

Power Responsive

Snapshot: emerging opportunities from location-based demand side flexibility (DSF) and electric vehicles.

This snapshot reflects discussions held on **the emerging opportunities from location-based demand side flexibility (DSF) and electric vehicles** at the 12th Power Responsive steering group, 5 July 2018 (under the Chatham House rule). The discussion was split into two parts, covering the potential DSF contribution from: cities and local authorities; and electric vehicle charging. Key questions included:

- What are the main opportunities and challenges for offering DSF?
- What role can Power Responsive play in unlocking this flexibility?

The general discussion followed opening from a broad range of stakeholders to establish the different perspectives that may exist.

Discussion Summaries

The potential DSF contribution from cities and local authorities.

Devolution of power from government is incentivising many local authorities to implement flexibility trials that hope to provide financial, environmental, health, and social benefit within communities.

Some see the Balancing Services marketplace as fragmented and this is driving local authorities, who see the benefits of optimising flexibility, to develop platforms and initiatives that optimise assets cohesively across communities, therefore providing flexibility, not only to network companies, but on a peer-to-peer basis also.

However, results are yet to be seen in many instances with a number of activities still taking place to on-board project participants, including Distribution Network Operators (DNOs), some of whom sit on project boards.

Some barriers still need to be addressed as many who could participate in local authority initiatives struggle to justify the business case. Also, flexibility opportunities often fail to be realised, as city developments (buildings) don't incorporate flexibility as part of the initial project objective. Local authorities can play a key role in co-ordinating demand side flexibility into future projects.

The potential DSF contribution from electric vehicles.

Numerous trials are looking to into the emergence of EVs from various perspectives including, take-up, behaviour, and impact on demand. However, many trials and studies focus on early adopter behaviour, which doesn't necessarily reflect the mass-market.

Continued high uptake of EVs could result in overnight electricity demand exceeding current peak demand. But EVs needn't be disruptive. If managed, smart charging can help to smooth demand peaks as opposed to contribute to them, and soak-up excess generation at times of high output.

A counter argument exists, however, with a question surrounding the future use and behaviour towards vehicle ownership. Should we move into a world of shared or autonomous vehicles, we may see vehicle use increasing to 23 hours per day (with 1 hour of charging), reducing the opportunity to provide flexibility to the electricity networks.

The right charging infrastructure needs to be in place, possibly with common standard developed. Domestic users with no access to off-street parking may still face barriers, for instance. Equally, organisations who have looked at transitioning to EV fleets have posed questions around on-site charging, time of use, length of use, and shared access, and high capital cost vs lower running costs of transitioning from traditional vehicles. Freedom of choice in charging is deemed necessary, with consumers able to charge dependent on their preference – for example, economic value, environmental impact, convenience, speed, etc.

Main Discussion Notes

The potential DSF contribution from cities and local authorities.

Guest speakers presented their views on the potential for location-based flexibility:

Energy Systems Catapult

Energy Town is a new business platform in the energy systems catapult that seeks to support ecosystems for innovators whilst providing lessons learned to future projects with the aim of delivering value to innovators, regulators and policy makers. Not all market arrangements are fit for consumers, so communities of innovators (Piclo, Verv, Grid Edge, Levelise) are looking to address consumer barriers directly. They aim to test the market and simulate future rules of the game, starting with homes, customers, and kit. This should be scalable from prototype to thousands of homes.

West Midlands's Combined Authority (WMCA)

The West Midlands is the second biggest energy market in the UK after London. The WMCA is focused on how delivery of the industrial strategy can be achieved through local infrastructure, with energy underpinning many aspects. Local authorities are looking for further devolution of power, and therefore WMCA are working with local authorities on how to deliver local energy more effectively, including through a consultation on a regional energy strategy for the West Midlands. Energy Capital is a project brings together academia, industry and the public sector, aims to attract investment in smart energy technologies, research and infrastructure to deliver a wide range of economic benefits across the WMCA region, with the aim of positioning the West Midlands as the UK's centre of clean energy technology. Energy Capital itself will not procure flexibility, but will empower individual zones within WMCA to do this, working with partners who have particular skills.

Four pilot zones:

- **Black Country** – main issues cost of energy for energy intensive industrial companies. Fuel poverty.
- **Coventry and Warwickshire** – opportunity for connected EVs. Scope for heat networks.
- **Birmingham & Tyseley** - As Tyseley & Birmingham is the most developed of the Energy Innovation Zone's and is completing the second phase of the [Tyseley Energy Park](#) later this summer
- **UK Central** – growth hub around Birmingham airport, hard to treat properties.

Part of the project looks to tackle the barriers preventing local authority innovations understanding, for example, whether barriers are planning, policy, financial incentives or ECO administration.

Greater London Authority (GLA)

Supported by the Mayor of London, Flex London is a project within the GLA looking to grow communities of innovative products. By identifying opportunities and potential barriers, Flex London seeks to develop a cohesive London marketplace for flexibility, providing benefits to individual sites, and the wider system with 1GW of flexible demand by 2050. Phase 1 sought to identify potential providers of flexibility, whilst phase 2 brings parties together to deploy new technologies and models. Government and forums such as Power Responsive have helped to raise awareness, but Balancing Service currently offer fragmented value and the level of return maybe insufficient. The GLA has undertaken analysis on a range of sectors in London that could have flexibility, approaching over 70 organisations to join the process. There has been much interest at a conceptual level, but there appears to be some concern about business impact of delivering flexibility and a greater focus on energy efficiency. There's also interest in electrical storage, but the business case doesn't currently justify itself. Shared storage could be an option. It was highlighted that a solution-based approach is required; not a technology based approach.

Crown Commercial Service (CCS)

CCS is currently identifying a commercial route for smart energy cities, bringing together public sector users to maximise assets. The strategy is to be finalised by the end of the current financial year, with the intention to go to market by the end of next financial year. A proposed dynamic purchasing system will enable providers to come into the market at any time with no purchasing/ procurement windows, which could support new entrants. The solution will provide access to flexibility for all, with providers able to write their own specifications.

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Discussion

Air-conditioning in commercial buildings is currently not a major source of demand side flexibility. This is thought to link to a lack of on-site cold store facilities (for which there is not a developed UK market). Awareness of types of assets, and how they can provide flexibility, is required in order to provide clarity and attract participation. It was acknowledged that fragmented markets fit together as participation increases, although prices are believed to be too low to attract market participants.

A contradiction exists as demand users seek to reduce their network access, and become more self-sufficient; versus the need to access networks to provide services back the grid. Network access and charging have previously been seen as passive activities, and a more active demand side will be required to realise opportunities. It's important to ensure markets are accessible to all and that value can be stacked.

A question was raised regarding the level of interaction and engagement between local authorities and DNOs. It was felt that DNOs were likely to engage at the level of the metropolitan authorities, with examples shared of DNOs sitting on boards for initiatives and projects.

The group discussed examples of innovative city development projects that failed to realise significant flexibility. It was concluded that implementation of demand side flexibility initiatives can easily be derailed by a lack of project co-ordination and the failure to incorporate demand side flexibility into initial project objectives. Cities and local authorities can be effective in leading this co-ordination for the benefit of stakeholders within their region. Different barriers exist within the domestic space however, largely due to the relatively small loads.

Developing energy services approaches – to tackle -based energy efficiency, fuel poverty and health outcomes (such as reduced emissions / clean air) are high on local authority / cities' agenda. These issues somehow need a clearer link to regional involvement in demand side flexibility.

The potential DSF contribution from electric vehicles.

Guest speakers presented their views on the potential demand side flexibility contribution from electric vehicles (EVs), to set the scene for wider discussion.

Energy Technologies Institute - based on a significant Energy Technologies Institute (ETI) EV trial, presented on the trends of EV uptake within GB, the potential impact on peak demand and trials to understand consumer behaviour around EV charging. In recent months there has been a spike in EV sales, with EVs accounting for up to 2% of new cars sold in GB. Continued high uptake could result in overnight electricity demand exceeding current peak demand. Many studies to date have concentrated on early adopters, who are atypical of most users. Mass-market users will have the biggest influence over energy requirements and it is not fully understood how this segment of the population may respond. The ETI is now focusing on mass-market consumers potential behaviours towards/preferences for EVs by running two trials which are anticipated to conclude by the end of 2018:

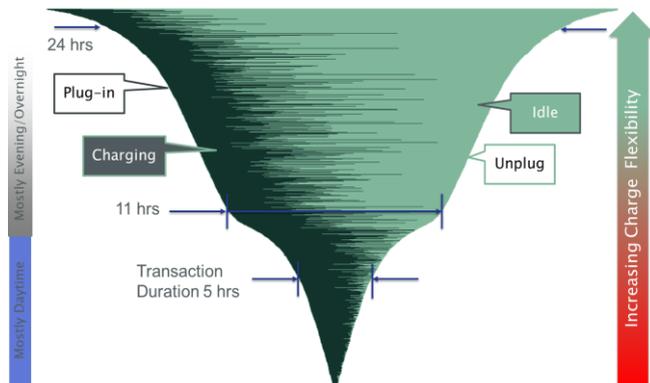
- **Charging behaviour trial** – 240 mass market consumers were given an EV for 2 months to assess response to different tariff propositions – user-managed (time of use tariff) versus supplier-managed charging. Data on EV use and charging will be supported by additional attitude questionnaires and choice experiments.
- **Vehicle Uptake Trial** – to enhance understanding of adoption of EVs, 200 consumers are being given access to three vehicle types: electric – battery, plug in hybrid, and petrol. The findings will inform understanding of consumer preferences.

EA Technology – trials are underway to understand the potential impact of EV uptake on electricity networks, and the role of demand side flexibility in managing this:

- **My Electric Avenue** was delivered between January 2013 and December 2015 by EA Technology and Scottish and Southern Energy Networks, and explored the impact of clustering of EVs. The project found that, as a result of EV charging, afternoon demand levelled off compared to the typical national peak daily demand profile, and evening peak doubled. It was found that stopping and starting charging to manage the impact on the network had no impact on vehicles and drivers didn't notice or care.
- **Electric Nation** – builds on My Electric Avenue by seeking to discover how the impact of EVs on distribution networks will be altered by different types of vehicles with different sizes of battery

that charge at different rates. Similar trends to those seen in My Electric Avenue have emerged, with charging over the evening peak being far greater.

Steering Group members were shown a ‘tornado diagram’, which illustrated that the longer EVs are plugged in and charging, the greater the level of flexible electricity there would be available.



With more rapid charging (towards the narrow tip of the tornado diagram), the less time there is likely to be for flexibility, as the vehicle charges for most of the time its plugged in.

Automated and electric vehicles bill – should there be a desire for common standards charging infrastructure, then primary legislation might be needed. But currently, there is no common view on this.

An organisation specialising in EVs, battery storage and solar panel manufacturing suggested that there is a common misconception that EVs are disruptive due to the challenges of increased demand, but we should turn attention to the opportunities created by the transition to EVs – such as reduced emissions and noise. Electric vehicle uptake presents the opportunity for the energy industry to support the transport industry to decarbonise and could support the penetration of renewables by absorbing excess generation.

EV charging should be managed, rather than uncontrolled, and market signals (such as time of use tariffs) can drive customer behaviours. To enable smart charging, it's important to consider shifting the conversation away from how the network will manage with EV uptake, to how to make it work for the customer. There is often a focus on rapid/fast charging. However, a shift to slow, smart charging may deliver electrification of transport more quickly. For the vast majority of the time, cars are charged at home or work. In order to enable those who live in apartments or houses with on-street parking, the right infrastructure will also need to be in place.

Discussion

The role of EVs for large energy users

Some industrial and commercial (I&C) vehicle fleet owners are considering replacing their traditional vehicles with EVs – but there are a number of challenges. For example, where employees drive their company vehicle home at the end of a working day, a need for depot charge-points may be required. However, a counter-view was that such challenges are not insurmountable. From an I&C user's perspective, the main catalyst will be the economics of management of their vehicle fleet. Whilst the capital cost of EVs is higher than traditional vehicles, the running costs are lower.

The discussion focused on one-directional charging, as opposed to two-way/vehicle-to-grid applications. Steering Group members suggested that EVs are currently perceived as mobile storage units, rather than offering services from both charging and discharging the battery. The correct metering and settlement reform would need to be in place to enable this.

Autonomous vehicles and future usage of EVs

In discussion, one challenge raised was the assumption of future vehicle replacement being one for one as we move towards 'shared' forms of transport, potentially leading to a decline in vehicles and more autonomous vehicles. Driverless vehicles could be in use 23 hours a day, requiring rapid charging and limiting the flexible electricity on offer.

Whole system thinking

Whole system approaches go beyond networks to encompass consumers, the charging structure of cars and the role EVs can play in absorbing excess generation. Members were asked whether efforts had been made to map the level of anticipated EV uptake across GB against distribution network capacity maps, with the view of better informing the potential for regional markets.

Consumer choice and signals to shape behaviours

We have largely become an “immediate” society, used to accessing technology conveniently when needed. Some EV drivers may also experience “range anxiety”. Drivers are comfortable travelling with close-to-empty tanks in traditional vehicles because they are able to judge the possible mileage, with easily accessible fuel stations. Whilst charge point infrastructure is a challenge for EV uptake in the immediate term, and drivers may be apprehensive about the risk of not finding a charge point when needed, society will adapt as EV technology becomes more commonplace.

The question of whether or how far common or inter-operable standards for EV charging infrastructure might be desirable was discussed. There was a belief that consumers should have freedom of choice and open protocols, whether their preference is for best economic value, least environmental impact, convenience, peer-to-peer trading etc. Members agreed on the need for appropriate signals to drive consumer behaviour and indicate where the value is for flexible electricity consumption. For example, from a System Operator perspective, peak demand may no longer be the sole and over-arching challenge; managing the trough in demand overnight requires action and EVs could support with this.

The importance of the government’s ‘Road to Zero’ strategy was highlighted, and allowing sufficient flexibility for the market to innovate. In order to utilise flexible electricity consumption from EVs, clear and user-friendly communication will be needed.

Next steps

It is important to ensure that discussions on DSF at a national scale, link in with local and regional initiatives. Power Responsive plans to engage with cities and local authorities in Year 4, and will revisit the topic of location-based flexibility at the Steering Group in April 2019 - alongside a discussion on residential and ‘behind-the-meter’ flexibility.

There are different outlooks for demand side flexibility for electric vehicles – ranging from individuals with EVs actively offering flexibility to the system - to autonomous and shared vehicles which require fast charging. We will consider the opportunities and implications of such scenarios in the Power Responsive Annual Report 2018.

This snapshot has been prepared by National Grid on behalf of the Power Responsive Steering Group.