

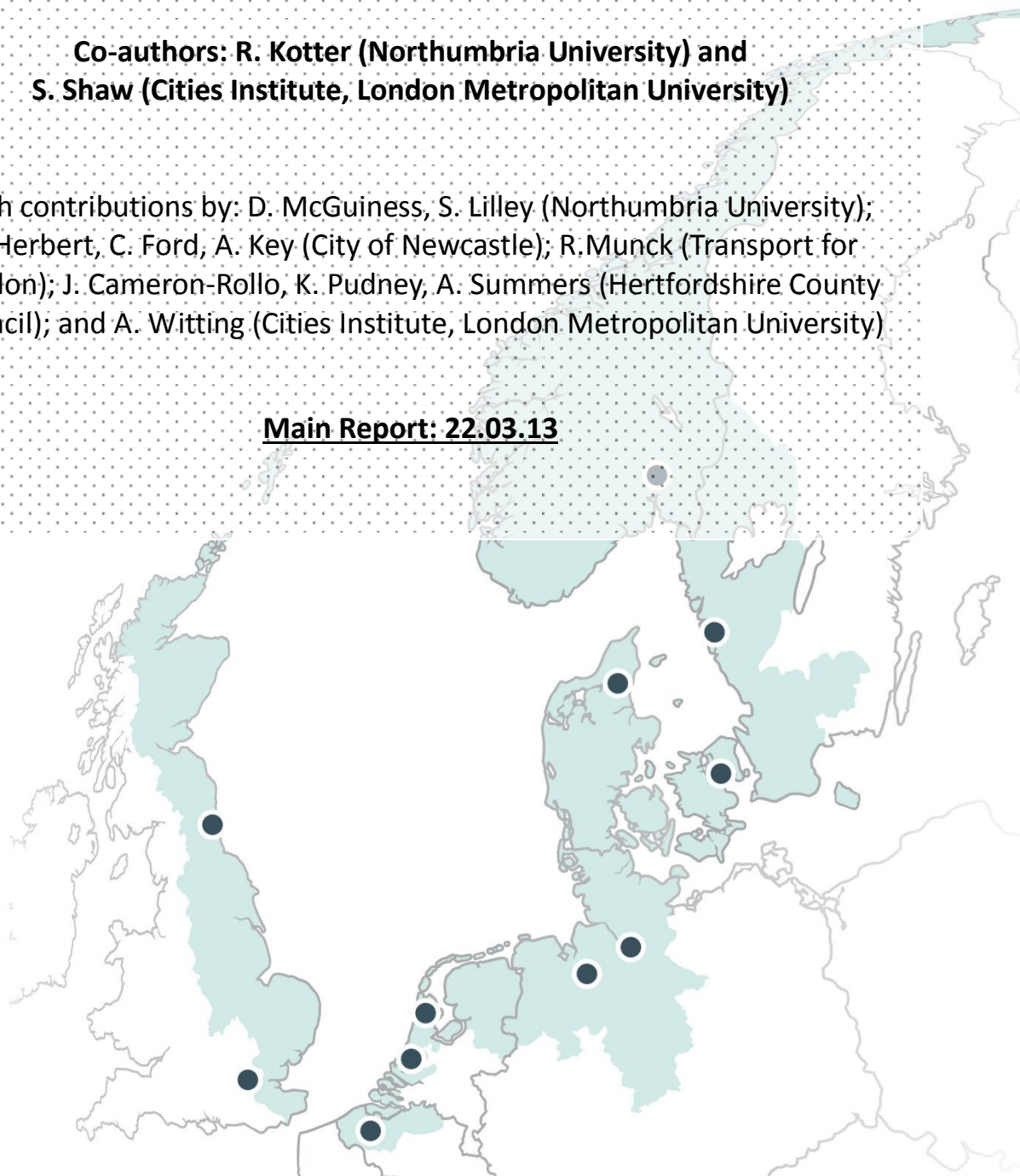
# Work Package 3

## Activity 6: Micro to Macro Investigation

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# EXECUTIVE SUMMARY

Across the North Sea Region (NSR) of the European Union, the step change to mainstream market acceptance of Electric Vehicles (EVs) is being supported by *macro-level* policy interventions. In the UK, key environmental and economic drivers include: climate change, 'green growth', energy security, decarbonising the electricity system, and local air quality (with connected public health issues and mandatory European standards of maximum pollution levels). The national policy framework includes grants to purchase new plug-in cars and vans, and tax exemptions. Further, match-funding from the Government supports eight 'Plugged-In Places' (P-I Ps), in eight locations in two phases: London, Milton Keynes, the North East, Northern Ireland, Scotland, Greater Manchester, The Midlands, and the East of London. Managed by public-private consortia, these pilot schemes provide a geographical focus to stimulate innovation and development of EV infrastructure. More than £400m has been provided by the government overall to promote the uptake of plug-in electric vehicles.

Around half of the charging infrastructure has been developed by private sector investment by companies now consolidating, though the business models for operating the charging infrastructure and associated services is still emerging and to be fully tested. According to AMA research, it is estimate that by the end of March 2012, more than 3,000 charging points had been installed in the country, of which 1,673 were delivered via the Plugged-In Places government scheme. More than 60 per cent of those (around 1,800 were available to the public; with 38 % then located in car parks and on-street parking to maximise visibility, but with commercial premises and garages -particularly car sales forecourts - also offering a significant resource). More have come on stream since, for the formal end of the P-I P programme in March 2013, and there is more funding being made available nationally (with some differences across the devolved part of the UK). Chargemaster (which reached an agreement in December 2012 to acquire Elektomotive, the first UK

company to roll out EV charging infrastructure; ClickGreen, 2012), which launched its Polar project in July 2011, was developing 4,000 new electric car charging posts through private funding, supplementing the government-backed P-i P schemes (see above). By 2025, the UK market for charging infrastructure is expected to be worth over £ 30 million, from a value of £8.3 in 2013. Between 2016 and 2020 alone, the market is projected to increase in value by 118 per cent, from £ 11 million to £ 24 million (Sunderland, 2013).

The next challenge the government has outlined, and has provided further funding for, is to grow the charging infrastructure also outside these pilot P-i P areas, as well as R&D and commercialisation of e-mobility products and services, including for trade and export within and beyond the EU.

As intended in the national vision for electric mobility, the strategy for each Plugged-In Place reflects the priorities and objectives of the consortium that manages it, and the particular circumstances of the area concerned. The UK Government also wanted to see different innovation models to be explored. This approach has shaped the 'rolling out' of macro-level policy at the *meso-level* of regions/sub-regions. The report considers how the vision for each area is, in turn, being scaled down to the *micro-level* of localities where charging points are being installed. It examines, in more detail, three Plugged-In Places that have particular significance for longer distance routes, including those that have the potential for transnational links across the NSR: Greater London, East of England (Hertfordshire), and North East of England (and particularly Tyne and Wear at the core of that). For the latter, connections to the devolved territory of Scotland and the P-I P programme having started there are considered.

Overall, some observations are made on the slowly emerging exit strategy (into commercialisation) of the P i- P programme, which formally came to end in March 2013, though some more funding is also available in those areas for installing electric car charging points in garages and driveways, rapid chargers, and some further off-street - and on-street by demand from residents - parking charging via 75% grants to local authorities and train companies in England (Scotland, Wales and Northern Ireland being devolved with regard to powers over policies relating to local

authorities and transport, but not residents in this context) – and ministers hope that this might help to fill the gaps outside / between the P-I Ps in England – the UK.

The UK Government acknowledges that Plug-in hybrids (PHEVs) and extended-range vehicles (E-REVs) - supported by the infrastructure of rapid chargers, battery swap and flexible ownership models - all have the potential to help EV owners develop the confidence to make longer trips, and that these should be supported through P-IPs. A 'National Chargepoint Registry' for EV users is currently being developed, but has yet to be completed. The Government has not set out in any detail how a fully 'joined up' national network of EV infrastructure will be developed to capitalize on opportunities for international links. Some progress in inter-operability is noted – specifically between P-i P regions more recently, but many barriers persist and a European and global standardisations of electric vehicle and charging infrastructure is being discussed at international and EU level (Knox, 2013; Barlag, 2011; Green eMotion, 2013; AMA Research, 2013) but has not as yet materialised, which is still presenting challenges (and has led to some costly replacement, retro-fitting and upgrading issues also in the P-I P regions) (Lumdsen, 2012).

Wireless electric vehicle charging is a new agenda being investigated, trialed and commercially development in the UK as well (Thompson, 2013, Qualcomm, 2013). Also, there is a realisation that a smart electricity management system (smart grid, Vehicle to Grid) is needed to cope with a support the three-way interaction between electricity providers and local distribution network operators, customers and homes / workplaces / production facilities, and the electric vehicles. Accordingly, government and private sector funding has been invested into testing projects already underway and with interim reports available such as the Customer-led Network Revolution (Northern Powergrid, 2013) or the I2EV project due to run from January 2013 to December 2015 with project partners EA technology, Scottish and Southern Energy Power Distribution Ltd, Northern Powergrid, Nissan, Fleetdrive tow universities (EA Technology/ Ofgem , 2013; The Green Car Guide, 2013).

It is argued in this report that, if EV drivers are to overcome their understandable 'range anxiety', the infrastructure to recharge their vehicles must be fully integrated

and easy to use. The (potential over-)provision and (under-)use of some charging infrastructure in (some) areas is regarded as a ‘chicken and egg’ issue (Paine, 2013). For the future rollout of Low Carbon Vehicles in the UK, political and societal factors are arguably at least as (if not more) important as technological and economic ones (IET, 2012).

Local Authorities will play a leading role in developing a comprehensive and interoperable charging network to meet these expectations. Working in collaboration with other electric mobility stakeholders, including commercial providers, they must be equipped for two critical challenges:

- *Scaling up to the ‘bigger picture’*: how to raise the confidence of EV users who wish to make longer journeys (with the same electric vehicle or also by transport mode change in between), including national journeys (including with rail in between) and transnational journeys through international transport hubs to/from other NSR countries and elsewhere in Europe via ferry ports, airports and the Channel Tunnel? The issue of nodes and gateways is flagged up here.
- *Scaling down to ‘street level’*: how to ensure that EV users, especially those who are less familiar with the locality, have the confidence to find publicly-accessible points, plug-in, and leave their vehicles charging? And how to support those arriving in a locality to be able to hire an electric vehicle to make this a fully low-carbon journey?
- *Methodologies for Mutual Learning: a Digital Map Interface for Effective EV Infrastructure’* - a supplementary paper to this report - outlines methodologies to help Local Authorities and other EV stakeholders address these challenges and exchange good practice - from the micro-level of the streetscape up to the macro-level of transnational links - in the context of the *e-mobility NSR* project (1).

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<sup>1</sup> We would also point towards two other reports on EV Macro and Micro Level Infrastructure Planning and EU project in this area: Lumsden, M. (2012) *Successfully Implementing a Plug-in Electric vehicle Infrastructure. A Technical Roadmap for Local Authorities and their Strategic Partners* (Stevenage: IET Standards Ltd) and the ENEVATE NWE EU Interreg IVb project and the ENEVATE Toolkit being developed in this context by October 2013 (<http://www.futuretransportsystems.co.uk/projects/enevate--tool-kit.aspx>; [http://www.futuretransportsystems.co.uk/\\_diskcache/287-enevate-tool-kit-wp2-outline-part-1.pdf](http://www.futuretransportsystems.co.uk/_diskcache/287-enevate-tool-kit-wp2-outline-part-1.pdf)); as well as the ongoing FP7 EU project Green eMotion (<http://www.greenemotion-project.eu/>) which has delivered an Interim Report on Macro and Micro level Infrastructure Planning at the end of October 2012 (Whelan, J / ESB; [http://www.greenemotion-project.eu/upload/pdf/deliverables/D1\\_5-Interim-Report-on-Macro-and-Micro-Level-Planning-Final-approved2.pdf](http://www.greenemotion-project.eu/upload/pdf/deliverables/D1_5-Interim-Report-on-Macro-and-Micro-Level-Planning-Final-approved2.pdf))

# INTRODUCTION

As specified in the *e-mobility NSR* project outline, Work Package 3, Activity 6 (WP 3.6) provides: ‘an investigation at different scales from macro-level down to ‘street level’, especially around infrastructure of charging points, parking areas/waiting areas’. This includes consideration of ‘different contexts from dense urban areas (central and inner suburban London, and central Newcastle and Gateshead) to city fringe and semi-rural (Hertfordshire and East of England Counties, Tyne and Wear and North East of England). The results will be used as input to other Activities and Work Packages’.

This report informs Work Package 3 (WP 3) ‘Inventory of state of the art and stakeholder analysis’ coordinated by Delft University of Technology. Addressing the brief (above), it investigates the *spatial dimension* of policy interventions to encourage the transition of mainstream markets from Internal Combustion Engine (ICE) vehicles to Electric Vehicles (EVs) with particular reference to the UK. The authors highlight the *significance of scale* (relationships between the different spatial levels of e-mobility governance), and *geographical location* for policy development, strategy and implementation. These are important considerations in the national and transnational aspirations to create the comprehensive and interoperable charging infrastructure network that is needed for EV drivers to be confident that they can complete their journeys, but also to be able to make a multi-model low carbon journey where an EV is part of the story.

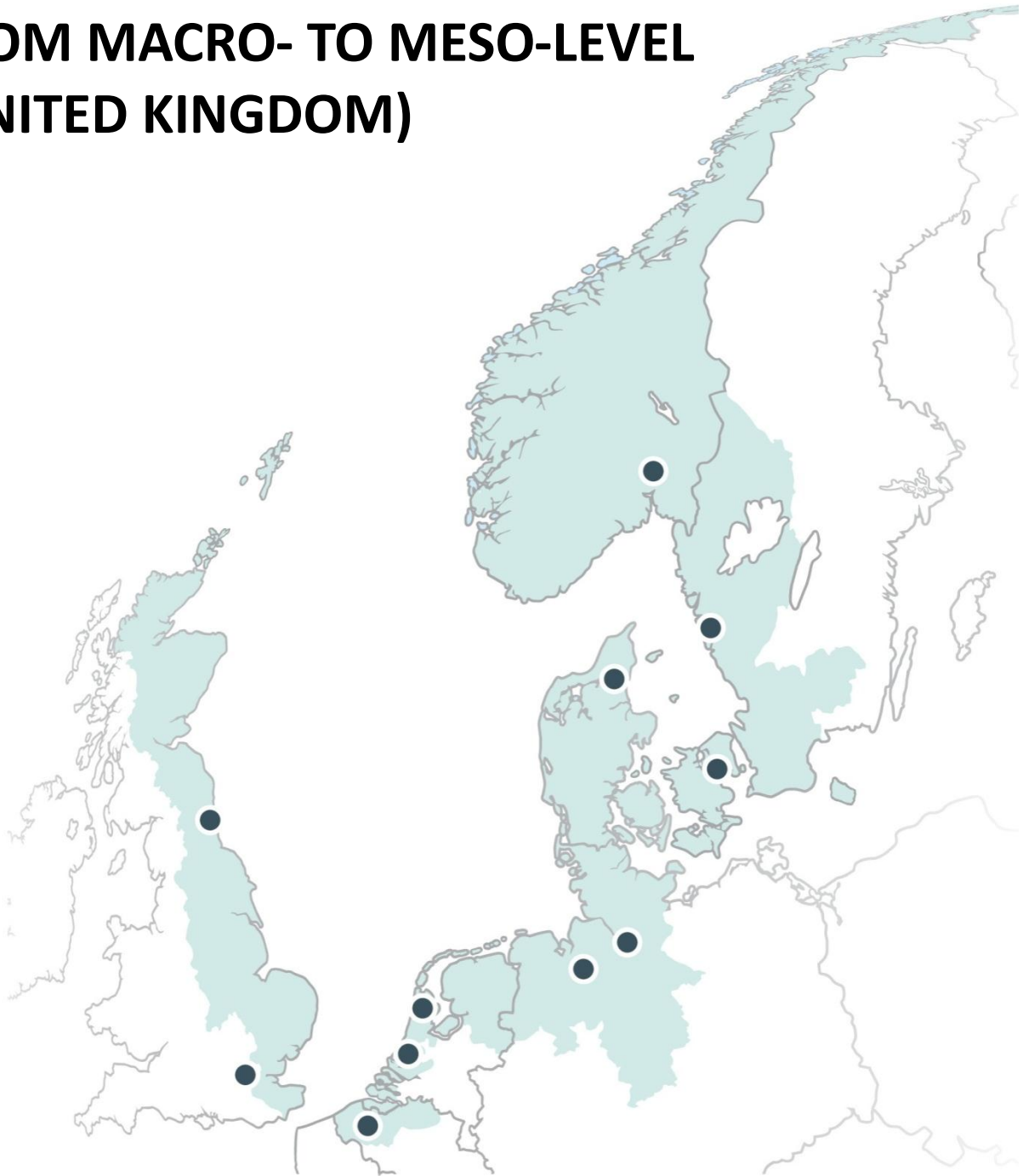
Section One: ‘From Macro to Meso-level (UK)’ reviews the *macro-level* of national policy: the strategic framework to support EVs and EV infrastructure in the UK set out by the Office for Low Emission Vehicles (2011) and in other policy statements. It identifies the relevant Departments of Government and other key stakeholder agencies, and considers how the macro-level vision is being rolled out to the *meso-level* of ‘Plugged-In Places’ (P-I Ps): regions/sub-regions and other localities where electric mobility infrastructure is being piloted through area-based initiatives.



Section Two: 'From Meso to Micro-level reviews current developments in EV infrastructure with reference to three P-IPs which have particular significance for longer distance routes, including those that have potential links with other countries in the North Sea Region through international transport hubs. The report considers how the *meso-level* strategic vision for e-mobility is being operationalized in Greater London, the East of England (Hertfordshire) and North East of England (Tyne and Wear), down to the *micro-level* of the streetscape and parking places where charging points are being installed.

The authors emphasise the role of Local Authorities, with their wider responsibilities for transport and land use planning, as well as the public realm of streets and shared spaces. To supplement this report, a further paper for WP 3.6 - Methodologies for Mutual Learning: a Digital Map Interface for Effective EV Infrastructure - outlines two methodologies. These are designed to support Local Authorities and other EV stakeholders who are working to create a fully 'joined up' and accessible charging network, especially for longer distance e-driving. The project team are currently piloting a database with digital map interface that can be developed to provide a knowledge platform to share good practice: at different spatial scales from micro to macro-level, and in different contexts from dense urban centres to more thinly populated areas.

# SECTION ONE: FROM MACRO- TO MESO-LEVEL (UNITED KINGDOM)



## 1.1 INTRODUCTION TO SECTION ONE

This section reviews the *macro-level* of national policy: the strategic framework to support EVs and EV infrastructure in the UK, set out by the Office for Low Emission Vehicles (2011) and in other policy statements. It identifies the relevant Departments of Government and other key stakeholder agencies, and considers how the macro-level vision is being rolled out to the *meso-level* of ‘Plugged-In Places’ (P-I Ps): regions/sub-regions where electric mobility infrastructure is being piloted.

As in other countries, public policy often emphasises the ‘national interest’ in competitive global markets. Nevertheless, as demonstrated through the *e-mobility NSR project*, programmes of action to address environmental, economic and energy security issues require trans-global insights and collaborations. Climate change is a manifestly global issue; CO<sub>2</sub> emissions from transport, power generation in one country affect world-wide atmospheric systems. Sustainable ‘green growth’ to stimulate economic recovery and boost exports is also critical to global futures, as is the security of energy supply, and the decarbonisation of electricity systems. Action to improve poor air quality that affects public health in particular localities requires local action (cf. Wyman 2012; Vidal, 2013), but is subject to transnational legislation: currently the European Union Ambient Air Quality Directive (2008/50/EC). The European Environmental Agency (EEA) declared in March 2013 that air pollution in most 12 EU member states did exceed the legal limits set by the European Union’s National Emission Ceilings (NEC) Directive in 2010 (covering SO<sub>2</sub>, NO<sub>x</sub>, NMVOCs and NH<sub>3</sub>), and despite some improvements between 2010 and 2011 (based on provisional data) there are still problems, particularly relating to emissions from transport, and particularly in some cities. The EEA’s new version of AirBase provides publically available air quality information for Europe. The latest annual *NEC Directive Status* and *Air Quality in Europe* reports, to be published by mid-2013, are expected to show up problems for the UK also, especially with regard to its major cities.

The discussion below reviews the development of national policy to nurture the early market for EVs in the UK over the last five years or so. It considers how the macro-level aspirations to address global and national environmental and economic issues through support for electric mobility have been shaped by the policies and fiscal austerity of the Coalition Government (Conservative and Liberal Democrat), elected May 2010. It is noted that this new Coalition Government did carry forward considerably the policies of the previous administration (“New” Labour) with regards to E-mobility (including inter-departmental bodies such as OLEV and Cenex, and the funding commitment, though not without some discussion just prior and after elections) – but is also has changed considerable the sub-nation landscape in England (with many Quangos being dissolved, and notably here the regional development agencies, and with the establishment of some now instruments and institutions). It also considers the framework through which national policies are being scaled down to regions and sub-regions within the UK.

Summary of key points:

- In the UK, the key agencies of Government are the Department for Transport (DfT), the Department for Business, Innovation and Skills (BIS), and the Department of Energy and Climate Change (DECC); the Office of Low Emission Vehicles (OLEV) is a special purpose unit that brings together the work of these three Departments; the UK’s Centre of Excellence for Low Carbon and Fuel Cell Technologies (Cenex) functions as a national standards agency and represents UK interests within the EU
- In collaboration with the EU and international agencies, (notably the International Electro-technical Commission (IEC) which develops international standards for electric vehicle recharging), other key drivers of e-mobility include: the Technology Strategy Board (TSB) with its Industry Advisory Panel for its Low Carbon Vehicle Integrated Delivery Program; the Automotive Council UK; the Institution of Engineering and Technology (IET); the Royal Academy of Engineering (RAEng); professional chartered institutions such as the Institute of Mechanical Engineers, the Institution of Chemical Engineers, the Institution of Civil Engineers; interest groups such as the RAC Foundation (Royal Automobile

Club Foundation for Motoring Ltd); the Society of Motor Manufacturers and Motor Traders (SMMT); the Battery Vehicle Society and Going Green; the International Energy Agency (IEA); Intelligent Transport Systems (ITS) and Future Transport Systems (FTS) as national and international consultants. More bodies who take an interest are evident in the House of Commons' Transport Committee LCV Inquiry, such as the Motor Industry Observatory, WWF-UK, the Renewable Energy Association, pteg, the Chartered Institute of Logistics and Transport in the UK, the eMotor Cycle Industry Association

- As with other EU Member States, developments in e-mobility have been shaped by the Government's response to global climate change, low-carbon energy supply through the electricity system (with some early projects on smart grids being funded by the government), as well as energy security, and concerns over local air quality (and hence public health) issues, which have particular significance for cities such as Greater London and Newcastle (see also Section Two below)
- Aspirations for national economic recovery and energy security have also been important drivers, especially to position the UK as a world leader in "green technology" and smart transport solutions (with not just domestic job creation and UK demand, but also export and traded services internationally being earmarked), again with regional/local implications, especially to nurture developments in e-mobility Research and Development, and the emerging e-mobility value chain, especially in emerging growth clusters such as Tyne and Wear, East of England, and East London (see also Section Two below)
- This has been evident in substantial government (BIS, TSB) grants to the automotive industry (e.g. Nissan, Sunderland for basing the Leaf EV production there and also the new electric battery plant, and the automotive R&D supply chain), including the creation of the UK Energy Storage R&D centre (based at the University of Warwick) for the advancement of electric and hybrid vehicles (BIS, September 2012) co-funded between central government (£9m) and industry /

universities (£4) in the High Value Manufacturing Catapult to exploit a market which is estimated to be worth £250m for the UK by 2020

- The Public Spending Review by the UK Coalition Government (May 2010) protected State support for e-mobility, and the national policy framework is set out comprehensively by the Office for Low Emission Vehicles (2011) in *'Making the Connection: Plug-In Vehicle Infrastructure Strategy'*. Subsequent national budgets and public spending reviews by the Chancellor of the Exchequer and the Treasury have confirmed this spending over the lifetime of this parliament, and have detailed how the remainder sums then not committed are to be spend, plus some new investments also in this field (King, 2012; OLEV, BIS and DfT 2013; BBC 2013)
- This includes over £300m for the *'Plug-In car grant'* (25% up to £5k for new vehicles) and a plug-in van grant (20% per cent towards the cost of the vehicle, up to £8k), and exemption from Vehicle Excise Duty (car tax), introduced on 1<sup>st</sup> January 2011, but from 2015 onwards there will be less favourable terms for the company tax rate low emission vehicles, and no capital allowance for leased business cars (announced in the 2012 Budget)
- However, the government / Chancellor of the Exchequer have made it clear that they are halting the 'fuel duty escalator' for petrol and diesel cars (including scrapping an increase in petrol tax in the last budget in 2013) so that the price gradient between petrol / diesel and electric cars will not be as favourable to EVs as would have been. The Feed-in Tariff for the National Grid may also come under revision for renewable energy, with Vehicle to Grid implications
- A report by the RAC Foundation argued (Lane 2011) that if the UK Committee on Climate Change's projection of 1.7 million plug-in vehicles on the road by 2020 is to be achieved, the UK Government should introduce more radical incentives, such as the so-called 'feebate' system in France, which gives significant rebate to buyers of the greenest cars (not just EVs)

- The same RAC Foundation report (Lane 2011) highlighted the price gradient between full (Battery) Electric Vehicles and hybrids, petrol and diesel cars which are also described as ‘energy efficient’ and are marketed with ‘green credentials’
- A report by the House of Commons Transport Committee (September 2013) questioned whether government subsidies to encourage people electric vehicles were a “good use of public money”, benefiting only a “handful of motorists”, and were being used to help more affluent households with the costs of a second car
- The Government is match-funding (£30m until March 2013) *Plugged-In Places*: eight pilot projects to install and trial recharging infrastructure (2011-March 2013)
- The Government has just announced (Feb 2013) the details of a £37 m funding package (out of the £400 committed by central government overall already in this area) to provide 75% of the cost (estimated to be around £10,000 for standard chargers) of installing new charging points for people, installing charge points where they live; local authorities installing rapid charger points to facilitate longer journeys, or providing on-street charging on request from residents who have or have ordered plug-in electric vehicles; and for train operators installing new charge points at railway stations. Ministers also want local authorities to install more on-street charging pints, particularly outside the eight Plugged-In Places region (through councils will have to fund around £2.500 themselves, in the context of shrinking local authority budgets and allocation from central government). Grants for residents apply across the UK, but for local authorities and train companies only to England since power over these policies is devolved in Scotland, Wales and Northern Ireland

- There are also some revisions to relevant smaller national funding schemes, such as the Transport Innovation Fund: the Congestion Innovation Investment Fund has been replaced with a new Urban Challenge Fund in March 2013, and the new fund also allows low carbon transport innovations to be funded which are not expressly targeted at addressing congestion issues, but can address issues such as urban air pollution and public health (Sunderland, 2013)
- The abolition of the Regional Development Agencies (RDAs) for North East of England (One North East), East of England Development Agency (EEDA) and the London Development Agency (LDA) means that the *Plugged-In Places* are regional/local public-private consortia, managed by independent agencies
- In Scotland, devolution within the UK means that Transport for Scotland is the lead agency on EV developments (see Section Two below)
- A study commissioned by the RAC Foundation (Hanley & SKM Colin Buchanan 2011) argued that Local Authorities have significant powers (planning, parking and traffic policies) to encourage the adoption of all types of lower carbon vehicles (including, but not limited to plug-in electric vehicles), and that those policies currently purely focussing on plug-in electric vehicles should be modified to also include the adoption of (technology-neutral) measures to encourage lower carbon vehicles
- Initial data from research carried out through the TSB 'Demonstrator' programme (2011) using 340 ultra-low carbon vehicles (both with individual and fleet users), found that most drivers soon overcome 'range anxiety': only 35 per cent of the private drivers were "more worried about reaching their destination in an EV than in a petrol car" after three months of driving one, down from 100 per cent before the trial began
- Nevertheless, the House of Commons, Transport Committee (2012: para. 20) heard evidence that drivers welcomed the public charging infrastructure as "people are worried, if they travel somewhere that is 45 miles, whether they have enough energy to get home" (c.f. Elektromotive 2011)



- Although home or work-based charging seems to be preferred by most EV drivers, market adoption of EVs will require a publicly accessible charging network that has high visibility, e.g. in car parks in retail/leisure premises, locations at nodes of the road network, and inter-modal transport hubs such as park and ride railway stations for commuters
- The Transport Committee (2012: para. 22) found considerable variability in the number of points installed by each Plugged-In Place, and highlighted the need to ‘standardize and simplify EV infrastructure to ensure inter-operability of cars and infrastructure in different locations’ (ibid, para. 23)
- They also expressed concern (HoC 2012: para. 29) that although the total number of charging points in the UK was thought to be over 3,000, as yet the National Chargepoint Registry had fewer than 500 entries
- The Government acknowledges that plug-in hybrids (PHEVs) and extended-range vehicles (E-REVs) supported by the infrastructure of rapid (quick), fast, and standard chargers, battery swap and flexible ownership models all have the potential to help EV owners develop confidence in making longer journeys, and therefore supports a range of approaches for extending journeys through the Plugged-In Places (P-I Ps), including plans to install around 50 rapid chargers at key locations
- As yet, however, it remains unclear how a fully ‘joined up’ national network of EV infrastructure will be developed to capitalize on opportunities for international links

## 1.2 MAJOR NATIONAL AGENCIES

The leading Government agency with responsibility for e-mobility is the Office for Low Emission Vehicles (OLEV). Set up under the previous New Labour Government, OLEV brings together the work of three Government Departments: the Department of Transport (DfT), the Department for Business, Innovation and Skills (BIS) and the Department of Energy and Climate Change (DECC). The Technology Strategy Board (TSB) is a non-departmental public body sponsored by BIS; the Automotive Council UK is a joint industry and BIS body. The Committee on Climate Change advises Government on meeting the carbon budget and on preparing for the impacts of climate change. It is an independent body established under the Climate Change Act (2008) ([www.theccc.org](http://www.theccc.org)).

These Departments of Government and other agencies work closely with the European Union and other cross-border agencies for e-mobility, especially the International Electrotechnical Commission (IEC), the body which develops international standards for electric vehicle recharging. TSB works in close partnership with OLEV, DfT and the Engineering and Physical Sciences Research Council (EPSRC) to support Low Carbon Vehicle research and development under a range of themes, including hybrid vehicle technology. Priorities are set by an industry-led steering group and informed by the New Automotive Innovation and Growth Team (NAIGT)'s *Technology Roadmap*, and by the Automotive Council research group (TSB 2010).

This has resulted in some productive collaborations, e.g. in 2012 the IET (Standards Ltd) and representatives from the automotive, energy and electrical industries, Government and regulatory bodies launched a Code of Practice for Electrical Vehicle Charging Equipment Installation (2012). IET Standards Ltd also recently released for sale (with commercial training offered) a technical roadmap for local authorities and their strategic partners to successfully implementing a plug-in electric vehicle infrastructure (Lumsden, 2012). Government-funded research projects - such as the Technology Strategy Board's Ultra-Low Carbon Vehicle Demonstrator Programme (£25m) and the Energy Technology

Institute's plug-in vehicles Economics and Infrastructure Programme (£11m) - have accelerated the development and uptake of EVs (Lumsden 2012).

With respect to Low Carbon Vehicle Research and Development (R & D), there is close collaboration between the TSB, DfT, the Engineering and Physical Sciences Research Council (EPSRC), the Low Carbon Vehicle Partnership, e.g. the TSB's £1.3 million investment in the development of a new, lightweight battery for use in electric, small, city cars to improve their performance, functionality and range. Also, the Low Carbon Network Fund, as well as the EPSRC and other UK Research Councils are funding research on smart grids and sustainable electricity generation and consumption, with vehicle to grid interfaces.

## 1.3 LAYING THE FOUNDATIONS FOR A NATIONAL STRATEGY TO SUPPORT ELECTRIC MOBILITY

The previous New Labour Government's policy statement for *Ultra-Low Carbon Vehicles in the UK* (DfT 2008) outlined its intention to a) establish the UK as an attractive location for trials of prototype ultralow carbon vehicles, b) develop the market, and c) attract investment and R & D to make the technology suitable for mass production. Three milestones are central to the success on the ground:

- Demonstrate the potential of EVs in a 'real world setting' by 2010
- Develop urban centres into 'electric car cities' by subsidising ultra-low carbon cars by 2012
- Promote the nationwide use of electric and plug in hybrid cars beyond 2012

A report by the Royal Academy of Engineering (2010) concluded, nevertheless, that EVs are only as 'green' as the electricity that charges their batteries. The RAE identified the serious challenge of ensuring that the electricity supply system can cope with charging tens of millions of vehicles whilst still reducing carbon emissions from power generation. The Academy has identified four major technical issues:

- the availability of high energy-density batteries at a price and with a long enough cycle life for electric vehicles to be economically viable
- the practicalities of charging vehicles - particularly for users without off-street parking
- the electrical distribution infrastructure to provide power to millions of charging points
- the need for a national energy system and 'smart grid' that can recharge millions of electric vehicles using low-carbon electricity without overwhelming local distribution circuits.

Acknowledging these caveats, the incoming Coalition (Conservative-Liberal Democrat) Government (May 2010-) reaffirmed its continuing support for ultra-low emission vehicles, highlighting their critical role in meeting the UK's binding targets to reduce greenhouse gas emissions by 50% by 2027, and by 80% by 2050.

Introducing the Government's comprehensive policy framework for e-mobility - '*Making the Connection: The Plug-In Vehicle Infrastructure Strategy*' (OLEV 2011: 5) - Secretary of State for Transport Phillip Hammond emphasises that '...in the longer term an increased an increased penetration of ultra-low emission vehicles will be vital to meet our environmental goals. We are laying the foundations now with this Strategy to support growth in the ultra-low emission market that we want to see in the future. Plug-in vehicles are a vehicle technology now, but for this market to grow, consumers need to be reassured that they are affordable and meet their needs. An effective recharging infrastructure, alongside improvements in vehicle range, is a fundamental part of this. However, it is important that this infrastructure operates in the most effective way possible to maximize the environmental, economic and energy system benefits of plug-in vehicles'. Thus, the macro-level policy commitment to the growing market in plug-in vehicles arises from the contribution they, and other low and ultra-low emission vehicles can make to the five key drivers of national policy discussed below.

## 1.4 KEY DRIVERS OF NATIONAL POLICY TO SUPPORT E-MOBILITY

As outlined above, the UK Government has reconfirmed its commitment to e-mobility and to 'growing the market for plug-in vehicles in the UK because of the contribution they ...can make across our economic and environmental priorities' (OLEV 2011: 19). It has identified the five major issues as critical to the rationale for macro-level interventions to support e-mobility: climate change, 'green growth', energy security, decarbonising the electricity system, and air quality. More recent developments in national policy is considered below (1.5) in relation to these key drivers of change.

**Climate change:** Response to climate change has been a very important driver for e-mobility in the UK. The *Climate Change Act (2008)* legally binds policy makers in UK to reduce greenhouse gas emissions by 80% by 2050. In 2004, the transport sector, in particular road traffic, was responsible for approximately 25% of total UK carbon dioxide emissions (FoE, 2006). According to the House of Commons, Transport Committee *Emission from Transport* report (2006), transport was the only sector of the UK economy in which carbon emissions were higher in 2004 than the baseline year of 1990 (HoC, 2006), and ultra-low carbon vehicles are expected to play an important role in redressing the balance.

The *King Review of Low-Carbon Cars (2008)* recommended that, in addition to other low carbon technologies and behaviour change, growth in the market for EVs would be a necessary feature of the national strategy to achieve an 80% reduction in transport emissions (HM Treasury 2008). The Government's Committee on Climate Change (CCC) recommended: 'Electric cars are a key technology for decarbonising transport in the 2020s and should be developed as an option in the period to 2020. We have suggested that it is feasible and desirable to have up to 1.7 million electric cars on the road in 2020 on the path to widespread deployment required to meet carbon budgets in the 2020s' (CCC, 2010: 23).

*An Investigation into the Scope for the Transport Sector to Switch to Electric Vehicles and Plug-in Hybrid Vehicles*, a report for the UK Government (BERR and DfT 2008) by Arup and the UK's Centre of Excellence for Low Carbon and Fuel Cell Technologies (Cenex) concluded that battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) have the potential to produce significant greenhouse gas emission reductions compared to conventional vehicles over the full life-cycle. Cars and light goods vehicles would offer the most promising early applications for electric and plug-in technology.

The report concluded that over a full life-cycle, compared with conventional Internal Combustion Engine (ICE) vehicles, significant greenhouse gas emission reductions would be possible. Their calculations took account of emissions from power generation and emissions relating to production and disposal. Even based on the current UK electricity grid mix, an emissions reduction of 40% would be expected. With further decarbonisation of the UK power mix, reductions from the use of EVs would increase. The report examined the impact of EVs and PHEVs on the UK electricity grid, and concluded that there was sufficient generating capacity to cope with the increased electricity uptake, assuming that demand for charging would be managed and targeted at off-peak periods. Further, the report stated that existing national transmission network would be sufficient to cope with the demand from vehicles, although there may be local distribution issues to overcome.

OLEV (2011: 19-20) reconfirmed that the incoming Coalition Government's commitment to reducing the UK's greenhouse gas emissions by 50% in 2027 and by 80% in 2027, and that '[p]lug-in vehicles will make a substantial contribution to meeting these targets... ultra-low and zero-emission vehicles will need to become commonplace'.

The House of Commons, Transport Committee (HC 2012: Summary) has recently stressed the significance of EVs for the Government's commitments under the Climate Change Act 2008: 'There are a number of approaches to decarbonising road transport. Plug-in vehicle technology is one of the more market-ready of these approaches. The Government hopes to encourage consumer demand for plug-in vehicles by providing financial incentives for consumers to buy these cars and by providing funding for publicly-available vehicle charging infrastructure. Consumer demand has increased since

the Government introduced the plug-in car grant'. As yet, however, demand for EVs in the UK 'remains relatively small. In 2011, 1,052 vehicles eligible for the plug-in car grant were registered' (ibid).

**Green growth:** As in other Member States, economic recovery is given a very high priority indeed. In this context, the UK Government wants to position the country as a world leader in "green technology" and smart transport solutions. The Government believes (OLEV 2011: 20) that 'the emergence of ultra-low and zero-emission vehicles offers significant potential for economic growth in the UK'. The Automotive Council (2011) (Cited in OLEV 2011: 20 section 2.4) identifies opportunities across a new value chain for the development, deployment and integration of plug-in vehicles. UK infrastructure companies such as Chargemaster, Elektromotive and POD Point, along with ancillary service providers and systems integrators have entered the market further down the value chain towards the user interface (ibid 20). Scaling down to the regional sub-regional level, there are potential benefits for wealth creation, employment and training in emerging growth clusters such as Tyne and Wear, East of England, and East London (See Section Two below).

There is some evidence that company-to-company innovation - part-funded by the Technology Strategy Board - is also taking place, e.g. Bladon Jets (the Coventry-based micro-gas turbine specialist) was approached by Jaguar Land Rover (JLR) to explore the weight-saving potential of a gas turbine range extender for electric vehicles (Mortimer 2011, 2012). Further, Turbo Power Systems (TPS) received a significant tranche of Research and Development investment, including a company-wide £6.5 m from TAO Sustainable Power Solutions, part of a Brazilian energy company (Dent, 2010), as well some public funding from the North East of England Regional Development Agency and a sub-regional development agency (see Section Two: Tyne and Wear)

**Energy security:** EVs can also play their part in easing the UK's demand for oil, and reducing security risks associated with the country's continuing dependence on fossil fuels. It is anticipated that global oil demand is likely to rise by around 18% compared with 2009 levels, driven especially by China and India (IEA 2010). Domestic UK oil production from the North Sea peaked in 1999 and the UK has been a net importer since



2005. If power can be generated from other energy sources, a significant shift away from Internal Combustion Engine vehicles towards EVs would improve energy security and cushion the impact of rising and volatile oil prices on the national economy (OLEV: 2011: 21; cf. Strahan 2012).

**Decarbonising the electricity system:** The UK Government's legally binding target for the reduction of greenhouse gas emissions includes a commitment to reduce CO<sub>2</sub> emissions from electricity generation. Through the UK National Renewable Energy Plan (2010) renewables will provide 30% of UK electricity by 2010 (DECC 2009b). The intention is that as the national electricity system is progressively decarbonized, the benefits of plug-in vehicles will increase 'well to wheel'. In particular, EVs could provide an attractive use for night-time power generation, and in the longer term intermittent generation from renewables such as wind would be utilised efficiently through smart management of the electricity grid that would shift recharging times to optimum periods for the energy system as a whole (OLEV 2011: 21).

**Air quality:** Targets for improving air quality is also an important driver, especially the European Union Ambient Air Quality Directive (2008/50/EC) (EC 2008) In the UK, road transport is a significant contributor to poor air quality and it is the main source of pollution in 92% of the areas with problematic levels identified by Local Authorities (DEFRA 2010). As in other Member States, deindustrialization and clean air legislation have brought long term improvements, but current air pollution levels remain harmful to health in some localities, including areas within Greater London and Tyne and Wear discussed in the following section. Battery electric vehicles produce no pollutant emissions at the tailpipe, and most use regenerative braking, which reduces particle emissions from brake wear. A critical mass of zero-emission vehicles should therefore play an important role in reducing respiratory-related health problems in the worst affected localities (OLEV 2011: 22); these include, for example, central and inner London and areas around Heathrow Airport.

South Coast electric vehicle recharging network, led by the Sussex Air Quality Partnership (Sussex-air) provides a good example of area-based implementation. "The two Sussex (county) councils, through Sussex –air, have been working with the Low

Emission Strategies Partnership to develop policy measures that can be used to reduce greenhouse gas emissions and improve air quality simultaneously. Sussex-air is integrating low emissions strategies (LES) into planning policy through a range of policy measures.” (Lumsden 2012: 32). This fits well with a recommendation (Quarmby 2011: xiii) from the RAC Foundation’s study “Going Green”, that “a study of how effectively to tie together and align air quality responsibilities with carbon emission reduction objectives should be undertaken jointly by representatives of central and local government in England.”

## 1.5 STRATEGIC POLICY FRAMEWORK FOR E-MOBILITY IN THE UNITED KINGDOM

These key drivers of change have influenced the Government's support for e-mobility. In accordance with the national vision introduced above, the strategic policy framework in the UK includes interventions: (a) to support the purchase of EVs by consumers and businesses, and (b) to develop recharging infrastructure and thus roll out the national policy at the meso-level of regions and sub-regions of the country.

“To achieve its vision, the UK government sees that it would have a role in:

- Supporting the automotive industry
- Supporting research, development and demonstration projects
- Providing the necessary charging infrastructure, focussing on a “core” of electric car cities and regions
- Fostering the skill base that meets the automotive industry's needs
- Making ultra-low carbon vehicles competitive
- Coordinating the activities across cities, utilities, the automotive industry, consumers, infrastructure providers, and government departments“(Tsang, 2012: 23).

### 1.5.1 Interventions to support the purchase of EVs

**Plug-In Car Grant and favourable tax regime:** As in other EU Member States, the Government currently offers subsidies and fiscal incentives to support the early adopters of EVs in the initial phase of the Product Life Cycle for plug-in cars. The Plug-In Car Grant (PiCG) was launched on 1 January 2011. Despite the fiscal austerity measures elsewhere, the Public Spending Review made provision of over £300m over the life of this Parliament (2010/15) for the PiCG to reduce the upfront cost of eligible vehicles to consumers and businesses. This programme awards motorists with a grant worth 25 per cent of the cost of their low emission car, capped at a maximum of £5,000 and only available to vehicles which meet strict criteria, including a regulation that they emit less than 75g/km of CO<sub>2</sub>.

For example, the Nissan Leaf (produced in Sunderland) cost £30,990 (on-the-road price), but the grant brought the price down to £25,990. The following cars have been made eligible for the PiCG:

1. **Nissan LEAF** (an acronym standing for “Leading, Environmentally Friendly, Affordable Family Car”): arrived March 2011 in UK dealerships, with the new European version having started production in March 2013 in the UK (with a range improvement, according to Nissan, from 109 to 124 miles, and also more luggage space in the boot., estimated to cost £23,000 (including UK Plug-in car grant) [http://www.nissan.co.uk/vehicles/electric-vehicles/electric-leaf/leaf](http://www.nissan.co.uk/vehicles/electric-vehicles/electric-leaf/leaf.html#vehicles/electric-vehicles/electric-leaf/leaf) (The Independent, 12/03/2013)
2. **Mitsubishi i-MiEV**: arrived Jan. 2011 <http://www.mitsubishi-cars.co.uk/imiev/>
3. **Citroen CZero**: arrived January 2011. <http://www.citroen.co.uk/home/#/new-cars/car-range/citroen-c-zero/>
4. **Peugeot iOn**: arrived January 2011. <http://www.peugeot.co.uk/vehicles/peugeot-car-range/peugeot-ion/>
5. **Tata Vista**: estimated arrival was March 2011, however in May 2012 there were reports that Tata motors had decided to postpone the launch <http://www.tatavistaev.com/>
6. **Chevrolet Volt**: arrived April 2012 (Car of the Year 2012) <http://www.chevrolet.co.uk/experience-chevrolet/future-and-concept-cars/future-car-volt-production-model.html>

7. **Smart for two** electric drive: arrived January 2013. [http://uk.smart.com/smart-world-environment-smart-electric-drive/02c494d2-2eb7-5785-8988-0c63d3b6dd53?csref=thesmart\\_electric](http://uk.smart.com/smart-world-environment-smart-electric-drive/02c494d2-2eb7-5785-8988-0c63d3b6dd53?csref=thesmart_electric)
8. **Vauxhall Ampera**: arrived April 2012. (Car of the Year 2012) <http://www.vauxhall-ampera.co.uk/index.php/eng/home>
9. **Toyota Prius Plug-in Hybrid**: arrived 2012 [http://www.toyota.eu/green\\_technologies/plugin\\_hybrid\\_vehicles/Pages/Prius\\_plug-in\\_hybrid.aspx](http://www.toyota.eu/green_technologies/plugin_hybrid_vehicles/Pages/Prius_plug-in_hybrid.aspx)

Newly arrived:

10. **Renault Zoe**: arrived early 2013. Fully electric, with leased electric batteries. Official maximum range of 130 miles. From £13.650 (including UK Plug-in car grant). <http://www.renault.co.uk/cars/range.aspx>
11. **Renault Twizy** <http://www.renault.co.uk/cars/model/twizy/product.aspx>

There is no ownership option for the battery. If the vehicle is retained after the credit agreement has been fully paid then the battery hire will continue up to a maximum of 72 months and be renewed thereafter until a battery hire transfer (as described above) is completed.

Initial take-up of the PiCG was somewhat slow, with 534 grant applications in the whole of the UK during the first quarter of 2011 when the scheme started (Elektromotive, 2011). A report by the House of Commons, Transport Committee (12<sup>th</sup> September 2012) *'Plug in vehicles, plugged in policy?'* examined the national strategy for bolstering demand for ultra-low carbon cars and expressed concern that grants were benefitting only a handful of well-off motorists. It also observes that the launch of the PiCG saw 1,052 plug in cars bought in the year to January 2012, compared to just 111 in 2011 (The Independent 2012). Department of Transport (DfT) statistics show that from the beginning of April to the end of June 2012, 473 new electric cars were purchased under the PiCG scheme (DfT 2012).

The Committee, nevertheless, 'heard conflicting reports about whether the rate of plug-in car purchases is on track with the DfT's ambitious predictions and whether the financial incentives on offer are effective. The DfT believes that the introduction of the plug-in car consumer incentive scheme has had a positive effect on the demand for

these vehicles. Norman Baker MP, Minister for sustainable travel, told us that the DfT monitored the sales of low carbon vehicles and they are "on a trajectory on the way up." He was "entirely relaxed about the number of cars that have been sold" as this was "entirely in line with where we thought it was going to be" (ibid, para. 11). Other witnesses were not so convinced: 'Dr Berkeley, from Coventry University, told us that "consumer demand is still lagging way behind" and that "the subsidy is really ineffective because the price is still too high". We were warned of the risk that the Government was subsidising second cars for affluent households, as plug-in cars were being purchased as a "support vehicle rather than a primary mode of transport" (ibid, para. 12).

**What car? green awards** the BMW 320d EfficientDynamics automatic was named Green Car of the Year 2012, Ford Mondeo was named best green family car, and the seven seat Toyota Prius+ won the green MPV award, the Mazda CX-5 2.2D Skyactiv-D 150 SE-L was named the best green SUV. The best alternative fuel car was the Chevrolet Volt, a range extender that does 235.4mpg and emit 27g/km of CO<sub>2</sub> (the Journal 2012)

**Plug-In Van Grant and favourable tax regime:** Both private consumers and businesses can benefit from the Plug-in Van Grant when purchasing a qualifying ultra-low emission van and registering it in the UK. A qualifying ultra-low emission van can receive a grant of 20 per cent towards the cost of the vehicle, up to a maximum of £8,000. The Government is adopting a 'technology neutral' approach to reducing emissions from transport. This means that any van which meets the criteria below will be eligible for the subsidy. The Plug-in Van Grant has been designed to help make the whole-life costs of a qualifying van more comparable with petrol or diesel equivalents. Over time, as manufacturers begin to make these vans in greater volumes, the costs of production should begin to fall. This will help make acquiring an ultra-low carbon van a realistic option (DfT 2012) [Endnote 1].

The following vans have been made eligible for the Plug-In Car Grant:

1. Azure Dynamics Transit Connect Electric:  
<http://www.azuredynamics.com/products/transit-connect-electric.htm>

2. Daimler Mercedes-Benz Vito E-Cell <http://www.daimler.com/dccom/0-5-1466472-1-1467155-1-0-0-1466827-0-0-135-0-0-0-0-0-0-0.html>
3. Faam ECOMILE: <http://www.faam.com/index.php?action=index&p=209>
4. Faam JOLLY2000: <http://www.faam.com/index.php?action=index&p=212>
5. Mia U: <http://www.mia-voiture-electrique.com/en/models/mia-k>
6. Renault Kangoo ZE: <http://www.renault-ze.com/en-gb/z.e.-range/kangoo-z.e./kangoo-van-z.e.-1939.html>
7. Smith Electric Smith Edison: <http://smithelectric.com/smith-vehicles/models-and-configurations> Smith Electric produces electric vehicles for depot-based, predictable route, multi-drop applications. Customers include Sainsbury's, TNT, DHL and John Lewis (Smith Electric 2012).

A report by Cenex with the Climate Group and the Energy Saving Trust (February 2012) offers technological guidance in *The EV20 Plugged-In Fleets Report*, in which they demonstrate the economic and environmental benefits of employing EVs in commercial fleets and provide practical guidance for fleet managers looking to introduce them. The report highlights:

- The complete range of financial and operational incentives for fleet EV uptake
- The 'sweet spots' that help EVs bring commercial advantage and future-proofing
- The steps needed to assess the EV business case, company to company [Endnote 2].

By 2012, 99 claims had been made through the Plug-in Van Grant scheme (DfT 2012). Therefore a total of 1805 claims have been to date for both cars and vans through the Plug-in Grant, 913 of those in the first half of 2012 compared to 892 claims in the whole of 2011.

**Review of fiscal incentives in 2012:** The Government has made it clear that it will monitor the effectiveness of the incentives, and the level of subsidy will be regularly reviewed. The March 2012 Budget announced a number of changes to

the financial incentive programme for low carbon vehicles with respect to tax concessions that had previously been allowable. The House of Commons, Transport Committee (HC 2012: Section 2, para. 14) expressed its disappointment with changes that ‘has made purchasing a plug-in vehicle less attractive to the corporate consumer with little overall benefit to the Exchequer’. In particular, they were disappointed with the announcement that the company tax rate for low emission vehicles will be increased after 2015 and that leased business cars will not be eligible for first year capital allowances’. The Committee (ibid para. 15) reported that ‘industry witnesses told us that the perception that financial incentives were changeable was also problematic’. Thus, they regretted ‘the Treasury's decision to change the financial incentives framework for low carbon vehicles without prior consultation. Such unexpected changes to these incentives risk creating instability in the market for plug-in vehicles’.

**Bus Service Operators:** The Department of Transport (DfT) modified the Bus Service Operators Grant (BSOG) for community / public transport in 2009 to provide greener buses through rewarding gains in fuel efficiency and the introduction of low carbon buses. In July 2010 the DfT launched the “green bus fund”, enabling makes awards available to private bus operators to introduce hybrid electric buses for public transport.

At a regional and local level funding and support is available, often within the wider context of sustainable transport initiatives. Funding through the Local Sustainable Transport Fund (LSTF) will replace the Local Transport Plan funding stream, with £560m available for 2012-15. Many local authorities have included electric vehicle development within thematic schemes or projects (Lumsden 2012: 6).

Examples of policy development with a partnership approach include the South Coast electric vehicle recharging network (see Lumsden 2012: 32-34) and Bristol’s “Green Capital” partnership vision on transport. The strategy involves three phases between 2012-2015 and incorporates LSTF and ICT4 EU funding, as well as use and circa 25 % reinvestment of Section 106 tariffs for new developments (Lumsden 2012: 40-42).



## 1.5.2 Interventions to support the development of re-charging infrastructure

**EV charging infrastructure requirements:** As EVs have a shorter range than conventional vehicles, the availability of a comprehensive charging infrastructure is critical in creating a viable environment for operation. There are three main types of EV charging infrastructure in the UK:

1. Standard (3kw) points can top up a battery in a couple of hours and charge a battery from flat to full in 6 to 8 hours.
2. Fast (7 – 46kw) points are able to top up points in 30 minutes, and charge from flat to full in less than 4 hours.
3. Rapid/Quick (50 – 250kw) chargers will act as an emergency to be utilised when drivers are near-empty battery. This is due to the high level of infrastructure required for the technology to operate safely, as a result these will be located in strategic off road locations.

The UK Government envisages that the majority of private EV owners will charge their vehicles mainly at their domestic property overnight, and/or at the workplace (OLEV 2011: 7-8). Element Energy Limited (2009) argue that residential and workplace recharging points are technically capable of providing the majority of EV accessible passenger km at a much lower cost than publicly available recharging solutions, and that workplace parking can provide attractive locations, as commuters will on average have their cars parked for 7 hours a day. However, as illustrated below in Section Two with reference to central and inner London, in higher density urban areas many EV drivers cannot charge their vehicles fully at a domestic property, and workplace parking may also be in short supply.

Mass market adoption of EVs will therefore require a publicly accessible charging network. This should have high visibility to help promote interest amongst consumers

and to encourage uptake. The publicly accessible network will include, for example, car parks in retail/leisure premises, and locations at nodes of the road network, especially urban and suburban centres, e.g. public car parks and on-street parking. Further, inter-modal transport hubs may be particularly viable locations, e.g. park and ride railway stations for commuters, whose cars will normally be parked for several hours.

**Code of practice for installing charging infrastructure:** The Technical Regulations team at the Institution of Engineering and Technology (IET), together with a committee of experts from the automotive, energy and electrical industries, Government and regulatory bodies launched a Code of Practice for Electrical Vehicle Charging Equipment Installation (February 2012). The new Code is compliant with the IET Wiring Regulations BS 7671:2008 (2011), as well as European and international standards (IET 2012, 2011).

**Plugged-In Places Programme:** As part of its Programme for Government, the Coalition Government set out its commitment to a national recharging network for electric and plug-in hybrid vehicles (Government, 2010: 31). Thus, public policy has acknowledged the need to support the infrastructure requirements highlighted above. Although the Public Spending Review (PSR) austerity measures affected many other budgets, State support for EV infrastructure was protected through to 2013. This was made clear when the Government published its strategy for collaboration with commercial stakeholders in *Making the Connection* (OLEV: 2011). This includes:

- Ensuring plug-in vehicles are an attractive choice for the motorist, making it easier for individuals to charge at home, at night, after the evening peak in electricity demand and making it easy for individuals to locate and use public chargepoints;
- Making it easier to install recharging infrastructure by removing regulatory barriers;
- Proposing the inclusion of policy on plug-in vehicle infrastructure in the National Planning Policy Framework to encourage local authorities to consider adopting policies to include plug-in vehicle recharging infrastructure in new domestic, workplace and retail developments.

While £30m match-funding from central Government for P-IPs was protected, the governance system - especially its relationship with regional planning and development - was redesigned. Through to May 2010, the outgoing New Labour Government had intended that P-IPs would be managed by the Regional Development Agencies (RDAs), but the incoming Coalition Government has abolished the RDAs for England. This included the RDAs for the North East of England (One North East), East of England Development Agency (EEDA), and the London Development Agency (LDA) (see Section Two below). Accordingly, P-IPs were established as - or transferred after their establishment (2010/11) to - public-private consortia managed by independent agencies, rather than semi-state agencies, as envisaged by the outgoing Government.

The precise mix and lead players differ in each part of the UK. The central Government scheme offers match-funding to consortia of businesses and public sector partners to support the installation of electric vehicle recharging infrastructure in eight Plugged-In Places (until Spring 2013):

- East of England (see Section Two below)
- Greater Manchester
- Greater London (see Section Two below)
- Midlands
- Milton Keynes
- North East (see Section Two below)
- Northern Ireland
- Scotland (see Section Two below)

The House of Commons, Transport Committee has recently (September 2012) reviewed the development of P-IPs (HC 2012: Section 3, Providing Infrastructure). As they observe, these pilot projects have been 'expected to perform a number of roles including: helping to raise the profile of low carbon transport amongst local transport providers, encourage private sector involvement with infrastructure installation or helping to test equipment. The data collected through these trials will then be used to shape the design of a national recharging infrastructure network' (ibid, para. 19).

As noted above, the Government's strategy for electric mobility, anticipates that most recharging will be 'taking place at home, at night, after the peak in electricity demand. Home recharging should be supported by workplace recharging for commuters and fleets, with a targeted amount of public infrastructure where it will be most used, allowing people to make the journeys they want' (OLEV 2011: 7). The Transport Committee heard evidence reconfirming that 'vehicle owners tend to prefer recharging their cars at home or at work. However, "drivers very much welcomed the public charging infrastructure" as "people are worried, if they travel somewhere that is 45 miles, whether they have enough energy to get home"' (HC 2012, para. 20).

The work of the Transport Committee considered the provision of this public charging infrastructure because of its significance for public spending. They ascertained that in the period up to the end of March 2012, Plugged-In Places had installed 1,673 charge points, and the DfT provided the following breakdown of the number of charging points installed by each Plugged-In Place in the period up to 31 March 2012:

Table 1: Number of charging points installed in each Plugged-In Place to 31 March 2012.

Source: House of Commons Transport Committee (September 2012)

Plugged-In Place	Chargepoints installed
East of England	135
London	640
Manchester	0
Midlands	100
Milton Keynes	115
North East	399
Northern Ireland	85
Scotland	199
Total	1673

In addition to the P-IP scheme, some private charging point providers are also installing electric vehicle infrastructure. The total number of points in the UK may therefore exceed 3,000 (ibid, para. 21). The Table above shows considerable variability in the number of points installed by each P-IP. The Society of Motor Manufacturers and Traders (SMMT) commented that 'this is in part a result of the trials having started at

different times and therefore being at different stages of development'. However, the Committee heard discussion of other factors. The SMMT stated that that "there has been varying success in the eight Plugged-In Places projects, with some locations demonstrating commercially viable plans for when Government funding ends and others whose status is less certain." The Committee also noted that the characteristics of the plugged-in place may also have a role, with larger cities tending to have a greater population of individuals willing to adopt new technologies' (ibid, para. 22).

The House of Commons Transport Committee (2012) also highlighted the need to standardize and simplify EV infrastructure: 'If the Government wishes to encourage sales of plug-in vehicles, then consumers may need confidence that they will be able to charge their cars in public spaces, if required. Although the Plugged-In Places pilots trials have made progress towards providing infrastructure, there is further work to be done in standardising access to infrastructure, both in terms of widening access to membership schemes and ensuring interoperability of cars and infrastructure in different locations' (ibid, para. 23). They draw attention to the variety of membership or registration schemes currently in operation. 'General Motors told us: "Different charging schemes from across the UK should be harmonised ...in order to use electric points in different parts of the country you would have to be a member of multiple schemes. This is off-putting and complicated for customers and only serves to reinforce concerns over range anxiety."

The Committee therefore made the following recommendation: 'Making sure that vehicle owners can access chargepoints across the UK should be a priority in the DfT's plug-in vehicle strategy. The DfT should set out how it will work to remove barriers to chargepoint access across the country' (ibid, para. 24).

Furthermore (ibid, para. 25), there are 'different types of infrastructure in use in different areas of the UK and abroad. The use of different types of connector, which allow vehicles to be plugged into chargepoints, in different areas is a particular concern. Mr Baker [Transport Minister] told us that "we have to try to settle on something that is efficient and safe to use and that is standard as far as possible". The DfT's approach is to push for agreement in Europe on the type of connector to be used as standard, though

it recognises wider international agreement may be needed and "there is only so much the UK or even the EU can do to get international agreement on that matter." Thus: 'The DfT should set out how it intends to reach agreement in the EU on the type of infrastructure to be used as standard for plug-in vehicles' (ibid, para. 25).

**Mapping charging infrastructure:** The locations of charging points for plug-in vehicles are to be systematically mapped across the country to make it easier for motorists to go electric, the UK Government's Transport Minister Norman Baker and Business Minister Mark Prisk announced (11 November 2011) that a National Chargepoint Registry would be developed by POD Point – a UK-based chargepoint manufacturer – will be a publicly-accessible database of charging points across the UK (DfT 2011). Alongside this, a new system – the 'Central Whitelist' – will be created to make it easier for motorists to access each chargepoint without having to sign up to new schemes each time they charge in a different location.

As yet, however, the aspiration for a comprehensive register for EV users remains 'work in progress'. There are various (but mostly incomplete) directories of EV charging points across the UK to date, including the EV network UK [Endnote 3]. In September 2012, the House of Commons, Transport Committee (HC 2012: para. 29) noted that National Chargepoint Registry 'is clearly far from complete. According to DfT estimates, the total number of chargepoints in the UK is more than 3,000, but the National Chargepoint Registry has fewer than 500 entries. We understand that the registry is under development, but it is hard to understand why the DfT's database does not contain at least those chargepoints it knows to have been installed using public funds'.

They concluded (ibid: para. 32) that 'The DfT must take the lead in providing data on the location of chargepoints so that the public can see where they can charge their vehicles. Making this database more comprehensive by adding the location of publicly-funded chargepoint should provide an incentive for private chargepoint providers to follow suit and upload the location of chargepoints they have installed'. The Committee recommended that: 'An accurate and comprehensive registry of chargepoints installed by the Plugged-In Places scheme should be made available within the next six months. Publication of a full registry should encourage private chargepoint providers to upload

their data for public use. We recommend that it be made a requirement of Plugged-In Places funding that details of the location of chargepoints installed using this funding are uploaded to the National Chargepoint Registry (ibid: para. 32).

With the assistance of the National Audit Office, the Committee also 'looked into the relationship between provision of infrastructure in an area and the registrations of plug-in vehicles in that area to see whether readily available public chargepoints can be shown to stimulate consumer demand for plug-in cars. The DVLA provided us with data regarding the number of licensed vehicles that are eligible for the plug-in car grant across different areas of the UK. We compared these data against the location of chargepoints, as listed on the National Chargepoint Registry. The National Chargepoint Registry is a database provided by the DfT, which it states "will enable all chargepoint manufacturers and infrastructure scheme operators to make data on their chargepoints available in one place.'" (ibid, para. 27).

Table 2: Number of cars eligible for the plug-in car grant (from DVLA written evidence) and the number of points from the national registry across English regions and devolved authorities. Source: House of Commons Transport Committee (September 2012)

Region	Number of Licenced Cars eligible for Plug-in Car Grant	Number of Charge Points on National Chargepoint Registry
Northern Ireland	6	44
Scotland	70	82
Wales	14	2
East Midlands	47	18
East of England	67	9
London	147	19
North East	77	213
North West	37	10
South East	313	14
South West	180	10
West Midlands	168	28
YorkshireandHumberside	28	3
Unknown Region	20	0
<b>Total</b>	<b>1174</b>	<b>452</b>

The table above compares the number of licensed cars that would be eligible for the plug-in car grant with the number of points from the national registry across devolved authorities and English regions. The Committee concluded that ‘the figures in the National Chargepoint Registry differ from those provided to us by the DfT for the number of chargepoints installed by the Plugged-In Places programmes across the country (Table 1). From tables one and two, there does not appear to be a clear relationship between the number of plug-in vehicles registered in an area and the abundance of chargepoints in that area’ (ibid, para. 27). Indeed, analysis of the table ‘shows no relationship between the demand for plug-in cars and the supply of public charging infrastructure. It is unclear whether this is because of gaps in the National Chargepoint Registry. The data provided by the DfT...relating to the Plugged-In Places scheme, does not provide any greater clarity. This may raise questions about the assumption that providing infrastructure will stimulate demand for plug-in cars’ (ibid, para. 30).

**Enabling longer journeys:** OLEV (2011: 46-7) confirms that the Government wants plug-in vehicles to become a viable mass-market alternative to conventional cars. It acknowledges that while 95% of trips in Britain are less than 25 miles and thus well within the range of battery electric vehicles (BEVs), consumer purchasing decisions are influenced by the potential to travel further. Plug-in hybrids (PHEVs) and extended-range vehicles (E-REVs) - potentially in the future with micro-generators and ‘supercapacitors’- supported by the infrastructure of rapid chargers, battery swap and flexible ownership models - all have the potential to help EV owners develop confidence in making longer journeys. Thus, national policy supports a range of approaches for extending journeys through the P-IPs, including plans to install around 50 rapid chargers at key locations [Endnote 4].



### 1.5.3 Projected uptake, driver acceptance and other issues for e-mobility

**Projected uptake of electric cars:** Estimated projections of the national uptake of electric cars can vary widely. The AEA (2009) reported to the Committee on Climate Change on the market outlook for battery electric vehicles and plug-in vehicles, and the Automotive Council's New Automotive Innovation and Growth Team (NAIGT)'s Product Development Roadmap contributed to this. On behalf of the Department of Business Enterprise Regulation and Reform (BERR) and Department for Transport (DfT), Arup and Cenex (2008) developed four scenarios:

- *Business as Usual:* current incentives are left in place and no additional action is taken to encourage the introduction of electric cars
- *Mid-Range:* environmental incentives continue to grow at their current rate.
- *High-Range:* significant intervention to encourage electric car sales, charging infrastructure is widely available in urban, suburban and in some rural areas.
- *Extreme Range:* there is a very high demand for electric cars, with sales only restricted in the short term by availability of vehicles. In the longer term, almost all new vehicle sales are EVs or PHEVs.

A calculated projected uptake of EVs has been developed for each of these scenarios:

Table 3: Projected uptake of electric passenger cars in the UK. Source: Arup/Cenex (2008: 5)

Scenario	2010		2020		2030	
	EV	PHEV	EV	PHEV	EV	PHEV
Business as usual	3,000	1,000	70,000	200,000	500,000	2,500,000
Mid-range	4,000	1,000	600,000	200,000	1,600,000	2,500,000
High-range	4,000	1,000	1,200,000	350,000	3,300,000	7,900,000
Extreme range	4,000	1,000	2,600,000	500,000	5,800,000	14,800,000

The key projection is that in the medium term (up to 2020), if current initiatives are left in place and no additional action to incentivise consumers takes place, there will be 70,000 electric cars and 200,000 PHEVs on British roads.

A joint submission by the RAC Foundation and the RAC in April 2012 to the House of Commons's Transport Committee *'Plug-in vehicles, plugged in policy?'* confirms that the RAC Foundation and the RAC fully support efforts to decarbonise road transport through the promotion of low-carbon vehicles, in order to meet the government's greenhouse gas (GHG) reduction targets set out in the Climate Change Act 2008 and subsequent Carbon Budgets. However, they argue that "there is no single solution to the decarbonisation of road transport. Different power train technologies (e.g. pure-electric, plug-in hybrid, hybrid, biofuel, highly optimised internal combustion engines) will all be used in different applications, where they are most suited. Plug-in vehicles will be part of the solution. The Government should 'set the rules of the game' through a long-term policy framework and leave it up to the market to decide which technology to choose in each application. It should not pull all its eggs in one basket, e.g. plug-in vehicles only. In the short to medium term, (highly optimised) internal-combustion engine vehicles are likely to remain the dominant form of power train because barriers to plug-in vehicles (most notably battery costs and range) will limit these vehicles to niche markets. Surveys carried out by the RAC indicate that the current generation of plug-in vehicles is unattractive to financially stretched motorists, mainly due to performance characteristics (range) and high purchase costs."

The most recent Elektromotive survey (June 2011 view:

[http://www.elektromotive.com/html/news-story.php?news\\_id=69](http://www.elektromotive.com/html/news-story.php?news_id=69)) with a participating sample of 1,417 drivers, suggested that the lack of a wide-spread, publicly-available recharging infrastructure could be one of the main factors holding back electric vehicle demand. Two thirds of motorists (65.7 per cent) said they would be more likely to buy an EV if charging posts were readily available at roadsides and in car parks across the UK. Of the 1,417 that participated in the survey, only 7.8 per cent said that the greater availability of charging posts would *not* make them more likely to buy an EV. Over a quarter of those surveyed said they were 'undecided', suggesting that a significant

minority still need to be persuaded about the viability and benefits of electric vehicles (Elektromotive 2011).

**Driver acceptance of EVs:** According to the initial data from a survey of both private and fleet electric vehicle (EV) drivers, commissioned by the Technology Strategy Board (TSB, released in September 2011), most drivers soon overcome fears about running out of power but most still believe petrol cars perform better, new research suggests. Only 35 per cent of the private drivers were more worried about reaching their destination in an EV than in a petrol car after three months of driving one — down from 100 per cent before the trial began. The UK-wide demonstrator programme involves 340 ultra-low carbon vehicles, with a range of vehicle types, including high performance cars and small city runabouts, driven by real users making every day journeys (TSB/Everett *et al* 2011). Key findings from the first three months data included:

- *Experience and adaptation:* Learning how to use the vehicle was more straightforward than the drivers had anticipated prior to the trial. 95 per cent of private drivers (PDs) found that EVs were no more difficult to use than the car the participants usually drove. This ease of adaptation is backed up by usage data showing that there was no significant individual journey length or daily mileage per vehicle change over the first three months of usage, showing users made little or no change to their daily driving habits after switching from conventional to low carbon vehicles.
- *Performance:* Prior to the trial, only 16 per cent of PDs and 14 per cent of Fleet Drivers (FDs) expected their EV to perform better than their normal car. However, these scores improved by 24 per cent and 26 per cent respectively after three months.
- *Range anxiety:* Prior to the trial 100 per cent of PDs said they would be more concerned about reaching their destination with an EV than they would with their normal car. After three months this dropped significantly, by 35 per cent. The drop in range anxiety is in part due to the increased understanding of vehicle capabilities, driving techniques and journey planning. Charging data also

shows users gained more confidence in their journey distance over the three months, with an eight per cent increase in users allowing their batteries to drop below 50 per cent before plugging in. However, after three months of vehicle use, both PDs and FDs still cite the adequate range they require for daily trips at 92.12 miles and 120.64 miles respectively, showing that despite confidence in the vehicles' ability an increased range is still a key desire (TSB 2011, Harris 2011). The EV manufacturer user trial for BMW's MINI E is summarized below [Endnote 5].

**Safety of quadricycles:** This report does not include quadricycles when referring to EVs. Nevertheless, it should be noted that there has been some discussion over the safety of these vehicles, which has to some extent affected wider public perceptions of all EV because of the media coverage after a lethal crash with a G-Wizzquadricycle (a vehicle with four wheels whose unladen mass is not more than 400kg - excluding batteries if it is an electric vehicle - and whose maximum continuous rated power does not exceed 15 kW, and which are exempt from standard vehicle testing) in London at the end of 2011 (Clarke 2007).

**Intelligent transport systems support and telematics:** In order to overcome range anxiety, manufacturers of electric vehicles are now starting to develop in-car technology, and smart phone applications. The Ford Focus Electric Car, to be launched soon, will enable e-drivers to schedule and also monitor the charge of their car by mobile phone using an electric smartphone app. The application is able to provide a location of the nearest Ford Focus Electric Car Charging machines with the most efficient route. "In an exclusive discussion [on [evupdate.com/telematics](http://evupdate.com/telematics)] on Nissan, Agero, Continental and SAP also outline how to harness EV vehicle connectivity to develop a suite of services that improve the EV ownership experience by enhancing vehicle efficiency, reducing charge time and allowing consumers to locate available charging stations at the cheapest costs" (Ragg 2012). Bristol City Council has joined the ICT4 European EVUE project (2012-2015) to develop smartphone-enabled EV driver communication systems.

**EV insurance and training:** There are many issues that have arisen in relation to insurance policies for electrical vehicles. Initially (2011) insurance premiums could be quite expensive, due to the specialist repair work required, however the top speed of EVs is lower, so they are less risk. Other issues for consideration when insuring an electrical vehicle are: cover for the battery (some EV owners lease the battery from the manufacturer) and cover for scenarios, e.g. if anyone trips over the charge cable when the car is parked and charging (Independent 2011). Furthermore, concerns have been raised about the limited knowledge of repairing EVs and appropriate access to training needs as the market develops. Insurance companies and policies are being developed and adapted, e.g. PlugInSure<sup>2</sup> is a specialist company for insuring EVs. Training for organisations involved in the low carbon vehicle sector can help in bringing down EV insurance costs, e.g. the Skills Academy for Sustainable Manufacturing and Innovation, developed by Gateshead College will provide training to apprentices and others looking for jobs in the low carbon transport sector. Training will be provided on elements of working with low carbon vehicles, e.g. routine maintenance and repair activities, hazard management and EV and battery manufacture. Tadea driver training centre<sup>3</sup> at Gateshead College's Skills Academy for Manufacturing and Innovation provides an EV driving training programme for individuals and fleet drivers. The training centre has access to the performance track originally built by Nissan Motor Manufacturing UK Ltd [Endnote 6].

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<sup>2</sup> <http://www.pluginsure.co.uk/>

<sup>3</sup> <http://www.tadea.com/drivingtraining>

## Endnotes:

[1] Plug-In Van Grants: The vans eligible for the Plug-in Van Grant are:

Table of eligible vans	
Make and model	Availability
Azure Dynamics Transit Connect Electric	On sale now
Daimler Mercedes-Benz Vito E-Cell	On sale now
Faam ECOMILE	March 2012
Faam JOLLY 2000	March 2012
Mia electric Mia U	May 2012
Renault Kangoo	On sale now
Smith Electric Smith Edison	On sale now

Van eligibility: Vehicles must have been confirmed by Government as eligible under the rules of the scheme in order to receive subsidy:

Van eligibility criteria	
Criteria type	Explanation
Vehicle type	Only new vans are eligible (vehicle category 'N1' with a gross weight of 3.5 tonnes or less). This includes pre-registration conversions (normal, internal combustion engine vans that were converted to battery or hybrid versions by specialist converters before the van's first registration).
Carbon dioxide exhaust emissions	Vehicles must emit less than 75 grams of carbon dioxide (CO <sub>2</sub> ) per kilometre driven.
Range	Eligible fully electric vans must be able to travel a minimum of 60 miles between charges. Plug-in hybrid electric vehicles (PHEVs) must have a minimum electric range of 10 miles.
Minimum top speed	Vehicles must be able to reach a speed of 50 miles per hour or more.
Warranty	Vehicles must have: <ul style="list-style-type: none"> <li>• a 3-year or 60,000-miles vehicle warranty (guarantee)</li> <li>• a 3-year battery and electric drive train warranty, with the option of extending the battery warranty for an extra 2 years</li> </ul> 'Drive train' means the parts that send power from the engine to the wheels. These include the clutch, transmission (gear box), drive shafts, U-joints and differential
Battery performance	Vehicles must have: <ul style="list-style-type: none"> <li>• either a minimum 5-year warranty on the battery and electric drive train as standard</li> <li>• or extra evidence of battery performance to show reasonable performance after 3 years of use</li> </ul>
Electrical safety	Vehicles must comply with certain regulations (UN-ECE Reg 100.00) that show that they are electrically safe.
Crash safety	To make sure vans will be safe in a crash, they must either have: <ul style="list-style-type: none"> <li>• Minimum EC regulatory standards for volume production;</li> <li>• Or evidence that the van demonstrates high levels of safety as judged by international standards. For example, crash testing for other internationally recognised consumer information programmes or regulatory standards, that offer a comparable level of safety stringency as EC minimum regulatory standards for volume production.</li> </ul>

[2] Commercial fleets: The Cenex Fleet Carbon Reduction Tool (FCRT) was used during the development of this report, to analyse the potential ownership cost and environmental impact of operating electric cars and vans in a range of different operational scenarios. The results of the analyses have helped prove that electric vehicles can provide financial as well as environmental benefits when they are deployed in the right situation. Employing duty cycle analysis and whole life cost modelling, the tool provides the intelligence that fleet decision makers need to determine which combination of vehicles will prove both operationally practical and financially beneficial. The FCRT is a simulation tool that can calculate the fuel usage, carbon dioxide (CO<sub>2</sub>) emissions generated and operating costs incurred by the operation of a fleet of vehicles. The tool is designed to be flexible in operation and employs whole life cost modelling so that the evaluation of a variety of differing powertrain technologies within a fleet can be compared on equal terms. In addition, the FCRT can be used to ascertain the exact criteria required to cover a specified duty cycle in order to identify the lowest cost vehicle capable of fulfilling the task.

[3] EV network UK: There are various (but mostly incomplete) directories of EV charging points across the UK to date, including the EV network UK: <http://www.ev-network.org.uk/>The EV Network supports EV owners by two means:(a) Firstly, the EV Network aims to establish and maintain the most comprehensive listing of publicly available charge points in the UK. This listing will be available for download from the public area of this website and thus be available to both members and non-members. (b) Recognising that the public infrastructure is small and will take years to develop to an adequate level, EV Network members agree to provide access to their own charging points at their homes or businesses to other EV Network members. This service is provided on an exchange basis - by becoming a member one agrees to make one's own charging point(s) available to other members for occasional use in exchange for which one receives access to other members' charging points. Even if only half of the hundreds of EV drivers in the UK contributed their details then that could easily increase the number of charge points available in the UK by a factor of 10 to the benefit of present and future EV drivers. Members currently have access to details of around 200 locations across the UK where an EV may be charged. Each location has charging facilities for at least one vehicle, and in one case for over 100 vehicles.

[4] Recent developments in rapid/quick charging points: Towards the end of September 2011, it was announced that Nissan has teamed up with leading utility and electrical vehicle supply equipment companies to speed development of cheaper, smaller, quick chargers for electric vehicles, with the primary intention is to reduce the costs of rapid DC charging units, and to accelerate the installation of publicly-available Quick Charge (QC) points in the UK and across Europe. This agreement between Nissan, Circutor, DBT, Efacec, Endesa and Siemens is expected to result in a dramatic reduction in the price of the units – by over half to under €10K – paving the way for businesses such as service stations, car park operators and retail outlets to install quick chargers and run them profitably as a commercial enterprise.

This will mean Nissan LEAF drivers, and other quick charge enabled vehicles such as the Mitsubishi i-MiEV or Peugeot iOn, could conveniently use their vehicle for longer journeys and recharge the batteries to 80% capacity in less than half an hour. This infrastructure will open up Nissan LEAF ownership to a whole new spectrum of buyers who occasionally need to do longer journeys. A CHAdeMo DC quick charger delivers 50 kW of high voltage DC electricity straight to the battery, speeding up the charging process. There are currently several such chargers installed in the UK, mostly at Nissan dealerships but also under the One North East infrastructure scheme – however they are currently particularly expensive to purchase and install. A Nissan LEAF has a range between charges of around 100 miles as tested over the New European Driving Cycle (NEDC). Increased opportunities for quick charging will mean that a quick power boost will give Nissan LEAF customers greater driving opportunities. Compliant with charging policies of European countries, the QCs are also AC quick charge ready to support the arrival of AC quick charging cars. The rollout of these two types of charging facility will reduce range anxiety often associated with driving electric vehicles. Deliveries of Nissan LEAF have already begun in the UK, albeit in small numbers for now (Newspress 2011).

#### MINI E Trial in numbers

- 40 MINI Es
- 12 months
- 138 drivers (32 women 106 men)
- 258,105 miles
- 33,345 journeys
- 80,282 kWh electricity
- Highest individual mileage: 7954 miles
- Avg. mileage per vehicle over 6 mos: 3226
- Avg. cost to charge over 6 mos: £60, less than 2p per mile

#### The MINI E

The MINI E is a two-seat development of the familiar MINI Hatch, powered by a 204hp electric motor that also generates 220 N·m of torque.

A 35 kWh Lithium-Ion battery containing 5,088 cells provides the power. The battery was charged by a special home charger supplied by consortium partner Scottish and Southern Energy. This enables a charge time of 3.5 hours at 32 amps.

The MINI E has a top speed of 95 mph (153 km/h) and an official range of 149 miles (240 km) according to FTP72 standards, although a realistic range is 112 miles (180 km).

[5] EV MANUFACTURER USER TRIAL: BMW MINI E In early August 2011, BMW released the results of its EV user trial in the UK:

“The BMW Group released the data from the MINI E field trial in the UK. With 62 members of the public and 76 pool users running the battery-powered hatchbacks over two six-month periods, the Government-supported trial is the most in-depth of its kind in the UK to publish its findings.

An large amount of data was collected electronically by data-loggers in the car and the home charging points, and also from extensive driver research carried out by Oxford Brookes University. The early findings have already informed the development of the 2011 BMW ActiveE car, a four-seat car based on the BMW 1 Series Coupe, but the biggest beneficiary will be the BMW i3, the first purpose-built EV from the BMW Group, set for launch in 2013. The information has also helped to inform UK policy-making decisions and other EV market stakeholders, BMW said.

The UK trial discovered that everyday use of the electric MINIs didn't radically differ from the typical driving patterns of a control group of drivers of conventionally powered cars in the same segment. The daily journey distance of 29.7 miles was slightly more than the 26.5 miles recorded by the control cars, a mix of MINI Coopers and BMW 116i models. (The UK average daily distance driven for private cars overall is less than 25 miles.) With information gathered by on-board data-loggers, the average single trip distance was recorded as 9.5 miles compared to the UK average of seven miles.

Four out of five people reported that 80% of their trips could be done exclusively in the MINI E, and this increased to 90% saying that with the addition of rear seats and a bigger boot, all their trips could have been done in the MINI E.

84% said that severe the severe low temperatures during both phases of the field trial affected the distance that could be driven between charges, but despite that, four out of five participants told the researchers they thought the MINI E was suitable for winter use, with one user, Janet Borgers, saying she “*regularly did 88 miles in a single journey in the cold weather*”. Another female commuter clocked up almost 8,000 miles over a September to March period.

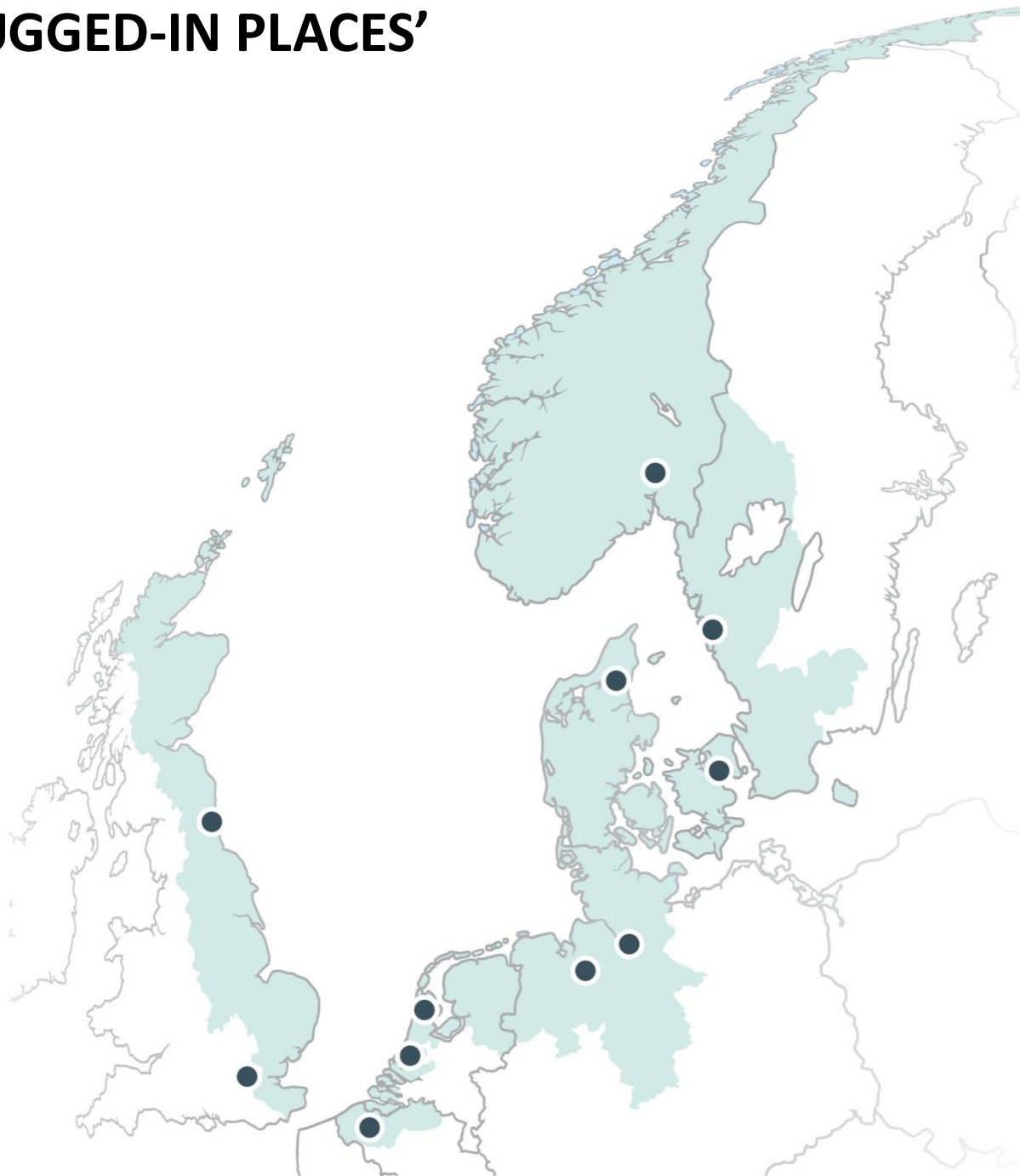
Given the daily driven distance of just under 30 miles, the drivers felt confident enough not to have to charge their MINI E every night. The average was 2.9 times a week according to information fed back via electricity smart meters, with special night-time tariffs successfully encouraging individual drivers to charge when it was cheapest, which coincided with a low demand period and a greater proportion of renewable energy in the grid mix.



Nine out of ten drivers told the researchers that charging actually suited their daily routine, with 81% agreeing with the statement *“I prefer to plug in the car than go to a fuel station”*. The running cost-savings were appreciated by users, with one participant telling researchers the thing she’d miss most was: *“the money I will have to start paying for fuel again!”*

[6] The Motor Insurance Repair Research Centre (also called Thatcham; <http://www.thatcham.org/about/>) provides 70 % of the data that insurance companies (which also fund this non-for-profit organisation) use to score a vehicle’s insurance risk. The main criteria include: Performance – 0-60 mph time for petrol cars, and torque for diesel and electric cars, top speed, repair time, costs of repair, new car price; and vehicle weight. Added together, these make up the ‘overall insurance group rating’ (IGR), although the final rating may take into account specific vehicle characteristics. IGRs are merely guidelines and insurance companies are free to set their own rate for each vehicle. At the end of the process a vehicle will fall into one of 50 insurance groups. To give some examples, the Vauxhall Ampera falls into group 21, as does the Nissan LEAF (which initially fell into group 28 because it did not have an alarm system). One interesting issue with electrical vehicles is the risk of electrical faults in the home, and, in the worst case scenario, your house burning down. This is covered by home insurance, not vehicle insurance. When thinking about insuring their electric vehicles, potential buyers (or indeed current buyers) should therefore look at the ‘total cost of insurance’ (philipomm, 2012)

## SECTION TWO: FROM MESO- TO MICRO-LEVEL IN 'PLUGGED-IN PLACES'



## Introduction to Section Two



Figure 1: Map of Plugged-In Places (OLEV 2011)

This section reviews current developments in EV infrastructure with reference to three Plugged-In Places (P-IPs) which have particular significance for longer distance routes, including those that have potential links with other countries in the North Sea Region through international transport hubs. The report considers how the *meso-level* strategic vision for e-mobility is being operationalized in Greater London, the East of England (Hertfordshire) and the North East of England (Tyne and Wear), down to the *micro-level* of the streetscape and parking places where charging points are being installed.

In their evidence to the House of Commons, Transport Committee, the Institution of Mechanical Engineers observed that, without a recharging infrastructure, consumers will be reluctant to purchase electric vehicles, and that the network will need to be in place before usage starts to increase. At the same time, ‘private companies that could install

chargepoints will not invest in this technology unless they can be guaranteed a sufficient market of drivers wanting to charge their cars. The Government expects that the Plugged-In Places programme will help solve this dilemma by providing initial infrastructure investment and alleviating potential consumers' range anxiety. This should "de-risk" subsequent private sector involvement' (HC 2012: para. 26).

The discussion below examines, in more depth, how each P-IP is responding to the somewhat 'chicken and egg' situation, and the challenge of encouraging the switch to plug-in vehicles. It highlights the variation in strategies and approaches to implementation. These differences reflect the priorities and objectives of the public-private consortium that manages each P-IP, as well as the particular circumstances of each region/sub-region.

## 2.1 GREATER LONDON

Summary of key points:

- Transport is responsible for 22% of London's carbon dioxide emissions and 46% of emissions of oxides of nitrogen, while road transport in central London is responsible for around 80% of particulate emissions
- The Mayor of London has an aspiration to make London the 'EV capital of Europe'. The Mayor's strategic documents set out his vision for increasing the uptake of EVs in London, with a range of activities covering infrastructure, vehicles and incentives
- Current barriers to EV uptake include cost, limited infrastructure for public charging, and a lack of public confidence and information about the increasing variety of EVs becoming available
- In May 2011, the Mayor launched Source London, the Capital's first London-wide network of publicly available charge points and membership scheme. There are nearly 800 charge points currently available, with the intention of having 1,300 charge points in the network by 2013
- Source London has been delivered by Transport for London (TfL) in partnership with private and public sector partners. 18 London boroughs have either installed Source London charge points or will do, with a further 8 indicating they will do so in future
- The Mayor's London Plan includes a requirement for that a portion of all car parking in new homes, offices and shops will be equipped with EV charging points

- TfL is leading a London consortium of public and private partners involved in the Government's Plugged-In Places initiative, which was awarded £9.3m to support the roll out of charging infrastructure in London
- The Electric 20 and the London Electric Vehicle Partnership provide forums for public and private sector organisations and the motor vehicle industry to share information and accelerate the proliferation of EVs in London
- Other incentives to encourage the uptake of EVs in London include a 100% discount for EVs from the Congestion Charging scheme, as well as exemptions from road tax, the Office for Low Emission Vehicle's Plug-in Car and Van grants and free or reduced rate permit parking offered by some London Boroughs
- The Mayor's support for diesel-electric hybrid technology is demonstrated in the design of the 'New Bus for London', the prototype for which entered regular service in 2012, with the intention that just over 600 vehicles will be introduced by 2016

### 2.1.1 Strategic vision for EV Infrastructure in Greater London

The strategic vision for EV infrastructure in Greater London is set out in the Mayor of London's strategic documents, principally in: the Mayor's Transport Strategy (GLA, 2010); the Air Quality Strategy, (Mayor of London 2010e), the London Plan, (GLA 2011); and the Climate Change Mitigation and Energy Strategy (Mayor of London 2010d). The Mayor's plans for EVs are set out in detail in the Electric Vehicle Delivery Plan (Mayor of London 2009a).

Transport is responsible for 22% of London's total carbon dioxide emissions, equivalent to 9.90 MtCO<sub>2</sub> per year, with nearly three quarters of this from road transport (Mayor of London 2011). In central London, road transport accounts for around 80 per cent of particulate matter emissions, while across Greater London, transport accounts for 46 per cent of emissions of oxides of nitrogen (Mayor of London 2010e). While improvements to the internal combustion engine will continue to reduce vehicular emissions of carbon dioxide and air pollutants over the next few decades, it is generally agreed that the adoption of new vehicle technologies will be required to achieve emission targets. Of the potential candidates, there is growing consensus that electric vehicles (EVs) are the best near-to-market low-emission vehicular technology. With no emissions at point of use and "well-to-wheel" carbon dioxide emissions up to 40% lower than comparable petrol or diesel vehicles, EVs will play an important role in tackling both local and global environmental challenges in the future.

The Mayor wants to make London the 'EV capital of Europe'. His objective is to achieve 100,000 EVs on London's roads as soon as possible, and e-drivers will be supported by a network of publicly accessible charge points across London. A range of activities covering infrastructure, vehicles and incentives, marketing and communication will support this aspiration and the Greater London Authority (GLA) and Transport for London (TfL) are working with both public and private partners to make this a reality.

Currently, there are barriers to the uptake of EVs in Greater London, which include the significant upfront price premium over conventional alternatives, limited infrastructure

for public charging and a lack of public confidence and information about the increasing variety of electric vehicles that are coming on to the market. However, TfL acknowledges that there have been rapid advances in the design and technology of electric vehicles, which makes new generation EV models similar in style, with all the usual conveniences of their petrol and diesel counterparts. The range of the vehicles (in excess of 70 miles for pure EVs and over 100 miles for PHEVs) and the speed (over 60 mph) makes them more than adequate for London driving, where around 90% of all car trips are under 6 miles. The cost of electric vehicle technology is falling and fuel prices have risen, making electric vehicles more cost effective over their lifecycle. More vehicle manufacturers are bringing EVs or PHEVs to the market so the available choice will broaden.

EV charge points are becoming more widely available across Greater London. In May 2011, the Mayor launched *Source London*, the Capital's first London-wide network of publicly accessible charge points and membership scheme, available at: [www.sourcelondon.net](http://www.sourcelondon.net).

In addition, the Mayor has used his planning powers to ensure that a portion of all car parking in new homes, offices and shops will be equipped with EV charging facilities. The London Plan provides the specific requirements which vary by type of development. TfL is also working with the Energy Saving Trust to understand the business case for using EVs in commercial fleets.



### 2.1.2 Operationalizing EV infrastructure in Greater London

Source London is the Capital's first London-wide publicly accessible charge point network. By 2013 there will be 1,300 charge points in the network, giving London twice as many charge points than petrol stations. This will give drivers the confidence that they will never be far from somewhere to charge up, enabling and supporting the expected increase in electric vehicle numbers. Currently (September 2012) there are nearly 800 charge points available.

Source London is the network that brings together London's new and existing public charge points into one network. Source London is replacing previous arrangements where users registered and paid for access with individual London boroughs. TfL is working with the London Boroughs and other organisations to make their existing charge points part of the Source London network as soon as possible. Source London members get access to all Source London charge points for a £10 annual fee, providing unlimited free electricity to charge their vehicle.

Vehicles that are capable of charging from standard 240v mains power and have a compatible connector type are able to use Source London charge points. New Source London charge points will have standard UK 3-pin connections but can be upgraded when international standards are set for EV charging connectors. Around two thirds of the current charge points have the 3-pin connections, with one third having the 7-pin 'Smart' connection. Source London currently (2012) has 294 fast charge points (7kW, 32 Amp) and 498 standard charge points (3.7kW, 13-16 Amp). For more information about Source London and charge point locations, visit [www.sourcelondon.net](http://www.sourcelondon.net).

TfL is leading a London consortium of public and private partners involved in the Government's Plugged-In Places (P-IP) initiative. The Consortium was awarded £9.3m to support the roll out of charging infrastructure in the Greater London P-IP provides match funding from the Department for Transport (up to 50%) for the installation of publicly-accessible electric vehicle charge points for partners in the consortium (see Section One above).

Source London has been delivered by TfL in partnership with private and public sector partners. Private sector partners involved in the delivery of Source London include: Asda, Capital Shopping Centres, EDF Energy, Enterprise Rent-a-Car, Europcar, Gatwick Airport, Heathrow Airport, Hertz, IKEA, NEP, Nissan, Old Ford Housing Association, SSE, Siemens and Southern. Public sector partners include Whittington, National Health Service (NHS).

To date, 18 boroughs - Brent, Camden, Ealing, Enfield, Greenwich, Hackney, Hammersmith & Fulham, Haringey, Harrow, Hillingdon, Hounslow, Lewisham, Merton, Newham, Redbridge, Southwark, Sutton and the Royal Borough of Kingston upon Thames - have either installed Source London points, will be retrofitting existing points and/or installing further Source London points by 2013. Eight further London Boroughs - Barking & Dagenham, Croydon, Havering, Islington, Richmond upon Thames, Tower Hamlets and Wandsworth - have signed a statement of intent that they will install retrofit existing or install new charge points as part of the Source London network. TfL is working with the London Boroughs, on an ongoing basis, to ensure that existing borough charge points will be part of the Source London network, bringing together publically accessible charge points to London. TfL has also installed new charge points in four London Underground car parks. These are located at High Barnet, Hounslow West, North Greenwich and Watford and are available as part of the Source London network.

TfL currently has 5 Toyota Prius Plug-in hybrid cars; 4 Mitsubishi I-MiEV electric cars, 4 Smith electric vans, a Peugeot iOn and a Citroen Nemo. The vans will be used in the incident response fleet for bus operations and the electric cars to support traffic light and camera maintenance work. In addition, there are 14 Alke electric vehicles in use on the TfL contract with Serco and 16 Modec electric vehicles in use by Highways and Maintenance and Works contractors. Six Renault Kangoo vans are being integrated into the bus station cleaning contractor's fleet. The Metropolitan Police are also testing five plug-in Prius cars as part of its fleet.

Two key partnerships, the Electric 20 and the London Electric Vehicle Partnership provide a forum for private and public sector organizations and the motor vehicle industry to share information and accelerate the proliferation of EVs in London. The

Electric 20 is a working group of 20 blue chip companies that use electric commercial vehicles in their fleets and have agreed to work with the Mayor to share information about their experiences and help increase the uptake of commercial EVs in London. The London Electric Vehicle Partnership, chaired by the Mayor's Environment Advisor, brings together key stakeholders and decision makers from within the vehicle manufacturing industry, London boroughs, the Greater London Authority, energy and infrastructure providers and EV users to accelerate the delivery of new EV technology and increase the level of support for EV drivers in London.

There are number of incentives available to encourage the uptake of EVs. There is a 100% discount from the central London Congestion Charging scheme for EVs. This could lead to savings of up to £2,268 per year for regular drivers in the Congestion Charging zone. In terms of national incentives, EVs are currently exempt from vehicle tax, a potential saving of around £125 per year for an average sized car. Purchasers of new electric cars and vans receive grants towards the cost of the vehicle from the Office for Low Emission Vehicles. The Plug-in Car and Van Grants have been designed to help make the whole-life costs of a qualifying car or van more comparable with gasoline or diesel equivalents and provide grants of 25%, up to a maximum of £5,000, for cars and 20%, up to a maximum of £8,000, for vans. Many local authorities in London also offer free or reduced rate permit parking for EVs.

A recent development that potentially has wider significance for e-mobility is the first widespread trial of wireless charging in the UK by technology pioneers *Qualcomm*. The innovative technology enables EV users to charge their battery by driving over an electric charge pad, instead of plugging in their vehicles. *Qualcomm* have partnered with Renault to develop a manufacturer integrated and warranted wireless charging system and will use up to 50 vehicles to determine how the system could be rolled out in the future. Based partly in the Shoreditch 'TechCity' centre in London's East End, the trial will include technology/supply partners such as *Addison Lee* and *Chargemaster*.

Transport for London is also investigating the potential for further electrification of heavy vehicles, including buses. High-power induction charging could be combined with

a range-extended electric (of plug-in hybrid configuration) bus to overcome the limitations of operating a pure electric bus on a London bus route.

The 'New Bus for London', designed as a 21st century version of the historic 'Routemaster', uses diesel-electric hybrid technology. It is driven by an electric motor and powered by batteries that are recharged by a diesel generator (that only runs when the batteries need recharging), and by regenerative braking. The bus has capacity for 87 passengers, with three doors and two staircases for speedy boarding/exit. The first prototype entered regular service in February 2012 on route 38, which is operated by Arriva. In September 2012, TfL announced its intention that just over 600 vehicles will be introduced by 2016: the largest order for hybrid buses ever made in Europe (TfL 2012). <http://www.tfl.gov.uk/corporate/media/newscentre/metro/25832.aspx>

## 2.2 HERTFORDSHIRE

Summary of key points:

- Hertfordshire County Council is a key partner in *EValu8*<sup>4</sup>, the East of England P-IP, which intends to install 600 charging points across the East of England region 2011-13, of which 105 will be in Hertfordshire and Luton
- *EValu8* will create a comprehensive EV infrastructure network across the East of England, focusing on five journey types: intra-urban, inter-urban, rural-urban (linked with park and ride, and rail stations), London-based commuting (linked with Greater London public transport and P-IP), potential journeys to/from ports and airports as international gateways
- This will be important as Hertfordshire residents may consider the relatively short range of EVs less suitable than their counterparts in Greater London, especially in urban fringe and semi-rural areas with smaller, lower density settlements
- *Source East*<sup>5</sup> offers subscribing e-drivers access to charging points across the East of England, but as yet Source East and Source London are *not* interoperable for e-drivers
- The County Council envisages significant potential to develop Hertfordshire's 'Electric Vehicle Innovation Cluster' of research, technology and manufacturing industries, with economic as well as environmental benefits

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<sup>4</sup> [www.eval8-ti.org.uk](http://www.eval8-ti.org.uk)

<sup>5</sup> [www.sourceeast.net](http://www.sourceeast.net)

- Hertfordshire's (April 2011) *Local Transport Plan 2011-2031* confirms support for 'infrastructure and facilities to enable and encourage the use of electric and electric hybrid vehicles', and Council's Cabinet Panel for Highways and Transportation (September 2011) has identified future workstreams to enhance EV uptake
- The Council's emerging work on EVs includes:
  - Supporting the development of an effective and comprehensive EV charging network
  - Potentially supporting infrastructure development through funding, including bids for external funding where appropriate
  - Being proactive as a partner in multi-authority and cross-sector EV infrastructure schemes such as P-IPs
  - Promoting Hertfordshire's EV technology and manufacturing cluster, potentially alongside partners such as the Local Enterprise Partnership
  - Support for stakeholders, including the second-tier District Councils, installing charging points which are compatible for EVs built by different manufacturers in appropriate locations in workplaces and public areas
- Nevertheless, County policy ('LTP3') will be subject to regular review, as risk and cost factors - especially high prices for EV purchase and uncertainties over EV maintenance costs - may adversely affect the viability of installing EV infrastructure
- Although charging points should be installed in highly visible locations, the design and positioning should be sensitive, should not disrupt the free flow of traffic, and where possible enable more than one vehicle to be charged simultaneously

- Operational measures by the County Council will include: promoting provision for EVs in new developments; installing charging points at Council properties, on the road network, and through other programmes
- By the end of 2011, four early charging points (fast chargers) had been installed in publicly accessible places in Hertfordshire, and further were installed in urban centres including Watford, Hemel Hempstead, and St Albans during 2012
- Points are also being installed in workplaces and other commercial premises
- Land use planning policies may be used to ensure accommodation of EV in new developments

Discussion is taken place to address the lack of a standard smartcard for EV users to access the subscription-based systems for the Source East and Source London charging points, e.g. for longer commuting trips

- UNO of Hatfield has introduced two new diesel electric hybrid buses, March 2012, purchased with funding secured from the DfT Green Bus Fund, with support from Hertfordshire County Council. These are operating in the St Albans area. Furthermore Hertfordshire County Council secured £9.7m funding via the DfT Local Sustainable Transport Fund, for the BIGHERTSBIGIDEAS project, running from March 2012-March 2015. The project will bring changes in sustainable transport provision and stimulate economic growth in Hemel Hempstead, St Albans, Watford and between. The projects include: Improving walking and cycling routes; Enhancing local bus services; Marketing sustainable transport options in and between the three towns; and Using innovative technology (Hertfordshire County Council 2012)

### 2.2.1 Strategic vision for EV Infrastructure in Hertfordshire

Unlike Greater London (above), Hertfordshire County Council has not published a detailed strategy for EV infrastructure provision. Nevertheless, it is a key player in *EValu8* [[www.eval8-ti.org.uk](http://www.eval8-ti.org.uk)], the consortium of more than 50 public and private partners for the East of England P-IP which received £3m OLEV match funding from the Government in the phase 2 of P-IP bids (2011-13). The East of England network will form an important part of the national EV infrastructure - and potentially internationally within the NSR - linking with the adjacent P-IPs for Greater London and the city of Milton Keynes, approved in 2010 in phase 1. *EValu8 Transport Innovations Ltd.*, a not-for-profit company underwritten by University of Hertfordshire, was set up to distribute funding to install the EV infrastructure, with a projected total of 600 charging points across East of England 2011-13, 105, of which will be in Hertfordshire, and in Luton (a Unitary Authority).

*EValu8* will create a comprehensive EV infrastructure network across the East of England, focusing on five journey types:

1. Journeys within cities
2. Journeys between cities, including the P-IP for the city of Milton Keynes (another unitary authority)
3. Rural-urban journeys where there are no viable public transport alternatives, linking in with park and ride sites, and rail stations
4. London-based commuting, linking in with the capital's public transport and the adjacent Greater London P-IP
5. Potential journeys to/from ports and airports as international gateways
6. Lack of off-street parking is a less significant issue for e-drivers than in central and inner London (above). However, this network will be important as Hertfordshire residents may consider the relatively short range of EVs less suitable, especially in urban fringe and semi-rural areas with smaller, lower



density settlements. As with Source London (above), electricity is supplied by *Source East* [[www.sourceeast.net](http://www.sourceeast.net)]. For a nominal £10 per annum, this offers subscribing e-drivers access to charging points across the East of England. Further, from October 2012 the subscription-based charging schemes in Source East and Source London became inter-operable, using a common system of cards/card readers. Nationally, the Government (OLEV 2011: 43) has supported 'a common standard for plug-in vehicle smartcards issued by the Plugged-In Places to access their infrastructure. This will mean that any smartcard issued by any one of the Plugged-In Places will be capable of being read by infrastructure from all the projects'.

In addition to the environmental benefits of increased demand for and use of EVs, the County Council envisages significant potential to develop Hertfordshire's 'Electric Vehicle Innovation Cluster' of research, technology and manufacturing industries. Commissioned by the County Council, *A Low Carbon Economy for Hertfordshire* - a report by Oxford Economics (2010) - highlighted the potential to develop a low carbon economy cluster in the County, and to create a sustainable transport and communications infrastructure to reduce local vehicle dependence and to 'green' the local distribution sector. More broadly there is a developing cluster of EV research and development companies across the East of England region, including Nissan and Cranfield University in Bedfordshire, and Cosworth and Ricardo in Cambridgeshire.

A policy statement in Hertfordshire's (April 2011) *Local Transport Plan 2011-2031* confirms support for 'infrastructure and facilities to enable and encourage the use of electric and electric hybrid vehicles', and in September 2011, the Council's Cabinet Panel for Highways and Transportation considered the implications for Hertfordshire of the recently published national strategy on EV infrastructure (OLEV 2011) which came to a preliminary view that EVs and charging infrastructure technology was expected to advance significantly, along with attitudes and behaviour of EV owners, and identified future workstreams that could take place in Hertfordshire to enhance EV uptake.

A range of potential strategic actions that could be taken forward would include: supporting development of an effective and comprehensive EV charging network;

potentially supporting infrastructure development through funding, including bids for external funding where appropriate; being proactive as a partner in multi-authority and cross-sector EV infrastructure schemes such as P-IPs; promoting Hertfordshire's EV technology and manufacturing cluster, potentially alongside partners such as the Local Enterprise Partnership (a Coalition Government initiative, led by Local Authorities and businesses to drive sustainable economic growth and job creation); supporting stakeholders, including the second-tier District Councils, to install charging points which are compatible for EV's built by different manufacturers in appropriate locations in workplaces and public areas.

The Cabinet also acknowledged risk and cost factors that may impact negatively on the viability of installing EV infrastructure, especially high prices for purchasing EVs and uncertainties over EV maintenance costs. For these reasons, policy on EV infrastructure should be monitored and reviewed on a regular basis.

### 2.2.2 Operationalizing EV infrastructure in Hertfordshire

At the same meeting (September 2011) the Cabinet Panel also agreed a number of operational principles:

- Although charging points should be installed in highly visible locations, the increase in street furniture should be minimized, especially in aesthetically sensitive locations, and their location should not disrupt the free flow of traffic
- Each charging point should be installed with a minimum of ground works, and where possible enable more than one vehicle to be charged simultaneously, reducing the need for further points nearby
- Safety will be a critical factor in choosing design options for charging points, and other infrastructure (e.g. wi-fi hosting) may be supported where appropriate

Operational measures by the County Council will include: promoting provision for EVs in planning for new developments; promoting e-mobility through other County Council programmes, e.g. travel planning; installing charging points at Council properties, and on the County Council road network; encouraging the uptake of charging infrastructure at non-County Council owned sites in Hertfordshire.

By the end of 2011, four early charging points (fast chargers) had been installed in publicly accessible places in Hertfordshire (100% funded EValu8/EEDA legacy): Watford (Bushey Arches car park), Dacorum (Maylands Business Centre), Welwyn, Hatfield (Howardsgate), and Hertford (Count Hall). Charging points were installed in 2012 (additional funding for Local Sustainable Transport Fund) in urban centres: Watford, Hemel Hempstead, St Albans. Further charging points are being installed in workplaces and other commercial premises where owners apply to EValu8 for match funding while planning policies may be used to ensure accommodation of EV In new developments.

## 2.3 NORTH EAST OF ENGLAND/ TYNE AND WEAR

Summary of key points:

- The North East EV programme started in late 2008, and was instigated and coordinated by One North East (ONE), a government-funded regional economic development agency (which, like all other English RDAs) has since been wound up in May 2012, and dissolved by central government).
- ONE was also charged by the UK central government to deliver the UK's first 'Low Carbon Economic Area for Ultra Low Carbon Vehicles' (although some of the senior people in charge then argue now that this more marketing than substance).
- In the broadest sense, investments in the programme were catalysed by three factors: reducing emissions from road transport, decreasing dependence on imported fossil fuels and creating new green industries to stimulate economic growth.
- However, given the importance of automotive manufacturing to the regional economy, securing future investments in this industry was a key motivator.
- A particular objective of the programme was to create one of the first environments to support early mass adoption of EVs, encompassed a range of projects covering manufacturing, infrastructure, innovation, skills and awareness raising.
- This included, in early 2011, the creation of an open-access test-track facility and workshop building, signed over from Nissan to Gateshead College on a 20-year lease (supported by £2.4 m the then regional development agency, ONE)

- Nissan is just starting (March 2013) the mass production (50,000) of the fully electric plug-in Leaf, with electric battery production plant in the region also, worth £420 million as investment and supporting 2,000 jobs in the automotive sector (with more than 500 at Nissan's Washington/Sunderland plant); with a flanking Skills Academy for Manufacturing & Innovation (Gateshead College) and also a Centre for Low Carbon Vehicle Development by a range of partners in the R&D and skills area.
- The North East's P-i-P programme has now been handed over to Gateshead College's fully owned subsidiary, Charge Your Car (North), with Gateshead College's Zero Carbon Futures training, workforce development and consultancy full subsidiary currently the key central player, which is undertaking commercial partnerships with other EV services and infrastructure providers in the region and beyond in the UK.
- Gateshead College was recently, late 2012, successful in gaining £6.2 million Regional Growth Fund contribution funding (inherited as a bid from ONE) which is, however, being reliant on major leveraged private sector investment to be drawn down, which will build on Gateshead College's £ 8.4m Skills Academy for Sustainable Manufacturing and Innovation (SASMI) and also to develop further the EV Test Track and associated infrastructure nearby, including a 2,000 sq m International Low Carbon Vehicle Research and Development Centre based at Nissan's former Design Centre adjacent to the Nissan plant in Washington, Sunderland and the new Turbine Business Park.
- It is envisioned that the capacities mapping of universities and firms in the region can be more systematically brought together, and made visible in terms of inward investment and also external perception of the North East of England in relation to EV issues.
- Newcastle Science City with its partners, as well as the Local Enterprise Partnerships (North Eastern and LEP) are hoping to contribute strategically to this.

- There is still a strong, and developing, industrial and services and skills base relating to EVs in the North East of England – despite some up and downs with individual players.
- Local authorities, as well as many private businesses, have engaged well with the EV agenda (including with EV fleet vehicles), and have developed key capabilities and interests (including commercial).
- There is a good visibility now of EVs in the region through a variety of initiatives, and the region (ONE, TORG – Newcastle University; Future Transport Systems) have engaged with a range of EV demonstrations and trials (SMART MOVE, Cenex / ONE; SWITCH EV), so learning should be possible from that in the region.
- 44 EVs have been tested across the range of vehicles by a range of organisations over 6 months, and they are being used from cars to vans and trucks.
- The region has developed a range of formats to make EVs accessible, as well as the supporting charging infrastructure – with a back office function and membership facility for both individual and business users, a pay-as-you go access facility for EV charging points, an extensive EV off-street as well as retail and work-based charging infrastructure, Nissan dealerships, a car club that includes an EV, EV taxi firms, hybrid buses in the fleets of several private operators, as well as the new ‘Mu’ motoring concept of Peugeot.
- The biggest Low Carbon Customer Revolution consumer experimental consumer behaviour (some commercial but mostly household) and smart grid project has been ongoing in the North East and North Yorkshire by CE Electric / Northern Powergrid with an academic partner.

- This learning is to be built upon by a new research project investigating the secondary use for electric vehicles, in terms of providing household energy in a simulated home from domestic solar panels or wind turbines. Over the next 6-12 months, the demonstrator will see PV panels linked up to an electric vehicle battery, with a measuring and control system tracking both outputs and inputs of electricity using measurement devices and logging the data.
- In March 2013, additional funding has been made available to local authorities looking to install EV chargers in public and residential areas, quick charge points in strategic locations and towards the installation of domestic charging points in homes and for train operators and any public workplace for use by fleet, pool or individual vehicles.
- There is to be a legally binding combined authority from County Durham, across Tyne and Wear up to Northumberland on transport issues.



### 2.3.1. Strategic vision for EV Infrastructure in the North East of England P-i-P

Electric vehicles and their benefits for the environment have an important role to play in enhancing sustainable transport provision. The North East is becoming the most connected area for EVs in the UK. North East England is leading the way specifically due to the Nissan plant, which produces 25% of all cars on the UK's roads, and will begin production of its flagship EV, the LEAF in 2013. Also due to launch imminently is Nissan's lithium ion battery plant at Sunderland, a £200m investment. The EV supply chain in the North East is worth almost £1 billion (Yip, 2011; Beeton, 2012). Nissan, with a turnover of £4.3bn, was top of the Top 200 North East firms, recently (Lognonne, The Journal , Nov 2012).

ONE received £7.8m from the DfT's / OLEV's "Plugged-in Places" programme to roll-out electric vehicle charging points across North East England over 3 years. This fund is intended to install 1,300 charging points in the North East by March 2013. Of the 1,300 charging points 619 will be publically accessible and 681 domestic.

The North East of England Plugged-In Place project, then called "Charge your Car" (CyC), started in early 2010 with funding of £7.8m over 3 years to March 2013, funded by ONE (One North East, the regional development agency), OLEV, public and private partners: all 12 local authorities in Tyne and Wear committed funding to assist the regional bid. Alongside this there were 28 partners representing a consortium of around 40 organisations. From this funding, the Regional Development Agency One North East (ONE), a recipient of part of this grant, paid for the installation of 30 charging points across Newcastle.

Since early 2012, CyC (North) Ltd is a wholly owned subsidiary of Gateshead College because the UK Government closed the Regional Development Agencies and a new home was needed for the PIP project.



- Gateshead College has an ongoing strategy to develop its remit in Low Carbon Vehicles, and is a key workforce development organisation in the region - also in the LCV sector - and hence was a good fit.
- Gateshead College's new £8.4 m Skills Academy for Sustainable Manufacturing and Innovation (SASMI) centre / facility is based next to Nissan plant at Washington / Sunderland, and houses Zero Carbon Futures (a full subsidiary of Gateshead College), which operates the Electric Vehicle Test Track, and CyC (North) Ltd.

CyC (North) aims to:

To create a comprehensive connected network of electric charging infrastructure, across the NE region, within the next 3 years: Install 1000 charging points, with public and private access, workplace, domestic and quick charging points with interoperability, communications capability and EV user support. CyC works with OLEV and other UK P-i-P projects to:

- Advance the development of common standards,
- evaluate different technologies,
- harmonise local incentives,
- understand user-behaviours and impact upon infrastructure.

Key successes of CyC, reported include firstly the partnership approach (to buy and install charge posts on behalf of partners), it is suggested that Local Authorities aim to develop EV infrastructure using a similar partnership basis. The partnership approach across the North East region ensured an interoperable system was in place, making the network 'more *user friendly for the EV driver.*' The project built on existing initiatives in the region (such as the local authority Covenant of Mayors agreement to tackle climate change), providing local authorities' justification to be involved. An important factor was the availability of grant funding, providing flexibility and adaptability to tackle key challenges. The key challenge will be to sustain this beyond the period of P-IP support (Lumsden 2012).

The North East England has a vision to become a world leader in the development, manufacturing and deployment of EV technologies. The region is at the centre of the EV manufacturing industry in the UK, attracting major investments to produce a range of vehicles (from personal to commercial to scooters), electric batteries and specialist components. This includes a £423 million investment by Nissan to establish the region as its European headquarters for the manufacture of LEAF and batteries, from 2012/3 onwards, but also US investment into Smith Electric Vehicles through a take-over.

To attract these investments, an £80 million programme of major pilots and new innovation assets was initiated in 2008 by the regional development agency, ONE (now abolished). This has established North East England as a leading intentional knowledge centre and test bed for EV and recharging infrastructure technologies.

An example of public sector investment is the £75,000 grant from One North East, the regional development agency, as well as support from the Tyne and Wear Development Company, to Turbo Power Systems (TPS) and its power electronics division in Gateshead to look at the potential of connecting energy from photovoltaic (PV) cells to charge electric vehicles, for instance in car parks. (Dent / The Journal, 2010).

- This is overseen in practice by CyC (North) in the North East now, and the role of Universities and colleges and OEM producers and service providers is also critical.
- In 2009 the UK government designated the North East as the UK's Low Carbon Economic Area for Ultra Low Carbon Vehicles. This gave the region a leading role in supporting the transition of the automotive sector to a low carbon future.
- Thanks to the work of One North East until its winding up and Charge your Car (CyC) [and subsequently Charge your Car (North)] and the North East's Plugged-in Places scheme, the North East is now the most connected EV region in the UK with well over 300 charging points in place.

- Charge Your Car (North) took the award for Low Carbon Road Transport Initiative of the year in February 2013 from the Low Carbon Vehicle Partnership for shaping a future UK electric vehicle infrastructure, with groundbreaking technology trials, and generating more than 600 chargers at home, public locations and businesses across Teesside, making this one of the best-connected places in the country for electric vehicle charge points (Price / Evening Gazette, 2013)
- The North East is actively participating in a number of international programmes:
  - At the European level this includes ENEVATE (EU Interreg IVb North West programme) and the E-Mobility Network for the North Sea Region (EU Interreg IVb North Sea Region programme). At the global level, the region is also participating in the EV Ecosystems project (IEA HEV Task 18) and has been designated as the UK's pilot region for the Electric Vehicle Initiative (EVI).
  - Smith EV, AVID and some others, such as Liberty, are regional OEM producers and are active in sales networks in the NE region on EV vans / commercial vehicles. Sevcom is a successful and growing EV supply manufacturer (*electric vehicle-control systems*) in the region.
  - Higher and Further Education Institutions have a role to play. For instance, a report for Northumbria Commercial Enterprises (2011), "Plug-in Electric Vehicle Market", was commissioned from Urban Foresight (Dr. David Beeton) for Northumbria Commercial Enterprises Intelligence (Final Report June 2011). "*The study considers the complete ecosystem required to support mass adoption of electric vehicles, including the total system of infrastructure, regulation and R&D. The report concludes by providing a directory of the key stakeholders that are active in the sector to support Northumbria University's Low Carbon Mapping Project.*" (Northumbria University Low Carbon Mapping ' Web Brain', 2012). Newcastle University, Sunderland University and Durham University have also developed a portfolio for EV-related research, consultancy and academic

teaching at undergraduate and postgraduate level, with further education colleges such as Gateshead College developing HND / foundation degree and vocation skills training in the area (Zero Carbon Futures website, 2013).

- Technology supply chain, tier 1 components suppliers and systems developers and manufacturers are also very important in this ca. £1 billion supply chain (Dr. Colin Herron, ZCF, 2012). For instance, in 2003 Ryan Maughan helped establish vehicle control systems developer ComeSys in Cramlington, South Northumberland, before later in 2008 establishing AVID Vehicles Ltd (which makes engines and gear for HEVs and FEVs), co-located at Nelson Park in Cramlington, both operating under umbrella company MSI Holdings. ComeSys Europe is a key supplier to AVID. Venture capitalists Chris Thompson (chief executive of the Express Group), Chris Baylis (former head of engineering at Nissan Europe) and D. Howard Forrest (former managing director with the Cookson Group) have all invested substantial amounts of capital (after a commercial bank loan deal collapsed late on). One of AVID Technology's (formerly ComeSys Europe) successes in 2009 was winning a £10m contract with Yangzhou Yaxing Moror Coach C. Ltd in Nanjing City, China, to fit its green engine electric technology to improve the cooling system of bus engines into hundreds of their buses for a trial there (after a successful trial in the North East of England, with the development having received a ONE grant of £15,000), and then later between 2,500 to 3,000 units (Avidgr.com, 2009/2010).
- This was supplemented later by new company HYPERDRIVE, which focuses on LVCs, including EVs – and developed a testing format of leasing and renting EVs in the region for individuals and companies. Cramlington-based Hyperdrive Innovation and SR Technology Innovations from Durham have, in spring 2013, been awarded a RGF Collaborative LCV grant contribution of £300,000 to develop a technology that will help electric cars stay powered for longer hoping that their electric vehicle range extender will create a boost in the uptake of electric vehicles (Lognonne, 2013).

There have been some specialised smaller transport and technology consultancies, such as Future Transport Systems (FTS), and now Urban Foresight, which have a well-developed EV portfolio nationally and internationally. There are also consultancy and training services operators such as TADEA and, in the near future, TRL, with a growing presence in the region on EV-related services, in partnership with Zero Carbon Futures. At the end of November 2010, a North East and North Yorkshire based project “The Customer-Led Network Revolution”<sup>6</sup> attracted a £27 million contribution, the largest award made by Ofgem, the electricity and gas regulator, in its first competition for the Low Carbon Network Fund. This innovative fund, worth £500 million over five years, was established this year by Ofgem to encourage distribution network companies to engage with partners to carry out ground-breaking projects to help develop a smart grid and assist in the creation of a low carbon economy. Households and businesses in the north of England will be among the first in Britain to benefit from the introduction of a smarter electricity grid as a result of a £54 million project by CE Electric UK - now Northern Powergrid - and its partners, British Gas, Durham University and EA Technology. The project, which will involve around 14,000 homes and businesses centred in the north of England, is aimed at producing knowledge to help electricity customers across the country reduce both their energy costs and their carbon emissions. If, as a result, it accelerates the introduction of low carbon technologies by one year, it could save the country around £8 billion in energy costs and 43 million tonnes of CO2 emissions. As well as exploring what the impact on electricity demand of customers using PV solar panels, electric vehicles and heat pumps, the project will explore the use of new technology on the electricity network and commercial solutions, such as different pricing structures. This will help the electricity industry find the best way to keep down the cost of connecting customers to the grid and minimizing the cost of meeting their electricity needs. The project operates across Durham, Leeds, Newcastle and Sheffield:

The North East of England recently welcomed the announcement from Government of a £6.2 million boost to the low carbon vehicle economy of the region. At the core of the bid is a plan to create 1,500 apprenticeships in the low carbon vehicle sector as a result

<sup>6</sup> <http://www.networkrevolution.co.uk/default.aspx>

of the successful bid to the second round of the UK's Central Government Regional Growth Fund (RGF), but also further investment into infrastructure such as the further commercialisation of the EV Test Track. RGF is a £1.4 billion fund operating across England, supports projects and programmes that create economic growth and sustainable employment. It is based on matching private sector spend and also jobs per capita ratios, and partners will have to prove that when they draw down the funding. The successful bid will advance the North East as a national/ international leader in the production of Low Carbon Vehicles, associated technologies, infrastructure and developing the workforce in these areas.

The recently announced Low Emission Transport Collaborative Projects Fund, supported by the Government's Regional Growth Fund, will offer grants of between £50,000 and £300,000 to SMEs to develop innovative products and services on low carbon vehicles (LCVs). This will provide an opportunity for North East businesses to apply to the fund, increasing the reputation of the North East LCV industry (Lognonne/The Journal 2012).

- Gateshead College aims to be at the forefront of training for the renewable energy and low carbon sector, and are the preferred training provider for Nissan UK and Smith Electric Vehicles, with a proven track record of delivering effective training in this field, recently having opened its Skills Academy for Sustainable Manufacturing and Innovation (SASMI), in Washington / Sunderland, which is the UK's first training centre dedicated to the clean technologies sector. Gateshead College also run a Performance Track designed for low carbon vehicle development, testing and trialling. Gateshead College states that the RGF programme will be delivered using a unique model that will see public and private sectors, including universities and research centres, come together to create capacity and jobs in the North East. It will include the creation of 5,000 jobs over 10 years, of which 1,500 will be apprenticeships in sustainable manufacturing and electric vehicles specialisms, a dedicated Innovation Centre based at SASMI and curriculum development.

- Delivering a range of projects, the RGF fund bid will look to further develop the automotive industry in the region, ensuring the area is recognised as a hub for low carbon. Projects include:
  - The further development of Turbine Business Park – adjacent to the Nissan Sunderland plant.
  - Developing skills at all levels including apprentices and workforce development and delivering new qualifications in the Low Carbon Vehicle field to ensure the region’s workforce can benefit from the opportunities within these sectors.
  - Support the development of the Test Track and Low Emission Vehicle Development Centre as a Research and Development and training facility.
  - Developing innovation in new LCV technologies by supporting business and university / college collaboration
  - Increasing support for the local supply chain to ensure they can access the existing £80 million of local opportunities.
- The new (since April 2012) North Eastern Local Enterprise Partnership (NELEP), which is business led (though some commentators note that less than half of the 18 members of the NE LEP are 100 % private companies, and have noted some Newcastle and Sunderland divides on it, in perceived contrast to the Teesside LEP), has outlined the following vision to central Government for Regional Growth Funding / ERDF:

*“Through smart, enterprising leadership between the private, public and voluntary and community sectors we will rebalance the economy, and create Europe’s premier location for low carbon, sustainable, knowledge-based private sector-led growth and jobs.”*

(NELEP 2010)



Title: NELEP Illustration

Source: Draft Implementation Plan North Eastern LEP Proposition - Enterprise Zones ('D' is the Ultra-Low carbon Vehicle Zone, around Nissan's Sunderland / Washington factory)



*This vision will be delivered by four strategic economic priorities, designed to maximise private sector contribution to driving growth:*

1. **Supporting Enterprise and Private Sector Business Growth:** The North Eastern LEP will support activities able to make sustainable improvements to the LEP economy's existing enterprise and business base, and that contribute to the rebalancing of growth and employment towards the private sector.
2. **Building on Key Economic Strengths:** The North Eastern LEP is committed to supporting programmes or projects that build on, and develop further, the existing strengths and assets of the LEP economy. Partners have agreed that the key sectors critical to the long term growth prospects of the North Eastern LEP area include: Electric Vehicle Production; Offshore Energy Generation and Supply; Science and Technology; Advanced Manufacturing and Engineering; Professional, Financial and Business Services; Construction; Culture; Creative; Tourism; and Land-based Industries.
3. **Improving Skills and Performance:** The North Eastern LEP will support actions that both stimulate and will meet greater employer and individual demand for higher skills in order to improve the competitiveness and productivity of businesses and organisations in the LEP area.
4. **Strengthening Transport, Connectivity and Infrastructure:** The North Eastern LEP will support initiatives that seek to improve transport networks and infrastructure in the LEP area, as a means of strengthening internal and *external connectivity, in order to attract new investment and encourage business expansion, and unlock access to new employment or training opportunities.*

In its submission to the North East Independent Economic Review established by NELEP on behalf of the Low Carbon Vehicles sector, Zero Carbon Futures (2013: 1) maintains that the "North East of England has a history of innovation and engineering in the automotive sector which comprises over 200 companies and employs 26,000 people. Home to the UK's largest car plant and largest exporter, Nissan, the automotive industry and associated supply chain in the region is worth close to £ 1 billion. The automotive

industry is currently undergoing its biggest transformation in its history with the introduction of electric and hybrid vehicles and it is as a result of North East England's innovative automotive industry environment that the region is regarded as a pioneer in the new and emergent sector. Established companies based in the region – Sevcon and Smith Electric Vehicles – have been at the forefront of developments in commercial electric vehicles for many years and over the past six years more than £ 300 million has been invested in developing our world-leading expertise and R&D in this emerging technology. North East of England is gaining an international reputation in the development and manufacture of low carbon vehicles and is the only area in Europe with such a comprehensive sector geared up to the development of low carbon vehicles comprising of manufacturers, battery development, R&D, skills and training as well as a leading supply chain.”

The ZCF submission does also argue, however, that:

- There is need for a co-ordinated body for the sector in the North East of England (despite some efforts of co-ordination undertaken by ZCF, a subsidiary arm of Gateshead College more recently) as a resourced alliance (such as in existence with the North West Automotive Alliance) to further the industry and stimulate economic growth as well as responding to inward investment opportunities in this sector
- Since this is a sector still in its market entry phase with to date low volumes of equipment and services, technology still to be defined and no dominant technology having yet emerged, it is difficult as yet to develop a commercial model for R&D and infrastructure and therefore public subsidy is still required to stimulate the market
- To compete in global markets. Engineering and technical skills to drive this forward are required, the lack of which could become a barrier for the sector; and hence talent attraction and retention, collaboration with the regional universities, and promotion of opportunities available in this sector are needed

- More consistent support is needed to help UK companies to join supply chain initiatives and intervention from central government would be welcome to aid commercialisation
- The region has a real potential to become the European centre for LCV development, if positioned and promoted as such, attracting investors on a range of areas – from R&D, manufacturing through to the development of integrated transport systems and smart city development, and enabled by a trained workforce with the right skills.
- There is a real potential to built on the regions strengths in manufacturing, engineering, energy and science to stimulate private sector growth in LCV if it works collectively to ensure the region is internationally known as the place to work, study, do business ad set up business in this field.
- The area of Low Carbon Vehicles is not just an economic issues, however: National policy surrounding CO2 reduction targets also play an important part by supporting te development of this sector, and North East partners are contributing to the national policy debate through engagement with government department, responding to consultations and provisions of written and oral evidence to select committees and through expert support to other Professional Institutions such as the IET, RAEng and CBI. (ZCF, 2013; NELEP, 2013).
- **Tees Valley LEP:** the Tees Valley LEP – Tees Valley Unlimited - has two ambitions:
  - To drive the transition to a high value, **low carbon economy**; and
  - Create a more diversified and inclusive economy (Tees Valley Unlimited, no date).

- The Local Enterprise Partnerships (LEPs) of both Teesside (Tees Valley Unlimited) and the rest of the North East (NELEP) have secured new Enterprise Zones (EZ) giving advantageous investment incentives to new commercial and industrial development.
- However, whereas Teesside’s five towns appeared united all along with their successful submission (with the Teesside LEP being the first approved in the UK and the first Enterprise Zone granted), the rest of the North East was arguably experienced more differences in finding a common platform even after their Enterprise Zone (EZ) submission to the Government succeeded. Regarding the Government’s Regional Growth Fund, in the latest differences among seven local authorities, one faction wanted EZ status for “core zones” of Newcastle and Gateshead on the eve of the twin councils axing their 1NG local development body, while another preferred an A19 corridor, and a third wanted the Tyne’s banks financed for a new era of waterfront industry. Central Government has finally approved a compromise – part of the A19 corridor suitable for ultra-low carbon developments beside Nissan at Washington, and the Tyne riverside taking in the Swan Hunter site, Neptune Yard and Port of Tyne’s north estate. Northumberland and Durham should benefit also, not least through supply chains. £200m EZ offering is meant to set up to 7,000 new jobs over a decade.
- In a recent study, *The UK’s Growth Landscape* - which contains a detailed study of the strengths and weaknesses of the North East region, the Confederation of British Industry (2012) calls for the various Local Enterprise Partnerships in the North of England to work collaboratively to address the problem of transport links particularly with other parts of the North, and also calls on the two LEPs in the North East of England to collaborate in key areas. The Group of Northern Group of Labour MPs in the House of Commons underscores this in their submission to the North East Independent Economic Review established by NELEP (NELEP, 2013).

- As the North East England is set to become one of the world's major EV manufacturing regions, investments are being made in national innovation assets to support further technical development and provide the skills required to shape future growth in this new industry. Central to this is a new £8.4 million Skills Academy of Gateshead College which will become the UK's national training centre for the ultra-low carbon vehicle industry, and is attracting international interest from India, Japan etc ... This will provide skills required for large-scale manufacturing of EVs and advanced batteries as well as specialist EV training to vehicle technicians, dealerships, and first responders. Sunderland City Council is also planning to expand the adjacent Turbine Business Park, attracting more EV related businesses, and facilitating easier access to the EV test track from there. The EV Test Track in Washington / Sunderland will benefit from the RGF money, and EV bus testing and retrofitting facilities are being explored with stakeholders.
- In June 2012, four leading institutions have formed a partnership to further develop the North East's electric vehicle industry. The group hopes to increase investment in the sector, help to develop the technology needed to grow, create best practice models for management and help to attract staff in industry. Its members have signed a memorandum of understanding to launch the Zero Carbon Vehicle Centre of Excellence programme. This aims to increase the number of electric vehicle technologies developed and trialed in the region; grow jobs in the sector; and become a leader in EV and fuel-efficient driver training. The partnership is comprised of Gateshead College, Teesside sustainability advisers Tadea, transport consultants TRL and Gateshead-based Zero Carbon Futures (an ultra-low carbon technology and consultancy business as well as running the regional P-i- P programme, and a wholly owned subsidiary of Gateshead College), launched in 2011 to continue One North East's work driving the industry (ZCF website, 2012).

- The biggest Low Carbon Customer Revolution consumer experimental consumer behaviour (some commercial but mostly household) and smart grid project has been ongoing in the North East and North Yorkshire by CE Electric / Northern Powergrid with an academic partner.
- Durham University's Energy Institute is to investigating the technical issues surrounding where and when people choose to charge their electric vehicles and which micro-generation systems fit best with the demand from electric cars. One of the questions explored is how homes can produce power from micro-generators (domestic-scale renewable energy systems that produce electricity such as solar photo-voltaic systems, roof-mounted wind turbines and combined heat and power systems and power systems that are similar to a conventional domestic gas boiler but produce electricity as well as heat) for their own household electric cars, and the effects of the Government's Feed-in Tariff Scheme into the National Grid. (Henderson, 2013).
- This learning is to be built upon by a new research project investigating the secondary use for electric vehicles, in terms of providing household energy in a simulated home from domestic solar panels or wind turbines. Over 6-12 months, the demonstrator will see PV panels linked up to an electric vehicle battery, with a measuring and control system tracking both outputs and inputs of electricity using measurement devices and logging the data. The demonstrator will be built at the new R&D Technology Centre, a facility currently under development by Gateshead College and Zero Carbon Futures for low carbon development, testing and trialling. Energy consultancy Tadea, working alongside Scott Racing and Opus Green, will develop an innovative working model that will demonstrated the viability of the combined technologies of maximising the performance of small-scale renewable energy generation, making sure firstly that the energy generated from the sun can be used at night; and secondly how we can utilise electric vehicle batteries after they have come to the end of their working life on the road (Bdaily Business News, March 2013)

- There are also ambitions of both the automotive OEM producers and the infrastructure and enabling companies such as Charge you Car (North) / Zero Carbon Futures to export out of the region into the rest of the UK (based on expertise in the P-I P programme), Europe and outside Europe. In June 2012 it was announced that Elektromotive and Charge your Car (North) Ltd., two of the UK's leading developers of electric vehicle recharging infrastructure, are teaming up to accelerate the rollout of pay-as-you-go charge points nationally through a new joint venture, operating under the banner Charge Your Car Ltd, that will be tasked with creating a recharging network of 10,000 public access pay-as-you-go charge points across the UK. The rollout is understood to deploy charge points that make use of Elektromotive's back-office billing system. The first deployments of the new charge points are expected to commence early in 2014. Elektromotive currently operates more than 3,000 charge points across the UK, while Charge Your Car (North) operates 400 public charge points in the North East and had been planning to expand its network nationwide. Elektromotive said the new network would be "open source", meaning that any charge point provider can link to the pay-as-you-go billing system as long as they use the industry-standard Open Charge Point Protocol. As such the company is looking to add additional partners as charge point owners and charge point manufacturers onto the scheme as a means of further accelerating the rollout of charge points. Elektromotive also stated that the company was also seeking partners interested in implementing the Charge Your Car network outside of the UK. The new venture looks set to intensify competition with the rival POLAR recharging network, which aims to install 10,000 charging points that can be accessed by electric vehicle owners through a membership model.

- Following on from the announcement in January 2013 that Chargemaster Plc was to acquire Elektromotive Limited, Charge Your Car Ltd (CYC) entered into an agreement with Chargemaster to support the roll-out of the existing Charge Your Car network and Pay As You Go (PAYG) services by structuring a mutually beneficial business model for existing customers of Chargemaster and CYC to access the CYC network as the operating platform. The strength of the CYC network is its newly developed PAYG system which connects EV drivers to charge points across the UK without the need for multiple membership schemes. Parties see the significant benefits of charging points across the country being accessible through multiple mechanisms. The Chargemaster customers gain from increased access to charging points in addition to those operated by POLAR, the largest recharging network in the UK.
- More recently, the Charge Your Car network has agreed a tie-up with Transport Scotland to expanding over the border into Scotland as Transport Scotland announces all its existing 500 free-to-use charging points will join Charge Your Car's open access network. The UK's first open charge network, CYC will welcome a further 250 charge points in early 2013, as more charging points are installed across Scotland and connected to the scheme - more than doubling the size of the existing network and making it much easier for electric vehicle (EV) drivers to travel further, crossing the border between Scotland and England. Transport Scotland's range of charge points include APT, Charging Solutions, Elektromotive (now Chargemaster Plc), POD Point and Siemens installations, all of which are OCPP (Open Charge Point Protocol) compliant, enabling them to join Charge Your Car's charge point management system (Sunderland, 2013).





### 2.3.2 Operationalizing EV infrastructure in the North East of England

- The North East England began one of Europe's first modern large-scale recharging infrastructure pilots in early 2009. Initially focused on the city of Newcastle upon Tyne, it set out to inform EV infrastructure policy and system design.
- The 2009 SMART Move Electric Vehicle<sup>7</sup> trial was one of the UK's first EV demonstrations. EVs were integrated into 10 different vehicle fleets and driven by 264 individuals during the trial.
- The infrastructure trial has since expanded as part of the national 'Plugged in Places' project to connect all of the major population centres in North East England and to establish the UK's first regional recharging network for EVs. 1,300 recharging points are being installed in public locations, workplaces and homes.
- The £10 million SWITCH EV demonstration programme expanded this further, supporting a number of manufacturers in accelerating the introduction of new EV technologies to the UK market. This project is part of a national programme run by the Technology Strategy Board. It includes vehicles from AVID, Liberty Electric Cars, Mitsubishi, Nissan, Peugeot and Smith Electric Vehicles. These vehicles are being made available organisations and individuals across North East England. This includes a number of key trials, such as piloting the integration of EVs into a car club operation, Commonwheels.
- After 6 months, in April, a summary of the main results of the Switch EV project were published. These suggested that drivers tend to be more thoughtful in how they use their cars, when driving an electric vehicle, considering if journeys are necessary and are more environmentally conscious about the journeys that they

<sup>7</sup> <http://www.cenex.co.uk/consultancy/vehicle-deployment-trials/smart-move>

take. Drives did increase the amount of journeys that they take to city centre locations, however, where charging posts were located. During the 6 month period, the electric vehicles driven a total of over 161,000km and their carbon emissions are less than half those of an equivalent conventional combustion engine car would emit. More drivers of the trial charged their car at work compared to those who charged at home or at publically available re-charging posts and 24% of the trial said driving the EV had changed their perception of them (Newcastle University April 2012).

- The region's EV trials (Switch EV) are being supported by Newcastle University which is fitting each vehicle with bespoke data collection units to take information directly from the CAN-bus or GPS system. This is providing data on the effects of road topology and congestion on vehicle range and environmental impacts extrapolated from energy exchange and battery usage (SWITCH EV, no date).
- In 2010 the region also launched the UK's first back office scheme for EV recharging. The customer-facing scheme called 'Charge Your Car' provides administrative services such as driver registration, payments and customer support. Information is provided on the location and use of recharging points and the system also captures valuable data on a vehicle's charging history and basic diagnostic information on recharging performance.
- Charge Your Car (North) are also introducing a free 'charge your car' app in early 2013. This enables EV drivers to pay for and access recharging across the UK recharge network. Features will include: Search charge points; Live charge point status; Start and end a charge; Favourite and Recent charge points; Route planner and Enable payments through a pre-paid account or debit / credit card (CyCN).
- Charge Your Car (North), at the end of 2012, introduced a marketing initiative in regional newspapers and billboards, "Why Not Electric?" – with the slogan: "Fuel your car for the price of a cappuccino" (whynotelectric.com)

- The North East England has a population of 2.6 million people largely concentrated around the main urban centres of Newcastle, Sunderland and Middlesbrough. Its compact nature and the fact that its main urban centres lie within a 45 mile radius make the region ideally suited to the operational range of current EV technology.
- At a lower geographical resolution than the North East of England, the Tyne and Wear Local Transport Core Team (hosted by Newcastle City Council, but made up of officers of and working for all 5 local authorities of Newcastle, North Tyneside, South Tyneside, Sunderland and Gateshead) is responsible for the Local Transport Plan<sup>8</sup>, with the LTP3 running from 2011-2014. The Local Sustainable Transport Fund is also managed by Local Core Transport for the Tyne and Wear Integrated Transport Authority (with local authority councillors overseeing this).
- Newcastle City Council currently (March 2013) has 91 EV charging points in the city, 40 of which are publically available and the rest being in Council car parks and with other businesses. A second phase of installations is currently underway with a further 30 points proposed all across the City. The Council fleet now includes 8 brand new Citroen C-zeros pool cars, 2 Mitsubishi i-MEV as well as the usual electric vehicles such as the vans, street cleaning and parks vehicles. A marketing campaign will be launched in April 2013 to promote the existing EV infrastructure in the City and promote the new posts and all things EV. However, there is no further progress with the freight consolidation centre and the EV van which was hoped to be utilised in this context; this will hopefully be able to be progressed later down the line.

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<sup>8</sup> <http://www.tyneandwearltp.gov.uk/>

- In early 2010, Durham County Council became the first local authority in the UK to introduce Optare's Solo EV battery-powered bus into service. The County Council, which ordered its Solo EVs using grants from the government's £30 million Green Bus Fund, put three onto its Durham Cathedral bus service. The Durham buses are 8.1 metre models, with a seating capacity of 24 and are being built at Optare's Leeds plant. They operate between the railway station and coach park ferrying visitors to the World Heritage Centre at Durham Cathedral (Tinham, Jan 2010).
- In May 2011, Durham County Council took delivery of a Nissan Leaf for its car pool, and does have an EV charging points at County Hall (McKay / The Journal, 2011).
- Stockton Borough Council (Teesside) has been one of the leaders in this, having incorporated EVs into their pool and they are being used for several journeys each day. According to Stockton Borough Council's sustainability manager, in 9,000 miles SBC have only spent £213 on fuel and nothing on road tax or maintenance costs (Bdaily business network 2012).



### 2.3.3 Operational NE Charging Points (August 2012)

- **Standard chargers (3/7 kW) 280 Installed**

County Durham coverage increasing

Call to Action required for Northumberland – Northumberland County Council in considering this and Northumberland National Park Authority has been proactive in rolling out EV installation points.

- **Quick Chargers (50 kW DC and 22 kW AC) Installed**

Metrocentre (Gateshead); Gateshead International Stadium; Test EV Track, Washington (Sunderland); Dalton Park Outlet Shopping Centre (County Durham); Felling Bypass (Gateshead); Hexham (Northumberland); Alnwick (Northumberland); Haggerston Castle Holiday (Northumberland, 7 miles south of Berwick-upon-Tweed) Wynyard (Teesside), A66W (Morritt) Progressing – A1/A167 (Barnard Castle, Co Durham), A1/A690 (Durham), A66E (Stockton-on-Tees).

- The North East currently has quick charging points located at Berwick, Alnwick, Hexham, Washington, Dalton Park, at the Metrocentre in Gateshead, on the Felling Bypass, and at Wynyard Park in Teesside. The region was the very first to install a public quick charger (at the Metrocentre, in February 2011) and now has more quick chargers than any other part of the UK. Quick charging points in the region currently up to eight and more being progressed, and the number of standard points to over 300, with 76 currently in place in Tees Valley. As a result of Charge your Car - the North East's Plugged in Places scheme - the region now boasts the UK's most comprehensive EV charging point network.

- **Domestic Chargers**

- Phase 1,67 Installed
- Domestic Chargers (phase 2) Started
- Back Office + EV User membership “Charge Your Car”
- 65 Users and Useful Feedback starting to come in
- Total energy supplied = 17,640 kW

- **EV Quick Charging Performance Information:**

- 80% Charge (circa 80 miles) in 25 minutes for Nissan LEAF
- Requires a 3 phase 100A 415V supply (commercial infrastructure) + civils
- 50kW DC output
- Standard connector and vehicle communication protocol

Source: McDonald, 2012 and Key, A / NCC (2012)

- All of CyC (North) units are SGTE units, adapted by Elektromotive for CyC (North) use.

**CYC (NORTH) BACK OFFICE:** operational since October 2010; pay as you go trial implemented in January 2011; next generation under procurement. Initially, no CYC cards were required then introducing PAYG (pay as you go) system.

- In February 2012, approximately 100 EV cars in the region – with approximately 25 charges per month. Take-up of EVs is being further stimulated in the region by Switch EV, an EV trialling project managed by Newcastle-based EV infrastructure provider Future Transport Systems. Switch EV is a Technology Strategy Board project trialling 44 electric vehicles across the North East since September 2010. The vehicles have been leased to organisations, councils, car clubs and individuals across the region, providing real life experience of living with an electric car. Switch EV will run until May 2013, and around 400 people are expected to take part during the project.

- 49 plug-in publically accessible charging points have been installed in Newcastle upon Tyne to date; 284 have been installed across the North East region, as follows:
  - 336 Standard chargers (3/7 kW) installed
  - 10 Quick chargers (50 kW DC and 22 kW AC) installed
  - 80 Domestic chargers installed
- NCC is planning to install a further 30 charging points in the following multi storey car parks around Newcastle City Centre
  - Quayside
  - Grainger Town
  - Eldon Square
  - Eldon Gardens
  - Dean Street
  - Oxford Street

### 2.3.4 Early Adopters of Electric Vehicles in the North East

(Local Transport Plan 3 (LTP3), 2011-14<sup>9</sup>, Source: Herbert, NCC)

With emerging technologies, it is important to identify ‘early adopters’ who through their purchasing preferences and behaviour are quick to adopt a new product. High tech products, such as electric vehicles, are often bought first by innovators and early adopters, with mass market consumers following once a product is established and perceived as less risky.

The Travel Smarter style data analysis tool was used to determine the socio-economic features of early adopters. Identifying the characteristics of these groups will enable a better understanding of what motivates potential early adopters and more effective communication of electric vehicle benefits.

Utilising the Smarter Travel style groupings, the following early adopters were identified:

- Young Minded: younger, single or co-habiting, students, have a car
- Family Focus: large households, married with children, middle aged, have a car
- Traditional Values: small household, 1 car, married
- Affluent Professionals: car users, employed, high income, married

In order to maximise the uptake of electric vehicles amongst the population of Tyne and Wear, it is important to cross analyse these “smarter groupings” with other location specific data which has been derived from the Census and Household Travel Survey focused around key trip characteristics (locations were the proportion of people are driving more than 10km to work). Mapping the information across Tyne and Wear provides an understanding of where future electric vehicles owners are likely to live and where the priority locations are for the roll out of infrastructure to support electric vehicles across Tyne and Wear.

<sup>9</sup> <http://www.tyneandwearltp.gov.uk/>



The largest representations are found in the following residential areas:

- Whitley Bay – North Tyneside
- Cullercoats- North Tyneside
- Tynemouth – North Tyneside
- North Walbottle – Newcastle
- Ryton – Gateshead
- Crawcrook - Gateshead
- Sunnyside – Gateshead
- Whickham - Gateshead
- Birtley - Gateshead
- Washington - Sunderland
- Doxford Park - Sunderland
- Cleadon – South Tyneside
- Killingworth – North Tyneside
- Heaton - Newcastle
- South Gosforth - Newcastle
- Gosforth - Newcastle
- Jesmond - Newcastle
- Kingston Park - Newcastle
- Whickham - Gateshead
- Low Fell - Gateshead
- Harton, South Tyneside
- Boldon, South Tyneside
- Fulwell, Sunderland
- Ashbrooke, Sunderland

### 2.3.5 Installing and maintaining charging point infrastructure in the NE

- Newcastle City Council (NCC) is also leading the way incorporating 25 EV within its fleet, ranging from pool cars to refuse collection vans (Lumsden 2012). Newcastle City Council has, shaped the growth in and acted as a demonstrator for use of electric vehicles. NCC has also developed, provided and delivered expertise for installing and maintaining charging point infrastructure In the NE. Newcastle City Council, or more specifically the Technical Services division of E and R, have been appointed to install and maintain the charging points and posts throughout the North East.
- A case study example 'Use of EVs in Newcastle upon Tyne car club' focuses on EV user experiences in the Commonwheels car club in Newcastle. A Peugeot iOn was used for the trial as part of the Switch EV electric vehicles demonstration programme, supported by Newcastle City Council. Newcastle City Council provided leadership, to pay the vehicle lease cost, facilitate the location of charge points and car club bays, by ensuring traffic regulation orders were completed, and the benefits of joining the car clubs were clearly conveyed, against losing city centre car parking spaces (Lumsden 2012).
- Following the demise of ONE, a new company has been set up named Zero Carbon Futures at Gateshead College with the aim of turning the North East into the premier region in Europe for the production of low-carbon vehicles. In conjunction with Zero Carbon Futures, Gateshead College has established the Charge Your Car company which is a not for profit organisation set up to oversee the Plugged in Places project in North East England. Charge Your Car incorporates the role and remit of the now defunct One North East EV Project which is funded by a mixture of public and private money. Charge Your Car comprises 60 partners in the North East, with involvement by local authorities.

- There are still grants<sup>10</sup> available (until March 2013 for now) to support the purchase and installation of charging points for businesses in North East England that want to be part of the EV network via Charge your car (North). At the moment, the funding ranges from 50-100% of the overall £5,000 cost, and the grant level differs depending on geographical location and business type. Criteria:
  - Host to provide free parking space and access
  - Host to provide free electricity for EV charging for the length of the project (until March 2013)
  - Host to allow other EV drivers to access the post
  - Host to maintain equipment for at least 5 years.
  
- Gateshead Council have secured ten SEV Edison Transits, to be used for the council fleet – secured through participation in the Low Carbon Vehicle Procurement Programme. The council also have ten Mitsubishi iMiEVs, have trialed a Nissan Leaf and an AVID CUE-V through the Switch EV programme. In total the EVs have covered 100,000 miles. Through the P-IP project, 15 charge points have been installed both in public and council-owned locations. Gateshead Council reported that all of the vehicles have performed well, and would include more in their fleet, if more ‘cost competitive,’ charging infrastructure has not been a constraint (they were mainly used for short distances), training and support provided by vehicle manufacturers and the ability to trial vehicles was ‘invaluable,’ rapid charging is ‘absolutely key’ for public infrastructure (and could increase EV fleet use) and finally a need for ‘tariff models that linked to charging EVs but not necessarily at off peak times’ was identified as charging was often expensive (Lumsden 2012).

<sup>10</sup> <http://www.leadthecharge.org.uk/>

- Northumberland Cheese Company at Blagdon Estate Northumberland, are taking part in applying for funding from Charge Your Car to install EV charging points on the estate (The Journal 2012).

### Public sector

- Public authorities, such as Northumbria Police, are also accelerating the uptake of EVs and EV charging point infrastructure since installing a number of charging points across its properties after successfully gaining grant funding through Charge your Car (CYC), the North East's Plugged-In Places programme. Six charging points have been installed at strategic locations, comprising police stations across the force and its fleet management workshop in Killingworth. The force has installed the charging points in a bid to prepare itself for the expected surge in electric vehicle sales over the coming years, and to reflect its own commitment to reducing carbon emissions.
- Regarding biking innovation there has also been a trial of electric bikes at Newcastle University with staff and students initiated by Earthdoctors ([www.earthdoctors.co.uk](http://www.earthdoctors.co.uk)). Scratchbikes have implemented a shared bicycle network in Newcastle. In association with the Business Improvement District Company, NE1. Earthdoctors and Scratchbikes are developing a shared user electric bicycle network (Haddon, NSR-E-mobility 2<sup>nd</sup> newsletter, 2012).
- Northumbria University has likewise joined the regional EV Switch trials for the next 6 months from April 2012, with two charging points having been installed, one on its City Centre Campus, and one on its Coach Lane Campus.

- The Edison 7 Seater Minibus, manufactured by Smith EV in the region, has been deployed with Stockton Borough Council through Switch EV, and is being used for the Department of Transport's Certificate of Professional Competence (CPC) training for professional drivers. Driver training is currently available to all drivers from local authorities across the Tees Valley, with over 400 employees set to complete the CPC. From early 2012 onwards, the opportunity has been also been open to contractors of Stockton Council, with a specific focus on school transport providers (Future Transport Systems, 2011).
- Bishop Auckland college will be taking part in the Switch EV regional trial. Students at the college have also been involved, as part of an enterprise competition to produce window sun visors for the electric vehicles (Pyrah/Northern Echo 2013).

### Commercial

- The now national Common Wheels Car Club, which started in the North East, has included one EV in its fleet in the Newcastle (NCC), and is hoping to expand this on Tyne and Wear through the Department for Transport's Sustainable Transport Fund. Common Wheels Car club has incorporated 1 EV into its pool of vehicles currently based at Newcastle University. All Newcastle University students are able to access the EV and hire it.
- An entrepreneur is trying to set up an EV taxi company and is working on securing funds for EV's, but is unable to access an EV as part of the Switch EV trial as Northumberland don't have one. NCC is unable to fund or part fund an EV for him at the moment. He is hoping to be up and running by the end of the year and has an award winning business plan<sup>11</sup>.

<sup>11</sup><http://www.uknetpark.net/BusinessDirectory/Business.aspx?businessid=323>

- Phoenix Taxis (coaches and buses) based in Blyth, South Northumberland, who pride themselves on having one of the “greenest” taxi fleets in the UK - with the majority run on LPG or being Hybrid vehicles – have recently acquired the North East’s first fully electric taxi, a Nissan Leaf.
- However, In another case, a Nissan Leaf was deemed to be “too small” for the purposes of operating a tax service by the licensing authority, a local authority) , so the company had to switch to a Toyota Prius for this service.
- a South Tyneside-based mini-cab driver is operating with a Nissan Leaf and is happy with it (but had to install himself a spare wheel and thinks the boot small – which is extended in the new European version)
- Drive Green, a ‘green’ taxi company has been developed by entrepreneur David Hazeldine of Newton Aycliffe, and has received £10,000 funding investment from First Deal (launched by Rivers Capital Partners, Square One Law and Finance Tree, suing investment from the Finance for Business North East Angel Fund), to operate the low carbon vehicles on Tyneside . First Deal is a new pump-prime investment package aimed at early start-up businesses (including by students) for business incubation, and the key idea is that this should lead to a further £150,000 or more as the package leads to their first serious investment. As part of the deal, the recipients get mentored, and provided with financial and legal advice and introductions to potential angel investors. The deal will see the investors take a small stake in the company (Lang / The Journal 2012).

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[http://www.tees.ac.uk/sections/business/news\\_story.cfm?story\\_id=3828&this\\_issue\\_title=May%202011&this\\_issue=216](http://www.tees.ac.uk/sections/business/news_story.cfm?story_id=3828&this_issue_title=May%202011&this_issue=216)

- The Tyneside business park Quorum supported UK Climate Week in early March 2013, Britain's biggest climate challenge campaign, by promoting more sustainable modes of travel, including Drive Green taxis, a technology-led, start-up business based in Newcastle (see above). Quorum Business Park was recently shortlisted for the North East Business Award for Environment and Corporate Sustainability.
- Simon Bailes Stockton (on Tees) dealership was selected by Peugeot UK HQ in April, 2012 to pilot the new 'Mu' motoring concept which combines the idea of car hire and a car club – but which is free to join. Whilst the 'Mu' scheme also allows people to rent bikes, scooters, large MPVs, sports coupes, vans, ICE cars, it also extends to electric vehicles. One reason Peugeot chose Simon Bailes to pilot this scheme was their key role in introducing electric vehicle technology and eco-driving to Teesside (the other regions being London, Bristol, Birmingham, Manchester and Glasgow). Users of 'Mu' sign up online and pre-buy points, which are then exchanged for the hire of the vehicles
- Large-scale corporate dealerships such as Simon Bailes in the Gateshead or Benfields in the North East (Newcastle, Sunderland and North Tyneside) both undertake fleet servicing for a number of commercial fleet EVs
- Smith Electrical Vehicles reported (September 2012) that it has had to reduce manufacturing target for 2012, to 380 instead of 620 forecast earlier in the year. (The Journal 2012).

- Sevcon, a Gateshead based electrical vehicle component maker, has reported growing sales in 2012, by 10% to £22m by September 2012 (The Journal 2012). Sevcon are working on a city electric car, the Renault Twizy. The Renault Twizy was the highest selling plug-in electric vehicle in Europe in the beginning of 2012, selling 8,000 units by August. This impacted on the status of Sevcon and raised their profile across Europe (Business Quarter Autumn 2012).
- However, more recently Sevcon (which designs and manufactures motor controllers) has made moves to double its international presence in the electric vehicle component market (estimated to be worth £100 million) by signing partnership deals with firms in Finland (Hybria), Bulgaria (BLS Automation), and Turkey (Ekol) – who recently have spend time at the firm's HQ in Gateshead , to add to its existing outlets in Italy, Spain, Holland, France and Germany, They are also looking in the next few months to secure dealership partnerships in Poland and Russia also. The emphasis is on conversion of fleets to electric (rather than LPG), for fleet managers to be able to cut emissions and avoid carbon taxes, which are becoming a feature of the European on-road vehicle market (Lognonne / The Journal, April 2013).
- Sevcon is also keen to grow their own supply of high-quality engineers, and hence has set up an innovative student bursary scheme recently to sponsor high quality students based on their first year results (for the duration of the studies), with a guaranteed job at the firm upon graduation (Northumbria University, March 2013).
- Garage equipment suppliers Gott Technical Services have provided a bespoke vehicle lifting solution to Benfield Motor Services to help them create a vehicle lift that would support everything from the electric Nissan Leaf to luxury cars (Ford / The Journal, March 2013).



- The Benfield Motor Group Ltd in Newcastle was recently listed in the top 50 fastest growing private businesses in the North East. It is an independent family owned dealership since 1957 and has grown to include dealerships across Yorkshire (Laing/ The Journal 2012). The dealership have an electric vehicle relationship manager, Gareth Chandler, who recently reviewed the Nissan Leaf, of which the dealership sell, reasons why he suggests electric vehicles are the transport of the future include: space – the Leaf accommodates five people comfortably and the boot is big; quietness – no engine noise , wind noise or vibrations, acceleration – instant acceleration, and now the ease of electric vehicle charging with over 500 charging points installed in the North East, giving electric vehicle drivers confidence (instead of range anxiety). He discusses the financial benefits to businesses including the tax incentives, no petrol cost and lower maintenance costs than petrol or diesel engine vehicles (Chandler /The Journal, 2012).
- Uspires UK, a Sunderland based firm, which produces and supplies parts for the Nissan Leaf, is investing £40m into the North East facility, to prepare for an increase in business, to supply parts to Nissan for four of their cars. Uspire has also installed charging points for employees and visitors to use, free of charge (Lognonne /The Journal 2012).
- Liberty Electric Cars based in Cramlington, created 500 jobs for a contract to produce motors for 10,000 electric buses in 2010. They converted a Range Rover into a high speed, pure electric vehicle capable of 200miles on a single charge; and achieved the world's best luxury electric vehicle prize for the same vehicle in 2010 (McCusker /The Journal 2010).
- Nifco's Stockton-on Tees-based factory takes the company into the electric vehicle battery market, and was one of two completed Regional Growth Fund projects co-funded by central government, through Tees Valley Unlimited (TVU), Teesside's local Enterprise Partnership (Lognonne, 2012).

- Two innovative North East firms have been gifted £300,000 to develop a technology that will help electric cars stay powered for longer. Cramlington in South Northumberland-based Hyperdrive Innovation and SR Technology Innovations from Durham are hoping that their electric vehicle range extender will create a boost in the uptake of electric vehicles. The project is going ahead through co-funding from the Low Emission Transport Collaborative Projects Fund, set up to help companies in the low-emission transport sector to bring new products to market and create jobs in the North East.
- Nissan reported an annual turnover of £4.3bn in 2012 and was named in top place in the Journals annual list of the North East biggest companies (Lognonne/the Journal 2012). Nissan also built a new battery plant in Washington for its range of electric vehicles (McCusker / The Journal 2010).
- Liberty Electric Cars announced 500 jobs would be created in Cramlington, after securing a contract for the Chinese government to produce motors for 10,000 electric buses (McCusker / The Journal 2010).

### Public transport

- Newcastle City Council bid for the Local Sustainable Transport Fund from central government in the order of £5 million, a slice of which will go to supporting low carbon transport, particularly cycling and walking. The initial bid featured an expansion of the EV presence in the car club. South Tyneside Borough Council, for instance, is focussing some of its efforts here on school and pupil traffic / transport, including lower carbon vehicles.

- There has also been some progress on Low Carbon buses. Stagecoach has already introduced hybrid buses in Newcastle (though the full electric The Quaylink service (between Newcastle and Gateshead city centres, based on an ERDF grant and then taken on by Stagecoach) did not prove to viable, partly it seem due to the hilly terrain and electric battery issues), and Sunderland University has seen its campus connected by a Low Carbon public bus service in September 2011. At the end of March 2012, the UK's Department for Transport announced nationally which companies in which regions had been granted the latest Green Bus Funding Awards. The North East of England will therefore have 42 new low carbon buses. The five winners are:
  - Arriva Durham Ltd – 11 gas single-decked buses.
  - Arriva Northumbria Ltd – 10 double-decker hybrid electric buses.
  - GO North East – 15 double-decker hybrid electric buses
  - Nexus – 1 single-decked hybrid electric bus
  - Tyne and Wear Bus Company – 5 single-decked hybrid electric buses
  - The Sunderland Connect route 700, operated by GO North East, Sunderland City Council, University of Sunderland and NEXUS, is serviced by hybrid engine buses, across major city centre attractions and amenities (Nexus 2011). The service has recently increased the frequency of the service to every 15 minutes, to meet demand for local residents and students (The Journal, September 2012).

## Business parks

- Business infrastructure, such as Quorum Business Park in North Tyneside, have also promoted EVs as part of their Sustainability Strategy, in close cooperation with Benfield Nissan, a key regional EV dealership for both personal and commercial vehicles. Quorum Business Park recently installed a third EV charging point on the site, to become a hub for electric vehicle adoption. As part of the regional EV Switch trials, Quorum Business Park occupier Balfour Beatty Worksmart is one of 44 participants in the North East. The next six months will see three Balfour Beatty employees trialling a Peugeot iOn, following the installation of an EV charge point in the company's car park.
- Business estate communities and Community Interest Companies have also become interested in EV uptake. In mid-June 2012 it was announced that organisations across Team Valley had recognised the benefits of electric vehicles and there are now electric cars and recharging points in action across the estate. Gateshead College, Sevcon, Turbo Power Systems, Traidcraft and UK Land Estates have all taken part in the regional Switch EV programme by driving electric vehicles for 6 months. The Nissan LEAF, Peugeot iOn, AVID Cue-V and Smith Edison Minibus are all regular visitors to the Team Valley, driven by employees as commuter vehicles and pool cars. With no noise and zero tailpipe emissions, the cars make a positive contribution to local air quality and make Team Valley a more pleasant place to be. Switch EV worked closely with teamvalleylinks.com, a Community Interest Company (CIC), to promote the initiative and encourage businesses on the estate to participate in the EV trial programme. The CIC works with employers, employees, students and shoppers (the Team Valley Community) to promote all forms of sustainable travel to combat congestion on and around Team Valley. Although the introduction of EV's on the estate will not reduce the number of vehicles on the roads significantly, they are regarded as an

essential element of good Travel Planning. Travel Planning is about creating a coordinated approach to business and commuting travel, with commitments to reducing traffic congestion and cutting CO2 emissions. Promoting electric vehicles – alongside other measures, including car sharing – either for use as pool cars or commuting vehicles - help achieve this (SwitchEV 2012).

- On Teesside, Wynyard Park, a 700-acre Tees Valley business park, set an example earlier in 2012 and is now all geared up to welcome electric vehicles (EVs) after installing a quick charging point - marking another milestone in the North East's Charge your Car programme. The new charging point is at the entrance to 700-acre Wynyard Park on Wynyard Park Avenue and is easily accessible from the A19 and A689. The development manager at Wynyard Park, said: "This will be of benefit to both site tenants and visitors, whilst also being a massive boost for our long-term development plans. "Our vision for the site is to create a high-class mixed use sustainable community that includes a hospital, homes, shops and leisure facilities. Environmentally-friendly facilities such as this charging point reflect that vision and we are delighted with its installation." The project manager for Charge your Car, said: "Wynyard Park is one of the North East's leading business locations and is well positioned close to all of the region's major road links. Additionally, Stockton Council has been a real advocate of Charge your Car since the programme was launched, so we were really keen to see a quick charger installed in the south of the region which will help to plug a gap in the network. Quick charging points are vital to ensure that EV drivers can make longer journeys around the region and beyond as they charge an EV in under 30 minutes. Charge your Car has therefore placed these points at strategic locations across the North East and has a number of others in the pipeline." The Wynyard Park quick charger can be accessed by Charge your Car members for free and will also be available to visitors to the region as part of the new Pay as you Go network at £5 per charge.

Stockton Borough Council has been instrumental in developing the network of charging points in Tees Valley. The council's Cabinet Member for Regeneration and Transport, said: "The installation of the quick charger at Wynyard Park, the first for Tees Valley, is a welcomed boost for the region's EV charging point infrastructure. It marks an essential next step in the development of EVs, extending the range of these vehicles and providing drivers with the flexibility to travel unrestricted around the region."

### National Parks and tourism

- Leading by example, Northumberland National Park Authority is continuing the installation of 11 charging posts in and around the National Park at car parks in the Ingram Valley; Alwinton; Bellingham (Hareshaw Linn); Rothbury; Falstone, sites along Hadrian's Wall (Walltown, Once Brewed, Cawfields and Housesteads) and at the Authority's headquarters in Hexham. Most visitors to the National Park arrive by car and the charging posts will reassure electric cars users that rural areas can be accessed for leisure and business. Over the last two years the authority has trialled electric vehicles and invested in a fleet of energy efficient diesel, hybrid and petrol cars. As well as creating a greener organisation, the new green cars have resulted in £30,000 of annual savings. The authority's manager declared the electric vehicle trials as very helpful, finding that the model with a reliable range of 80 to 100 miles was particularly well received by staff and it became a useful addition to the national park authority fleet. There are now 12 electric charging points placed around the 1,000 km<sup>2</sup> national park, which are presently in the process of being upgraded to enable even faster charge times.
- There is also an *electric bike hire* to explore Alnwick, Northumberland.

## 2.4 SCOTLAND: a devolved perspective

- According to the Scottish government, the Climate Change (Scotland) 2009 Act sets world-leading but deliverable emissions reductions targets. More recently the *Low Carbon Scotland* suite of policy documents has been published. This includes *Low Carbon Scotland: Meeting the Emissions Reduction Targets 2010-2022* (the Report on Proposals and Policies), *The Low Carbon Economic Strategy*, and the *Energy Efficiency Action Plan*. Each contains strong strategic commitments to the transition to LCVs and their environmental and economic potential. Low and Ultra Low Carbon Vehicles progress document expands upon them.
- A discussion paper produced by RR Donnelley for the Scottish government, Scottish Enterprise and the Highlands and Islands Enterprise (Business, Enterprise and Energy Directorate), entitled *Towards a Low Carbon Economy for Scotland: Discussion paper* (March 2010) makes reference to the Climate Change (Scotland) Act 2009 which commits Scotland to reductions of at least 80% from 1990 levels by 2050, with an interim target of 42% by 2020 (Figure 3, page 16), subject to advice from the Committee on Climate Change.
- Scotland's *The Climate Change Delivery Plan* (June 2009) provides an overview of the key sectors for emissions reduction and the opportunities for carbon sequestration and the transformational outcomes required. This Plan is a pre-cursor to the Report on Proposals and Policies which the Act requires Scottish Ministers to produce, setting out how the statutory emission reduction targets will be achieved. The Act also brings a new duty for all public bodies to contribute to delivery of the targets and to help deliver adaptation to the impacts of climate change and to act in a sustainable way. Two relevant areas here are flagged up in the discussion paper:

- **public sector procurement:** stimulating the supply of resource-efficient solutions where they are affordable and offer value for money;
  - **infrastructure for energy, waste, transport and ICTs:** including for example, smart energy meters and energy transmission grid, smart sensors, recharging infrastructure for electric vehicles and universal broadband provision.
- Under the Sustainable Transport section of the report, the RR Donnelly discussion paper states that: “As part of the National Conversation on Scotland’s constitutional future, we are considering what a future Scottish Government could do in relation to transport policy if it had further devolution or independence. Transport as a sector accounts for over a quarter of the total energy consumed in Scotland. Approximately 99% of the energy consumed in the transport sector comes directly from oil-based fuels, such as petrol and diesel, with the remaining 1% from electricity. There is a strong link between our work to improve energy efficiency in transport and that to reduce subsequent greenhouse gas emissions. It is, therefore, crucial that we improve the energy efficiency of our transport system, through the introduction of low-carbon technologies, improving the fuel efficiency of fossil-fuelled vehicles and actively reducing the absolute levels of fuel consumed.
  - The RR Donnelly discussion paper also makes reference to a Glasgow demonstration project, the **Glasgow Electric Car Pilot:**

“A Scottish consortium has been offered more than £1.8m under the UK Technology Strategy Board's Ultra Low Carbon Vehicle Demonstrator Programme (ULCVDP) to run a pilot electric car scheme in Glasgow over the next three years. The ULCVDP was funded by the Department for Transport through the Low Carbon Vehicle Procurement Programme. The trial will involve 40 electric vehicles produced by Allied Vehicles, Glasgow. Dundee-



based Axion Ltd will supply the batteries for the cars. Other consortium partners are Scottish Power, which will provide charging points and Strathclyde University, which will provide technical assistance. The bid was supported by Glasgow City Council, which is taking several vehicles into their fleet and supporting Scottish Power with the charging infrastructure rollout. The total project has a value of £3.8m. Glasgow City Council is also involved in the Department for Transport's Low Carbon Vehicle Procurement Programme and will be acquiring a number of low-carbon vans for use in its fleet.”

Other agents include Recharge Ltd, an Edinburgh-based company, which is supplier of electric vehicles, recharging solutions, leasing finance, insurance and (extended) battery warranties. Recharge, with grant funding from the Scottish government, is working with Dumfries and Galloway Council to trial the installation of solar panels and electric vehicles onto two local authority sites, with the feed in tariffs from the National Grid being sufficient to repay the capital cost of the panels, charging infrastructure and the provision of suitable electric vehicles. Recharge has a distribution agreement for the UK to supply several electric cars from Nissan and Peugeot with more being negotiated, of small electric vans, of electric mopeds, bicycles. Current customers include Local Authorities, Police Forces and NHS Health Trusts (Transport Scotland, March 2011).

A partnership led by Edinburgh City Council has been granted £120,000 from Transport Scotland in March 2013 to spend on new public charging points (7 kw standard chargers), which will be placed on trunk roads in Scotland every 50 miles, with detailed plans on where the new charge points to be located to be finalised by June 2013. The Scottish government has invested an extra £2.6 m for this (Sunderland, 2013).

From early 2013, Transport Scotland's range of 250 charge points – which include APT, Charging Solutions, Elektromotive, POD Point, and Siemens installations, and all of which are Open Charge Point protocol (OCPP) compliant – will be connected to the North East of England's Charge Your Car network (Sunderland, 2013). From April 2013, EV drivers will be able to access the Charge Your Car network via an app on their smartphone, which will enable EV drivers to access and instigate a charge at any pay-as-you-go charge point, making recharging quick, convenient and affordable.



### 2.4.1 Low Carbon Technologies for Transport

- In June 2009 the Scottish Government published a consultation document to help establish how the development and uptake of Low Carbon Vehicles (LCVs) in Scotland might best be accelerated (Scottish Government, 'Consultation on Low Carbon Vehicles', 22 June 2009 –See: [www.scotland.gov.uk/Publications/2009/06/25103442/13](http://www.scotland.gov.uk/Publications/2009/06/25103442/13)). The consultation period closed on 2 October 2009 and the Scottish Government subsequently worked on an analysis of the 51 responses received, into an LCV action plan for 2010
- The consultation outlined the technological options that are currently available and likely to come on stream in the future. As a starting point for discussion, it sought views on a potential target for the public sector fleet to be entirely comprised of LCVs by 2020, and that 95% of all new vehicles purchased in 2020 might be LCV. Both of these are in line with the 'stretch ambition' scenario produced by the UK Committee on Climate Change.
- . In March 2011, the Scottish Government published their Progress Report on Low and Ultra Low Carbon Vehicles. The document seeking "to provide an update on the evolving policy context, specific actions taken and planned actions to support the significant progress by 2030 towards the wholesale uptake of low carbon vehicles", but not attempting to "set out a definitive route map. A successful market transformation will be primarily industry led with support from governments at all levels, and across the globe. The Scottish Government is committed to playing as full a part as we can, both by influencing other governments and acting directly where our role is clear".

- “The Scottish Government welcomes the fact that the European Commission is in the process of setting mandatory targets for the emission intensity of new cars and vans, which apply to all vehicle manufacturers. Regulations have already been passed to reduce new car fleet average emissions to 130 gm CO<sub>2</sub>/km by 2015, with a long term target of 95 gm CO<sub>2</sub>/km by 2020. The European Commission has also published draft regulations to reduce new van fleet average emissions to 175 gm CO<sub>2</sub>/km by 2017, with a long-term target of 135 gm CO<sub>2</sub>/km by 2020.”
- “Complementing these regulations, the EC’s Clean Vehicles Directive requires the public sector bodies to include environmental costs as award criteria for procuring vehicles. This regulation was transposed into Scottish law on 4th December 2010.”
- “Fiscal measures are the responsibility of the UK Government. Vehicle Excise Duty (VED) has been restructured to stimulate low carbon vehicle uptake. Cars producing less than 100g of CO<sub>2</sub> /km pay no excise duty, while fees for other vehicles escalate based on their vehicle emission band. The UK Government has also introduced the so called ‘show room tax’ with higher VED rates for new cars that are in the upper emissions bands. This increased tax for year one of ownership seeks to raise the consciousness of the buyer about the environmental implications of their purchase.”
- “As indicated in the RPP, the Scottish Government would welcome the fiscal autonomy to tailor fuel and vehicle excise duties to encourage the uptake of LCVs and Ultra Low Carbon Vehicles (ULCVs)` and more effectively contribute to emissions reductions.”

- “Currently, nearly all road vehicles are powered by internal combustion engines, fuelled by either petrol or diesel. In a DfT review of the innovation system for low carbon technologies, it was suggested that over the next 10 to 15 years, continued incremental improvements in fuel efficiency could be achieved in the road vehicle industry through additional refinements to the standard petrol and diesel internal combustion engines. These technologies relate to both improving the efficiency of the powertrain directly and also to non-propulsion elements. Examples of potential enhancements to the powertrain include variable valve actuation, direct injection and turbo charging, whilst non-propulsion developments include friction reduction, regenerative braking, low rolling resistance tyres and lightweight materials.”
- “The King Review suggested that adopting a selection of the most cost-effective technologies could achieve a 30% fuel efficiency saving for the average new vehicle within the next 5-10 years. The cost of these measures depends very much on the scale on which they can be rolled out. If rolled out on a sufficiently large scale, King estimates that the additional production cost could be around £1,000 to £1,500 per vehicle (Transport Scotland, 2011)”

Over the past two years, the Scottish Government has invested over £ 8 m in electric cars and infrastructure, enabling Sotland’s public services to purchase around 270 local carbon vehicles (Sunderland, 2013)

## 2.4.2 Uptake of Low Carbon Technologies and Fuels

**The Scottish Government's (2011) *Progress Report on Low and Ultra Low Carbon Vehicles* states that:**

- “Due to major uncertainties around rates of technological development and energy prices, forecasting the future of fuels with any confidence is extremely difficult. This highlights the importance of adopting an approach that ensures flexibility remains for the market to respond to changing circumstances. However, it may be likely that, in the medium-to long-term, a range of different fuels will be in operation simultaneously. This is because:
  - fully electric, plug-in hybrids, or hydrogen powered cars are still a long way from achieving significant market penetration;
  - biofuels may be unlikely to represent the dominant part of a fuel mix as a result of land and other constraints;
  - different fuels may suit different purposes. For example, the current range and recharging times of EVs may make them better suited to short city trips, whilst larger vehicles may be able to accommodate the larger tanks required for gaseous fuels such as hydrogen;
  - and the niche availability of energy sources may make some fuels better suited to certain geographic areas. For example, areas where there is a surplus of renewable energy, including wind and hydro, might find that it is more cost effective to convert this into hydrogen for road transport uses.

Civil Society in Scotland has monitored, encouraged and ask the Scottish government to do more on ULCVs.

- According to a report / study by WWFT Scotland, *Powering Ahead: How to Put Electric Cars onto Scotland's Road* in September 2011 (expanding on an Atkins report commissioned by WWF Scotland, *Electric Vehicles: Driving the change: Final Report* released in April 2011; and building on a WWF UK Q&A statement released in June 2010, and a WWF Scotland report in June 2010, *Watt Car ?: The Role of Electric Vehicles in Scotland's Low Carbon Future* ): „As we face up to the challenge of reducing our greenhouse gas emissions one sector in particular stands out as requiring particular attention and renewed effort; the transport sector has bucked the trend seen elsewhere for emissions reductions and instead has increased its emissions by 11% since 1990.
- The Atkins report for WWF Scotland in April 2011, stated that: In 2010, WWF Scotland published *Watt Car: the role of electric vehicles in Scotland's low carbon future*. The report demonstrates that to ensure transport plays a full part in meeting the 42% [GHG] reduction target for 2020, three changes need to be implemented. Firstly, we must reverse the current growth in annual car km driven to the levels seen in 2001; secondly we must progressively decarbonise the power sector; and finally, we must secure no less than 290,000 electric cars on Scotland's roads by 2020. The research has identified that many of the identified barriers are equally applicable to private, public and corporate fleets. However, there are a number of differences worth highlighting.
- Local authority fleets are expected to be least affected by the identified barriers, due to a need to show leadership by demonstrating support for the technology required to meet CO2 reduction targets. Company car users are expected to be most affected due to the high mileage they typically undertake and a general preference for larger, high performing models.

- ‘High purchase price’ could be expected to be less of a concern in the context of public and corporate fleets given the strong buying powers of the organisations concerned and a greater appreciation of whole life costs. However, public sector fleet managers have reported that they are unlikely to buy EVs for their fleets unless incentivised to do so by the Government, because the overall cost is currently seen as being uncompetitive.
- The ‘limited range of EVs’ and ‘lack of recharging infrastructure’ is likely to be less of a concern for corporate utility and public sector fleets where daily mileage is predictable and less than the maximum range of a single battery charge, and where infrastructure can be provided in a depot to allow overnight charging. Scheduling tools may be required to manage charging, and the electricity supply may need to be upgraded as historically, many premises were built with limited provision of power for the building and car park.”
- The targets in the Climate Change Act of a 42% reduction in greenhouse gasses by 2020 and 80% by 2050 mean we need to transform our transport system. One important step to achieving this will require removing the carbon from our road transport. If we are to achieve this massive transformation in how we travel around Scotland we will need to see electric vehicles replacing our current dependence on petrol and diesel cars.

CO<sub>2</sub> emissions associated with an electric vehicle (EV) powered by electricity from today’s grid are approximately half that from the average internal combustion-engine car. This figure should improve to approximately 80% less by 2030 as the power sector is progressively decarbonised.

WWF Scotland sees an important role for electric vehicles in our future transport system. However, on their own they won't be nearly enough,



we will also need to remove the carbon from our electricity supply, reduce our dependency on the private car, support the important switch to public transport and encourage far greater levels of walking and cycling.

No part of our future transport mix can be viewed in isolation, the electric vehicle will be part of a system that provides attractive low carbon options and actively discourages our current reliance on the petrol driven car.”

- The first of two pioneering "hybrid" ferries has been launched by the deputy first minister from the Ferguson shipyard in Port Glasgow in mid December 2012, being built as part of the Low Emission Hybrid Ferries Project (BBC Scotland News, Business, 17 December 2012)
- In February 2013, a plan for charging points for electric cars throughout the Scottish road network, as part of a government scheme (Plugged-in Places UK programme by OLEV) to cut vehicle emissions, was revealed. The responsible agency is Transport Scotland. A total of £ 2.6m is being invested in the scheme, which the Scottish government hopes will contribute to their aims of ‘decarbonisation’ of road transport by 2050.
- Householders will also be given the chance to install free fast home charging points, with the help of 100 % funding, to be installed by energy firm SSE (BBC Scotland News, 06/02/2013).
- Scottish Transport Minister Keith Brown also said that the Scottish government was launching a new website, ChargePlace Scotland, which will be allow the public to find charging points and detail financial help available to switch to an electric vehicle.

- A partnership led by Edinburgh City Council has been granted £120,000 from Transport Scotland to spend on new public power points for electric vehicles as part of the Scottish Government’s ambitious “electric revolution”, with as many as 24 new locations across the capital (Edinburgh)
- A former Scottish government consultant, John Curtis (former head of low carbon vehicles and fuels at Transport Scotland) raised some concerns that these won’t be used, but that they would be needed to be there as a safety net to encourage people to buy electric vehicles in the first place. He revealed that it would take up to three-and-a-half hours to charge an electric car at one of the 7kw posts to be installed around Edinburgh, at a cost of about £5,000 each, which will resemble bollards and charge two vehicles at a time. Shopping centres, ferry terminals and leisure complexes have been tipped as likely locations.
- Public charging stations already exist at seven known locations in Edinburgh, including the Our Dynamic Earth visitor attraction on Holyrood Road and the nearby Radisson Blue Hotel. Private council depots and educational institutions, including Edinburgh College, also have terminals. Edinburgh’s City finance and budget committee convenor, Councillor Alasdair Rankin, said that the council was fully committed to creating a greener transport fleet and that the council already had ten full electric vehicles, three hybrids and 14 charging points, and that the council was going to work with its partnership organisations to identify potential sites for publically accessible charging points throughout the city. Mr Curtis said that the charging points could be retro-fitted over time into rapid speed terminals capable of powering accessible cars in 20 minutes. Rapid charging points cost about £50,000 each compared to the lower-powered 7kw outlets.

- There will be a Referendum on Independence i Scotland in the Autumn of 2014, which has just been agreed between the Scottish Nationalist (SNP) government under First Minister Alex Salmond and British Prime Minister David Cameron, which will be a straight 'stay in' or 'leave the UK' option. A middle option of increased devolution is not on the table. The referendum. In principle, can now include Scots over the age of 16, if the issue of the Electoral Register can be solved.



## SECTION THREE: CONCLUSIONS



## 3.1 CONCLUSIONS AND KEY POINTS

As the macro-level vision for EV infrastructure in the UK is ‘rolled out’ at meso-level through the eight national pilot Plugged-In Places (P-IPs) 2011-2013, each P-IP is developing a strategy that reflects the priorities and objectives of the public-private consortium that manages it, as well as the particular circumstances the area concerned. Further charging infrastructure is being installed by other agencies, both within and in areas outside these trial areas. Challenges remain for the future ‘joining up’ of the emerging infrastructure networks so that EV drivers have the confidence to make inter-regional journeys within the UK, and (potentially) transnational journeys through international transport hubs that link with other NSR countries and elsewhere in Europe.

Further, successful implementation within regions/sub-regions will be influenced by the creative use and take-up of funding for charging points (especially through P-IPs to Spring 2013), and negotiation – especially by Local Authority officers – at the micro-level to provide network coverage in accordance with their strategies with local agencies/landowners, e.g. supermarkets, sites on industrial estates, commercial car parks, car parks of Train Operating Companies. This reinforces the need to for a national and transnational vision for electric mobility that takes account of *scale* (relationships between the different spatial levels of governance), and *geographical location* as EV infrastructure is installed in *different local contexts*.

Local Authorities, working in collaboration with other stakeholder agencies in their areas, have a leading role to play in developing a comprehensive charging network that is fully joined-up and accessible from the EV user’s point of view. To achieve the desired transition to mainstream market acceptance of electric mobility, they must be equipped for two critical challenges:

*Scaling up to the 'bigger picture'*: how to raise the confidence of EV users who wish to make longer journeys between regions of the UK, and (potentially) between the UK and other countries via ferry ports, airports and the Channel Tunnel?

*Scaling down to 'street level'*: how to ensure that EV users, especially those who are less familiar with the locality, have the confidence to find publicly-accessible points, plug-in, and leave their vehicles charging?

'Methodologies for Mutual Learning: a Digital Map Interface for Effective EV Infrastructure' - a supplementary paper to this Main Report - outlines two methodologies designed to help Local Authorities and other EV stakeholders in their localities to address these challenges, exchange good practice and facilitate mutual learning from selected 'test-bed' localities in the context of the e-mobility NSR project. The prototype e-mobility knowledge platform is being developed by the project team, using a digital map interface, which can be viewed:  
<http://maps.citiesinstitutesurveys.org/UKEmobility.html>

### Key Points: From Macro- to Meso-level

- As in other NSR countries, the rationale for Government intervention to support e-mobility makes reference to the key environmental benefits of decarbonising road transport, and improving local air quality (and hence public health), as well as better energy security, and significant benefits for businesses and employment, rebalancing the economy through 'green growth'
- The contribution of e-mobility to these desirable scenarios will be the subject of Research and Development, especially through support from the UK Technology Strategy Board, with the Department for Transport and the Engineering and Physical Sciences Research Council
- National interventions to stimulate the early market through financial incentives to purchase new EVs have included the Plug-in Car and Plug-in Van Grants, and exemption from Vehicle Excise Duty
- Further, Government has supported pilot projects to install and trial EV infrastructure in 'Plugged-In Places' (P-IPs), eight of which were awarded match-funding (2010/11-2013) to support public-private consortia, led by independent not-for-profit agencies
- Designed to stimulate innovation and development, each of the three P-IPs considered above (Greater London, East of England, North East of England), reflects the priorities and objectives of the consortium that manages it, as well as the particular circumstances of each region/sub-region
- The Government's intention is that geographically-focused consortia will continue to nurture the early market, and to secure longer-term investment in EV infrastructure in their areas
- The Government acknowledges that vehicle purchasing decisions are influenced by the potential to take longer journeys, and that Plug-in hybrids (PHEVs) and extended-range vehicles (E-REVs) - supported by the infrastructure of rapid chargers, battery swap and flexible ownership models - all have the potential to help EV owners develop confidence in making longer journeys
- National policy supports a range of approaches for extending journeys through the P-IPs, including plans to install around 50 rapid chargers at key locations
- As yet, however, the Government has not elaborated in any detail how a fully 'joined up' national network of EV infrastructure will be developed to capitalize on opportunities for international links

**Key Points: From Meso- to Micro-level**

- At the meso-level, the pilot P-IPs are expected to encourage innovation and to inform the future development of a national system
- Thus, there are differences as well as similarities between the three P-IPs examined in more detail above, especially with regard to:
  - The mix of benefits envisaged and the package of interventions
  - Network strategy, criteria for location/design of charging points
  - Trialling of innovative infrastructure, e.g. for EV drivers undertaking longer trips
- Although charging points are being installed, EV drivers may encounter difficulties in locating them, as well as gaps on longer distance routes *between* P-IPs, and various deterrents including: lack of design standardization, information on how to find and use publicly accessible points. Inter-operability between different areas has been an issue, although some progress has been made, e.g. between the subscription-based charging schemes in Source East and Source London from October 2012
- Over the next through years, Local Authorities, working in collaboration with stakeholders – including commercial providers, other levels of government and governance and other municipalities – will play a critical part in overcoming these deterrents for EV users and would-be users



## 3.2 MACRO- TO MESO-LEVEL

In June 2011, the incoming UK Coalition Government set out its ‘integrated and pragmatic approach’ to e-mobility. Its commitment ‘to support market growth’ of EVs, is reflected in three national interventions: the Plug-In Car and Plug-In Van grants (£300m 2011-15) to reduce the upfront price of eligible EVs to consumers and businesses; through a favourable tax regime, notably exemption from Vehicle Excise Duty; and by continuing the previous Government’s Plugged-In Places (P-IP) Programme (£30m 2010-13) to match-fund EV infrastructure in eight area-based pilots. With this financial support from Government, the P-IPs will coordinate action by the various agencies that are installing and trialling infrastructure in their respective areas, thus supporting the Government’s Carbon Plan commitment to install up to 8,500 charging points.

The shift to ultra-low emission vehicles ‘presents unique environmental and economic opportunities for the UK’, with ‘potential to decarbonise road transport while still enabling mobility and stimulating the kind of green jobs and investment that we require to help rebalance our economy’ (OLEV 2011: 6). At the macro-level, these are presented as anticipated contributions to desirable scenarios, rather than outcomes with measurable targets. Nevertheless, progress will be the subject of research and development through the Technology Strategy Board, with the Department for Transport and the Engineering and Physical Sciences Research Council.

Thus, the Government’s vision for EV governance is being rolled out and coordinated within the eight regions/sub-regions that made successful bids to be P-IPs. Following the abolition of Regional Development Agencies (2010/11), the P-IPs are being led by independent not-for-profit agencies. The Government’s intention is that these public-private consortia will continue to nurture development of the early market and to secure longer-term investment in EV infrastructure for their respective areas. Challenges of inter-operability remain, notably payment systems for e-drivers who want to access charging points in different P-IPs for longer journeys. The Government acknowledges

that vehicle purchasing decisions are influenced by the potential to take longer journeys, and that Plug-in hybrids (PHEVs) and extended-range vehicles (E-REVs) - supported by the infrastructure of rapid chargers, battery swap and flexible ownership models - all have the potential to help EV owners develop confidence in making longer trips. As yet, however, it has not made clear how international links can be made across the NSR and to other e-mobility networks.



## 3.3 MESO- TO MICRO-LEVEL

Scaling down to the location/design of charging points in the streetscape, relationships between meso- and micro-level of EV governance are equally critical for the successful uptake of e-mobility by consumers and businesses. The P-IPs are, by their very nature, experimental pilot schemes that have been set up to encourage innovation, and to inform the future development of a national system. Thus, there are differences as well as similarities that reflect regional/sub-regional priorities:

### 3.3.1 Greater London

- The strategy for EV infrastructure in Greater London stresses the key environmental benefits of reduced carbon emissions, better air quality and reduced noise; additional incentives include exemption from the Central London Congestion Charge
- By 2015 there will be a network of 25,000 charging points: 90% (22,500) in workplace car parks; 8% (2,000) in publicly-accessible car parks; and 2% (500) in dedicated parking bays on-street; this is supported by the Greater London P-IP
- Provision of accessible charging points will be essential, especially in inner/central London, where a high proportion of households are unable to charge EVs at home
- Whereas the intention is that every Londoner will be no more than one mile from the nearest EV charging point by 2015, provision is being targeted in 'EV hot points' where uptake and utilization by 'early adopters' is likely to be highest
- It is envisaged that by 2015 250 or more fast chargers (7-43kw) will be installed in publicly accessible locations by 2015 (50 by 2012) to provide basic coverage in town centres, as well as strategic points on the road network and at motorway services

- Other incentives to encourage the uptake of EVs in London including a 100% discount for EVs from the Congestion Charging scheme as well as exemptions from road tax, the Office for Low Emission Vehicle's Plug-in Car and Van grants and free or reduced rate permit parking offered by some London Boroughs
- A recent development is the first widespread trial in the UK of wireless charging with prototype drive-over pads by technology pioneers *Qualcomm*, based partly in the Shoreditch '*TechCity*' centre in London's East End, early 2012
- The Mayor's support for diesel-electric hybrid technology is demonstrated in the design of the 'New Bus for London', the prototype for which entered regular service in 2012, with the intention that just over 600 vehicles will be introduced by 2016

### 3.3.2 Hertfordshire

- Hertfordshire County Council envisages significant potential to develop Hertfordshire's 'Electric Vehicle Innovation Cluster' of research, technology and manufacturing industries, with economic as well as environmental benefits
- Although Hertfordshire does not have a comprehensive detailed strategy for e-mobility, it is a key partner in '*EValu8*': the East of England P-IP, which intends to install 105 charging points in Hertfordshire and Luton by 2013
- Although home-charging is possible for many Hertfordshire residents, the relatively short range of EVs may be a deterrent, especially in urban fringe and semi-rural areas with smaller, lower density settlements
- Across the East Of England P-IP, *EValu8* will create a network focusing on five journey types: intra-urban, inter-urban, rural-urban, London-based commuting, and potential journeys to/from ports and airports as international gateways
- Hertfordshire County Council (2011) acknowledge that EVs and charging infrastructure technology will advance significantly, along with attitudes and behaviour of EV owners, thus policy will be monitored and reviewed regularly

- Operational measures by the County Council will include: promoting provision for EVs in new developments; installing charging points at Council properties, on the road network, and through other programmes

### 3.3.3 North East of England/Tyne and Wear

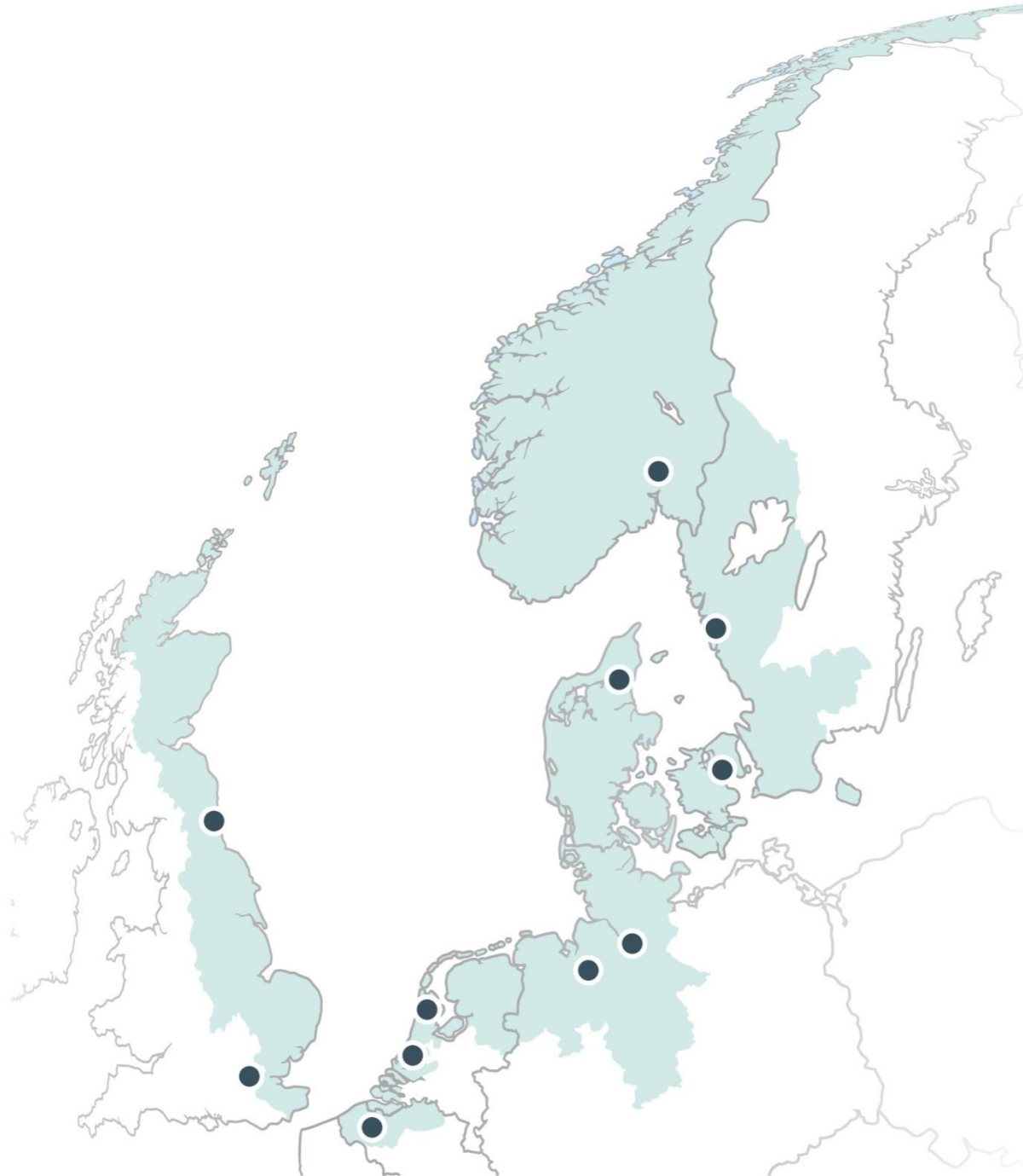
- The key drivers for the EV programme can be summarised into three central aims: reducing emissions from road transport, decreasing dependency on imported fossil fuels, and creating new 'green' (low to zero carbon) industries to stimulate economic growth
- The region already had a significant representation in the automotive sector with the presence of the Nissan plant (at Washington, Sunderland), a key employer within the North East regional economy. Securing investment for this plant and enhancing the regional automotive cluster was a key policy driver.
- In 2009 the North East of England began one of Europe's first modern large-scale re-charging infrastructures pilot. The pilot initially focussed on the City of Newcastle upon Tyne. It set out to inform EV infrastructure policy and systems design
- Following abolition of One North East (ONE), the previous regional development agency by the incoming Coalition government (2010-), governance of the region's EV programme is now more fragmented (not least between Tyne and Wear and Teesside in bidding for Regional Growth Funding etc), with the North East Plugged-in Places project, "Charge your Car", now directed by Gateshead College (through its full subsidiary Zero Carbon Futures)
- The infrastructure trail has since expanded as part of the national "Plugged –in Places project to connect all major population centres in the North East of England and to establish the UK's first regional recharging network for EVs. With over 1,300 recharging points being installed in public locations, workplaces and homes across the region

- The 10 million pound “Switch EV” demonstration and trial programme expanded this further, supporting a number of manufacturers in accelerating the introduction of new EV technologies to the UK market. This project is part of a national Technology Strategy Board. It includes vehicles from AVID, Liberty Electric Cars, Mitsubishi, Nissan, Peugeot and Smith Electric Vehicles. These vehicles are being made available to organisations and individuals across the North East of England. This includes a number of key EV trials, such as piloting the integration of EVs into a car club operation.
- Charge Your Car North has entered into a strategic relationship with Elektromotive Ltd to enable inter-operability. This has now been extended to Chargemaster Plc, who were announced to be acquiring Elektromotive, with multiple ways of access to EV charging points, including Pay-As-You-Go (PAYG).
- Further to this, Transport Scotland has joined Charge Your Car’s operational platform, bringing a further 250 charge points just north of the North East of England into the same network and also the PAYG inter-operability.
- Further funding has been made available in early March 2013 by the government to local authorities in the next 2 years to install EV chargers in public and residential locations and quick-charge points in strategic locations and for train operators and any public sector workplace for use of fleet, pool or individual vehicles.
- Some of the recent Regional Growth Fund (RGF a central government part-contribution to projects with job creation at the core of it) provided by central government has gone to the Low Carbon Vehicle sector, specifically through a £6.2 million initiative that aims to create 5,000 jobs in sustainable manufacturing over 10 years, including 800 apprenticeships.
- There is now the second round of submission, and eventually awarding if deemed appropriate by way of job and value creation, of the North East of England Low Emissions Collaborative Projects Fund handled by Zero Carbon Futures (ZCF), which is part of the RGF allocation to the region.

- In March 2013, the local and unitary authorities from Northumberland, across Tyne and Wear (Newcastle, North Tyneside, South Tyneside, and Sunderland) and County Durham have agreed to join forces to form a legally binding combined authority (as desired by central government, which must legislate for this in primary legislation) bidding for millions of central government funds, and to pool their resources on transport, regeneration and skills training. Business leaders, however, have called for the further step of one single council authority, which is not envisioned by the local authorities.



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NORTH SEA REGION ELECTRIC MOBILITY NETWORK

# e-mobility NSR

## About E-Mobility NSR

The Interreg North Sea Region project North Sea Electric Mobility Network (E-Mobility NSR) will help to create favorable conditions to promote the common development of e-mobility in the North Sea Region. Transnational support structures in the shape of a network and virtual routes are envisaged as part of the project, striving towards improving accessibility and the wider use of e-mobility in the North Sea Region countries.

[www.e-mobility-nsr.eu](http://www.e-mobility-nsr.eu)

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