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Communications

# **WPD & EA TECHNOLOGY: EV CHARGING & FLEXIBILITY SERVICES STAKEHOLDER WORKSHOP**

**APRIL 2019**



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## INTRODUCTION

On 10 April 2019, Western Power Distribution (WPD) and EA Technology jointly hosted a stakeholder workshop on EV charging and flexibility services. The workshop comprised presentations on the following topics: the findings of the Electric Nation trial; WPD's EV strategy; Time of Use (ToU) and EV tariffs; Flexible Power and Active Network Management; and WPD's EV Charging Hierarchy.

The workshop took place at The IET in Birmingham. The event consisted of two scene-setting presentations given by representatives of WPD and EA Technology followed by a Q&A. After a short break, there were three further presentations, each followed by a round-table discussion. The event concluded with a short session to summarise the comments given at the workshop.

EQ Communications (EQ), a specialist stakeholder engagement consultancy, was instructed to independently facilitate the workshops and take notes of the comments made by stakeholders.

Every effort has been made to faithfully record the feedback given. In order to encourage candour and open debate, comments have not been ascribed to individuals. Instead, notes have been made of the type of organisation that each stakeholder represents. A total of 41 stakeholders attended the workshop, representing 35 organisations. The organisations represented on the day are shown in Appendix 1 of this document.



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## **SESSION 1: STAKEHOLDERS' ROLE IN FACILITATING THE EV CHARGING NETWORK AND THE CHALLENGES THEY FACE**

After a short introductory presentation from Ricky Duke, Innovation & Low Carbon Network Engineer, Nick Storer, Principal Consultant at EA Technology, talked stakeholders through the findings of the Electric Nation trial. There was then a short ice-breaker discussion session where stakeholders were asked to explain their reason for attending the workshop, the role they played in the roll-out of EV charging and the challenges they faced.

Of the 41 stakeholders who attended the event, the most well represented group was suppliers, followed by aggregators and charge point manufacturers. When asked to complete a feedback form, providing details of their role, many ticked the box marked 'other'. These people included: consumer representatives; developers of software platforms necessary to facilitate the roll-out of EV charging; technical consultants; and those who considered themselves part of the EV charging supply chain, including battery storage providers.

Most stakeholders were interested in learning more about WPD's role in facilitating EV tariffs and other flexibility services, the opportunities presented by these, and how the barriers to rolling these out across the country can be overcome. In addition, stakeholders were keen to learn more about how consumer behaviour and how the learnings from trials such as Electric Nation can be used to inform their strategies, particularly with regard to incentivising customers to encourage the take-up of EV tariffs.

The most widely cited challenge was the disparate nature of the industry and the current lack of standardisation, both of assets and of charging regimes. A common theme that ran throughout the workshop was the need for greater collaboration between different organisations in order to create an equitable market. Whilst there was agreement that the number of EVs on the UK's roads would increase significantly in the coming years, it was acknowledged that, at present, the price of EVs is prohibitive, as is the lack of charging infrastructure both in convenient, accessible locations and in new homes. As a result, it was felt there is no critical mass, which makes it difficult for DNOs to roll out EV tariffs in a meaningful way.

It was also felt that consumers are currently put off buying an EV because of a lack of knowledge on their part of the benefits of owning one: something that needs to be addressed by the industry. In addition, it was widely thought that more should be done to make charging easier to remove a major factor preventing people from purchasing an EV.

### **1) WHAT IS YOUR REASON FOR ATTENDING TODAY AND WHAT DO YOU SEE AS YOUR ROLE IN FACILITATING THE EV CHARGING NETWORK?**

- "I work for a company which produces EV charging infrastructure. In particular, we look at transport systems and how we can deliver electric charging in cities in cost effective ways." Manufacturer

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- “I am personally interested in EVs as I come from an automotive and an energy background. Some of my key questions are about understanding the business case for different stakeholders. I can see how you might have contradicting drivers for different stakeholders.” Consultant
  - “We build smart chargers and charge points, and we built a software platform that provides flexibility services. We are also involved in how the market should be reformed in order to help customers get true value from this system.” Supplier
  - “I’m a consumer representative in the energy industry. I’m interested in the journey and experience of transitioning to electric vehicles. Lots have spoken about the technical side, but I’m interested in the consumers: what they do and how they will react, and how we will deal with problems in the future.” Consumer group
  - “We want to help DNOs to manage network charging. We’re aware of Time of Use tariffs and demand response, we want to bring EVs into existing initiatives.” Aggregator
  - “My focus is looking at how industry arrangements can be changed to accommodate EVs and energy storage.” Aggregator
  - “My company, as an energy firm, has a particular interest in EV. We have the third largest fleet of electric vehicles in the country and have 12,000 vehicles in the UK alone.” Supplier
  - “We’re a demand site aggregator and want a road map describing how the EV network will roll out. We want to see how we can facilitate things for our clients and know about grid capacities for our operations.” Aggregator
  - “We want to make sure that we can incentivise our clients to move towards the use patterns described in the presentation. We want to prove further that these sorts of trials work.” Supplier
  - “I’m interested in what financial support WPD can provide to help us to develop our platform for our customers.” Manufacturer
  - “I’m here to find out how much more we can optimise our batteries and to see how much more flexibility WPD can provide with lower thresholds.” Supply chain
  - “We provide the technology [a cloud system and a charger] to get real-time pricing, so our role fits in with that. We will be able to fit in some kind of tariff offering into our system down the line if we have reliable information from suppliers. However, WPD needs to work with energy suppliers to improve the diversity in price tariffs. The Time of Use tariffs are a solution up to a point but could become a problem eventually.” Manufacturer
  - “Our role is to try to automate the charging process and offer a reward for doing it. When people first buy an EV, they want it to be fully charged all the time, but that’s not often necessary for their needs. We need to work with WPD to play a role in incentivising people to take a more needs-based approach.” Supply chain
  - “We’re a partly government-funded consultancy. I’m also the technologist for our integration project, combining a managed charging trial, a bit like Electric Nation, but this time with more mainstream consumers. They’re provided EVs, and we’ll see the results soon. Rather than looking at load management locally, we’re thinking balancing at the national level.” Consultant

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- “We provide energy storage, batteries, and have software that optimises behaviour to make use of solar. People ask: “How do we get people to change their behaviour for Time of Use tariffs?” Our platform is aiming to do that. Optimising signals, our software models the profile of homes.” Supply chain

## 2) WHAT DO YOU REGARD AS THE MAIN CHALLENGES TO DELIVERING THE EV CHARGING NETWORK?

- “I would say ease of use is the biggest hurdle. We saw in WPD’s presentation [on smart charging] that the lack of satisfaction with EVs stems from issues relating to charging outside the home.” Manufacturer
- “The real challenge is bringing disparate industries together. Everyone wants to be in control and it’s a strange mix of small and large companies.” Supplier
- “For me, the problem is the price of the vehicles. We’ve ordered thousands of vehicles, including 4,300 this year alone, but the cost of them just isn’t viable at the moment.” Supplier
- “I think the main issue the lack of charging points on new housing developments. How are developers and local authorities are working together? Will it be possible to install chargers in every home?” Supply chain
- “Having done this trial, I don’t think it’s as much of a challenge as we first thought. When you look at the number of vehicles plugged in, it’s just getting DNOs to accept that’s the case. The physical wires are not as much a problem as understanding what is needed for capacity.” Supply chain
- “There are so many different sectors involved. The fact is that they’re all at different paces. They all might take a leap forward, but then one of the other ones will lag; there’s uncertainty there. If you are too early you might have stranded assets, but if you’re too late you get penalised by the market and regulators, so keeping a constant pace across is really difficult.” Consultant
- “Different aspects of connecting network planning with transport planning are a challenge.” Aggregator
- “Charging points are the big challenge. There are 26 charging regimes. There’s got to be standardisation for the consumer. It would be sensible to have a common way of controlling charging to make that work. From the presentation, maybe what’s required is a mandated Time of Use tariff.” Aggregator
- “There’s an interest not just in consistency, but also in understanding how the EV charging arrangements hook into the wider spectrum of network charging and network system operations, as well as commercial opportunities and balancing services. It’s effectively stitching together all of these different arrangements.” Aggregator
- “It’s not the technical challenge as such. There are some questions about whether we could standardise nationally and, given that we’re talking about significant load, whether that would be better through a secure network rather than leaving this for the network to decide. The question is, how do you come up with an equitable market?” Aggregator

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## SESSION 2: WPD'S EV STRATEGY

The second session of the morning was introduced by Paul Jewell, DSO Development Manager at WPD. Paul explained WPD's EV strategy, including forecasts, innovation projects and the company's targeted commitments in 2019 / 20. After Paul's presentation, there was a short Q&A. Details of the questions asked by stakeholders, and the answers given, are shown in Appendix 3 of this document.



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## SESSION 3: TIME OF USE (ToU) AND EV TARIFFS

The third session of the morning was introduced by Nick Storer. Nick explained Time of Use and 'Network Sympathetic' EV tariffs, after which the group were asked to give their views on how WPD can encourage EV owners to adopt these tariffs.

### SUMMARY OF FEEDBACK

Whilst it was accepted that WPD has a role to play in supporting suppliers to encourage the uptake of Time of Use (ToU) and EV tariffs, it was felt that this role is limited both by the lack of a legislative framework and by the level of savings provided by Distribution Use of System (DUoS) charges as they stand. It was felt that a radical shakeup of DUoS charges is required as, at present, the savings that customers can make are not significant enough to encourage them to adopt a different kind of tariff. In fact, when asked to vote on whether DUoS charges are enough to incentivise suppliers to promote EV and ToU tariffs to customers (by filling out a feedback form), the majority disagreed, including 57% of aggregators. It was also pointed out that these savings are not always passed on to the customer, so there is little incentive for them to change the tariff. It was noted that many customers are currently reluctant to change their supplier or install smart meters, even if there are savings to be made, so more needs to be done to both simplify the process and incentivise customers to change to a ToU tariff. It was commented by some that it should be left to the market to dictate the uptake of ToU tariffs, rather than DNOs or suppliers, and that this is largely down to price. It was added that this would only be possible when there was a larger number of EVs in operation.

There was acknowledgement that ToU tariffs are a complex issue for most customers, the majority of whom have little knowledge of the role of a DNO. Therefore, it should be the responsibility of suppliers, who have a closer relationship with customers, to encourage customers to take advantage of ToU tariffs.

Some, however, did see a role for WPD to play in this as the DNO / DSO is responsible for managing the load and protecting its assets. It was felt that the role of WPD should include providing suppliers with the necessary data and information, as well as the underlying structure required by them to encourage the uptake of ToU charges. It was therefore felt that WPD should be engaging more widely with stakeholders on this matter. It was, however, stated that issues relating to the sharing of data, including GDPR, could present a barrier to this.

There were also calls for Ofgem to provide greater leadership in this area by simplifying the charging regime to make it easier for customers to engage in the process and by ensuring that customers are able to benefit from ToU tariffs. It was pointed out that the regulator is already making progress in this area through its Significant Code Review, but it was felt by some that WPD should lobby the regulator to put more flexible pricing options in place. It was also commented that more knowledge of consumer behaviour would be helpful to inform Ofgem's future plans in this area. Stakeholders were keen to ensure that regulation is in place to ensure that customers are not penalised if they don't take advantage of ToU or EV charges, especially those who were less affluent and less knowledgeable. It was commented that a situation where the less affluent pay proportionately more for technology that only benefits the early adopters of new technology should be avoided at all costs.



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Whilst it was felt that the sheer number of tariffs that are available makes this subject overly complex for most customers, it was commented by some that there should be some form of regional differentiation in charging. It was suggested that bespoke DUoS charges could be the answer to this, as long as these didn't unfairly penalise customers for things beyond their control. It was, however, countered that this went against the concept of socialising costs, which might be unacceptable to the regulator.

Many stakeholders supported the creation of an industry-wide framework to ensure that tariffs are network sympathetic. Those who endorsed this concept cited the fact that EV charging will soon be central to the lives of many people in the UK, along with renewable energy and battery storage. It was also commented that a framework will help to facilitate a more collaborative approach across the industry and with other relevant sectors. Some, however, thought that this is not necessary at present. These stakeholders favoured a more *laissez faire* approach, letting the market decide. It was also felt by some that the industry is not yet in a position to put a detailed framework in place as there are still too many variables involved and it was added that this would come with a cost which would have to be borne by customers.

## 1) WHAT CAN WPD DO TO SUPPORT SUPPLIERS TO ENCOURAGE THE UPTAKE OF TIME OF USE TARIFFS?

- "In my opinion, the uptake of tariffs will come when there is a significant volume of electric vehicles on the market. At the moment, there are just too many issues beyond most people's control to enable us to influence what tariffs are available. If we accept that it's completely supplier-led, WPD's role as a DSO is to simply respond to developments in that field. At the end of the day, if WPD spots a constraint, it should be able to go straight to the market and get a response." Supplier
- "Fundamentally, the market will provide a response and in turn people will act." Supplier
- "Their [WPD's] role should be to understand what we need to do and bring in new flexibility projects." Supplier
- "I think it's got to be through the suppliers, because the suppliers have got the customer relationship and the agreement with them, so it feels like trying to replicate that in any way is going to be complicated. It's regulated to make sure it's fair, so it's got to be through the suppliers." Supply chain
- "WPD isn't the only party responsible for finding solutions. It's a complex issue and we shouldn't remove any stakeholders from the equation. WPD need to be engaging with them properly to see how we can overcome these barriers to EV charging." Supply chain
- "I think from WPD's perspective, if they make the right underlying structure, they'll have a broad range of offerings and the market will respond to the best option." Supplier
- "Ultimately it's WPD's responsibility to manage the load. They kind of have to in the end, because their kit might break so they have to have the last say." Supply chain
- "Ofgem are trying to address that problem so that it's not those who can afford a Tesla who are getting all the benefits, and everyone else paying for that. Really, the answer from WPD is to be fully involved in that for their network customers. There is a cross-subsidisation at the moment between those who are the least affluent [are] paying for network infrastructure that is used by the most affluent. There is a need to address that, but there is a case to be made that we need to decarbonise and that affects

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everyone. Everyone should pay their fair share towards making our society a decarbonised energy system.” Consumer group

- “Ofgem is clear with suppliers that they want them to make things less complex as otherwise, customers will not engage, so we need to be careful with that.” Consultant
- “Ofgem are minded towards Significant Code Review with an emphasis on distribution charging over transmission to be more cost reflective. So, there is recognition that arrangements need to change and provide better signals to customers, and we need to achieve consistency across distribution and transmission. I would agree personally that in order to influence customers, the signals have to be more obvious. It’s one thing setting the charges, but you’re reliant on the suppliers, and I’m not sure you can control that.” Aggregator
- “Ultimately, you have to influence the customer through cost, and you can’t just rely on the supplier for that.” Aggregator
- “There is the problem of what data is being shared. I can see GDPR being a problem here.” Consumer group
- “You said we could move to DUoS or have a red-amber-green. Is that ambitious enough? We have to rethink the DUoS tariff. What worries me is there’s a lot of stick, not much carrot. Set dynamic DUoS tariffs. Be more ambitious.” Aggregator
- “If I understood correctly, the biggest savings you could make would be £20 per year because the DUoS is only a small proportion. But because it’s such a small proportion, there’s only so much you can do.” Supplier
- “The more information that we have from WPD, the better. This will enable us to have more flexibility to design our own tariff plans. If we have regional-specific information, we can be more creative in terms of what we can offer to consumers.” Supplier
- “We always think convenience wins over money. Setting some defaults over smart appliances, and saying it would work in the background, automated at different levels, it takes the effort out.” Supplier
- “WPD has to start exploring all the options, for example three-phase balancing in domestic homes. Perhaps they could focus more on the local community level: if I want to override the setting, that must have an effect on my neighbour, so perhaps there needs to be more of a community understanding about how much energy is being used locally.” Manufacturer
- “Offering flexibility to the DNO is a great idea, and I’ve spoken about reducing the charge with batteries, but people worry if the grid will be unstable. Developing that trust in the industry, this could work as a kind of management backstop. The bits of hardware that act as a benefit to the system, to generate the money, if you break them or take them out.” Supply chain

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## 2) WHAT BARRIERS STAND IN THE WAY OF SUPPLIERS OFFERING EV TARIFFS FOR ELECTRIC VEHICLE CHARGING? HOW DO WE OVERCOME THEM?

- “I think that tariffs should be different for different parts of the network. When voltage is high, convertors use less power and the end customer pays less. If there are significant amounts of voltage, that ought to be factored into the tariff.” Supply chain
- “Smart metering and data access is a barrier to shifting that peak. Customers don’t want smart meters. Could you do extra lobbying in this area?” Supplier
- “When we look at tariffs, we can’t necessarily work out the best value, and if we can’t as people in the industry, how can a general consumer know?” Consumer group
- “From a supplier’s perspective, I think there’s a lack of data on peoples’ behaviours. You want to incentivise people to use energy less at certain times, but you need to know enough about a customer’s patterns. You can’t do that until the behaviour is settled so it’s a bit of a catch-22 situation. I think the people at the forefront have found a model that works for now and hopefully over time that can be refined.” Consultant
- “Smart metering and the delayed roll-out of it are big factors.” Consultant
- “Tariffs and smart metering are largely out of a DNO’s control. This is up to the suppliers” Aggregator
- “One thing we can do is offer personalised advice to customers, making it relevant and targeted at the right time to change behaviour and reduce consumption.” Supplier
- “Some statistics show that if you work 20 miles away from home, you will charge once a week once you get past the range anxiety. When it comes to the need to charge, that’s going to be the option.” Supplier
- “Part of the challenge with tariff development is having an eye on the future big picture, which includes electric heating and new multi-level tariff models. As things stand, the prices are based on wholesale prices, rather than distribution costs. This means that your tariffs are not educating people on network constraints, so people aren’t clear about how you work and why it’s both important and beneficial to shift the load.” Consultant
- “Will the general public ever completely understand the ins and outs of network operations? It feels a far-fetched way of getting people engaged.” Supply chain
- “WPD needs to lobby Ofgem to get suppliers to put flexible pricing structures in place. This will mean that they will become commonplace.” Manufacturer
- “When I was designing an EV tariff, I was hit with a legislative barrier and was told to simplify it because we were told that we had to have a single one rather than a variable one. The situation that we’re facing now is the natural result.” Consultant

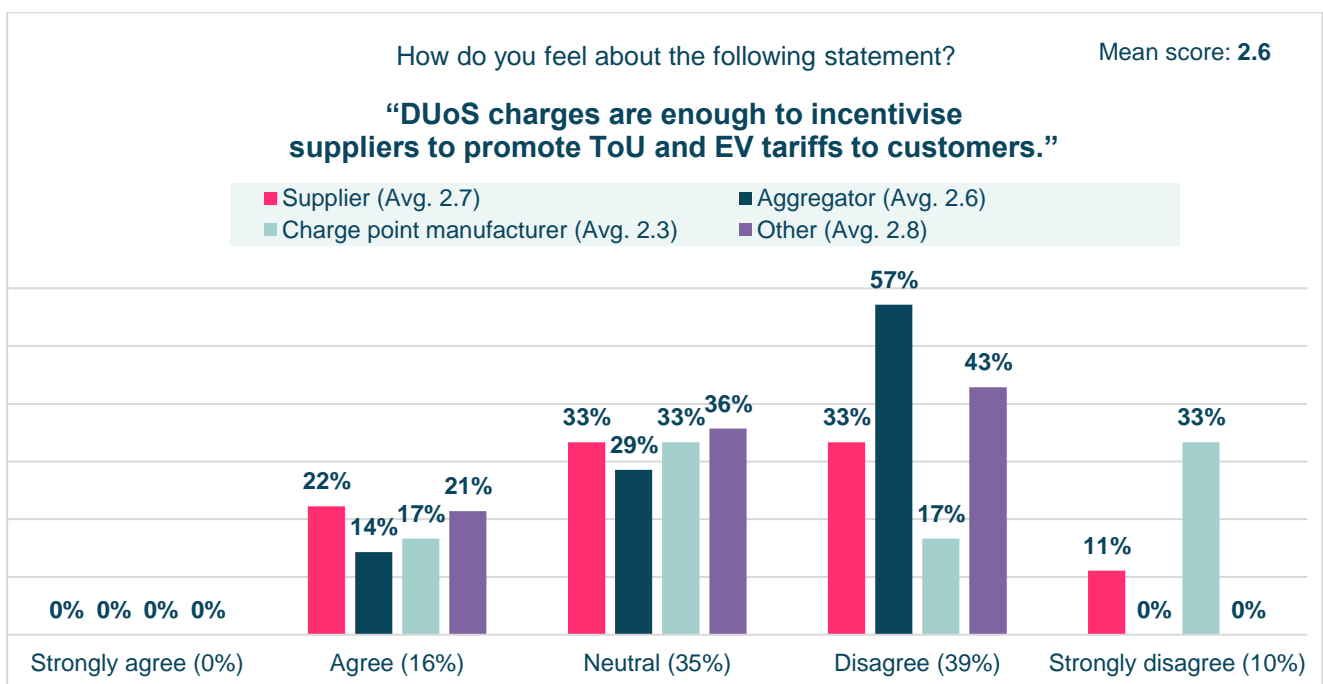
## 3) HOW DO WE INCENTIVISE AND / OR PENALISE SUPPLIERS TO ENCOURAGE THE USE OF THESE TARIFFS?

- “I think that there needs to be a change in mindset towards these types of tariff throughout the industry. Economy 7 was a really successful. The appetite is there for this type of tariff among customers, but the suppliers don’t seem to be keen enough to get people on them.” Consultant

- “It’s complex, so people need a breakdown of the control system. Automation needs to be improved, plus people need to be encouraged to have batteries in their homes.” Supply chain
- “They should have bigger incentives and penalties but I’m not sure they’d be allowed to by Ofgem.” Aggregator
- “One possibility is that DUoS is already somewhat region-specific. Given there will be specific problems on localised areas in the network, could you have a different bill in certain DUoS regions with a higher incentive in problem areas?” Consultant
- “There’s a place in Monmouthshire that recycles 95% of waste, so they’re incentivised for that. If you’re behaving in the right way, why should you be disadvantaged? Where your behaviour is having an impact, you should be penalised, but when you’re doing all you can, you shouldn’t.” Consultant
- “With some public education, you could adjust regionalised costs based on adherence in certain regions. Ultimately it’s passing on the saving from infrastructure that you don’t have to worry about.” Manufacturer
- “This isn’t just WPD’s problem. Any solutions and wins that WPD make should be shared with other distribution companies and transmission companies. It is a whole system solution we are looking for.” Consumer group
- “There’s a disconnect between customers and network companies. At the moment, the supplier is the intermediary. Any network charges are levied on the supplier, who should pass them on to the customer, but there’s no guarantee they’ll pass on the benefits. I would suggest that’s one aspect that needs to be thought about: how you get visibility of the customer cost or benefit and connect the charge to the supplier with the customer behaviour.” Aggregator
- “With that value differential of £23, do you think they’d have to increase that in due course? The wholesale price will go down after a while.” Aggregator
- “There needs to be some kind of protective cap put in place for suppliers just in case these tariffs cost them money. At the moment, you’re relying on suppliers to take the risk and hoping that others will follow if it takes off.” Supplier
- “In your thinking when rolling out these tariffs, you need to make sure that you aren’t penalising those customers who aren’t creating a problem.” Supplier
- “Ultimately, diversity of tariffs is key. You need to make sure that they’re not set for a certain time. There needs to be some kind of correlation when it comes to the variability of the tariff costs. DUoS charges are key to this.” Supply chain
- “Offering the incentive of this DUoS charge is not a sufficient framework to make sure that the tariffs are network sympathetic, as any saving will be lost through the way that people currently charge. Maybe you could have bespoke DUoS chargers for certain areas?” Manufacturer
- “The only problem relating to bespoke DUoS chargers is that it would destroy the idea of socialised charges.” Manufacturer
- “DUoS is a fairly weak incentive; it just provides when you use energy, which is a bit weak. What does WPD want things to look like once everything is underway? Do you add in a DUoS cost after the fact

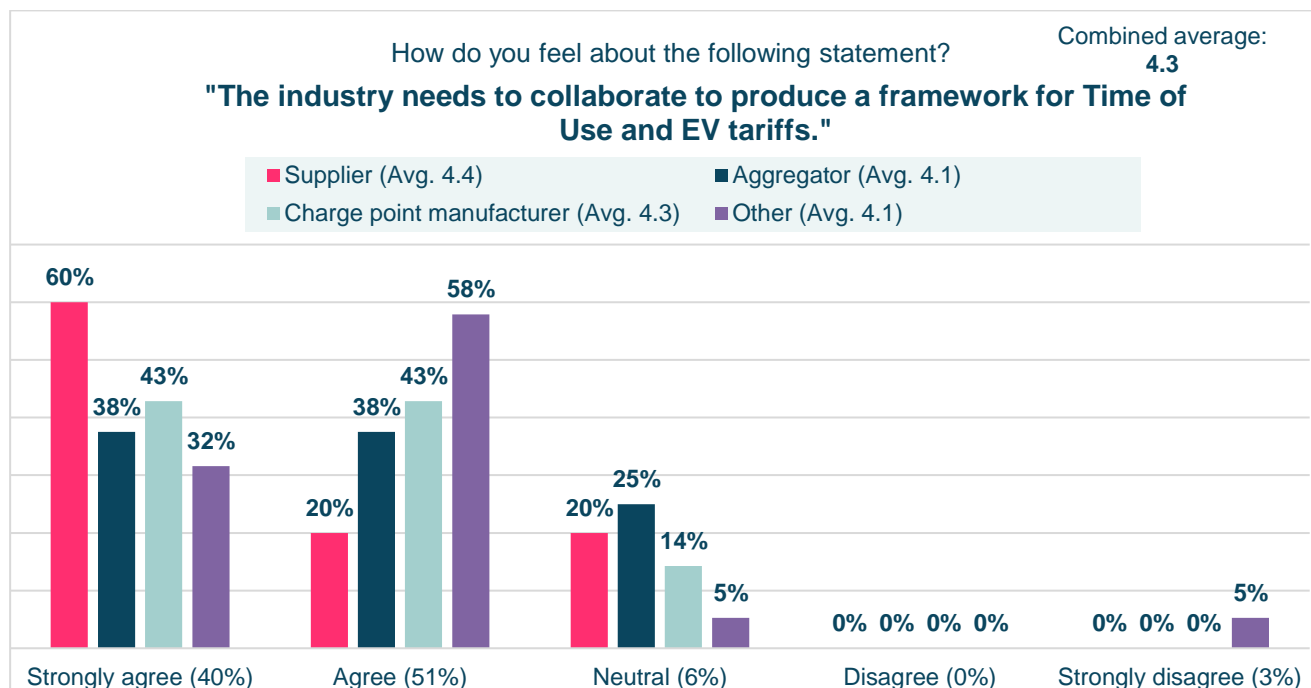
for total maximum demand, or change in demand, to make it work? This adds complexity but might give a signal.” Consultant

- “Join up the cost savings to the DNO as closely as you can to the benefit to the customer, so it’s fair and everyone gets it. There are market mechanisms that do that, but we need to feed in at the front end.” Supply chain
- “We did some work on Time of Use tariffs a few years ago, and it complements some of the messages presented today. You need to use a carrot, not a stick. We also looked at the different EV charging tariffs recently. We put out a piece of comparative work, and we found that you can’t compare like for like. Some tariffs are masking the fact that you might be better on Economy 7, or Dual Rate Meter tariffs than an EV tariff, so there is a need for suppliers and industry to make it easy for customers to understand what they’re buying and whether they are actually making a saving.” Consumer group
- “You do it through the price mechanism, saying it would save you money. You’re in the position from that proposition.” Supplier
- “The OEMs have that contact every few years, whereas the suppliers have that customer relationship, so that’s more competitive. The service propositions, moving away from the vehicles, they’d have a disadvantage over suppliers.” Aggregator



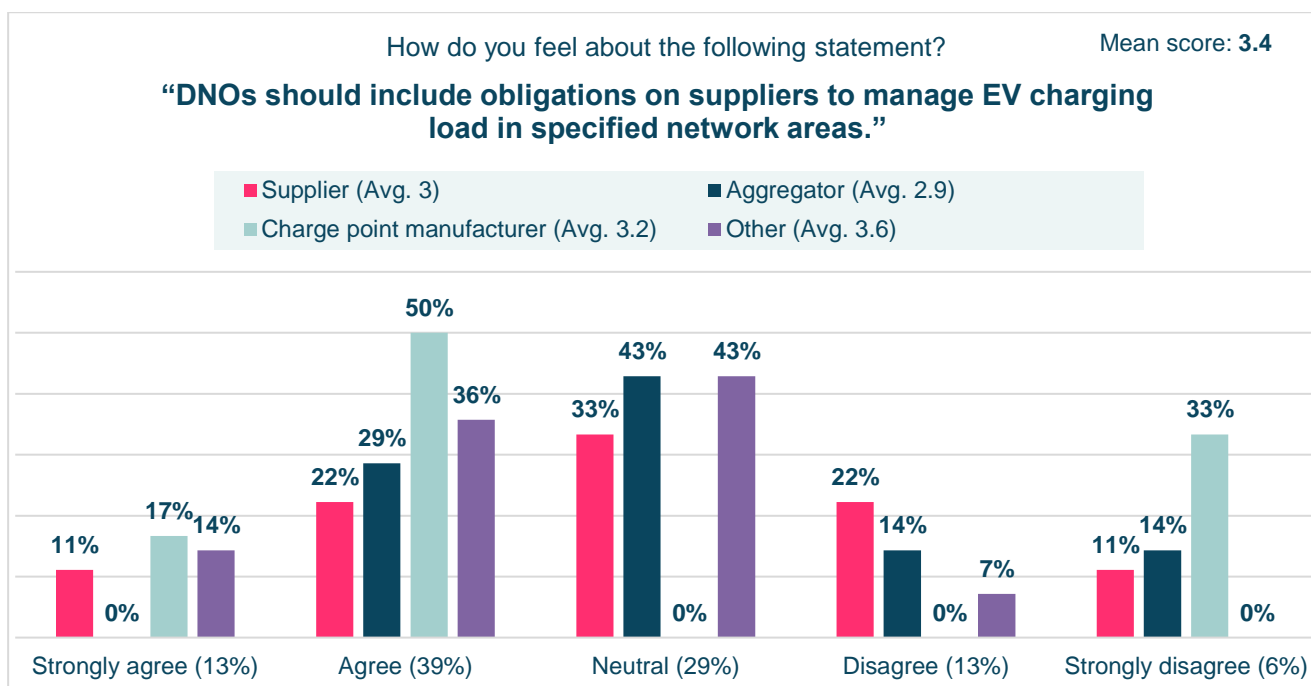
Nb. In the graph above, ‘strongly agree’ = 5 and ‘strongly disagree’ = 1

#### 4) CAN A FRAMEWORK BE PRODUCED TO MAKE SURE THAT THESE TARIFFS ARE NETWORK SYMPATHETIC?



- "Of course, a framework should be produced, and this should cover different sectors (e.g. energy, infrastructure, environment). Therefore, something needs to be done to make sure we're all on the same page. The questions is: who is covering the cost?" Supplier
- "As for bringing transport and energy together: how is it going to be managed? Do we know if the framework needs to exist in the first place? If not, it's pointless spending time establishing it when there's currently no evidence to show that it's needed at the moment." Supplier
- "EV charging appears quite far removed from everyday life but, in the future, it will be 100% connected to everything in the home, such as solar panels and smart meters. The problem is that at the moment, we can't see where it's going though. Also, in the future, we might see the development of a price comparison app for EV charging, which could change the status quo." Supply chain
- "From my end, I've consistently told Gemserv [who are currently working on putting in place an EV charging framework] that they don't have a mandate to create a Government framework in this area and that this issue will be resolved by the market, not Government frameworks." Supplier
- "That's a good point, but we do need to build flexibility into our system and build towards a framework. Smart meters are good provided that all parties have access to the information and can react to that data." Manufacturer
- "This isn't just WPD's problem. Any solutions and wins that WPD make should be shared with other distribution companies and transmission companies. It is a whole system solution we are looking for." Consumer group
- "It's on WPD and the DNOs to create that underlying market structure that enables us [the suppliers] to offer the value back to customers." Supplier
- "Ofgem needs to take the lead on it. From what I can see, there's a lot on the table that needs to be reformed." Supplier

- “Can legislation be changed so that ways of improving value being put forward by WPD can be introduced now, rather than proving them retroactively with live data?” Supplier
- “The reward for how long you’re plugged in over a longer period of time enables good behavioural patterns to be established. You need to think about the non-financial benefits achieved over the long term.” Consultant





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## SESSION 4: FLEXIBLE POWER AND ACTIVE NETWORK MANAGEMENT

Ben Godfrey, Network Strategy Manager, introduced the next session of the morning. He explained the potential to increase WPD's active engagement through the use of Flexible Power and Active Network Management before stakeholders were asked for their views on these mechanisms.

### SUMMARY OF FEEDBACK

Although many were of the view that EV charging could be part of Flexible Power, a number of stakeholders cited barriers that must be overcome in order to make this happen. Firstly, it was noted that this would depend on customers' behaviour and many people would not have the inclination to engage in the market themselves. Most stakeholders were of the view that Flexible Power is more suited to larger users of energy, those with battery storage or companies with large fleets of EVs, rather than individual EV owners. It was also added that EV owners would be reluctant to turn off their charge. Instead, the point was made that charge point manufacturers should participate in Flexible Power as well as locations where there are charging hubs such as car parks or (former) petrol stations, as they will be the biggest potential beneficiaries.

It was commented that advances in technology may make it more likely for EV charging to participate as this will lead to greater insight into customers' load profiles and real-time visibility of the network. It was, however, again noted that issues relating to the sharing of data must be overcome.

Further barriers to EV charging participating in Flexible Power suggested by stakeholders included the lack of a legislative framework, which may lead to some 'gaming' the system to their own advantage. The fact that all participants must have a smart charger was also seen as prohibitive.

Despite these barriers, it was noted that the wider roll-out of Flexible Power could provide opportunities for some, especially EV manufacturers, who could, in future, take on the role of energy suppliers.

There was not a great deal of support for the idea of DNO's using Active Network Management (ANM), even as a last resort, although it was commented that network constraints may make this inevitable in the future. When asked to vote according to their views on whether they supported the use of ANM to help balance the demand from EV charging, the mean score was 2.8 / 5, although the most prevalent answer given by both aggregators and suppliers was that they were neutral about this. However, it was felt that if this were put into effect, it would represent a failure on the part of the DNO. Many felt that customers would not react positively to relinquishing control of their electricity usage and it was felt that the unpopularity of this would mean that the Government would be unlikely to want to enact this.

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## 1) DO YOU THINK EV CHARGING CAN BE PART OF FLEXIBLE POWER? IF SO, HOW?

- “Isn’t Flexible Power much more suited to companies that have large fleets?” Manufacturer
- “If you’ve got everything scheduled, you can say ‘well I can afford to drop the power level by half’ for this amount of time.” Supplier
- “Of course, EV charging can participate, but you need real-time visibility of the network. The charge points could maybe give that visibility.” Consultant
- “You need smart chargers to improve visibility. I think the Government has already stated that they want to roll that out generally.” Consumer group
- “It’s challenging. We’ve done some stuff with flexible power batteries, and the way that they measure your response is they create an average profile for you and measure your deviation from that, then we look at availability on average against that baseline.” Supplier
- “I think from the customer side, the commercial mechanisms will have to be developed a lot, to work out how that flexibility gets switched, which customers’ devices are subject to the backstop, and who gets compensated.” Aggregator
- “It seems like this is a service for users with large loads that they don’t mind turning off on occasion, but EVs need to be charged on a daily basis.” Consultant
- “I can see that it won’t be appealing as there’s a fear of not getting charge or being penalised for having an EV.” Consultant
- “You’re going to see car parks and stations becoming more active in the day and at night, so commercial has a role.” Supplier
- “As a domestic customer, I don’t want to engage with the market and bid. Life’s too short!” Aggregator
- “It’s going to have to be. EV chargers will become part of the house’s load in the future. It will be an expensive problem to solve, but there’s no other choice.” Supply chain
- “WPD needs to make sure that it can deliver the amounts needed by its consumers. EV charging as part of flexible power can help to ensure this. This is why we’re excited about it.” Supply chain
- “I think EV charge point manufactures have to be part of flexible power as they will be the single biggest users. OEMs and manufacturers need to operate with this, but as with any new technology or drive towards being green, you can put lots of systems in place but ultimately the market will decide. Once it works commercially, everyone wins.” Manufacturer
- “The world is too flexible now, meaning that nobody within the ecosystem is sure about what the others are doing.” Manufacturer

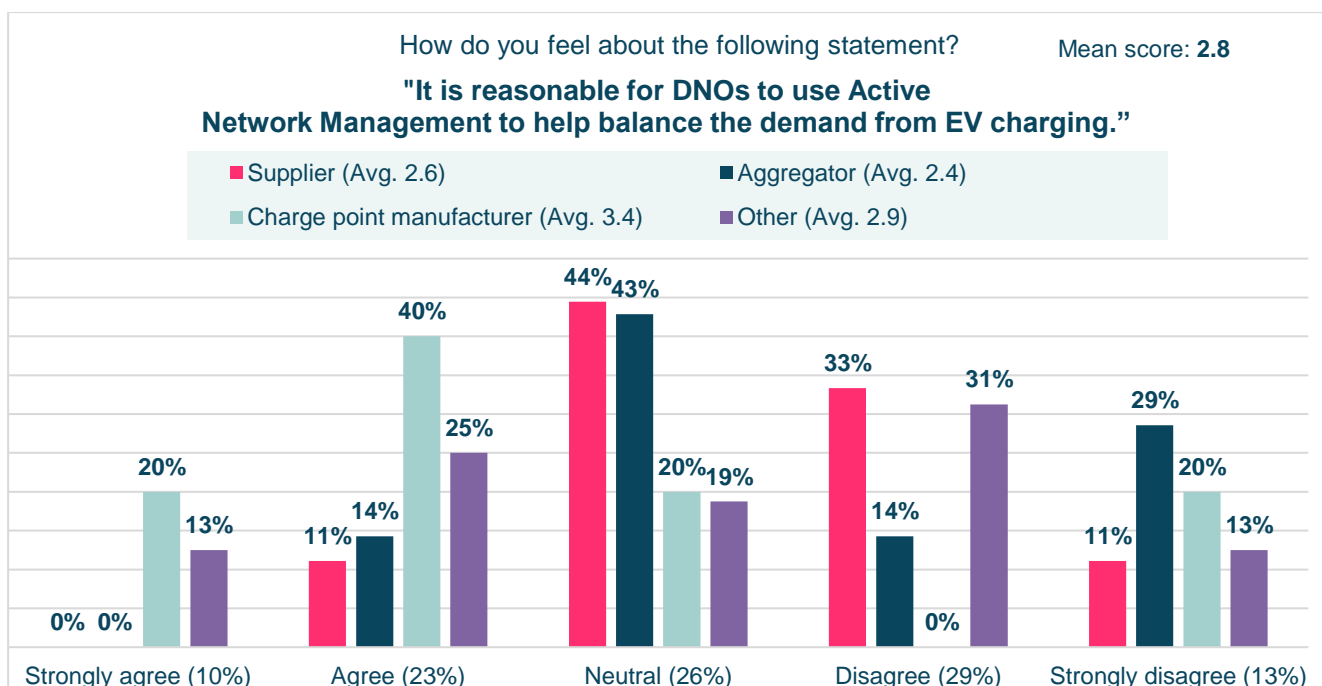
## 2) WHAT ARE THE OTHER CHALLENGES TO THIS AND HOW CAN THEY BE OVERCOME?

- “There would invariably be negative responses from customers. They will think: ‘Who are these people who can turn my power off?’ They’ll speak to the supply and say: ‘Stop this’. It could be disastrous for customer trust.” Consultant
- “I can see flexible power being useful for battery assets, but not so much for EV charging.” Manufacturer
- “Car manufacturers are very protective of their assets. They don’t want to sell their secrets because they have clout. They are still trying to decide whether they want to be part of the energy industry and

are holding back. They need to release this state of charge information because it's hindering the industry as a whole." Supplier

- "The big challenge is the market. Organisations came to us and told us we can do this. And two and a half years later, we haven't found a solution. We've prompted the market but knowing that they'd [be] ready for us." Supplier
- "In the future, more granular control of charge points will be possible, but DNOs want to be able to specify this in future." Aggregator
- "We need these different worlds to talk to each other more with an intention of mirroring each other's practices. Would it not be better to work together collectively rather than as individuals?" Supply chain
- "Local needs have to be met when trying to put together these flexible use models. At the moment, this is not necessarily happening, so a new process is needed. There needs to be a site-specific approach when it comes to flexibility." Manufacturer
- "WPD needs to think about where the biggest costs will lie and how it can help the greatest numbers of customers, because there will be problems in getting huge amounts of power to consumers when EV becomes mass market. We need a huge change in approach. Getting suppliers to play a bigger role in this planning is very important." Manufacturer
- "You can imagine a world that has the most stable energy system, and another with blackouts in some areas, and that'd be very unfair. You imagine a small village, one person buys in the village, and everyone else is excluded. There'd have to be an energy system management protocol." Supply chain

### 3) WHAT ARE YOUR VIEWS ON USING ACTIVE NETWORK MANAGEMENT AS A LAST RESORT? WHAT ARE THE BARRIERS TO THIS?



- “I struggle with the political angle. Personally, I can’t see that kind of blanket agreement for domestic Active Network Management getting through Parliament because the political rule just wouldn’t be there. If there were a period of sustained proven demand for flexibility, then it could be possible.” Supplier
- “The Electric Nation study found that people initially experienced range anxiety but then got used to their electric vehicles, so actually there might be a future in which not everyone needs a charger. In that context, Active Network Management could be reasonable, but I can’t see the Government supporting it.” Supplier
- “Would customers accept that lack of control in terms of not having their own charge point? I’m not convinced.” Supplier
- “Yes, I think so. If the range is substantial enough, you wouldn’t panic about it. Plus, if the National Grid plan is approved, which aims to install charge points with no more than 50 miles between each, that would allay people’s concerns.” Supplier
- “I agree, but the time it takes to charge them is still an issue. Why would I want to spend 10-15 minutes charging an electric vehicle when I could top up my car with petrol in a minute?” Supplier
- “Regarding legislation, it’s very difficult for the Government to legislate. Perhaps they could legislate on what you can’t do. For example, they could say you can’t install a dumb charger.” Manufacturer
- “Regarding policy, wind farms owners were paid £100 million last year to switch off their farms. There really ought to be a dialogue between the Government and relevant stakeholders. WPD need to reach out to others to say ‘we have extra power’ so that none is wasted. It all comes down to smart network management. The infrastructure is there but the data is not being interpreted effectively so as to capitalise on efficiencies.” Supply chain
- “You can’t future-proof all scenarios, so having Active Network Management may be necessary.” Consultant
- “I can see a scenario where a household is subject to active load management, and then those householders move and someone else moves in. It’s got to be really clear to them what the constraints are.” Consumer group
- “If it’s that bad, I understand there might be a short time frame for upgrade work, but the absolutely last resort should be to switch customers off.” Consultant
- “It’s a question of how long this takes in practice.” Manufacturer
- “DNOs want to put in bigger cables but are trapped as Ofgem won’t accept the business argument for this. Once you get a full street of EVs, the upgrade work could take place.” Aggregator
- “I don’t think end users would want to relinquish control of their house. Looking at demand response trials, people don’t find the incentives to be significant enough. Unless you’re energy-conscious, it won’t work.” Aggregator
- “It’s inevitable. If it doesn’t happen, you’ll get blackouts.” Aggregator
- “If you’re saying you can’t charge your car when you want to, then that’s inevitable. The alternative is that the lights go out. Either my lights go out or his car goes off!” Aggregator

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- “I have a concern about this conversation being attributed to EVs. The idea that you can do whatever you want with everything else but your EV charging is heavily controlled is negative and even potentially disruptive. Why isn’t this conversation being extended to people with hot tubs, for example?” Consultant
  - “Many households have issues with EV charging points because they already have swimming pools and don’t have three-point charging points.” Manufacturer
  - “What’s classified as ‘last resort’? How much does that sit with the DNO not being able to come up with a solution to deal with the problem itself quickly? How far along is it before the supplier is contacted to give them the chance to resolve the issue?” Supplier

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## SESSION 5: THE EV CHARGING HIERARCHY

The final presentation was given by Matt Watson, Innovation and Low Carbon Networks Engineer. Matt talked stakeholders through WPD's EV Charging Hierarchy: Time of Use tariffs; Network Sympathetic EV tariffs; Flexible Power; and Active Network Management, explaining the requirement of each one. Stakeholders were then asked for their views on this hierarchy.

### SUMMARY OF FEEDBACK

Stakeholders were generally of the view that WPD's charging hierarchy was appropriate and in the correct order. When asked to vote on this question, the vast majority, including 89% of suppliers, agreed with this.

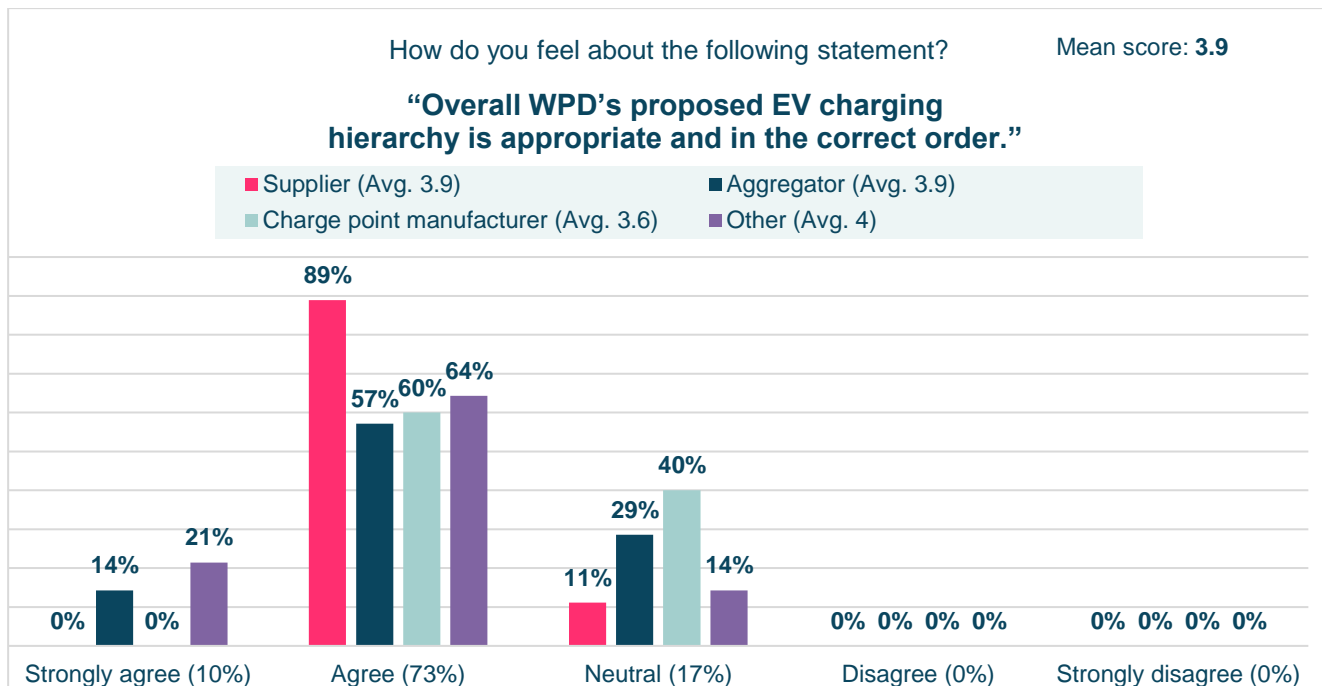
Many were of the view that ToU charges were the most effective of all of the charging regimes, although it was commented that WPD's distinction between ToU tariffs and network sympathetic tariffs was not appropriate as these are all part of the DNO's own network tools. There was, however, broad acceptance that traditional reinforcement should be the last resort as it is costly, and these costs would be socialised across the network.

The point was made that it was unfair that EV owners are penalised by having to accept different terms to other energy users, including those with energy intensive appliances such as hot tubs. It was felt that the network should be agnostic about the technology that is connecting to the grid. It was also felt that DNOs should work together to have a common policy as it was not appropriate for WPD to adopt its own hierarchy which is different to that of other DNOs. Stakeholders pointed out that, at present, it doesn't appear that DNOs are learning from each other, which holds back the industry as a whole. Ofgem was seen as being a hindrance to collaboration as it rewards innovation from individual DNOs and does not provide enough incentive to collaborate. It was also suggested that WPD look at models adopted by DNOs in other countries such as Italy, Spain and the Netherlands.

It was also acknowledged that this isn't an issue solely for DNOs to deal with. Collaboration with a range of stakeholders was called for. Suggestions of parties that should be involved included: Government; local authorities; housing developers; suppliers; charge point manufacturers; the EV Taskforce; and The Energy Saving Trust. It was also felt that more ought to be done to make the process of switching tariffs easier and more attractive for customers.

Stakeholders were keen to see that this event is followed up and that the feedback given is acted upon. It was commented that the outcomes of trials such as Electric Nation are shared widely across the industry. There was praise for WPD's EV strategy, but there was a general feeling that DNOs and the wider industry needs to be better at working together and avoid working in isolation.

## 1) WHAT DO YOU THINK OF THE EV CHARGING HIERARCHY?



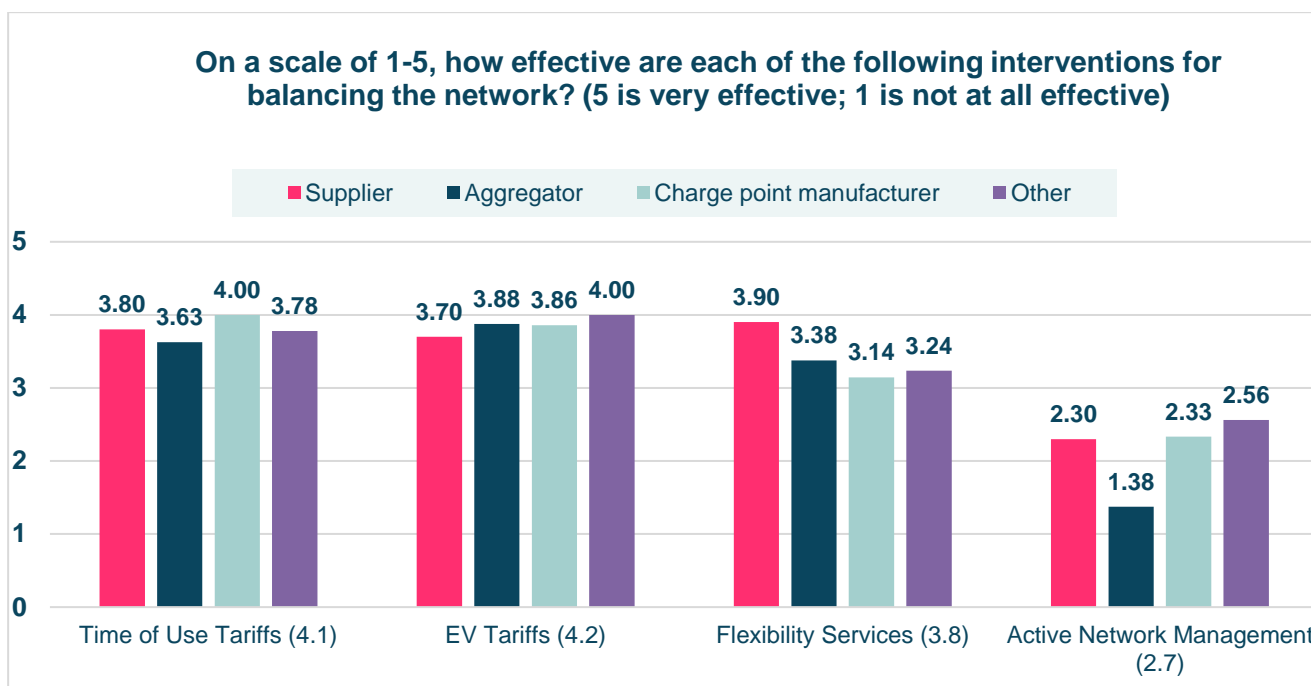
- “When I look at the hierarchy, it looks okay, but I don’t like WPD’s distinction between Time of Use tariffs and network sympathetic tariffs. It’s one network, it should be one set of charging regimes, but other than that, the idea that you have a market price-based proposition is sensible.” Supplier
- “As an industry, we need to be clear about how we use management means to connect domestic customers. It’s about speeding up the pace a bit. We’ve been talking about having a smarter grid and changing the way the system is managed when, broadly, I think we already know what the answers are and what the technology is. It’s just a question of rolling it out.” Supplier
- “I think Time of Use tariffs are the best way of doing this [facilitating EV charging]. Stopping people from charging is a failure. Whilst I understand that reinforcement is a backstop, it really is a last resort. When we get to using the half-hour settlement stage, the market will take over and dictate the way forward.” Supplier
- “They don’t get it. EVs in general have come in at the end of the party and they’re going to be the ones to do all the work. It’s clear that WPD don’t want to invest in their network unless it’s an absolutely necessary, and then only do the absolute minimum, which is maybe not in the spirit of cooperation.” Manufacturer
- “You can come in at 6pm and put the heating on full, and everyone can do that, but as soon as you plug your EV in there’s a problem. EVs are being picked on.” Manufacturer
- “I think network companies need to be agnostic to the technology connecting to their network. They shouldn’t be favouring particular technology. They have a role in unlocking a decarbonised network, so this hierarchy feels reasonable, but it should be on a cost-benefit approach. So, actually Active Network Management might be the most appropriate response to decarbonise the network.” Consumer group
- “In principle, they shouldn’t care, but the reason they are picking on EVs is that most electricity demand is inelastic. If you want heat, you need it now. If you want to cook, you need it now. There’s no elasticity



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in demand for electricity, but EVs are interesting because this is the first time on the network that's potentially elastic. There's an opportunity here, to make them give some benefits. I do think that it's right that they are singling out EVs because of the unique nature of the load. It's the first time that you can delay your electricity usage." Manufacturer

- "It's about optimising cost. You can reinforce a network to never need demand management but it's not the most effective way of doing things." Consultant
- "Network reinforcement should be a last resort." Supplier
- "Network reinforcement costs are socialised, so the costs need to be justified. If there's a business case for it, the network will be upgraded." Aggregator
- "In general, the hierarchy appears to make sense from an industry perspective." Aggregator
- "Time of Use can have the biggest impact, but there's a significant challenge in overcoming the supplier intermediary points. How can you guarantee savings will be passed on, unless you contract with the customer directly? You'll have greater level of coverage with Time of Use, but the lower you go down [in the hierarchy], the higher the cost and the smaller the service." Aggregator
- "You need Time of Use but some level of automation too. You need flexible power to overcome that." Supplier
- "Do the financial benefits exist to make it worth it getting the communications out there to alert customers about when they can charge?" Manufacturer
- "People have already saved money by buying an electrical vehicle in the first place, as it costs them far less per mile of fuel used. There needs to be sensitivity about commercial realities." Consultant
- "I think there's a problem regarding the DNO being disconnected from the customer. The energy supplier can offer a product the customer can see, and so it's about making people aware, otherwise there'd be problems." Supply chain
- "Ultimately there's a trade-off: flexibility versus investment. Some customers will want certainty, others might be fine with different ideas." Supplier
- "We did 10 years on the Thames Valley project, with smart meters. Everyone had different profiles. Our assumptions were way off. Sometimes massively over-, and under-, egging it. People are different, and even in areas where you think they'd be similar, there's a lot of variation. It's so hard to overlay profiles." Supplier



## 2) IS THERE ANYTHING ELSE THAT WPD SHOULD BE DOING THAT IS NOT INCLUDED?

- “The industry (DNOs) should work together to ensure consistency; there should be a ‘GB message’ to provide certainty to customers nationally and to the market.” Manufacturer
- “The DNO’s industry should come together to promote consistent messaging, funded by EV car manufacturers” Supplier
- “You could set a limit. Use dynamic load balancing for the house, so it pauses EV charging while showering.” Manufacturer
- “In Italy, they actually take the half hour’s worth of average energy, work out what your capacity is and the peak of that is what you get in your bill next round. They evaluate how much strain you put on the network and dial it back from your bill.” Supply chain
- “We are stuck in old-style thinking. There need to be a whole system mindset.” Consumer group
- “You should lean on the work done by other DNOs. We’ve done a whole day on network smart charging, and you never once mentioned what other DNOs have done, and the architecture isn’t that different. You definitely need better information sharing. In the 10+ years of innovation funding, there hasn’t been a single initiative that has been adopted by more than one DNO.” Supplier
- “It was the same team from My Electric Avenue that did Electric Nation, but it doesn’t always join up.” Supply chain
- “The rules make it harder to build on previous projects because you can get accused of not being innovative and get penalised by Ofgem. The least-risk approach is to do something completely new.” Consumer group
- “A lot of DNOs are talking about having more information control on the network and having a clearer picture of what’s being used. This would be helpful regarding EVs.” Aggregator
- “The information from Electric Nation has to be disseminated.” Aggregator

- “There’s a model used in Spain and in the Netherlands, which is worth exploring. It involves buying more capacity if you need it and decreasing it if you need less. This is directly linked to your tariff.” Consultant
- “One Australian supplier used an app with an offer giving everyone a free pint. The thought was that a community would be more energy efficient if everyone was all down the pub together.” Manufacturer
- “There was an app which encouraged people to turn off their lights through a zombie game. This was a way of engaging people on the issue in a very human way.” Supplier
- “People see changing over to Time for Use tariffs in a similar light to changing banks. You need to do something to change this perception.” Consultant
- “As aggregators, we need more information in future to help us to play a role in shaping new legislation and developing new assets.” Aggregator

### **3) ARE THERE ANY STAKEHOLDER GROUPS THAT SHOULD BE INVOLVED THAT WE HAVE PERHAPS NOT THOUGHT OF?**

- “We are yet to see any kind of leadership or direction from OEMs. They need to be clearer and actually announce that they are releasing vehicles.” Supplier
- “We haven’t talked about the ESO, in procuring balancing services. They started to get into domestic, and there is one provider that has home battery storage that plays a balancing mechanism. There’s this point here round the DSO-procured flexibility services, which takes priority? How do you sign up? If the DSO wants one thing and the ESO wants a different thing, are they pulling in different directions?” Consumer group
- “You do get conflicts. There has to be a harmonisation of the market for the DSO and ESO. You have to ensure you don’t get flexible assets doing things at different times without harming the network.” Supplier
- “The Open Networks work which is going on through ENA needs to come to a good conclusion that is ultimately useful for consumers who want to benefit from participating in it.” Consumer group
- “How involved are local authorities in this area? Partnerships to bolster communities and address demographic shifts are key.” Supplier
- “Property developers and housing associations should have a role.” Supplier
- “Housing developers could have a role as an aggregator.” Supplier
- “The EV Energy Taskforce was established by [the] Government but is industry-led. It provides recommendations to [the] Government about how the energy network may need to change to accommodate the uptake of EVs.” Aggregator
- “Government bodies: BEIS, Ofgem, OLEV, DfT.” Aggregator
- “The Energy Saving Trust would engage on behalf of consumers. They’re taking an active interest.” Aggregator
- “It’s worth remembering that [the] Government established Smart Energy GB for smart metering. Whether it’s done well or not is a different thing. But they wanted a dedicated marketing vehicle to tell

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people about the virtues of smart meters. Maybe there's an opportunity for concerted, coordinated action." Aggregator

- "WPD needs to work with price comparison websites to get information out there, which would demystify the kit involved." Manufacturer
- "Car manufacturers will be useful here, as they have technical expertise that WPD can tap into." Consultant

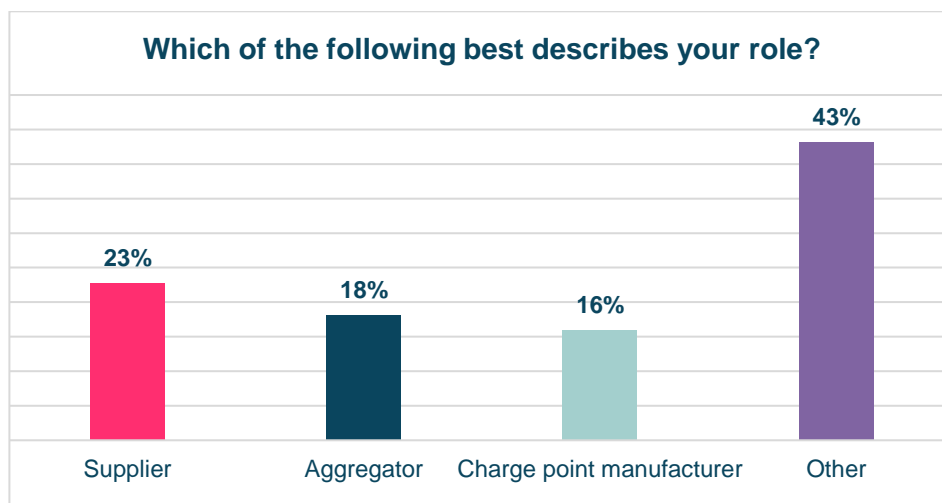
#### **4) WHAT DO YOU THINK THE NEXT STEPS SHOULD BE FOR TAKING THIS FORWARD?**

- "If we want to see the mass take-up of EVs, we need more reasonably priced models." Supplier
- "The problem is that £30,000 for an EV with incentives is being classed as standard. It's not right." Supplier
- "We need to see more engagement and leadership from the car industry. Also, there needs to be closer cooperation between planners and housing developers." Supplier
- "My view is that the cost of power will increase significantly in the next few years and these carrot-and-stick incentives will start really appealing to people. That will drive management." Manufacturer
- "The markets will deal with most of the problem, then intervene as is needed." Consumer group
- "Don't just share best practice: put it into practice." Aggregator
- "Each licensee has its own price control, so is encouraged to think about how it can maximise opportunities, but I think Ofgem would expect DNOs to work together." Aggregator
- "It's encouraging to hear that WPD is putting results out there for its EV strategy. The plans are very clear and user-friendly. I would just encourage WPD to put out more snapshots, as people will read them." Supply chain
- "A natural continual update from this event that goes beyond sending over the slides would be great. It would be more active and foster more specific feedback. Maybe you could get in contact within three months saying, 'We would like to engage with you on x or y'." Supplier
- "There is a pricing issue on regional and national levels. Energy companies offer national tariffs. Unless WPD is doing the same as all of the other power distributors, the pricing won't be seen as beneficial on a regional level." Consultant
- "When you put together a charge-point network, you want some kind of consistency in the process and the end product." Manufacturer

## APPENDIX 1: ATTENDEES

A total of 41 stakeholders attended the workshop, representing 36 organisations. The organisations represented on the day are shown below:

ABB	EY
Alfen	GreenFlux
BP Chargemaster	Just Energy
Bulb	KiWi Power
Burns & McDonnell	Marubeni Europe
Cenex	Mitsui
Centrica	Moixa
CGI	npower
Citizens Advice	Octopus Electric Vehicles
CrowdCharge	Ohme
Delta Energy & Environment	OVO
DriveElectric	PassivSystems
E.ON	Pod Point
ELEXON	Shell
Energy Systems Catapult	Smarter Grid Solutions
ENGIE	SmartestEnergy
ESB	SMS Plc
EVBox UK & Ireland	SSE

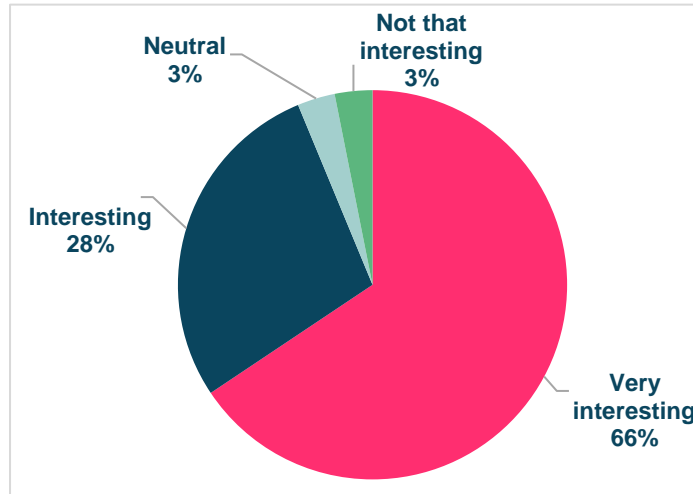


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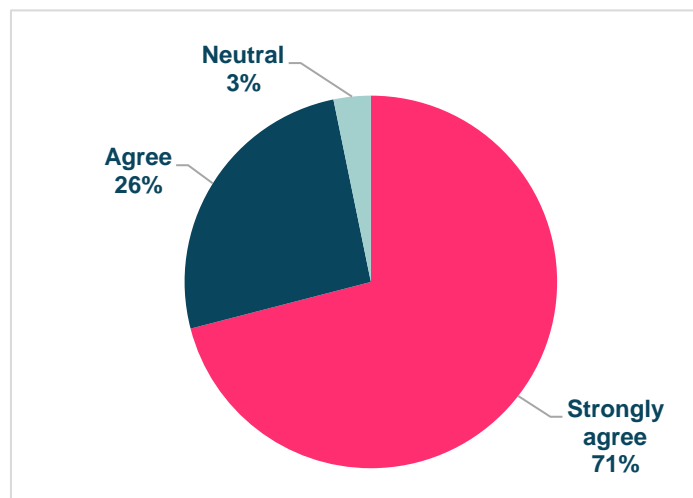
## APPENDIX 2: EVENT FEEDBACK

After the workshop, stakeholders were asked to complete a short feedback form about the event. The feedback was as follows:

### 1. OVERALL, DID YOU FIND THE WORKSHOP TO BE:



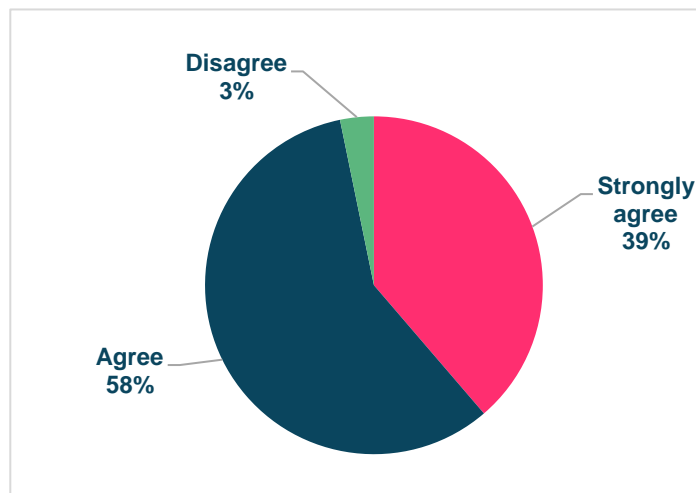
### 2. DID YOU FEEL THAT YOU HAD THE OPPORTUNITY TO MAKE YOUR POINTS AND ASK QUESTIONS?



### COMMENTS:

- “[There was] Plenty of time for discussion. Very good.”
- “Very well chaired and facilitated, gave everyone plenty of airtime.”
- “Perfect combination of table discussions and presenter questions.”

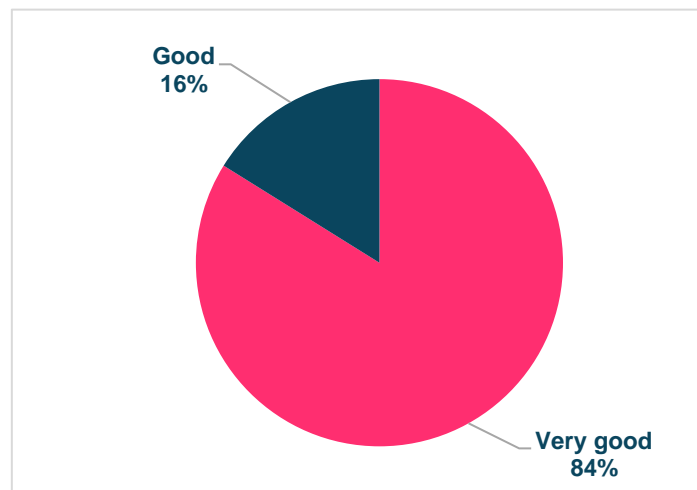
### 3. DID WE COVER THE RIGHT TOPICS FOR YOU ON THE DAY?



#### COMMENTS:

- “Wider connection of the EV topics to other related areas. Other DNO initiatives in the EV area.”
- “[They] need to consider industry frameworks - smart metering settlement, DCUSA, etc.”

### 4. WHAT DID YOU THINK OF THE WAY THE WORKSHOP WAS CHAIRED BY YOUR FACILITATOR?



#### COMMENTS:

- “By having a dedicated chair, tech expert and a scribe separately, the chair and an SME could engage with the group, while a scribe captured discussion. Other workshops fail to effectively capture the discussion.”
- “The discussion between presentations were extremely well-managed, and very productive. The tables were chosen with a good mix of contributors.”
- “[The facilitator had a] good knowledge of the subject and probed in exactly the right areas.”

### 5. ANY OTHER COMMENTS?



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- “Our table facilitator was very good and the mix of people at the table made for some really interesting discussions. Generally, a very well-thought-through event.”
  - “Excellent day. Very well organised, and well worth attending.”
  - “Great networking event. Will attend follow-ups.”

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## APPENDIX 3: Q&A

**Q:** Some of your thinking doesn't seem joined up. With the LV Connect and Manage project, have you looked at the work that UKPN have done and the smart charging architectures they proposed?

**A:** We'll talk about some of those issues today. We're not quite finished with Electric Nation, so it couldn't be included in the EV strategy. Part of today is discussing that strategy. The other thing is that we tried out two different system architectures for smart charging. The point wasn't to prove the technology, it was more about what the customers think of it and what would nudge them to do what we want them to do. UKPN's work is complementary, but it's not duplicating the work.

If there was no appetite for Time of Use, I'd still need to make sure we don't blow fuses on the network. I'd rather have a tariff-led solution and not fit constraint equipment.

**Q:** You mentioned 90% take-up of people who used the system, and 50% of them were using the app. Were the other 50% using timers on the cars? How did that work?

**A:** 50% of the people had the app but didn't use it. It still changed their charging behaviour. Post-trial survey questionnaires show that people understood the tariff was there and if they changed their charging behaviour, they'd get their reward. Some didn't use the app because they thought, "Why do I have to have an app for both my car and my charger?" and others didn't have smartphones. They chose to do the simple thing and use a timer. There are some disbenefits, such as having to remember to turn on the timer on the car to avoid using expensive tariffs. The app was used by a significant proportion of participants.

**Q:** What is WPD's view of vehicle to grid? Do they see it as long term? Does it look promising from what you are aware of?

**A:** It's still a bit early. With vehicle to grid, there is a question about whether it's vehicle to home. I like a solution where a customer has their own generation and storage that runs their home and car. If it means two batteries charging and discharging, that would be great. Hopefully we'll try that in the homes project. Nissan are offering it as a lifestyle choice rather than a solution. I wonder if we'll get to the next stage; if you buy a car on a monthly fee, in an electric world, you buy an EV, and that includes the energy to run your home. Does that change the world and make Nissan an energy supplier? If people are doing it, it helps reduce demand on our network. It would need to be easy and simple for customers.

**Q:** We feel it needs to be consistent and coherent. From what you've learnt, what sort of changes to industry arrangements should be prioritised?

**A:** The questions are, how do we meter energy, and how do we control customers? The first is already changing. If you're charging from a street lamp, there's a chance the energy is measured in a different way. So, it's making the use of energy more convenient for customers. The Connect and Manage kit is fine and it works, but we have to go to customers and ask them if we can fit it. There's a lot more supplier access than network operator access currently, so there needs to be a change there. These two areas would allow us to be more flexible.

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**Q:** In terms of customer controls, you touched on smart metering. There are some in place, DNOs load manage customers, there are dynamic metering schemes. It's not common across the rest of the country, but SMETS2 might change that. How do you see WPD using smart metering and how will the link be established between the universal platform and control of EV chargers? It seems like it should be a common architecture.

**A:** The radio tele switch is all over the place, it will come through the smart meter. It's supplier-led. We will still make use of that, and we make use of controlling the start time, so we've not done reinforcement, that will continue. It's not just Time of Use change, but also a throttling back of EV chargers when I'm monitoring the local substation and see that we're about to hit a peak. So, it might vary. There's an element about the standard Time of Use tariff I think we'll need to have; I think that should be in the smart meter.

**Q:** You can change those times day to day. Ofgem refers to ad hoc capabilities.

**A:** We'll be talking about that after the break. You saw we had a sudden jump at the price boundary in the graph, which is undesirable, so smart meter functionality to phase the switch could be a valuable way of making Time of Use tariffs work. There is some technology available already.

**Q:** Three phase will be fitted in new housing estates. My question is about the benefits case for that. A single-phase connection is between 23kW and 25kW. The benefits are either to offer more than 100A or for extra balance. You don't need more than 100, so is it balance?

**A:** It's a bit of both. There's an element of "Will we get close to 100A?" With three phase, we haven't changed the design of houses for ages. When customers use more electricity, will they need more capacity? Three phase costs an extra few pounds a meter. It futureproofs us. Initially it was more about balancing. We didn't want to push it on to house builders. I don't want customers to move into new houses and in 20 years, we need to dig up their garden. Superfast electricity ties in with superfast broadband. It's about getting ahead. Some more bespoke and eco housebuilders want three phase, as European domestic appliances are built for it anyway. Also, it means they have three times the capacity on the houses for PV. I think it will grow.

**Q:** As a customer, instead of 20 minutes' charging, why should I wait four or five hours? The only reason is cost saving. What if that saving is not significant and I want to ignore it? The difference between off-peak and peak was only a couple of pence per kW in one of our projects.

**A:** It's more about customer behaviour than price. Customers react to price; the behaviour was almost worth more than the value. Stores offer free charging for their loyalty card. It might change behaviour, so some of the change isn't just financial. The change for us will be the suppliers that start offering LCT-type tariffs.



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