impact of this indicator and obtaining usable data will be entirely dependent on the level of usage of the charging points. By up-scaling the data we can obtain we may be able to make further deductions of increased future take-up.

**Society – Awareness & acceptance.** Changing our infrastructure to support electric vehicles is a big challenge, and public support & take up will need to be monitored. This will be a particularly significant indicator in exploring potential barriers to increased take-up, and in answering questions such as: who will use electric vehicles, what kind of journeys will they make, for what reason will they use them?

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Transport – Information on the number of vehicles, number of trips, and quality of service will become more significant as and when take-up increases.

### CI.1.1 Selection of indicators

NO.	EVALUATION CATEGORY	EVALUATION SUB-CATEGORY	IMPACT	INDICATOR	DESCRIPTION	DATA /UNITS
	<b>ECONOMY</b>					
1		<b>Benefits</b>	Operating Revenues	Operating revenues	Revenues per pkm	Euros/pkm, quantitative, measurement
2a		<b>Costs</b>	Operating Costs	Operating costs	Costs per pkm	Euros/pkm, quantitative, measurement
2b			Capital Costs	Capital costs	Costs per annum	Euros/annum, quantitative, measurement
2c			Maintenance costs	Maintenance costs	Costs per annum	Euros/annum, quantitative, measurement
	<b>ENERGY</b>					
3		<b>Energy Consumption</b>	Fuel Consumption	Vehicle fuel efficiency	Fuel used per vkm, per vehicle type	MJ/vkm, quantitative, derived or measurement
	<b>ENVIRONMENT</b>					
5		<b>Pollution/Nuisance</b>	Air Quality			
6				NOx levels	NOx concentration	Ppm or g/m3, quantitative, measurement
7				Particulate levels	Particulate PM10 and/or PM2.5 concentration	Ppm or g/m3, quantitative, measurement
8			Emissions	CO2 emissions	CO2 per vkm by type	G/vkm, quantitative, derived
10				NOx emissions	NOx per vkm by type	G/vkm, quantitative, derived
11				Particulate emissions	PM10 and/or PM2.5 per vkm by type	G/vkm, quantitative, derived
	<b>SOCIETY</b>					
13		<b>Acceptance</b>	Awareness	Awareness level	Awareness of the policies/measures	Index (%), qualitative, collected, survey
14			Acceptance	Acceptance level	Attitude survey of current acceptance of the measure	Index (%), qualitative, collected, survey
15		<b>Accessibility</b>	Spatial Accessibility	Perception of accessibility	Perception of physical accessibility of service	Index(%), qualitative, collected, survey
17		<b>Security</b>	Security	Perception of security	Perception of security when using service	Index, qualitative, collected, survey
	<b>TRANSPORT</b>					
19		<b>Quality of service</b>	Quality of service	Quality of service	Perception of quality of service	Index, qualitative, collected, survey
		<b>Number of electric vehicles</b>	Demand for the charging points	Take up	Number of electric vehicles registered with the Brighton & Hove City Council EV scheme	numerical

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NO.	EVALUATION CATEGORY	EVALUATION SUB-CATEGORY	IMPACT	INDICATOR	DESCRIPTION	DATA /UNITS
		<b>Number of trips</b>	Number of trips	Number of trips	Information on number of journeys	Quantitative, calculated
		<b>Number of charges</b>	Number of charges	Number of charges	Usage of charging point	numerical

### CI.1.2 Methods for evaluation of indicators

No.	INDICATOR	TARGET VALUE	Source of data and methods	Frequency of Data Collection
	<b>ECONOMY (1, 2A, 2B, 2C)</b>	Budget figures	Examination of financial records compiled during life of the project by measure leader, compared to budget figures.  (As an initial incentive to potential users there will be no operating revenues for the scheme. Methods for collecting any future revenue data are only theoretical and will be based on assumptions.)	Ongoing
	<b>ENERGY (3)</b>	TBC	Data from charging points records of usage	Ongoing
	<b>ENVIRONMENT (5, 6, 7, 8, 9, 10, 11, 12)</b>	Air Quality Management Area (AQMA) targets	Carbon savings and Co2 reduction figures derived from collected data and national averages – report produced every 6 months by supplier. Also data from existing AQMA monitoring sites in the city.	Ongoing
	<b>SOCIETY (13, 14, 15, 16, 17)</b>	Changes in perception	Results of surveys on public perception on charging points and usage of electric vehicles.  Users identified through sign-up to the scheme (registration details) contacted by postal survey for their views on the scheme and suggestions for the future.  Non-users identified by a random postal (and online) survey bundled with other Civitas projects. The postal survey has been sent to every 20th address from the Councils Land & Property Gazetteer database to target residential population of the city (approx 118,000 households). Target size of the sample has been 5000+ to achieve 1000 responses (confidence interval +/- 3.0). The online survey on the Council's website. Baseline survey completed late 2009. Sample size was: 5,425. Response rate was: 689 (11%)	Mid to late 2009 for initial baseline survey  User survey by post in July 2012  Follow up survey completed in July 2012
	<b>TRANSPORT (19)</b>	TBC	Users identified through sign-up to the scheme (registration details) and contacted by postal survey.	User survey completed in July 2012

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No.	INDICATOR	TARGET VALUE	Source of data and methods	Frequency of Data Collection
			Non-users identified by a random postal (and online) survey to be bundled with other Civitas projects. The postal survey will be sent to every 20th address from the Councils Land & Property Gazetteer database to target residential population of the city (approx 118,000 households). Target size of the sample will be 5000+ to achieve 1000 responses (confidence interval +/- 3.0). The online survey would go on the Council's website.	
	Number of trips	increasing	Users will need to register with us to be able to access charging points	Numbers calculated from amount of electricity supplied through the charging points
	Number of charges	increasing	Data to be collected by supplier on a six monthly basis during routine maintenance. Data to include total power drawn, total recharging times, and total number of charges from each charging point.	6 Monthly returns

## **CI.2 Establishing a baseline**

This measure is designed to test the belief that scarcity of supply of fuel is holding back wider take-up of electric vehicles; therefore the baseline position tested people's attitudes towards electric vehicles and their willingness to convert to this innovative technology. Along side this qualitative study, an appraisal of the current usage of electric vehicles was conducted in order to assess the relative take-up once the scheme was implemented.

### Awareness/acceptance surveying

A resident's postal survey was conducted in November 2009, prior to the opening of the registration for the scheme, but once the charging points had already been installed. Therefore awareness of the charging points could be tested as well as exploring people's attitudes to technology and their perceived barriers to up-take. At this stage residents would have potentially seen marketing material for the points. 5,425 survey forms were mailed out to random addresses within Brighton & Hove; 689 people responded (99 of which were from a subsequent online version of the survey).

Key survey questions were:

- Have you heard or read about Electric Vehicle Charging Points prior to receiving this survey form?
- Do you think you are likely to use Electric Vehicle Charging Points?
- If you are unlikely to use Electric Vehicle Charging Points, can you tell us why not?

### Baseline electric vehicle usage

An appraisal of the baseline usage of electric vehicles in Brighton & Hove at the commencement of the charging point scheme has helped analyse the impact of the initiative. The awareness and acceptance surveying described above has helped explore this indicator.

### Baseline emissions

Air quality monitoring and historical data on emissions levels has been used to describe the situation prior to the implementation of the electric vehicle charging points in Brighton & Hove.

## **CI.3 Methods for Business as Usual scenario**

In the absence of the Civitas Electric Vehicle charging points project, there were no plans for on-street charging points to be installed in the Brighton & Hove area, and hence less incentive to acquire and run Electric Vehicles in the city. Even if private initiative had introduced them we would have no input into the monitoring and usage. We have therefore assumed for Business as Usual analysis purposes that no on-street charging points would have been installed over this period in the city.

## **C2 Measure results**

### **Baseline Awareness/Acceptance Monitoring**

As part of the impact evaluation process for Electric Vehicle Charging Points, a survey was conducted in November 2009 to collect baseline information on residents' awareness of the measure being implemented.

5,425 survey forms were mailed out to a random selection of addresses across Brighton & Hove taken from the Land and Property Gazetteer (LPG). The LPG forms the corporate address database that provides a unique and unambiguous identifier for each address/entry in the gazetteer.

There were only 590 (11%) forms returned so a further online survey was set up to try and increase the number of responses. 99 responses were submitted via the online survey. In both cases the chance to win a £50 shopping voucher was used as an incentive. In total there were 689 responses.

The survey intention was to repeat the methodology of the pre implementation phase to establish shifts in public awareness/ acceptance of Electric vehicle charging points. Unfortunately due to budget availability the methodology had to be rethought and a pragmatic approach taken. The 2012 survey was made available as online only and advertised on the Council's website. Although on other council surveys we have seen a growing shift to complete surveys online, and using this approach is not uncommon, it is acknowledged it does limit the numbers responding. In this particular online survey the response rate was not good, and consisted of only 49 responses.

A possible consideration around public awareness of the on street electric vehicle charging points may be related to general publicity. When the first site was launched this was accompanied with a lot of local media coverage. Once out of the implementation phase there was less opportunity to raise public awareness with news stories, although the profile has been maintained via the council's website and JourneyON

### **C2.1 Economy**

#### **C2.1.2 Costs**

Indicator	Before (date)	B-a-U (date)	After (date)	Difference: After-Before	Difference: After-BaU
2a Operating costs	0 (15/09/2008)	0 (15/09/2008)	24,262 Euros (14/09/2012)	24,262 Euros	0
2b Capital costs	0 (15/09/2008)	0 (15/09/2008)	80,676 Euros (14/09/2012)	80,676 Euros	0

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2c Maintenance costs	0 (15/09/2008)	0 (15/09/2008)	6,803 Euros (14/09/2012)	6,803 Euros	0
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**(Note – Capital Cost = site works and purchase of infrastructure e.g. Elektromotive, EDF/UKPN, signing & lining)**

For the Business as Usual scenarios, without the assistance of the Civitas Archimedes project it has been assumed that there would not have been any charging points installed in Brighton & Hove during the previous four years.

Table No.8

Financial year	Installation costs £s	Installation costs Euros	Installation Costs Euros/pkm
Year 1	16,897	19,236	-
Year 2	15,345	18,366	8.97 Euros/km
Year 3	36,452	42,406	8.99 Euros/km
Year 4	533	668	0.12 Euros/km

The table shows the annual installation costs in Euros divided by the mileage in km calculated as possible from the amount of energy supplied by the charging points to EV user's electric vehicles. In year 1 although substantial costs were incurred by the project no users were signed up to the scheme and therefore no calculation is possible. Year 4 shows the effect of the mature scheme with little in the way of installation costs but the highest calculated mileage from the amount of energy supplied.

## **C2.2 Energy**

### **C2.2.1 Energy Consumption**

Indicator	Before (date)	B-a-U (date)	After (date)	Difference: After-Before	Difference: After-BaU
3 Fuel Consumption	0 (15/09/2008)	0 (15/09/2008)	2,252.24kW (July 2012)	2,252.24 kW	0 kW

The fuel consumption figure is based on the download of usage and power drawn from the charging points which were supplied to the council by Elektromotive. This figure of 2,252.24kW was used by the equipment supplier, Elektromotive, as a basis for the CO2 reduction savings.

The average vehicle journey length in Brighton & Hove from modelled data is approximately 6.5 km, which is approximately 4 miles. Total mileage potential from the data supplied to the council by Elektromotive from the charging point downloads is 7,507 miles. Using the total mileage potential figure of 7,507 miles and the 4 mile average results in an estimated 1,877 average trips enabled by the charging points since the commencement of the project. (See section C2.5).

As set out in Section C2.3, this calculation demonstrated an overall saving of 1,493.23 kg of CO2 over petrol powered vehicles for the same distance travelled.

For the Business as Usual scenario, without the assistance of the Civitas Archimedes project it has been assumed that there would not have been any charging points installed in Brighton & Hove during the previous four years.

## C2.3 Environment

### C2.3.1 Air Quality

Indicator	Before (date)	B-a-U (date)	After (date)	Difference: After-Before	Difference: After-BaU
6 NOx levels	<b>(LTP2 indicator)</b> <b>NO2 only data:</b> <b>Site 1 Lewes Road</b> 2008 - - 54ug/m3 <b>Site 2 Grand Parade</b> 2008 - 40 ug/m3 <b>Site 3 Viaduct Road</b> 2008 - 39 ug/m3	0	<b>(LTP2 indicator)</b> <b>NO2 only data:</b> <b>Site 1 Lewes Road</b> 2010 - 74 ug/m3 <b>Site 2 Grand Parade</b> 2010 - 57 ug/m3 <b>Site 3 Viaduct Road</b> 2010 - N/A	<b>(LTP2 indicator)</b> <b>NO2 only data:</b> <b>Site 1 Lewes Road</b> + 20 ug/m3 <b>Site 2 Grand Parade</b> + 17 ug/m3 <b>Site 3 Viaduct Road</b> N/A	0
7 Particulate levels	N/A	N/A	27.4 ug/m <sup>3</sup> (2011)	N/A	N/A

The Air Quality indicator which is monitored and used in the BHCC Second Local Transport Plan is Nitrogen dioxide (NO2). Results for NO2 for 2008 and 2010 from our priority sites are included above, and show an increase in the level of NO2 over this period. The monitoring of particulate levels (PM<sub>10</sub>) commenced at Beaconsfield Road roadside, which is adjacent to the A23, in the calendar year 2011. For the purpose of comparison, the 2012 figures will be available early in 2013, but figures are not available from earlier years.

For the Business as Usual scenario, without the assistance of the Civitas Archimedes project it has been assumed that there would not have been any charging points installed in Brighton & Hove during the previous four years. It is to be expected that the use of the relatively small number of EVs currently in the city centre would have made a difference to the level of emissions. However, due to the low numbers it has not been possible to arrive at a meaningful measurement of what the difference might be.

**C2.3.2 Emissions**

Indicator	Before (date)	B-a-U (date)	After (date)	Difference: After-Before	Difference: After-BaU
10 NO <sub>x</sub> emissions	<b>(LTP2 indicator) NO<sub>2</sub> only data: Site 1 Lewes Road 2008 - - 54ug/m<sup>3</sup> Site 2 Grand Parade 2008 - 40 ug/m<sup>3</sup> Site 3 Viaduct Road 2008 - 39 ug/m<sup>3</sup></b>	0	<b>(LTP2 indicator) NO<sub>2</sub> only data: Site 1 Lewes Road 2010 - 74 ug/m<sup>3</sup> Site 2 Grand Parade 2010 - 57 ug/m<sup>3</sup> Site 3 Viaduct Road 2010 - N/A</b>	<b>(LTP2 indicator) NO<sub>2</sub> only data: Site 1 Lewes Road + 20 ug/m<sup>3</sup> Site 2 Grand Parade + 17 ug/m<sup>3</sup> Site 3 Viaduct Road N/A</b>	0
11 Particulate emissions	N/A	N/A	27.4 ug/m <sup>3</sup>	N/A	N/A

The Air Quality indicator which is monitored and used in the BHCC Second Local Transport Plan is Nitrogen dioxide (NO<sub>2</sub>). Results for NO<sub>2</sub> for 2008 and 2010 from our priority sites are included above. The monitoring of particulate levels (PM<sub>10</sub>) commenced at Beaconsfield Road roadside, which is adjacent to the A23, in the calendar year 2011. For the purpose of comparison, the 2012 figures will be available early in 2013, but figures are not available from earlier years.

**Carbon Dioxide emission calculations and comparison**

To calculate the Carbon Dioxide emissions saved through the use of the EV charging points the following method was used by our supplier, Elektromotive, who used National Energy Foundation CO<sub>2</sub> Calculator conversion factors.

1 Using an average electrical consumption of 0.30 kW/mile gave the mileage potential of 12,081km / 7,507 miles (a) from an average electric vehicle (G-Wiz and Smart ED) from the total amount of electricity in kW downloaded from the charging points.

2 An input of the energy in kW drawn from the charging points, and using a conversion factor of 0.537 produced as an output (b) the amount of CO<sub>2</sub> from UK Grid Electricity emissions for a typical electric vehicle.

3 Using the mileage potential (a) for an electric vehicle, and using the conversion factor of 0.36, typical CO<sub>2</sub> emissions from a petrol car were calculated (c) for the same distanced travelled.

4 The calculated CO<sub>2</sub> emissions from a typical electric vehicle (b) were deducted from the calculated CO<sub>2</sub> emissions from a typical petrol vehicle (c) to arrive at the CO<sub>2</sub> savings.

Total amount of CO<sub>2</sub> calculated, from energy production of electricity supply for charging points for the total power drawn:

**1,209.46kg of CO<sub>2</sub>**

Total CO<sub>2</sub> calculated emissions from petrol for the same distance travelled:

**2,702.67 kg of CO<sub>2</sub>**

Total CO<sub>2</sub> savings:

**1,493.23 kg of CO<sub>2</sub>**

Total CO<sub>2</sub> reductions:

**55% reduction in CO<sub>2</sub> emissions**

The calculations above were made by Elektromotive and utilise actual usage data alongside average values derived from the G-Wiz and Smart ED electric vehicles. Elektromotive have used the National Energy Foundation CO<sub>2</sub> Calculator to complete the analysis.

## **C2.4 Society**

### **C2.4.1 Acceptance**

Indicator	Before (Dec '11)	B-a-U (date)	After (July 2012)	Difference: After-Before	Difference: After-BaU
13 Awareness level	66.5%	0	32%	-34.5%	0
14 Acceptance level	0	0	35	+35	0

- Awareness level is based upon the percentage of respondents who said they had heard and/or read about electric vehicle charging points.
- Acceptance level is the number of people registered to use the charging points

For the Business as Usual scenarios, without the assistance of the Civitas Archimedes project it has been assumed that there would not have been any charging points installed in Brighton & Hove during the previous four years.

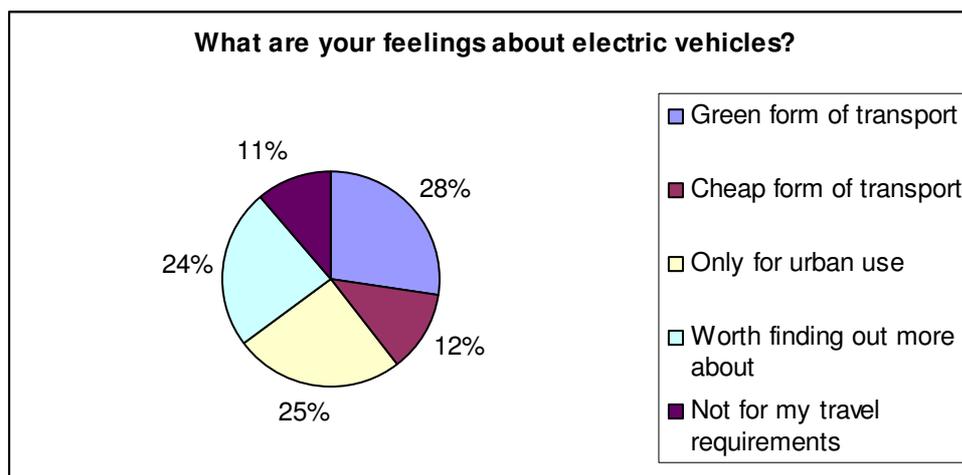
**What are your feelings about electric vehicles?**

Respondents were asked for their feelings about electric vehicles and were prompted by the pre-set suggestions below – top five responses.

Table No.5

	<b>2009 survey</b>	<b>2012 survey</b>	<b>Total</b>
Green form of transport	462 (27%)	22 (34.9%)	484 (27.4%)
Cheap form of transport	205 (12%)	9 (14.3%)	214 (12 %)
Only for urban use	436 (25.6%)	10 (15.9%)	446 (25.3%)
Worth finding out more about	410 (24.1%)	14 (22.2%)	424 (24%)
Not for my travel requirements	188 (11%)	8 (12.7%)	196 (11.1%)
Totals	1701 (100%)	63 (100%)	1764 (100%)

Graph No.5



The main feedback from the pre-set responses about electric vehicles were that they are a green form of transport worth finding out more about. Also that they are only for urban use, although the percentage agreeing with this statement has reduced from 25% in 2009 to a figure of 16% in 2012 .

Respondents are generally not sure whether electric vehicles are a cheap form of transport, or whether they are appropriate for their travel needs.

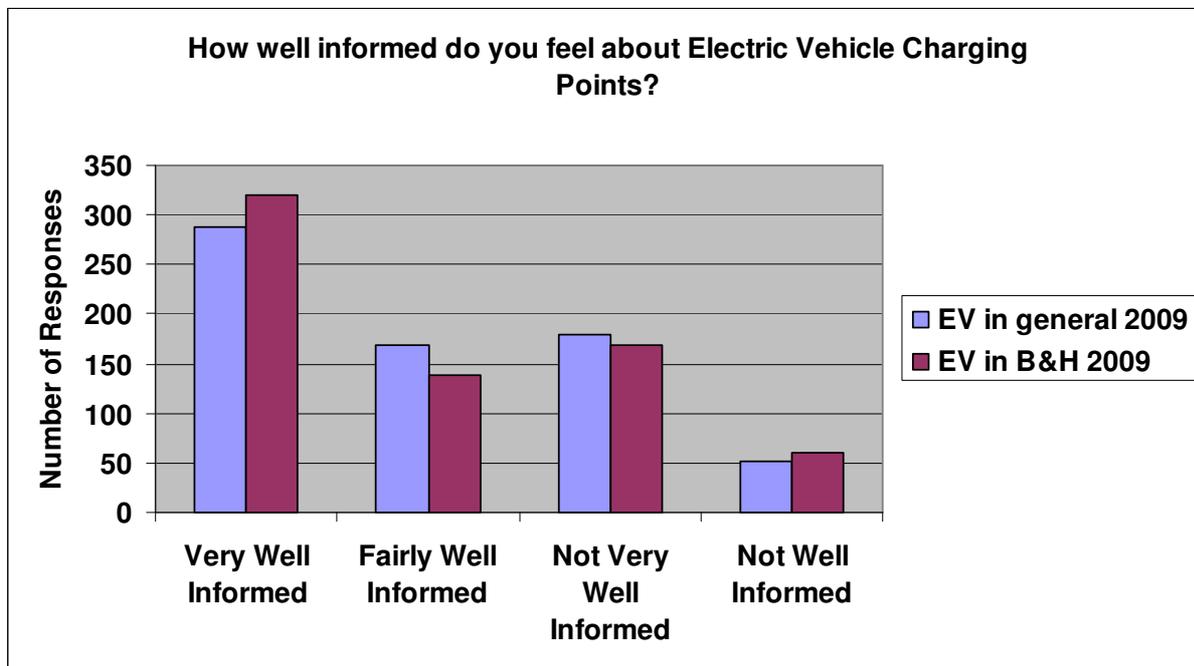
**How well informed are you about Electric Vehicle (EV) Charging Points in general, and specifically in Brighton & Hove?**

Respondents were asked where they had heard about this scheme and were prompted with the suggestions below.

Table No.1

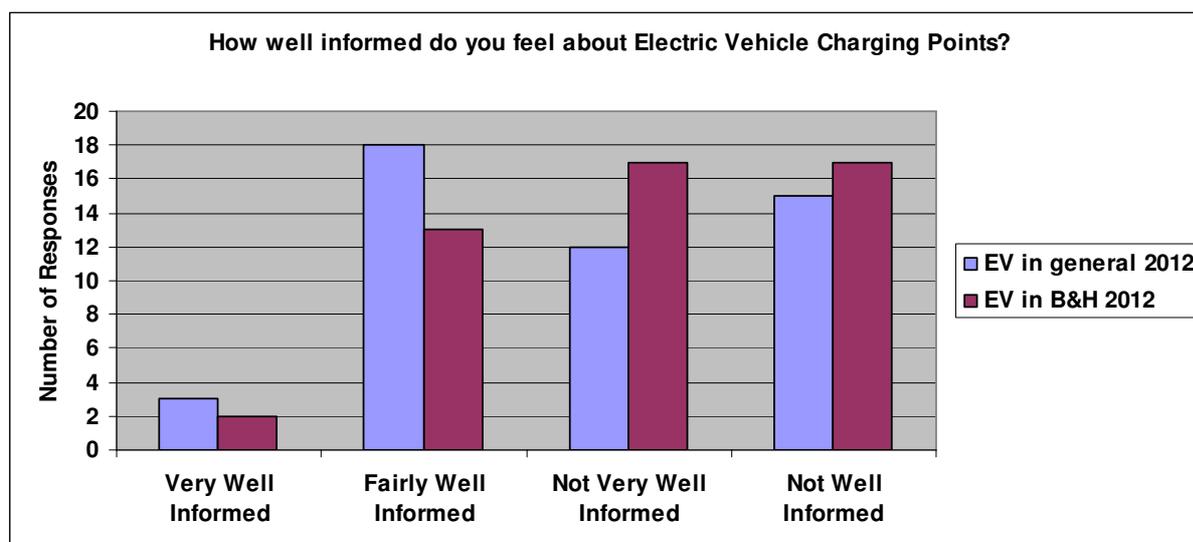
	<b>EV in general 2009</b>	<b>EV in B&amp;H 2009</b>	<b>EV in general 2012</b>	<b>EV in B&amp;H 2012</b>
Very Well Informed	287 (42%)	319 (46.5%)	3 (6.2%)	2 (4.1%)
Fairly Well Informed	169 (25%)	139 (20%)	18 (37.5%)	13 (26.5%)
Not Very Well Informed	179 (26%)	168 (24.5%)	12 (25%)	17 (34.7%)
Not Well Informed	51 (7%)	61 (9%)	15 (31.2%)	17 (34.7%)
<b>Total</b>	<b>686 (100%)</b>	<b>687 (100%)</b>	<b>48 (100%)</b>	<b>49 (100%)</b>

Graph No.1a



In general in 2009, respondents felt very well informed about the scheme, both nationally and locally. A slightly higher percentage felt they were very well informed at a local level.

Graph No. 1b



The responses to the surveys in 2009 and 2012 showing a significant reduction in the percentage of respondents who felt that they are very well informed or well informed regarding Electric Vehicle Charging Points.

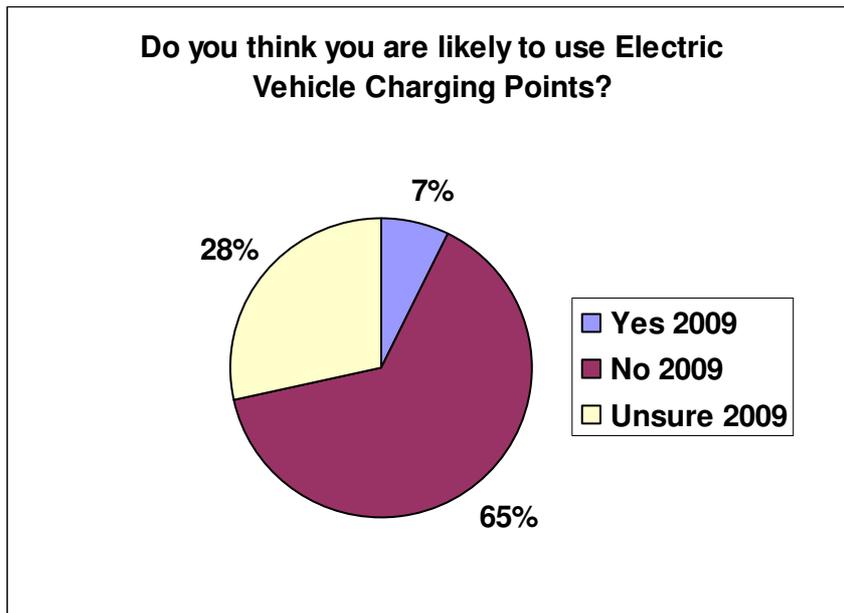
This change in perceived level of information may be partially due to the low response to the online only survey in 2012. The original launch of the first charging points in Brighton in October 2009 was accompanied by extensive coverage in both the local and national media. Since then there has been a continuing interest by the media in the scheme, and much coverage by local and national press, radio and TV, but this can be seen as a lesson of the need to maintain a constant flow of information to the public regarding new and innovative measures such as this.

### Do you think you are likely to use Electric Vehicle Charging Points?

Table No.2

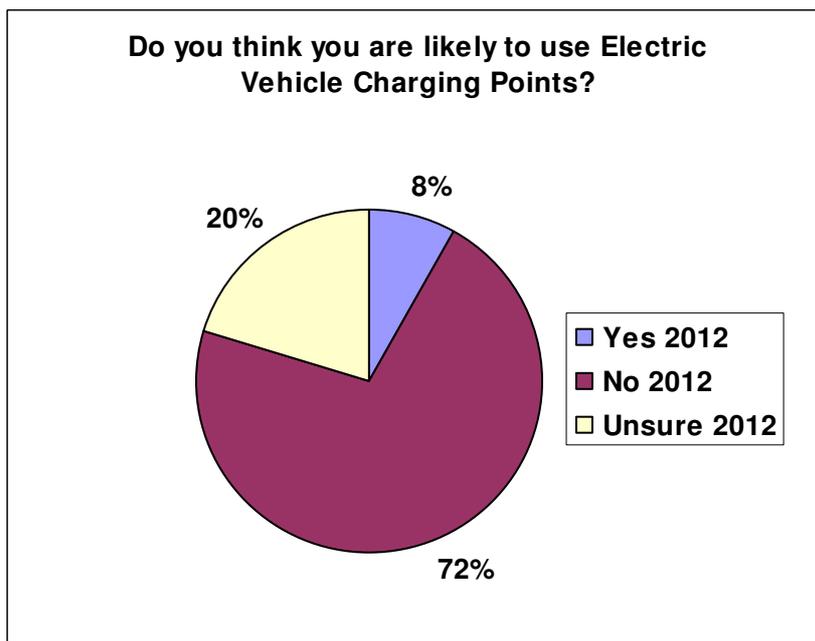
	Yes	No	Not Sure	Total
<b>EV Charging Points 2009</b>	48 (7%)	435 (65%)	191 (28%)	674 (100%)
<b>EV Charging Points 2012</b>	4 (8.2%)	35 (71.4%)	10 (20.4%)	49 (100%)

Graph No.2a



In 2009, 65% of respondents said they were unlikely to use Electric Vehicle Charging Points.

Graph No. 2b



In 2012, 72% of respondents said they were unlikely to use Electric Vehicle Charging Points.

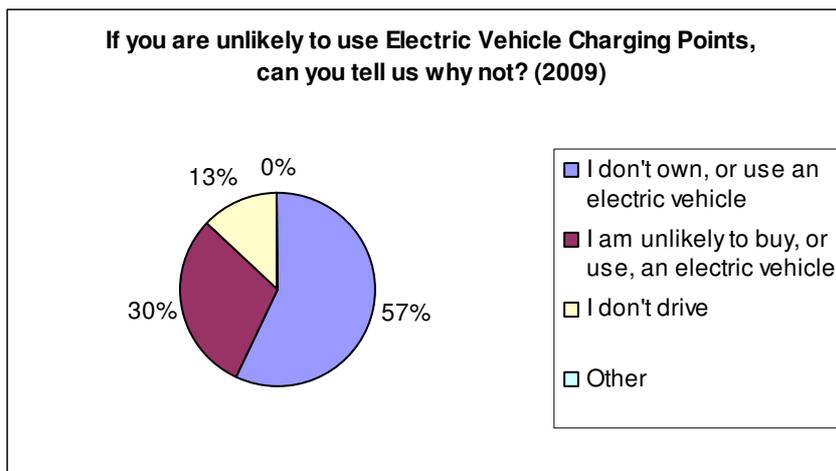
This increase in the number of people (from 65% to 72%) who thought that they would not use Electric Vehicle Charging Points may be due to changes in the wider economy over the period from 2009 to 2012. There are also greater levels of information regarding the relatively high costs of purchasing Electric Vehicles, which would not have been available to the same extent in 2009.

**If you are unlikely to use Electric Vehicle Charging Points, can you tell us why not?**  
 (Respondents were prompted to tick all that apply)

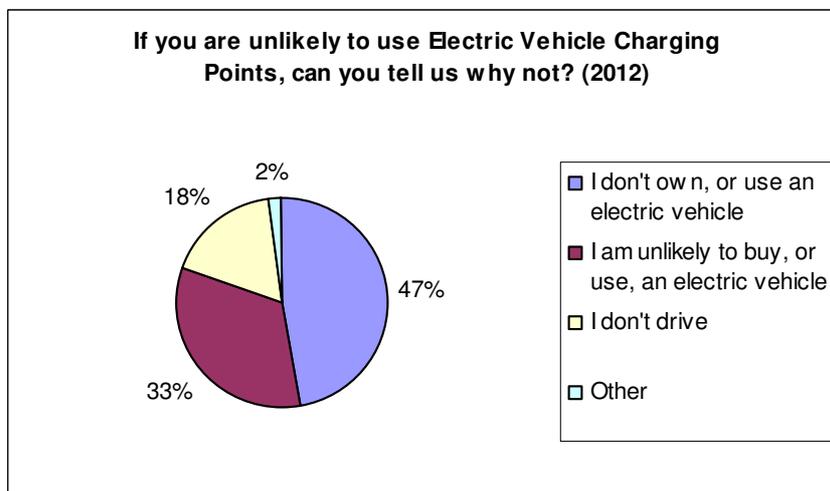
Table No.3

	<b>EV Charging Points 2009</b>	<b>EV Charging Points 2012</b>
I don't own, or use, an electric vehicle	509 (57%)	24 (47.1%)
I am unlikely to buy, or use, an electric vehicle	272 (30%)	17 (33.3%)
I don't drive	115 (13%)	9 (17.6%)
Other	-	1 (2%)
<b>Total</b>	<b>896 (100%)</b>	<b>51 (100%)</b>

Graph No. 3a



Graph No. 3b



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Other responses included:

With improvements I would consider an electric car – 13

Waste of money/ unsustainable (EV) – 7

The main reasons for not using Electric Vehicle Charging Points are as to be expected, and 87% in 2009 and 80% in 2012 of respondents said they were unlikely to ever buy an electric vehicle.

However, the most frequent additional response was that with improvements more people would consider taking up electric vehicles.

#### C2.4.2 Accessibility

Indicator	Before (date)	B-a-U (date)	After (date)	Difference: After-Before	Difference: After-BaU
15 Perception of accessibility	0 (15/09/2009)	0 (15/09/2009)	65% (13 out of 20)	65%	0
16 Relative cost of service	0 (15/09/2009)	0 (15/09/2009)	Free to users to register for the scheme and use the charging points	0 (July 2012)	0

Users were surveyed and asked what they thought about the locations of the EV charging points in the city. Out of 20 responses, a total of 13 users said that they thought that they are good locations.

There is currently no cost to users to either sign up for the EV charging point scheme or for using the charging points. As a result it is not possible to assign a cost of service relative to personal income.

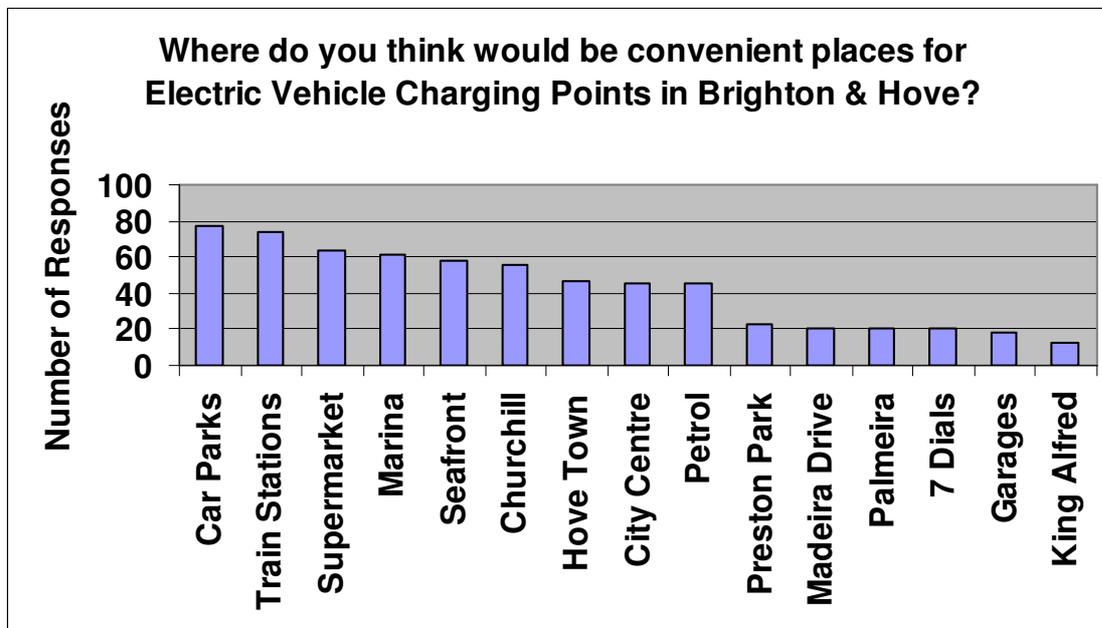
For the Business as Usual scenarios, without the assistance of the Civitas Archimedes project it has been assumed that there would not have been any charging points installed in Brighton & Hove during the previous four years.

**Where do you think would be convenient places for Electric Vehicle Charging Points in Brighton & Hove?**

Table No.4

Location	No. of responses	% of responses
Car Parks	77	12
Train Stations	74	11.5
Supermarkets	64	10
Marina	61	9.5
Seafront	58	9
Churchill Square	56	9
Hove Town Hall	47	7.5
City Centre	46	7
Petrol stations	46	7
Preston Park	23	3.5
Madeira Drive	21	3
Palmeira Square	20	3
7 Dials	20	3
Garages	18	3
King Alfred	13	2
<b>Total</b>	<b>644</b>	<b>100</b>

Graph No.4



Measure title: **Electric Vehicle Charging Points**

City: **Brighton & Hove**

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Measure number: **2**

### C2.4.3 Security

Indicator	Before (date)	B-a-U (date)	After (date)	Difference: After-Before	Difference: After-BaU
17 Perception of security	0 (15/09/2008)	0 (15/09/2008)	86% (18 out of 21)	86%	0

To establish the Perception of security, users were surveyed and asked if they were happy leaving their vehicles at the charging points. Out of 21 responses, 18 users answered yes to this question.

## C2.5 Transport

### C2.5.1

Indicator	Before (date)	B-a-U (date)	After (date)	Difference: After-Before	Difference: After-BaU
19 Quality of service	0 (15/09/2008)	0 (15/09/2008)	43% (9 out of 21)	43%	0
Number of electric vehicles	Not recorded (15/09/2008)	Not recorded (15/09/2008)	35 (July 2012)	35	0
Number of trips	0 (15/09/2008)	0 (15/09/2008)	1877 (July 2012)	1877	0
Number of charges	0 (15/09/2008)	0 (15/09/2008)	935 (July 2012)	935	0

For the Quality of service question users were surveyed and asked if they would pay to use the charging points – they are currently free to use – and the response used to gauge the approval of the charging point scheme.

For the number of electric vehicles – it was not possible to establish the number of EVs registered with the Driver & Vehicle Licensing Agency (DVLA) at the start of the scheme so we have used the number of members in the BHCC scheme.

The average vehicle journey length in Brighton & Hove from modelled data is approximately 6.5 km, which is approximately 4 miles. Total mileage potential from the data supplied to the council by Elektromotive from the charging point downloads is 7,507 miles. Using the total mileage potential figure of 7,507 miles and the 4 mile average results in an estimated 1,877 average trips enabled by the charging points since the commencement of the project.

The total number of charges has been taken from the download data from the charging points supplied to the council by Elektromotive.

With regard to the usage of the charging points in individual locations the most recent report from Elektromotive for the period 16/02/2012 to 15/07/2012 included corrupted data and communication problems with two of the charging points so has not been used.

However the previous report for the period 15/07/2011 to 16/02/2012 has valid data for all of the charging point locations and is as follows:

Bartholomews (city centre)	251 hours recharging	(27%)
Ditchling Road (slightly outside city centre)	308 hours recharging	(34%)
Withdean (sports centre – out of city centre)	276 hours recharging	(30%)
Madeira Drive (seafront - promenade)	78 hours recharging	(9%)

Note – the Madeira Drive site had only been operational for approximately 3 months during this monitoring period, so a higher figure would have been expected had it been up and running for the full 6 months. Usage at the three other sites is all quite similar to each other so no clear conclusions can be drawn regarding the relative merits of their locations.

For the Business as Usual scenarios, without the assistance of the Civitas Archimedes project it has been assumed that there would not have been any charging points installed in Brighton & Hove during the previous four years.

### EV Charging Data

Records of the actual usage of the charging points are manually downloaded on a regular basis. The table below shows details of all usage since the points were installed up until July 2012. The figures inevitably increase over time as new charging points are installed and begin operation.

Table No.5

Period of operation	Days of operation	Power used (kW)	Recharging time (hours)	Total Transactions (recharges)
13/10/2009 To 25/03/2010	163	82.40	115.43	62

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25/03/2010 to 15/08/2010	140	256.19	210.80	74
15/08/2010 To 14/01/2011	152	213.68	312.13	120
14/01/2011 To 15/07/2011	182	536.20	505.85	239
15/07/2011 To 16/02/2012	216	537.62	913.33	260
16/02/2012 To 15/07/2012	150	626.15	1747.95	180

<b>TOTAL</b>	<b>1,003</b>	<b>2,252.24</b>	<b>3,805.49</b>	<b>935</b>
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From the above figures the average charging time can be calculated as:

(Recharging time in hours / total transactions)

(3805 hours/ 935 transactions)

= 4.07 hours for the average charging time

### **EV Users**

As of July 2012 there are 35 people registered to use the Brighton & Hove Electric Vehicle Charging Points.

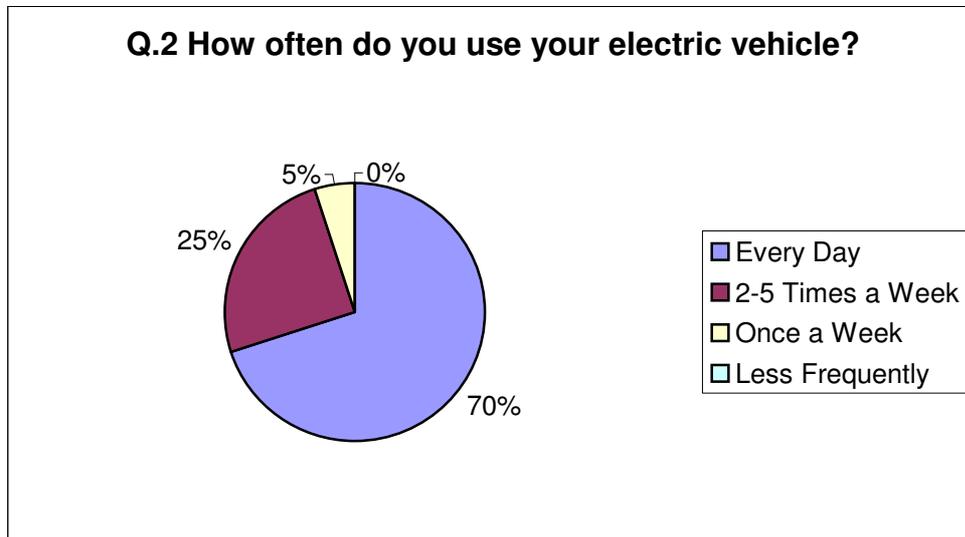
34% (12 people) of the users live in Brighton & Hove. The remaining 65% live anywhere between 10 and 150 miles outside of the city.

### Awareness and Acceptance

This awareness and acceptance user survey conducted in July 2012 explored the opinions and behaviour of this user group. Surveys were mailed out to all 35 current users, and 20 responded.

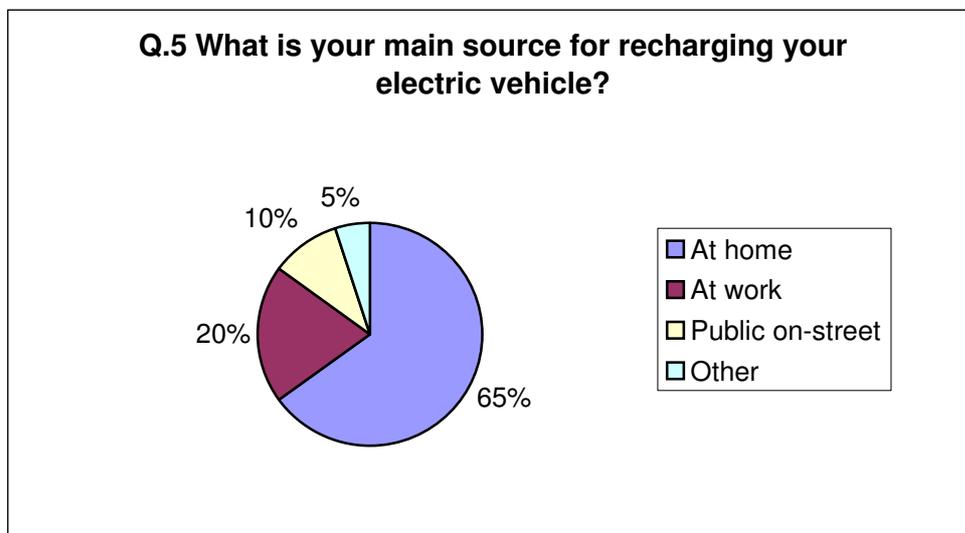
**Headline Results**

Graph no.5



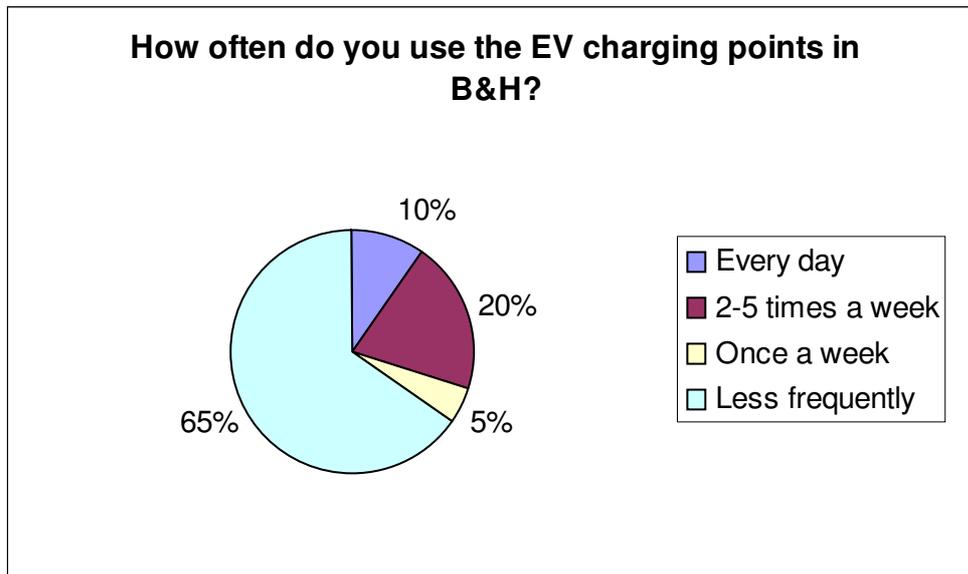
70% (14 people) of respondents use their electric vehicle every day. This suggests that the vehicles are used as primary modes of transport, rather than just occasional alternatives. This hypothesis is supported by the response to Q3 which showed the journey most often made by users in their electric vehicles being commuting (50%). 30% of respondents said leisure journeys were most often made in their electric vehicles.

Graph No. 6



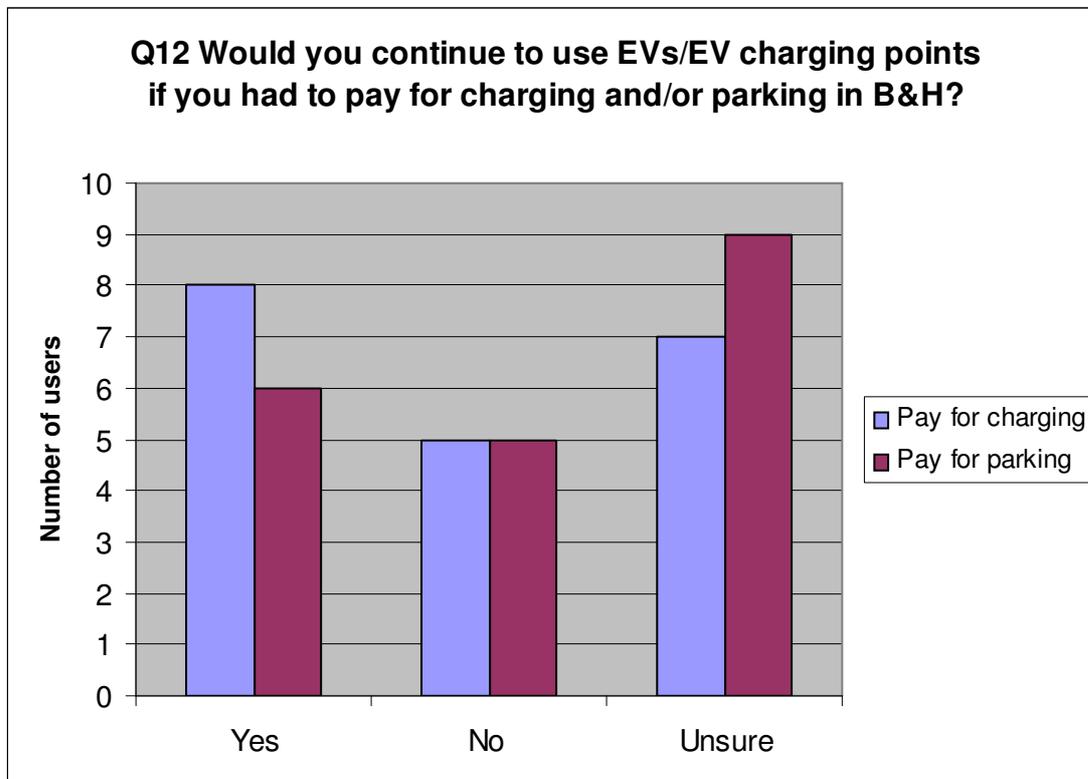
65% (13 people) of respondents said they mainly recharge their electric vehicles at home, whereas only 10% (2 people) mainly used public on-street points. This demonstrates what we expected in terms of usage; that the on-street charging points would not act as a main source of charge, but as a top-up.

Graph No. 7



Only 35% (7 people) use the EV charging points in Brighton & Hove once a week or more. 65% (13 people) of respondents use them less frequently. Out of the 13 people who said they used the EV charging points less frequently, 2 said they had only used the points once before, and another 2 people said they had never used them.

Graph no.8



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In an attempt to anticipate future usage of the scheme, users were asked whether they would use the scheme if they had to pay (for either parking or charging of their EV) (for continued running of the scheme, some payment would be necessary).

40% (8 people) of respondents said they would be willing to pay for charging their EV. 30% (6 people) of respondents said they would be willing to pay for parking their EV (whilst charging it). The positive response outweighs the negative, with only 25% in both cases saying they would be unwilling to pay. 35% - 45% said they were unsure whether they would be willing to pay. 4 additional comments stated their willingness to pay would be dependant upon the cost.

This is a promising view of how the scheme may progress in the future.

Further questions went on to explore potential methods of payment and membership to other adjacent EV charging networks.

## **C2.6 Cost Benefit**

### **Appraisal case, relevant alternatives and base line case**

The stages of the project are described in B4 and result in the installation of eight electricity vehicle charging points across the city. The business as usual case would result in no immediate plans for the introduction of any on street electric vehicle charging point across the city.

### **Project life**

The life of the project has been defined as the duration of the CIVITAS funding: 3 years. This is based upon the worse-case scenario that once funding is removed the project will not be able to continue due to a lack of local funds.

There is speculation that Electric Vehicles will become an increasingly significant mode of transport, and by keeping the project life to only 3 years we can hopefully monitor this development without the current charging technology becoming potentially out of date. Other possibilities for defining project life could be the average lifetime on an electric vehicle: 10 years, or the lifetime of the charging points: indefinite (dependant on maintenance).

### **Discount Rate**

The costs and benefits has been calculated using a discount rate of 3.5%, as supplied on page 26 of the Pointer guidance 'CBA Recommendations for Civitas Evaluation'

### **Key impacts of the project**

The key impacts of the project are:

#### Capital costs:

- Cost of installing charging points (local authority).

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- Cost of an electric vehicle and charging (user).

Operating costs:

- Cost of operating and maintaining the charging points (local authority).

Operating revenues:

- There has been no revenue associated from EV recharging project as it was decided by Brighton & Hove City Council to incentivise the scheme to potential users by making no fees or charges payable for either registering to use the charging points or for the parking or recharging at the charging points.

Fuel consumption:

- Average miles to the gallon for a standard car, compared to number of miles to a fully charged battery.
- Compare fuel cost to battery charge cost.

Air quality:

- Carbon Dioxide emission calculations and comparisons are supplied by Elektromotive based on the actual amount of usage of the charging points, using National Energy Foundation Co2 Calculator. Potentially we could upscale this information to make theoretical conclusions about the benefits of increased take-up. This will be compared against the emissions of standard non-electric vehicles in order to create a direct comparison between the two modes. With this comparison it would be possible to assess how air quality will improve over time with increased take-up of electric vehicles. In some cases national averages will be used for car emissions over a designated trip length, compared to EV emissions for a similar trip.

Social acceptance:

The baseline survey of non-users, conducted at the end of 2009 showed that 59.5% of respondents wanted to find out more about Electric Vehicles. This interest can be explored further and in greater depth.

- Registered Users – demographics, usage
- Residents – before and after surveys to random addresses
- Commercial – promotional work

**Main parties affected by the project:**

<b>Agents</b>	<b>Costs</b>	<b>Benefits</b>
Electric vehicle users	<ul style="list-style-type: none"><li>• Fuel cost</li><li>• Electric vehicle cost</li></ul>	<ul style="list-style-type: none"><li>• Convenient available charging points</li></ul>
General Population	<ul style="list-style-type: none"><li>•</li></ul>	<ul style="list-style-type: none"><li>• Awareness raising</li><li>• Air quality</li></ul>
Local Authority	<ul style="list-style-type: none"><li>• Capital cost</li><li>• Operating cost</li></ul>	<ul style="list-style-type: none"><li>• Innovative reputation/image</li></ul>

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Electromotive (Supplier of charging points)	•	• Image/reputation
EDF (Electricity supplier)	•	• Operating revenues (non applicable for the foreseeable future)

### Method and values for monetisation

The capital, operational, maintenance and other costs have been used from the relevant Civitas financial years, and distributed accordingly.

The savings from emissions are based on the differences in Co2 emissions between petrol vehicles and EV vehicles using the conversion factors supplied by the National Energy Foundation Co2 Calculator. The figures were supplied and calculated for us by Elektromotive who administer the EV network on behalf of Brighton & Hove City Council.

The rate used for these calculations is:

1 tonne of saved Co2 = 125,300 Euros

### C2.6.3 Life time cost and benefit

Table C2.6.1 Capital cost in the evaluation period (not discounted)

	Cases for comparison	Cost (e.g. □200,000)
Year 1	CIVITAS measure	19,236 Euros
	Reference case (or BAU)	0
Year 2	CIVITAS measure	18,366 Euros
	Reference case (or BAU)	0
Year 3	CIVITAS measure	42,406 Euros
	Reference case (or BAU)	0
Year 4	CIVITAS measure	668 Euros
	Reference case (or BAU)	0

Table C2.6.2 Operation cost in the evaluation period (not discounted)

	Cases for comparison	Values (e.g. □200,000)
Year 1	CIVITAS measure	0
	Reference case (or BAU)	0
Year 2	CIVITAS measure	6,432 Euros
	Reference case (or BAU)	0
Year 3	CIVITAS measure	8,859 Euros
	Reference case (or BAU)	0
Year 4	CIVITAS measure	8,971 Euros
	Reference case (or BAU)	0

**Table C2.6.3 Maintenance cost in the evaluation period (not discounted)**

	Cases for comparison	Values (e.g. <input type="checkbox"/> 200,000)
Year 1	CIVITAS measure	0
	Reference case (or BAU)	0
Year 2	CIVITAS measure	2,273 Euros
	Reference case (or BAU)	0
Year 3	CIVITAS measure	2,565 Euros
	Reference case (or BAU)	0
Year 4	CIVITAS measure	1965 Euros
	Reference case (or BAU)	0

**Table C2.6.7 Savings from reductions of environmental emissions (not discounted)**

	Cases for comparison	Values (e.g. <input type="checkbox"/> 200,000)
Year 1	CIVITAS measure	0
	Reference case (or BAU)	0
Year 2	CIVITAS measure	31,632 Euros
	Reference case (or BAU)	0
Year 3	CIVITAS measure	72,852 Euros
	Reference case (or BAU)	0
Year n	CIVITAS measure	82,617 Euros
	Reference case (or BAU)	0

The savings set out in Table C2.6.7 are the non-discounted savings calculated from annual CO2 emissions reductions through the use of electric vehicles on energy supplied from the EV charging point scheme. These savings are based on the calculated difference in the CO2 emissions from typical electric vehicles and typical petrol fuelled cars, the detail and calculations of which is fully explained in Section C2.3 Environment. The rate used in the calculations is 125,300 Euros per Tonne of CO2 saved.

Using the calculated CO2 emissions savings figures supplied to the city council by Elektromotive, the annual savings are as follows:

Year	CO2 savings	Rate (Euros) for CO2	Value (savings x rate)
Year 1	0	125,300 per tonne	0
Year 2	252.45	“	31,632 Euros
Year 3	581.42	“	72,852 Euros
Year 4	659.36	“	82,617 Euros

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Table C2.6.8 Other cost in the evaluation period (not discounted)

	Cases for comparison	Values (e.g. <input type="checkbox"/> 200,000)
Year 1	CIVITAS measure	0
	Reference case (or BAU)	0
Year 2	CIVITAS measure	1,493 Euros
	Reference case (or BAU)	0
Year 3	CIVITAS measure	133 Euros
	Reference case (or BAU)	0
Year n	CIVITAS measure	0
	Reference case (or BAU)	0

The 'Other costs' set out in table C2.6.8 above include: public survey costs, suspension of parking bay costs during promotional events, and travel costs around the city and to meetings with other local authorities to discuss electric vehicle infrastructure schemes.

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Table C2.6.10 Lifetime cost/benefit of CIVITAS measure (discounted)

	Capital cost	Operation cost	Maintenance cost	Other cost	Revenue	Savings from accident reductions	Savings from Journey time savings	Savings from reductions of environmental emissions	Total cost	Total Benefit	Cumulated cost
Year 1	19,236	0	0	0	0	N/A	N/A	0	19,236	0	19,236
Year 2	17,745	6,214	2,196	1,443	0	N/A	N/A	30,652	27,598	30,652	-3,054
Year 3	39,586	8,270	2,114	124	0	N/A	N/A	68,008	50,095	68,008	-11,108
Year4	602	8,091	1,772	0	0	N/A	N/A	74,516	10,466	74,516	-64,050
Total	77,170	22,576	6,083	1,567	0	N/A	N/A	173,176	107,395	173,176	-58,976

### **C2.6.5 Summary of CBA results**

The CBA indicates that the benefits of €173,176 from the electric vehicle charging point measure significantly outweigh the capital and maintenance outlay of €107,395 with a cost benefit ratio of approximately €1.6:1 (meaning that the accumulated benefits over the project lifetime are approximately 1.6 times the accumulated costs), with the NPV of the project resulting in a surplus of €58,976.

### **C3 Achievement of quantifiable targets and objectives**

No.	Target	Rating
1	Implement the first on-street electric charging points in the UK outside of London.	**
2	Encourage the take up of clean & energy efficient vehicles	**
3	Install 10 Green Electricity Vehicle Charging Points in order to test the belief that scarcity of supply of fuel is holding back the wider take up	*
NA = Not Assessed      O = Not Achieved      * = Substantially achieved (at least 50%) ** = Achieved in full      *** = Exceeded		

### **C4 Methods for up scaling**

Methods for up scaling this measure are currently being assessed based upon the level of demand and future funding/revenues. Should the up scaling be possible then the scheme could readily be extended with additional charging points in other locations.

Measure results demonstrate that take-up of the scheme has been relatively slow with only 35 registered users over the 3 years of operation. User and public surveys demonstrate that although the availability of public on-street charging points is important, perhaps more important is the development of the EV technology and a reduction in the cost of vehicles.

Therefore, up scaling this measure is dependant upon:

- Wider technological developments of electric vehicles
- Demand for more charging points
- Usage of current charging points

After the Civitas time frame the measure will focus firstly upon the continued running of the current charging points. This will be dependant upon willingness from users to begin paying for the provision. Only once this has been established could the provision potentially be extended.

## **C5 Appraisal of evaluation approach**

The evaluation approach for this measure was sound, and proved that of up most importance was the monitoring of the usage of the system and the behaviour and acceptance of users, as well as awareness of non-users.

How and when the current users access the charging points has provided an insight into how electric vehicles are being used, and what the needs of this small group are.

Indicators for pollution and environment have proved less relevant than originally anticipated due to the slow take-up of the scheme and the low usage of the charging points.

Due to the innovative nature of this measure the evaluation has proved to be more of a research piece exploring how best to implement such a scheme, and how people use and accept it. Therefore hard results of emissions saving are not as relevant as social attitudes and behaviour studies.

## **C6 Summary of evaluation results**

- 35 registered users of the scheme
- 55% reduction in CO2 emissions (compared to the same usage with non-electric vehicles)
- 35% of registered users use the B&H charging points at least once a week
- 65% of registered users charge their electric vehicles at home, most often
- The shortage of charging points is the factor that registered users like least about electric transport

### **Headline Results from 2009**

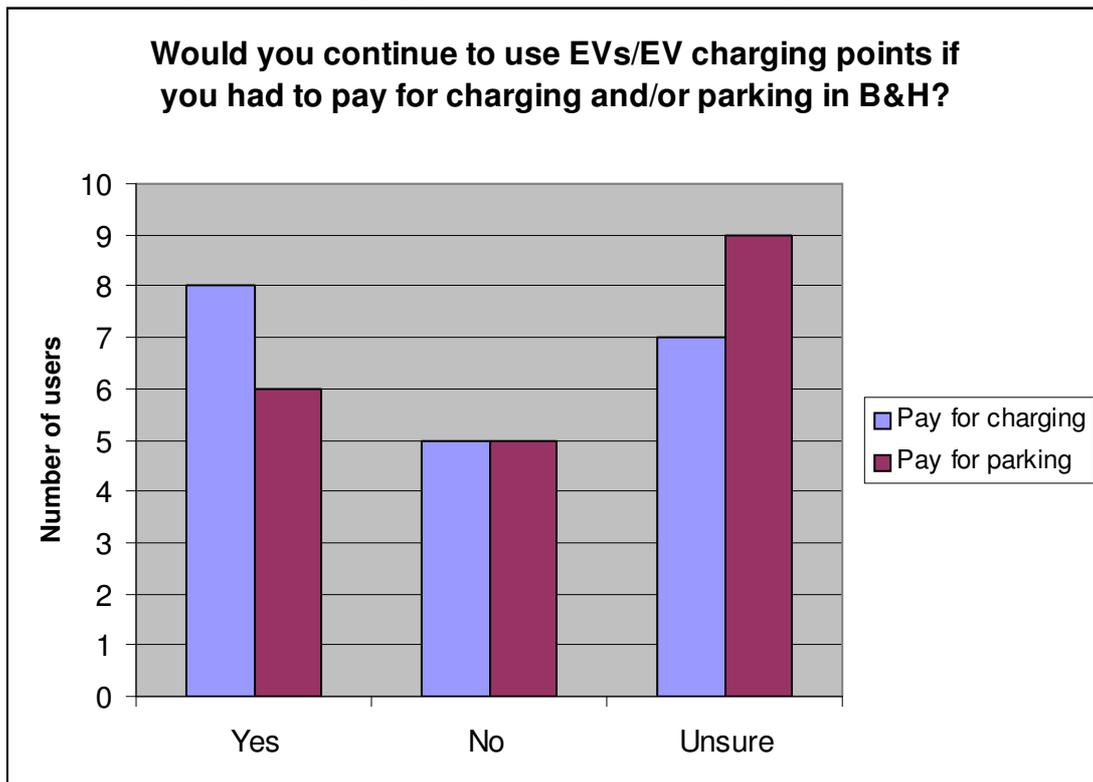
Are you likely to use Electric Vehicle Charging Points?

- 7% (48 respondents) said they were likely to use Electric Vehicle Charging Points.
- 43% (295 respondents) said they had heard about Electric Vehicle Charging Points.
- 39% (270 respondents) said they had read about Electric Vehicle Charging Points.
- 57% (509 respondents) of those that were unlikely to use Electric Vehicle Charging Points said it was because they did not own/were unlikely to ever buy an electric vehicle.

30% (272 respondents) of those that were unlikely to use Electric Vehicle Charging Points said it was because they were unlikely to ever buy or use an electric vehicle

### **C7 Future activities relating to the measure**

Future activities for this measure are based upon the monitoring of usage and social awareness and acceptance. Activities to date have focused upon the continued running of the scheme, and this is largely dependant on available funding. In the user survey, respondents indicated whether they would be willing to pay continued usage of the charging points; the results are displayed below.



Graph No. 9

A large percentage of respondents were unsure whether they would be willing to pay for charging and or parking in order to continue using the provision. Additional comments indicated that being unsure was largely down to not knowing exactly how much users would have to pay.

Positively, more respondents said they would be willing to pay for charging than not, and an even number of respondents would be willing to pay for parking than not.

85% of respondents to the user survey also indicated they would be interested in having the Brighton & Hove charging network linked up to surrounding networks in East and West Sussex and Hampshire.

Based upon these findings, along with usage data, a proposal for moving the measure forward will be formalised.

Obviously a great deal of what happens in the future for this project will be dependant upon the wider electric vehicle network, and the national/international state of electric vehicle development.

## **D Process Evaluation Findings**

### **D0 Focused measure**

	0	No focussed measure
6	1	Most important reason
4	2	Second most important reason
9	3	Third most important reason

### **D1 Deviations from the original plan**

- Deviation 1

The original plan was to install 10 on-street charging points in the Civitas area of Brighton. However, the greater than originally budgeted cost of the units and budget constraints led to a need to reduce this down to 8 charging points.

- Deviation 2

Completion of the installation of the second batch of charging points was initially delayed through the consultation process with residents and local councillors. When in-year budget cuts to grant funding were announced by central government, further delays occurred as it was necessary to first confirm the ongoing availability of the match funding needed to complete the project.

- Deviation 3

The full implementation and administration of the scheme was due to commence at the same time as the installation of the charging points in September 2009. However, delays occurred while the administration contract and user application form/contract were being finalised. This resulted in the scheme not being available for users to join until February 2010.

- Deviation 4

It was not possible to involve the Brighton & Hove Car Clubs in the timeframe of the EV charging point scheme. At the time the scheme was launched there was a general lack of commercially available electric vehicles and it was not possible to take the concept forward with car clubs in the city.

- Deviation 5

It has not been possible to supply data for Air Quality and Emissions regarding CO, CO2 in the city as these are not monitored locally by the council's air

quality monitoring team. The monitoring of Particulates commenced in the city in 2011, but no previous data is available for the purposes of comparison.

- Deviation 6

It was not possible to obtain figures from the Driver and Vehicle Licensing Agency (DVLA) of the number of electric vehicles registered in the Brighton & Hove area prior to the commencement of the project. We have therefore monitored and used the change in the number of user registered to the Brighton & Hove City Council scheme over the period that the scheme has been operational for this purpose.

- Deviation 7

It has not been possible to calculate a relative cost of service as there is currently no cost whatsoever to the user for registration to the Brighton & Hove scheme and the use of the charging points.

## **D2 Barriers and Drivers**

### **D2.1 Barriers**

#### **Preparation phase**

- **Technological** Difficulty in accessing electrical supply. This restricts where the charging points can be sited and significantly delays the entire planning process
- **Communications** Residents objection to proposed site of Withdean charging point which resulted in the point being relocated
- **Communications** Loss of parking bay space – added pressure on residents parking spaces which is already a contentious issue in Brighton & Hove

#### **Implementation phase/Operational phase**

- **Financial** Loss of parking revenue due to conversion of parking spaces. This has potential to becoming a larger barrier as take-up increases
- **Cultural** Potential for an influx of users from outside of Brighton & Hove taking advantage of the free user registration and access to network.
- **Cultural** Residents parking illegally in EV parking bays
- **Institutional** Up scaling – some other local authorities have signed up to an alternative EV network with different terms and conditions. This makes it difficult to link up services and possibly restricts take-up in Brighton & Hove
- **Spatial** Damage to charging points – mainly in busy areas
- **Cultural** Conflict of users (perceived future barrier)

Measure title: **Electric Vehicle Charging Points**

City: **Brighton & Hove**

Project: **Archimedes**

Measure number: **2**

- **Institutional** With increased up-take, enforcement of time spent charging will have to increase
- **Organisational** Only one company supplying electricity network; monopolisation. Difficult to get a good service from them.
- **Organisational** EDF sold off electrical network to different company – loss of contacts, change in service

## **D2.2 Drivers**

### **Preparation phase**

- **Technological** Electric Vehicles are more widely available from showrooms, as well as new models being on the market. This helps raise the profile of EV's and increase the number users.

### **Implementation phase**

- **Political** CMM report acted as a good news story; getting an official 'rubber stamp' for the new charging points and the project as a whole.

### **Operation phase**

- **Organisational** Eco Rally, Brighton Speed Trials, and the Future Car Challenge: all received positive PR and Electric Vehicles were highly promoted. These are all annual motoring events or rallies and included alternatively fuelled vehicle such as EVs and hybrids which has helped raise local awareness and interest, as well as national and international.
- **Cultural** French TV filming raised the profile of the Brighton & Hove EV project.
- **Cultural** BHCC promotional video for the Business Community will help raise awareness of the project and hopefully generate more business users.
- **Cultural** The new Peugeot Ion advert was filmed in Brighton. Very good promotion.
- **Spatial** The new Withdean site is a good location with room to expand the provision if need be.
- **Technological** The TRO opened up the provision for Hybrid cars, therefore helping to expand the potential target groups
- **Spatial** The Withdean charging point installation was successful without problems.
- **Organisational** More local authorities joining the South Coast EV network
- **Organisational** The EVUE local support group presented a good forum for information sharing and networking

## **D2.3 Activities**

### **Preparation phase**

**Spatial** Careful consideration of where to site the charging points dealt (to some degree) with the problem of access to an electrical supply. This had to be balanced out against where the points were most needed, and any public objections to sites. Quite often the physical barriers were not identified until work had begun on installation and therefore activities taken were based upon engineering solutions. This also meant delays to installation and additional spend.

### **Implementation phase**

#### **Operation phase**

**Organisational** With increasing numbers of EV's on the roads in the UK the need for a unified charging network will become more and more significant. At present no actions have been taken to manage the increase in other networks; however the barrier is counter-acted by increasing membership to the South Coast network.

**Political** Illegal parking in charging bays is likely to become a greater problem as the number of EV users increases in Brighton & Hove. At present the issue is being enforced with fines. In the future, the three-hour limit on car charging will have to be strictly enforced (currently it is not) as there will be greater demand for these sites. However, demand for charging spaces will also act as a driver, putting pressure on local politicians to invest in expanding the network.

## **D3 Participation**

### **D.3.1 Measure Partners**

**1. City, 1. Lead: Brighton & Hove City Council-** Sustainable Transport Department- Project lead and overall management.

**5. Private Company, 3. Occasional Participant: EDF Energy-** Electricity supply company and manager in the early stage of the project of the South East Electricity Network and responsible for the connection of new electricity supplies.

**5. Private Company, 3. Occasional Participant: UK Power Networks -** Manager in the later stage of the project of the South East Electricity Network and responsible for the connection of new electricity supplies

**5. Private Company, 3. Occasional Participant: Elektromotive Ltd –** Supplier of the EV charging point infrastructure, and responsible for the administration of and registrations to the EV user scheme.

## **5. Private Company, 3. Occasional Participant: Scottish and Southern Energy (SSE) –** Electricity supply company in the latter stages of the project.

Unfortunately, it has not been possible to involve any Brighton & Hove Car Clubs in the Electric Vehicle charging point measure. Some car club operators have begun to include electric vehicles in their fleets so there may be the opportunity to develop this idea at a later date.

### **D.3.2 Stakeholders**

**Electric Vehicle Users** – Individual and company users of electric vehicles who have registered with Brighton & Hove City Council to use the charging points.

## **D4 Recommendations**

### **D.4.1 Recommendations: measure replication**

- **Expansion of the scheme** - Since the Civitas Electric Vehicle Charging Point project was initiated in Brighton in 2008, there have been many similar schemes launched by both national and local government authorities and private companies both throughout the UK and throughout the rest of Europe. The sales of electric vehicles are still relatively low, but the need to continue to expand the spread of recharging infrastructure is seen as a major incentive to the continued take up of electric vehicles.
- **Carbon Reduction/Air Quality** - The wider usage of electric vehicles is seen to have many benefits for the environment, and would be beneficial for inclusion in other city's carbon reduction and air quality improvements projects and programmes.
- **Innovation** – The concept of electric vehicles and recharging is still quite new for much of the population. It is important that any public communications by infrastructure providers use clear and easily understood language and do not unnecessarily introduce anything which could be seen as a barrier to the take up and usage of charging points.

### **D.4.2 Recommendations: process (related to barrier, driver, and action fields)**

- **Open Access** -The charging network ideally needs to be open to all, nationwide.
- **Design considerations** - Careful design of the installation to avoid building problems and additional costs, while maintaining the option to extend the number of charging points at each location.

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Measure number: **2**

- **Locations** - Careful locating of the charging points is very important. Controlled parking zones, easy access to an electrical source, and user demand all need to be taken into consideration when choosing a location for a charging point.
  - **Electrical connections** - Allow plenty of time to make a connection to an electrical supply when installing charging points. The first phase of charging points to be installed had a very quick connection; however the second phase was much slower. There seems to be no logical reason for this except how quickly the stakeholders decide to act.
  - **Dissemination** -The importance of a good dissemination process for a pilot measure, as a way of making savings in communication costs.
  - **Incentives** - CIVITAS funding has enabled the registration and charging of electric vehicles in Brighton & Hove to remain free (to encourage take up with potential users). To transfer this initiative to another city we must assume that funds would not be available to offer the same kind of incentive, and therefore take up may be slower.
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