FUTURE TRANSPORT SYSTEMS
integrating transport with infrastructure

WINTER 2009

Renewable Energy and Electric Vehicles in Berkshire

With kind permission from Elektromotive Ltd

Future Transport Systems is working with Berkshire Economic Strategy Board (BESB) to identify opportunities for the installation of electric vehicle charging infrastructure and supporting renewable energy generation.

BESB is keen to understand the costs and benefits associated with supporting electric vehicles with charging points and also how an infrastructure could be 'seeded'.

Future Transport Systems is evaluating the suitability of various technologies as well as developing cost models for a range of charging system and renewable generation combinations.

Using principles developed whilst working on EV infrastructure projects in other parts of the UK, Future Transport Systems will also be suggesting sites where EV charging infrastructure may encourage and support the early adoption of electric vehicles.

It is extremely difficult to predict how the quantity of electric vehicles will increase in the UK and the factor common to most assessments is the large range between high and low trend lines. This study will also explore how local policies might be used to incentivise the use of electric vehicles, and the impact these measures will have on the demand, aiding market predictions.

Case Study: Location selection for on street charging

Future Transport Systems has been working with City Councils to install publically accessible charging points across Cities. The process has thrown up some challenges, and provided some valuable lessons. On the basis of this experience we have developed a specialist "tool kit" approach to ensure the smooth running of the programme.

One of the issues to be tackled was the change of land use from its existing function to become a reserved bay for EV parking and charging only. The first issue to be tackled was the specific location choice for bays.

The initial strategy for location selection included comprehensive mapping of key areas of activity across the city, including population density, areas of traffic congestion, areas of high pedestrian footfall, car parking places most in demand, areas of high employment and the proximity of existing sustainable transport modes. These elements were taken in conjunction with the range of electric vehicles already available, the desire for the first installations to be highly visible and the cost differential between on street spaces and spaces within car parks. A matrix was developed to assess all of these factors in order to build a comprehensive view of the desired locations.

The technical services team then completed their assessment to determine the viability and cost of installation at each location, factoring in the proximity to electricity supply, the length of ducting and cabling required, the amount of civil engineering work required and the impact on the street scene. Next steps included communication with the energy network providers, to establish the capacity of the grid, and the land use planners to specify the exact location most suitable for the electric charging bay.

Once the locations have been selected and agreed on by all stakeholders, the Traffic Regulation Order process begins to legalise the change in land use within the city.

Future Transport Systems partnering CENEX delivering driver experiences to 500

Future Transport Systems are pleased to be working with Cenex, the centre of excellence for low carbon and fuel cell technologies, to deploy 4 electric Smart cars within fleets across the region, as well as giving members of the public the opportunity to drive electric!

The vehicles have all been fitted with specialist data capture equipment to provide valuable information about the performance of the Smart ED when incorporated into a fleet as a pool car. Different patterns of usage and recharging patterns will be monitored, including testing the vehicles in different terrains, and measuring the effect that driver behaviour has on the range of the batteries. The data will be analysed by the Transport Operations Research Group at the University of Newcastle.

The 4 cars have already been driven by over 50 employees from Newcastle City Council and proved popular with all who experienced them. They will continue on a tour of the North East region, being housed with councils and organisations across the region including spending time in Middlesbrough and Sunderland as a trailblazer for the Joined Cities initiative.

The Smart EDs will also be made available to key organisations and Cenex and Future Transport Systems will be hosting a number of public "ride and drive" events, running test drives for up to 500 members of the public over the next 4 months.

Linking Electric Vehicle charging with renewable energy generation

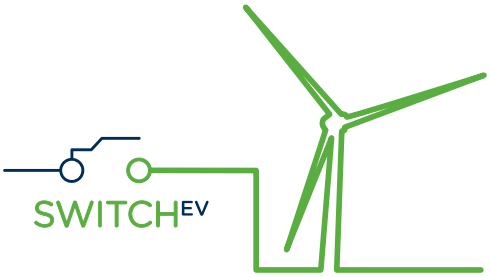
There is concern that a growing electrical load from electric vehicles should be backfilled with renewable generation and clients have asked us about the prospect of renewables being installed to provide local supply.

Our view is that many people and organisations continue to do their utmost to install renewable generation and that it is not easy. Hopefully EVs might increase the desire of others to do likewise and communicate a link between low carbon vehicles and sustainability but planning, economic and efficiency issues remain.

There is an appeal in using EVs to try and stimulate urban renewables. Micro wind can be problematic in turbulent, urban conditions but optimally located PV is an elegant albeit relatively expensive option.

Many micro renewables will be made considerably more attractive by the feed in tariff currently being developed for launch in spring of 2010. This will guarantee banded and relatively attractive rates for the electricity generated and the mechanism will allow the generator to realise the value of the feed in tariff even if the electricity is not exported. In the case of PV, the feed in tariff is likely to be in the region of 30 pence per KWh.

In relation to matching EV load with PV array size then assuming the average demand of an electric car is around 0.25KWh per mile and the average driver travels 7000 miles per year and PV panels generate around 110KWh per sqm per annum then an optimally located array of around 16 sqm would be required and this would have an installed cost of around £12,000. The suggested feed in tariff rate would then provide an annual income of around £550 pa in addition to the supply of electricity for the vehicle or other on site installation if the vehicle is not available to be charged.



The impact of EV loads on electrical networks

Given that electric vehicles represent relatively large domestic loads, they will have several implications for distribution network operators (DNOs).

The biggest short term implications will be associated with the load patterns on the distribution networks. DNOs have an obligation to provide networks that facilitate the electrical loads of users and are able to do this by analysing and modelling load patterns to manage investment.

The problems for DNOs will come from load patterns changing as people charge their vehicles. It is still very unclear how electric vehicle users will behave and therefore when and where they will choose to charge their vehicles. Clearly this will also be influenced by what type of charging points are installed and where.

It seems likely that users will plug in to charge when they return home so there will be demand peaks at the end of each working day. The total demand will depend on how low the charge levels are in the batteries and the peak will depend on whether the vehicles are charging on 3.5KW or 7KW connections, ie. the charge rate. These factors will then be multiplied by the number of vehicles in any given area.

If rapid chargers become a key technology they may become installed in clusters at locations such as motorway service stations or supermarkets and would produce further dynamics and complexities in load distribution.

New features in vehicles could also have significant implications. For example, if on icy winter mornings users get out of bed, turn on the lights, electric showers, kettles, toasters and then defrost and preheat their cars from the mains, demand peaks will be further increased. In the summer air conditioning could have a similar effect. Currently connections to domestic properties typically assume 10KW peak loads with some in-built flexibility.

The implications of these behaviours may be particularly problematic where networks are already 'stretched' or where volumes of vehicles increase significantly.

These issues illustrate the importance of developing data to predict how electric vehicle users might behave and models to influence the strategic location of charging points to minimise infrastructure investment. They also suggest that mechanisms such as variable tariffs might be valuable in influencing where and when people charge.

Infrastructure opportunities across the UK

• Plugged in Places

The Office of Low Emission Vehicles (OLEV) have recently announced that funding will be distributed to between 3 and 6 consortia across the country, chosen to act as trailblazers for electric cars and plug-in hybrid vehicle technology. £30m of funding has been announced to assist with the installation of publically accessible electric vehicle charging infrastructure. Deadlines for submission to OLEV is 31 January 2010.

The Plugged In Places initiative will create a critical mass of infrastructure in the lead cities or regions of the UK to support the early market for electric vehicles. The project will also allow different approaches for recharging to be trialled.

• Joined Cities

The Energy Technologies Institute (ETI) has also announced funding to support the Joined Cities initiative. In September the ETI announced that 9 cities will share £11m to support the roll out of a national, fully compatible recharging infrastructure.

The objective of the Joined Cities initiative is to deploy a cost effective and compatible network of recharging points. The move towards a single national network will enable plug in vehicles to be easily recharged anywhere, and will form the back bone of the UK recharging infrastructure.

• Infrastructure Grant Programme

The Alternative Fuels Infrastructure Grant Programme (generally abbreviated to IGP) is being administered by Cenex. The grants, from the Department for Transport, will provide up to 50% funding to encourage organisations to install refuelling or recharging infrastructure for alternative fuels. Funding is available for electric, hydrogen, natural gas/biogas stations and gas blends.

The DfT has recently announced several successful bids from across the country, and the programme has further applications windows running into 2010. More information can be found at www.cenex.co.uk/igp.

Lord Adonis at the launch of the Electric Vehicle Charging Infrastructure Programme, November 2009