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Re: Plan for a Smart, Flexible Energy System – A call for evidence

On behalf of Electricity North West, we appreciate the opportunity to respond to this important call for evidence on proposals for a transition towards a Smart, Flexible Energy System. Our response consists of three elements: this covering letter setting out our thoughts on some of the key elements to facilitate a smart and flexible energy system; Appendix 1 which provides our detailed answers to the questions posed in the Call for Evidence; and Appendix 2 which provides our vision on what a Distribution System Operator (DSO) will look like in the medium to long-term and the steps required to get there.

Collaboration across the sector will be critical to delivering these important changes for customers and we remain committed to our leadership and active support of the various Energy Networks Association (ENA) groups addressing these issues. In particular we see the network code panels and the P2, Transmission and Distribution Interface (TDI) and the TSO[1]:DSO Interface Groups as suitable forums to progress this work.

Appendix 2 provides some further information on our view of what the introduction of a DSO is likely to mean for our customers and stakeholders and is intended to be published in parallel on our website. We have included a copy with this response as it provides wider context for our comments.

In our opinion, there are two key elements that need to be addressed to facilitate a smart and flexible energy system, namely: a clear vision and timetable for the transition to DSO and a fundamental review of charging for the use of electricity networks. Whilst we discuss both of these elements in our answers in Appendix 1, both are so critical that we would like to particularly draw your attention to them.

DSO transition – need for a clear vision and timetable

We welcome the discussion within Chapter 5 of the Call for Evidence (CfE) on the need for DNOs to transition to a role as DSOs but suggest that the current thinking needs expanding to include a number of important additional responsibilities and sharpening into a clear vision.

In our view, the emerging role of the DSO must focus on the effective and efficient provision and balancing of network capacity. By this, we mean that we expect DSOs to deliver

[1] TSO means Transmission System Operator

localised and regional balancing of network capacity to ensure that the users of the networks benefit from the optimisation of existing capacity, without unduly stressing the assets and that the requirement for additional capacity is driven by users' requirements. The key indicators of this will be the technical constraints of the network, such as thermal and voltage limits.

This is a different type of balancing from that undertaken by the TSO and we believe it is important to clearly delineate these roles and responsibilities. With appropriate structures and governance we believe that the actions taken by the DSOs will assist the TSO in maintaining the macro system balance, whilst ensuring appropriate local focus, and providing a more efficient and effective approach to system management.

Clearly such a change will not happen overnight, but equally it is not a simple evolution either. As an immediate response, we believe increased coordination is required between the TSO and DNOs and, to this end, have recently called for significant revisions to the Terms of Reference of the TDI group to make it more effective in delivering this coordination. We also propose that greater consideration needs to be collectively given to the implications of the EU Network Codes by this group and other stakeholders as these Codes will increasingly govern this interface. The UK electricity markets are in many ways more advanced and competitive than those in the rest of Europe and therefore the EU Network Codes need to be implemented in such a way as to enable, rather than frustrate, the development of DSOs within the UK.

We would draw your attention to our responses relating to the need for DSOs and the TSO to have visibility of planned or anticipated contract actions at a technical level to ensure networks do not become unbalanced. Significant work needs to be undertaken on the method for providing a suitable level of transparency to ensure associated enablement costs are efficient. Therefore, we recommend that this is progressed now, whilst the volume of relevant actions is relatively small, to ensure a sufficiently robust and secure system in place before this volume increases.

Going forward, we believe a number of additional roles will emerge for DSOs. In our response to the questions in section 5 of the CfE (Q45 and Q46 in Appendix 1) we have outlined these roles which expand the existing duties of the DNOs to give an increased system, rather than network, focus. The new roles include: provision of network access (capacity); network capacity forecasting; determination of point of connection; determination of appropriate levels of network resilience; assessment of losses; making best use of existing assets; and service provision to other market participants. We also see an increased role for DSOs in identifying the necessary local transmission capacity and for developing local distribution capacity ahead of need within an agreed regulatory framework to deliver effective and efficient capacity provision.

We would welcome the opportunity to discuss these thoughts in more detail.

Fundamental review of charging for the use of electricity networks

The current charging framework for the use of electricity networks has provided an appropriate, albeit often complex, basis for apportioning the costs associated with developing and operating transmission and distribution networks between network users. Differences between the charging frameworks for the transmission and distribution were appropriate at the time of implementation to reflect different network roles and quite distinct uses of the two systems. However, use of the distribution network is changing significantly, raising questions about the suitability of the current arrangements. Whilst some parties are calling for minor, incremental changes to these arrangements, we believe that a longer-term vision for the role of charging in facilitating a smart and flexible energy system is essential to ensure that an equitable and stable charging framework emerges.

We recognise that a fundamental review will require a significant period of time to complete and we therefore propose that such a review is commenced as soon as possible. This will provide visibility of likely future changes to existing and future users of the systems so they are able to change their use of the system in advance of new arrangements coming into place, without the need for complex grandfathering arrangements.

The differences between transmission and distribution network charging are increasing generator concerns, as evidenced by the recent Open Letter[2] on the future treatment of embedded benefits. We therefore recommend that such a review considers charging for both transmission and distribution networks and that the overarching governing principles be applicable to both.

Similarly, we recommend that the review considers both Use of System and Connection charges as the two should work together to provide appropriate signals as to where customers can most readily access the system, as well as the ongoing impact on their use of that system.

We firmly believe that network charges should be cost reflective, although suggest that the current framework does not go far enough to apply this principle. There are, for example, a number of services that users of the distribution network receive, such as voltage stability, power quality and fault level, that are not fully factored into the existing framework. We have outlined our thinking on these aspects in our response to Q19.

In order to facilitate the transition to a smart and flexible energy system, we also believe the charging basis needs to move from the number of units taken from or put onto the system to one based on the amount of network capacity (including the services outlined in Q19) required or used. A large customer with co-located demand and generation may have a relatively small net import or export position. However, such a customer relies on the availability of considerable network capacity to deliver either extreme, as and when it needs to call on it. The customer's demands on network capacity therefore look very similar to its neighbour, an equally large customer that has chosen to not invest in on-site generation. Similarly, in the domestic sector, a household that combines Photovoltaic generation and storage to reduce its net position will require a similar level of capacity in the event that it is unable to generate or use its stored power as its neighbour who does not have such technologies installed. However, the current arrangements would result in much higher network charges for the latter customers in both of these examples. We are also mindful that the total charges to be recovered are largely fixed within a given period and hence such re-apportionment risks increasing charges for those less able to avoid them. Given that vulnerable and fuel poor customers in particular are likely to struggle to access such technologies, we believe it is essential that this issue is addressed to ensure that the burden of network costs does not fall to those least able to afford them.

[2] Available at https://www.ofgem.gov.uk/publications-and-updates/open-letter-charging-arrangements-embedded-generation

We have provided further information on how we believe charging arrangements need to evolve in response to Q19 in Appendix 1 and welcome the opportunity to discuss these with you further.

We hope the above comments assist your process however, we acknowledge that the topics covered in our response are complex and much of the detail is not easily explained within the constraints of this format. To further assist your considerations, we would welcome the opportunity to meet with you and your teams to discuss some of the points raised in more detail. We will be in touch to arrange a mutually convenient time.

If you have any immediate comments or questions, please do not hesitate to contact either myself or Steve Cox (steve.cox@enwl.co.uk).

Yours sincerely,

Peter Emery
Chief Executive Officer

Appendix 1: Our detailed answers to the questions posed in the call for evidence

There are a number of terms that we have used throughout our answers. Typically, these are defined on the first use. However, there are three important concepts that we distinguish here to assist the reader.

Flexibility: This refers to the extent to which a customer is able to change its use of the network in response to an external signal (either from a Network Operator (NO), such as TSO or DSO, or from another market participant, such as a supplier or independent aggregator). It can refer to any technology that is able to change such as controllable generation and Demand Side Response (DSR)[3], as well as responses derived from network assets (such as CLASS)[4].

From a NO's perspective, there does not need to be a distinction drawn between the technologies used to provide Flexibility, provided the level of response can be assured.

Intermittency: This refers to a customer's use of the network and is used in our response to distinguish between those customers who continually use network capacity and those who require it on an intermittent basis. The reason for the intermittency may vary between customers, with some only requiring use because of the inherent availability of a generation technology (eg wind and solar) and others only requiring partial use because they are largely self-sufficient (such as industrial and commercial customers with on-site generation that only require network access during peak periods or generation outages).

Variability: This refers to the extent to which the customer's profile varies as a consequence of factors outside of the energy industry, such as the impact of changes in weather patterns on generation technologies like wind and solar or water levels for hydro.

Questions: Enabling Storage

Q1: Have we identified and correctly assessed the main policy and regulatory barriers to the development of storage? Are there any additional barriers faced by industry? Please provide evidence to support your views.

We believe that the paper accurately reflects the consensus view of storage developers. However, in our view, it is overly focused on battery, similar chemical and kinetic storage systems. This is in part driven by the definitional base point selected for storage.

We are concerned that, whilst such systems undoubtedly have a role to play in the future UK energy system, there is a compelling economic and technical case for a number of alternate technologies. Any consideration of policy barriers must therefore be sufficiently broad in scope so as not to inadvertently introduce additional barriers or discriminate against emerging technologies. For the avoidance of doubt, we do not believe that storage should face any additional preferential or discriminatory treatment when compared to other Flexibility providers.

[3] For the purposes of this definition, it is assumed that storage operations will either look like controllable generation or DSR.

[4] Customer Load Active System Services (CLASS), a means of distribution network voltage control and network management services provided by a DNO to the TSO for the purposes of its system operator residual balancing activity.

For example, some of our stakeholders have indicated that storage would be more useful if combined with other technologies such as intermittent renewable generation. In such examples, storage is used to maximise the capture of renewable energy and regulate its output to the network. In some instances the storage rarely, if ever, imports energy from the network and hence may look quite different to a storage unit that is both importing and exporting.

Other technologies that are emerging rapidly include mains gas power fuel cells operating as base load generators in Germany, Japan and South Korea.

Q2: Have we identified and correctly assessed the issues regarding network connections for storage? Have we identified the correct areas where more progress is required? Please provide evidence to support your views.

Paragraph 4 on page 26 of the Call for Evidence (CfE) recognises that the connection characteristics of storage projects vary based on the use of the storage. Our experience to date is that this is what causes many of the issues regarding lack of clarity at present. Where storage developers are unable to specify their operating characteristics, Distribution Network Operators (DNOs) have to assume the maximum import and export requirements set out in the connection application and therefore the connection costs can be higher than would otherwise be the case. If some degree of curtailment can be accommodated by the developer, then much cheaper connections may be available. In our experience, storage developers typically want to keep all options open as they often do not know at the time of connection application what services they want to provide. If they are able to specify their operating requirements then we are better placed to work with them to develop a network connection that meets their requirements. Without this clarity it is difficult to understand how 'flexible connections' would be of benefit.

The definition of storage is key to avoiding barriers. In our view storage should not, in and of itself, be separately defined. Instead it is more important to look at the type of Intermittency and Flexibility that reflects the intentions of the developer. We therefore see standalone batteries as a co-located demand and energy source. In the example of co-location with Distributed Generation (DG) it is a regulating medium akin to a fuel bunker. The barriers identified in the CfE are in the main related to charging issues. These in turn are driven by questions over how intermittent demand and generation should be treated under charging structures both of which are much broader issues applying to many other types of customers

We believe that Intermittency, not power flow direction (i.e. import or export), is the key policy question and that this applies to numerous issues arising from ongoing work such as the review of the network planning standard, P2[5].

For example generation operators have long held the view that the presence of DG creates a network benefit. This is at one level true but the variability of resources such as wind significantly detract from the reliability of their output, particularly over longer time periods, and hence offer reduced value to network operators when assessing their contribution to balancing demand and generation. Such issues are generally improved from a network stance with technology, energy source and geographic diversity but Intermittency remains a key issue.

Where storage is combined with DG, it is at the customer's discretion to determine what import and/or export capacity it requires. The customer can request only one, such as export, to smooth its export profile with the storage effectively 'behind the meter'. This approach might also enable generation typically considered too variable to participate in certain ancillary services to enter these markets. It is also clear that the combination of technologies offers greater potential for network benefits. We note that existing DG connections offer a route to low cost connection points for storage operators and can be

[5] http://www.dcode.org.uk/dcrp-er-p2-working-group.html

readily facilitated by bi-lateral operator access contracts, subject to the operator applying for a modification to the existing connection through the normal processes.

We are unconvinced that it is in wider customers' interests for DNOs to particularly promote storage (or any other technology). However, we do envisage as we transition to a DSO world, that greater flexibility in how connection queues can be managed, such as 'matching' load and generation connection applications and offering connections contingent on both connecting, will be utilised.

Q3: Have we identified and correctly assessed the issues regarding storage and network charging? Do you agree that flexible connection agreements could help to address issues regarding storage and network charging? Please provide evidence to support your views, in particular on the impact of network charging on the competitiveness of storage compared to other providers of flexibility.

In line with other DNOs, we use the common methodologies of the EHV Distribution Charging Methodology (EDCM)[6] and Common Distribution Charging Methodology (CDCM)[7] to charge for the use of our system. As the names suggest, the EDCM and CDCM are common methodologies across GB with open governance in place for industry parties to propose appropriate modifications. Exports of energy (typically generation) onto our network attract credits and we are currently treating export from storage facilities/ devices in the same manner.

As stated in the CfE, we currently have the options of classifying the generation export as non-intermittent or intermittent. The decision on which classification to opt for is based on our understanding of the proposed use of the generation facility and experience of its use. As we have little experience of the operating regime for these types of network user, we would be initially guided by the owner of the facility.

The issues identified for storage are identical to those of the charging treatment for power flow Intermittency for generators, demand and other bidirectional installations. Finding a successful solution to these common issues is we believe the key challenge, not simply resolving the issue for storage. Such an approach would recognise the value that Flexibility brings across the network. For example, a controllable demand can be as valuable in local balancing as a battery installation. It is therefore inappropriate in our view for charging to be based simply on Maximum Import Capacity (MIC) / Maximum Export Capacity (MEC). The capability and contractual framework to schedule such power flows could be reflected in reduced charges for such customers.

It is important to consider that where customers contract with several parties to provide Flexibility then the value to any one party may be reduced. For example a storage operator contracted for frequency response may not adopt an operational pattern of value to the local network operator. Conversely where the operator maintains their flexible capability then they offer much greater value. We therefore conclude that in order to ensure that customers receive optimum value from Flexibility that the extent of Intermittency, not technology type, should be the primary policy consideration.

The value of Flexibility has been proven in numerous trials and business as usual implementations such as Active Network Management (ANM), and post fault demand reduction contracts such as C_2C[8] already deployed at scale. These flexible connection agreements already offer customers benefits but coupled with revised charging arrangements would unlock further opportunities and benefits.

[6] For customers connected at extra high voltage.
[7] For all other customers.
[8] C_2C contracts were developed as part of our Capacity to Customers project. More information is available at: http://www.enwl.co.uk/c2c/about-c2c

We strongly advocate cost reflective and fair recovery of network costs and believe it is essential that this philosophy is applied to all technologies. We therefore agree that, unless a customer chooses to have some level of curtailment on their operating pattern as described above, storage should pay for both import and export capability onto the networks.

Q4: Do you agree with our assessment that network operators could use storage to support their networks? Are there sufficient existing safeguards to enable the development of a competitive market for storage? Are there any circumstances in which network companies should own storage? Please provide evidence to support your views.

We agree that NOs can use storage or indeed other sources of Flexibility to assist in balancing local networks.

However storage is one of many potential solutions and NOs must act in the long-term interests of customers in selecting the most appropriate solution. We note that Cost Benefit Analysis (CBA) of the various methods available suggests at this point in time the Flexibility value derived from storage is relatively uncompetitive versus alternatives. Whilst storage may have wider system benefits, its network benefit versus even traditional assets such as circuits is currently unattractive. We are also mindful of DNO obligations to act in the interests of their customers, which may not always align with the interests of potential service providers.

For the avoidance of doubt, we believe that DNOs should only contract for the use of storage where it is the most efficient and effective solution to a given issue arising or forecast to arise on their network. To date, no example of it being in the best interests of our customers has arisen within our geographical area.

The value derived by the DNO from storage is of course completely separate as an issue from the charge that an operator should pay for network usage.

We believe that there are no systematic barriers to the development of a competitive market for storage. We would see such a market encompassing all flexible recourses and again we would reiterate the need to be technology agnostic in the development of such markets.

We do agree that in some rare instances, normally associated with unusual network configurations such as very remote communities or very high levels of residential customer generation, it may be appropriate for the NO to develop and own storage.

We note that recent EU Winter Package introduced the concept that storage ownership by NOs should be time limited and require regular market testing of divestment of such assets to independent operators. In effect, the NO should be allowed to be a storage owner of last resort where storage offers the most economic solution to customers but is not in itself sufficiently commercially attractive to attract independent ownership. We believe such an approach has merit in the early days of storage deployment; as it allows network issues to be resolved promptly and customers to benefit from longer-term competition in ownership.

Q5: Do you agree with our assessment of the regulatory approaches available to provide greater clarity for storage? Please provide evidence to support your views, including any alternative regulatory approaches that you believe we should consider, and your views on how the capacity of a storage installation should be assessed for planning purposes.

In our view it is important to allow time for other technologies and solutions, such as mains gas fuel cells and community energy systems to emerge and mature before any primary legislation is enacted. In our view, option b offers the most practicable solution whilst avoiding primary legislation.

We are unconvinced that there is a need to introduce a flexibility licence class as this may result in some participants effectively requiring two licences for the same root activity which is likely to increase, rather than decrease, regulatory burden and may deter some emerging solutions/participants.

Q6: Do you agree with any of the proposed definitions of storage? If applicable, how would you amend any of these definitions? Please provide evidence to support your views.

We note that the definition of storage used in the Capacity Market and the definition proposed by the Electricity Storage Network are very similar, with the latter definition being more generic. The Capacity Market definition is clearer that it is only 'imported' electricity that is converted into another energy form and both definitions are silent on the final use of the electricity generated.

Storage installations should, in our view, be included separately within the definitions of generation (under option b above) and demand. The two halves of storage activity (i.e. import and export) have very different effects on networks and it would be inappropriate and potentially costly to assume that timing signals from other parties such as the TSO will necessarily align with DSO balancing needs.

In ongoing work such as P2 and charging discussions the primary policy issue is the treatment of Intermittency.

We are currently leading the P2 review and expect that as part of the work to be undertaken, the DNOs will develop technical definitions of Flexibility and Intermittency (and the various aspects associated with these terms) further to allow implementation and realisation of the benefits of the various technologies available including storage.

It is of note that the P2 work demonstrates clearly that Flexibility and the appropriate treatment of Intermittent resources can release very significant network capacity (in the order of several billions of pounds in value) for the adoption of Low Carbon Technologies (LCTs)[9].

Questions: Aggregators

Q7: What are the impacts of the perceived barriers for aggregators and other market participants? Please provide your views on: balancing services; extracting value from the balancing mechanism and wholesale market; other market barriers; and consumer protection. Do you have evidence of the benefits that could accrue to consumers from removing or reducing them?

Independent aggregators have the potential to be a market model for collating Flexibility but they are likely to appeal to some groups of customers more than others. We are seeing evidence of interest in other market models such as community energy and localised 'self-balancing' arrangements that choose to not use a third party to aggregate their positions. These latter customer groups tend to be more informed of market requirements and opt to retain the full value of their Flexibility rather than pay a margin to Aggregators. We note that such groups are much more prevalent in other European countries and offer significant value to their NOs.

As described above in relation to storage, we therefore believe it is essential to focus on the solution that the Flexibility provider (including an aggregator) is offering to NOs and ensure a level playing field on these grounds, rather than focus on the needs of a particular sub-set.

[9] LCTs include a wide range of generation and demand technologies that have a lower carbon emissions impact that those they seek to replace.

Q8: What are your views on these different approaches to dealing with the barriers set out above?

Focusing on the solution that flexibility providers are responding to and ensuring that there is a level playing field for all potential participants is, in our opinion, a more appropriate approach to addressing barriers and ensuring the long-term interests of customers are met.

Q9: What are your views on the pros and cons of the options outlined in Table 5? Please provide evidence for your answers.

We believe that the watching brief approach is the most preferable of those set out as it is likely to provide the greatest responsivity to issues as they arise. Both industry-led change and regulatory involvement are likely to take some time to progress and run the risk of being out-dated before they are fully implemented. Watching brief, with the ability to seek derogations from Ofgem where necessary to assess whether modification really delivers the anticipated benefit, is we believe likely to lead to more timely interventions and increase the rate of progress.

Q10: Do you agree with our assessment of the risks to system stability if aggregators' systems are not robust and secure? Do you have views on the tools outlined to mitigate this risk?

At present, we do not have evidence of sufficient uptake that is likely to result in the system stability issues highlighted. We are therefore unconvinced by the arguments put forward to date. We are mindful however that as flexible capacity grows in volume this should be kept under review.

Chapter 2: additional comments

Chapter 2 focuses predominantly on concerns expressed by certain providers of Flexibility services in relation to perceived and actual policy and regulatory barriers. We recognise that they are valid concerns to these parties but believe it is important to flag that there are a subset of the future Flexibility spectrum and hence policy reforms should focus on the wider issues. Equally there are other material policy and regulatory barriers which we believe need to be addressed as a priority to enable a smart and flexible energy system.

The first of these is the ability of DNOs to charge Assessment and Design (A&D) fees for connection applications. We recognise the work currently being undertaken, particularly by BEIS, to look at this issue. The current approach enables potential developers to submit a high number of speculative applications, the costs of which are then borne by those parties who do proceed to accept a connection application. This limits our ability to provide a more bespoke service due to the sheer volume of applications received, particularly prior to tender and auction windows, and results in a sub-optimal service to connecting parties.

Linked to this, but not being considered at present, is the ability of parties to 'bank' capacity by accepting a connection application for a given capacity but then only using part of this. This has the effect of increasing network reinforcement costs for all other customers as NOs must assume that the banking party will, at some time, utilise the remainder of their contracted capacity and hence the NO needs to size its network accordingly. This issue could be resolved by either allowing DNOs to remove unused capacity after a fixed period of time or by incentivising the DNOs to be less risk averse and to apply a risk or diversity-based approach to its assessment of available capacity.

Finally, as set out in our covering letter and in response to Q19, it is our view that the current approach to electricity network charging acts as a significant barrier to enabling a smart and flexible energy system and we expect the impacts of this to be further exacerbated as the transition progresses. We therefore recommend a full and holistic review of network charging.

Questions: System value pricing

Q11: What types of enablers do you think could make accessing flexibility, and seeing a benefit from offering it, easier in future?

We consider that the arguments presented in the paper illustrate an underlying strategic need for visibility of contracted trades with Distribution-connected customers which give rise to changes in demand (or generation output) and hence energy flows enacted by commercial means.

As we move to a TSO - DSO regime, Flexible resources will be called upon for a range of services and obligations ranging from connection capacity management through ANM to participation in balancing markets.

This Flexibility relies on the underlying network (both transmission and distribution) being of sufficient capacity (net of any flexible capacity) to ensure reliability of power supplies to customers.

It is our view that as the proportion of Flexible resources (including DSR) increases that the TSO and particularly DSOs will need, at the very least, visibility of actual and contracted capacity positions. For example, a DSO considering the contribution of an embedded generator (including a storage installation) to network security and capacity would need to analyse both historic operating patterns and future contracted obligations. Without this visibility, forecasting network requirements including Flexible capacity needs will become increasingly difficult. Further, without such visibility, there is a risk that NOs will be unable to accurately forecast power flows and hence network capacity management measures (investment and commercial means) may be excessive or worse insufficient.

In order to ensure customers receive the optimum benefit from Flexibility across the energy supply chain we recommend that early consideration be given to enabling visibility of power flow and energy changes arising from use of Flexibility, particularly as the establishment of a platform to facilitate this will not be a small undertaking. We note that forthcoming European legislation requires a number of similar data flows between parties but, to date in the UK, there has been no substantive work on how this will be enacted.

In some instances, we believe that uncoordinated actions such as demand turn up / down may risk network instability (as opposed to system instability (as defined in section 68)) and hence impact local supply security. We believe there is therefore a need to ensure DSOs have visibility of and in some scenarios may need to approve (or at least have rights to veto) power-flow change commitments. This is an important market safeguard without which, for example, SO commercial actions could cause localised network failures. We recommend that consideration be given to affording DSOs such powers to ensure customers are not exposed to such risks to supply reliability.

Such visibility may not necessarily need to include commercial matters such as price but would include physical parameters. Regardless, NOs must have sufficient information to enable them to estimate the probability, timing and quantum of Flexibility contracts being triggered by other parties.

We agree that to ensure customers receive optimum value that a whole system approach to capacity management is needed. This is recognised in recent EU legislation requiring greater interchange of information on power flows between TSO and DSOs. Whilst these changes assist the TSO, they are not as yet mirrored in data flows into the DSO from aggregators, suppliers and customers, or from the TSO to the DSO. We believe that constraints are most likely to occur in the distribution networks and hence should be enabled by policy as soon as possible.

We believe the paper accurately identifies that price signals alone will be insufficient to ensure network stability in a future with a much higher proportion of Flexible resources. This conclusion supports the need for improved visibility of likely power flow positions and a 'post gate closure like' mechanism for DSOs to be able to balance distribution networks.

We would welcome the opportunity to explain our specific proposals in more detail.

Q12: If you are a potential or existing provider of flexibility could you provide evidence on the extent to which you are currently able to access and combine different revenue streams? Where do you see the most attractive opportunities for combining revenues and what do you see as the main barriers preventing you from doing so?

Through the commercialisation of our CLASS project, we have some direct experience of entering into the Flexibility market. Whilst CLASS is not yet fully deployed, we have undertaken significant work to understand the potential revenue streams associated with providing balancing services to the TSO. We do believe there are opportunities to combine revenue streams but this needs to be carefully balanced against the risk and necessary consequences of non-performance if a Flexibility provider fails to deliver. However, there may be scope to relax these consequences to an extent once a new solution has been successfully deployed and assured.

Q13: If you are a potential or existing provider of flexibility are there benefits of your technology which are not currently remunerated or are undervalued? What is preventing you from capturing the full value of these benefits?

No response.

Q14: Can you provide evidence to support changes to market and regulatory arrangements that would allow the efficient use of flexibility and what might be the Government's, Ofgem's, and System Operator's role in making these changes?

Please see our comments in 11 above relating to visibility and efficiency.

Questions: Smart Tariffs

Q15: To what extent do you believe Government and Ofgem should play a role in promoting smart tariffs or enabling new business models in this area? Please provide a rationale for your answer, and, if you feel Government and Ofgem should play a role, examples of the sort of interventions which might be helpful.

A requirement on energy suppliers to provide a clear breakdown on customers' bills of the breakdown between network costs and energy costs would be beneficial to promoting the development of Flexibility. At present, only the largest customers get visibility of their proportion of their end bill associated with using the networks. Being able to explain to customers how being involved in providing Flexibility (or not) will directly impact on their end bill will, in our experience, greatly assist customers in deciding whether or not to engage in this area.

Q16: If deemed appropriate, when would it be most sensible for Government/Ofgem to take any further action to drive the market (i.e. what are the relevant trigger points for determining whether to take action)? Please provide a rationale for your answer.

No response.

Q17: What relevant evidence is there from other countries that we should take into account when considering how to encourage the development of smart tariffs?

No response.

Q18: Do you recognise the reasons we have identified for why suppliers may not offer or why larger non-domestic consumers may not take up, smart tariffs? If so, please provide details, especially if you have experienced them. Have we missed any?

Our work on C_2C and Respond[10] shows that commercial customers, particularly but not exclusively generators, will readily enter into Flexibility contracts at the time of connection to the network. This is predominantly driven by their willingness to offer Flexibility in return for reduced connection costs. Once a customer has accepted a Flexible connection they are often willing to offer that Flexibility into other markets either directly or via their Supplier via a Time of Use (ToU) tariff or independent aggregator. Their view on Flexibility is then often much more developed than would be the case if driven by a smart tariff signal alone.

Whilst we recognise the reasons for latency in legacy customer take up of Flexible tariffs, our experience suggests that this will change over time as new customers connect or when existing customers revise their connection arrangements. In our use of DSR as an efficient alternative to traditional reinforcement, whilst its availability can be restricted in certain circumstances, we have not encountered any significant difficulties in securing customer participation in network balancing contracts.

We agree with the approach of focusing on enablement at this point in the markets development.

Questions: Smart Distribution Tariffs: Incremental change

Q19: Are distribution charges currently acting as a barrier to the development of a more flexible system? Please provide details, including experiences/case studies where relevant.

In considering changes to charges, it is important to fully appreciate the spectrum of services customers receive from the network connection. We believe the debate as outlined in the CfE paper has not considered all of these services. A number of factors are relevant to the development of the network, customers' usage of it and hence charging decisions. Our thinking on how these should be factored into a future charging framework is provided below.

Charges have historically been set on a maximum demand basis, however electricity consumption (as this is the quantity being measured) has been used as a means of charging as a proxy for demand. This was a reasonable assumption where customer load profiles were similar which is becoming less valid which more generation being connected behind the meter. These reflect to the maximum capacity costs and to some extent the costs of other services costs we also provide.

A network connection affords the customer voltage stability without which its private network, either as a householder or business user, may be overstressed or suffer brown outs. The flow and management of reactive power is the means by which this stability is delivered to customers. As customers adopt DG and storage, the problems of voltage management can come to dominate reinforcement costs. This effect is already being seen on transmission systems and is rapidly emerging on distribution systems where more active voltage stabilisation is already needed. Perversely as consumers consume less energy from the network, voltage control becomes more challenging and is set to become more expensive. This effect is very difficult to regulate via volumetric tariff signals as even if the customer has

[10] http://www.enwl.co.uk/respond/about-respond/what-is-respond-

zero power flow the effect is still manifest. Voltage stability is therefore more akin to a standing charge arrangement.

Similarly, fault level provides customers with the ability to turn loads on, particularly rotating loads without experiencing power quality difficulties. Fault level is provided continually from the network even where the customer has zero net power flow and can be considered to be like a flywheel allowing changes in demand to be accommodated smoothly. If a customer ran disconnected from the grid with say PV supplying their demand then in the event that they turned on a load such as a washing machine their power supply would collapse. Off grid operation can be achieved by incorporating expensive control equipment but fault level services from networks offer this flexibility much more efficiently. Again this service is not volumetric in nature.

Power quality is the term used to describe the uniform smooth nature of the supply voltage provided to customers. Many new devices such as invertors, vehicle chargers and even modern appliances are based on DC technologies and degrade power quality. In addition they are in themselves very sensitive to power quality and can fail in operation if power quality exceeds their design limits. This smooth regulation of power quality is achieved through network investments (including more active smart technologies such as meshing and active correction devices) and again will increase as the above customer technologies proliferate. Again power quality management and investment needs are not related to energy flow volumes or peak demand.

The above factors will come to increasingly dominate investment driven by appliance technology; customers generating and storing their own power; and the proliferation of energy sources on the distribution system. It is difficult to see how such costs could be equitably apportioned through simple capacity or energy ToU tariffs. We would see these cost best apportioned through a network access charge system. Conversely charges associated with simple capacity usage could be apportioned through ToU tariffs.

Our work and that of others supports the conclusion that residential and many SME customers are relatively insensitive to ToU signals unless they are very significant; typically a factor of ten is needed to illicit a response. We share the view that appliance technologies and automated home energy control systems are much more successful in allowing customers to respond to price signals and will play an important future role in enabling customers to benefit from flexibility. We also note that a number of these systems are now mature and deployed at scale around the world, although adoption in GB remains limited.

We are concerned however that, whilst they are readily accessible to more affluent customers, there is a risk that customers on lower incomes or those who are less comfortable with such technologies will be disproportionately disadvantaged. This is an important social and customer affordability issue given the challenges faced by fuel poor customers.

We also note that distribution charges are relatively small versus total energy costs, or the cost of energy generation / storage for those customers choosing to self generate. Given the changes in investment drivers outlined above, our conclusion is that distribution charges for residential and SME customers will need to incorporate some form of fixed charge coupled with a Maximum Demand (MD) based charge. We also believe that a volumetric collection methodology alone would not equitably apportion charges between customers. The current charging issues incentivise more affluent customers to avoid a significant proportion of network costs. In our view, there is a need to resolve the above points to ensure all customers pay a fair and reasonable charge for the services they receive.

Q20: What are the incremental changes that could be made to distribution charges to overcome any barriers you have identified, and to better enable flexibility?

We do not believe incremental changes to distribution charges are likely to overcome the barriers identified, unless they are developed as part of a more holistic piece considering all aspects of charging for use of the electricity networks. We therefore recommend that a fundamental review of charging, looking across transmission and distribution as well as between different customers, be undertaken as a matter of priority. Prior experience suggests that there will be a significant lead-time associated with a review of this nature and that it is likely to require some strategic leadership and direction from Ofgem/BEIS to deliver meaningful change to facilitate a truly smart and flexible energy system.

Incremental change is likely to focus only on those problems which are easiest to solve and this is unlikely to result in the wholesale change we believe is required.

We welcome the opportunity to discuss further how this may be achieved.

Q21: How problematic and urgent are any disparities between the treatment of different types of distribution connected users? An example could be that that in the Common Distribution Charging Methodology generators are paid 'charges' which would suggest they add no network cost and only net demand.

The Common Distribution Charging Methodology should not be looked on in isolation from the Common Connection Charging Methodology, the same basic principles apply to all users. At the time the methodologies were developed there was little evidence of generators driving costs and these assumptions were built into the modelling. It is a relatively easy process to identify areas which are generator dominated and to ensure that in the first instance generators did not received credits in these areas; charges could also be identified where generators are beginning to cause network reinforcement. However, focussing on such incremental changes could detract from the wider review of charging that is required.

We are not seeing a significant challenge in our area from the existing arrangements now but we do recognise this may be creating unhelpful commercial incentives in other parts of the network that are already predominantly exporting and expect this to become increasingly problematic as we move forward.

We believe that whether this continues to be the most appropriate approach for distribution charging should be considered as part of a more holistic review.

Questions: Smart distribution tariffs: Fundamental change

Q22: Do you anticipate that underlying network cost drivers are likely to substantively change as the use of the distribution network changes? If so, in what way and how should DUoS charges change as a result?

Please see our response to 19 above in relation to the changing nature of cost drivers.

In addition, we are beginning to see increased interests from parties in being 'self-balancing' between sites as opposed to installing private wires networks. We welcome this development and believe it is likely to be in the longer-term interests of all customers if appropriately treated. We are therefore working with Ofgem on a potential derogation to allow us to trial a variation to the common charging methodologies to help us better understand the commercial impacts for our customers and how this should be appropriately incorporated into charging to the benefit of all customers.

Q23: Network charges can send both short term signals to support efficient operation and flexibility needs in close to real time as well as longer term signals relating to new investments, and connections to, the distribution network. Can DUoS charges send

both short term and long term signals at the same time effectively? Should they do so? And if so, how?

Network charging, to be practicable, needs to give broad signals to users as a whole on the costs of using the network at different times. These are likely to reflect the longer term signal associated with using the network. These could be complemented by additional charges/ credits which encourage specific users to provide flexibility in the short terms to reduce network costs overall.

We would see network charges based on a fixed and volumetric basis as described above. However we would see Flexibility and Intermittency as key value drivers. We would envisage these being proportionately reflected in a future DUoS charge.

Q24: In the context of the DSO transition and the models set out in Chapter 5 we would be interested to understand your views of the interaction between potential distribution charges and this thinking.

We have attempted to set out our view on why a fundamental review of charging for the use of electricity network is required to facilitate a smart and flexible energy system in our covering letter. However, we recognise that this is a complex area and we welcome the opportunity to discuss our emerging thoughts on how we think distribution charging needs to evolve to reflect customers' use of the network and their interactions with a DSO.

Questions: Other Government policies

Q25: Can you provide evidence to show how existing Government policies can help or hinder the transition to a smart energy future?

Our primary objective as a network operator is to ensure that customers are able to use or generate power as they wish in a safe and secure manner.

To this end our primary concern over government policy is the assurance of visibility of changes in behaviour stimulated by tax policy or other incentives. For example, DNOs have little visibility of the location of EVs charging at home or of Heat Pump installations. Without this there is a significant public safety risk arising from overloading of equipment in customers' premises as evidenced by a number of recent events in our company involving excessive un-notified EV charging loads.

Recent experience has shown that insufficient thought has been given to ensuring such visibility with an over-reliance on installer notifications. In our experience, incentives offer a much more reliable route to notification to the DNO who can then act in the customers' interest to ensure safety and adequacy as required by the ESQCR and IET wiring regulations.

Whilst we recognise the concerns from some quarters in terms of how such notifications interact with data privacy concerns, we do not believe these concerns regarding data privacy should be allowed to endanger customers. We consider that the dangers to customer safety arising from an inadequate notification process have the potential to significantly inhibit wide scale adoption of LCTs.

We also note that incentives can produce large and sometimes concentrated adoption of technologies by customers. Residential Photovoltaics (PV) are one of a number of such

examples. Whilst these changes are of considerable assistance in achieving transition, it is important to appropriately balance pre-planning and the rate of transition.

We also note that many innovation projects (such as our Smart Street NIC project[11]) have shown that existing networks can, when overlaid with smart devices allowing meshing and other techniques, accommodate much more DG and indeed demand than previously thought possible. This learning facilitates more rapid roll out of LCTs in response to Governmental incentives. However, the DNO still needs notification of connection to allow these techniques to be deployed in a timely manner.

Historically, we have experienced a significant impact on connection application volumes when there have been significant changes in Government policy. Policy has, at times, changed quicker than many players have been able to respond to. Increased visibility of future policy changes would be likely to prevent such unintended consequences.

We have also seen certain behaviours, such as the 'banking' of capacity as an unintended result of Government policy. To maximise incentives, some developers have been reluctant to commit to full connection costs prior to securing planning which led to DNOs accepting a reduced payment on acceptance of a connection offer. This had led to some developers accepting and 'banking' capacity to the detriment of others in the connection queue. Whilst this can be addressed to an extent through the use of milestones, it remains a significant challenge to release underutilised capacity when a customer does not proceed to use the full contracted capacity.

Q26: What changes to CM application/verification processes could reduce barriers to flexibility in the near term, and what longer term evolutions within/alongside the CM might be needed to enable newer forms of flexibility (such as storage and DSR) to contribute in light of future smart system developments?

All types of demand side response present challenges as to how the response is measured when the underlying demand is changing. This is true for both the CM and other markets such as balancing services and in providing DSR to DSOs. The agreement of a consistent approach to measurement and verification across all potential market for DSR and storage would help reduce barriers.

Q27: Do you have any evidence to support measures that would best incentivise renewable generation, but fully account for the costs and benefits of distributed generation on a smart system?

In our work on P2, we are leading the change in industry design policies to allow DNOs to more fully recognise the contribution of DG to network capacity and security. Our work to date has shown that DG can, if appropriately located, make an important contribution to networks.

It also shows that supply reliability and capacity are in fact closely related and interlinked by the intermittency consideration described above. From a network perspective, other than intermittency, there is no significant difference between capacity provided by DG, storage or traditional circuit assets.

These conclusions and supporting evidence are outlined in the WS8 Phase 1 outputs report shown on the Distribution Code website.

Once phase 2 of our work has been completed, the relationship between Flexibility, Intermittency, DG and location will be more evident and form a basis for the derivation of an apportionment methodology for costs and benefits. Pending this work, we do not believe there is yet a clear quantifiable relationship and hence it would be premature to modify structures at this time.

[11] http://www.enwl.co.uk/smartstreet

On a broader note, we believe that measures to incentivise LCTs should be explicit. One legitimate criticism of the current use of 'embedded benefits' is that they are not explicit and require a reasonably good understanding of industry processes to be able to quantify their impact. As such, we do not believe this is an appropriate approach to deliver a smart and flexible system for the future.

Questions: Smart appliances

Q28: Do you agree with the 4 principles for smart appliances set out above (interoperability, data privacy, grid security, energy consumption)?

We believe that the principles set out are sensible and an appropriate first step.

It is important in such areas to facilitate customer adoption by provision of suitable structures such as interoperability. However, customers derive significant value and convenience from such appliances, far beyond the energy costs associated with running their white goods, so we would not support withdrawal of non-smart appliances for those who do not wish to pursue this option. We are also mindful of affordability for vulnerable and low income customers.

Of equal significance is the adoption of energy efficient appliances by customers. For low income customers, we would propose a role for DNOs in assisting customers in energy efficiency measures. The current UK energy efficiency focus is, in our view, inadequate and efficiency measures have an important role to play in the future of both networks (reduction in appliance consumption leading to reduced reinforcement requirements) and the wider energy sector.

There are a range of options available to make appliances even smarter whilst simultaneously reducing energy consumption and we would welcome the opportunity to discuss how DNOs could assist with this goal.

Smart plugs may be an appropriate and efficient means of enabling appliance participation while waiting for appliances to go through their life cycle to replacement. A number of trials have shown these to be effective and we note that a number of manufacturers have developed home automation by means of smart plugs, although uptake to date has been slow in GB.

Q29: What evidence do you have in favour of or against any of the options set out to incentivise/ensure that these principles are followed?

Food labelling provides a useful benchmark that shows that labelling works for some societal demographics. Any approach based on labelling should include customer education; as success will be dependent on customer knowledge, acceptance and uptake. There is a potential opportunity to link energy in to the Digital Britain initiative. Increasing digital proficiency of UK citizens will assist our customers to more fully understand their future energy choices and to be able to participate in the increased digitalisation of their energy services.

Regulation of appliances can only practicably occur within a European manufacturer framework and based on a defined service set. European smart trials in this area have shown that Electric Vehicle (EV) chargers (NEDO Smart Malaga EVs) and Heat Pumps (Smart Lyon trail) can be readily controlled at sufficient scale to provide useful and economically efficient services to DSOs and TOs. We would point to regulation of heating appliances in SSE as further evidence of the viability of appliance flexibility. However we have not seen any evidence yet internationally or within the UK that regulation of other less power intensive appliances is justified by the benefits.

Q30: Do you have any evidence to support actions focused on any particular category of appliance?

Our work on community engagement shows that energy efficiency support and education are effective in changing appliance usage patterns and in some instances can deliver significant energy and peak demand reductions. This work suggests that wet appliances (laundry

appliances, dish washers etc) are the most suitable for modification of time of usage whilst cooking and heating loads are suitable for absolute energy reduction.

Q31: Are there any other barriers or risks to the uptake of smart appliances in addition to those already identified?

The adoption of smart appliances requires a range of customer support measures including information provision, technical advice and ongoing support. In the early stages of adoption, it is important that suitable support is available from a trusted local source. We consider that DNOs are well placed to provide such support and can in addition provide locational focus to maximise network benefits.

Media reaction to smart appliances should not be underestimated. Historically, there has been some alarmist headlines linked to the development and demonstration of smart appliances which could undermine customer acceptance of these developments, 'Coming soon: the fridge that power chiefs can switch off to save energy' (Mail on Sunday, January 2009)[12]. Such a response could unduly undermine trust in the sector. It is therefore essential to demonstrate the benefits of such appliances in a manner that builds trust and provides customers with choice and an understanding of the purpose of smart appliances to counter any negative coverage. Equipping 'champions' to engage with their neighbours and peers within communities can also help to overcome some of these challenges.

Q32: Are there any other options that we should be considering with regards to mitigating potential risks, in particular with relation to vulnerable consumers?

Adoption of smart appliances by fuel poor and vulnerable customers will require additional support and could require funding assistance. DNOs are again well placed to provide these services and are not compromised in terms of their obligations or competition. We would envisage an enduring role for DNOs as they evolve to DSOs in facilitating both energy efficiency and smart appliance adoption.

Questions: Ultra Low emission vehicles

Q33: How might Government and industry best engage electric vehicle users to promote smart charging for system benefit?

We consider the wide scale adoption of electric vehicles to be one of the most significant and imminent challenges faced by our business.

We note that, without smart chargers, EV demand is simply inaccessible as a source of DSR and that chargers can represent a significant additional cost for customers especially when combined with vehicle purchase costs.

The correct installation of chargers is a very important customer safety concern and there have been a number of examples of independent installations where service termination equipment has been overloaded or earthing is not adequate to ensure safety.

We welcome and note the IET's work in developing standards in this area. However, in our experience to date, installers have not demonstrated a high level of compliance with notification requirements. As part of RIIO-ED1 policy setting, we promoted the arrangements that reinforcement costs associated with residential customer adoption of LCTs should be socialised via DNO reinforcement allowances. In a similar vein, we recommend that DNOs

[12] http://www.dailymail.co.uk/sciencetech/article-1111745/Coming-soon-fridge-power-chiefs-switch-save-energy.html

be allowed to take a lead in the funding, installation and management of charging infrastructure for residential customers. This would provide safety reassurance for customers and be of considerable assistance in ensuring EVs are connected via smart chargers. However, it may not be possible under the current proposals within the EU's Winter Package. We therefore urge that such opportunities to provide a safe and cost effective route to the deployment of such technologies are not precluded by any final legislation.

Public sensitivity to safety is an extremely important factor in assisting the transition to EV usage. Issues such as service termination fires or potential electrocution arising through inadequate earthing or inadequate load assessments have the potential to damage public confidence and we see DNOs as having an important role to play in delivering the equipment needed in a cost effective and safe manner.

In some respects, the first roll out of EVs represents the most significant opportunity to secure access to this very material source of DSR and we urge a coordinated approach to provision of these key assets through the funding mechanisms available to DNOs to ensure this opportunity is not lost. In the delivery of this, we envisage widespread use of independent service providers to promote installation efficiency but with standards and safety managed by the DNO.

Q34: What barriers are there for vehicle and electricity system participants (e.g. vehicle manufacturers, aggregators, energy suppliers, network and system operators) to develop consumer propositions for the: control or shift of electricity consumption during vehicle charging; or utilisation of an electric vehicle battery for putting electricity back into homes, businesses or the network?

The most significant barrier is the availability of smart, safe and reliable home charger installations – please see Q33 above.

Q35: What barriers (regulatory or otherwise) are there to the use of hydrogen water electrolysis as a renewable energy storage medium?

We note the recent trials by others of this technology and, whilst we recognise the potential, we have not seen this developed to a point where we can judge whether this will be a cost effective technology in the medium term.

<u>Questions: Consumer engagement with Demand Side Response</u>

Q36: Can you provide any evidence demonstrating how large non-domestic consumers currently find out about and provide DSR services?

Our work on C_2C and Respond shows that such customers can engage in DSR provision but that adoption requires significant education, advice and ongoing support. Larger customers have segmented demand and, whilst some elements of demand are not accessible, many are.

In our experience many customers have already been approached by Independent Aggregators but have not actively adopted DSR. There are many reasons for this including the importance of trusted partnerships, the complex commercial arrangements needed and technology costs.

Our experience to date suggests that once a customer has offered DSR to one party, then with appropriate support they are much more likely to offer services to other market areas. The first move into DSR would in our view be facilitated for many customers by their DSO.

We have focussed our approaches to date on those customers in areas of network congestion and have generally found customers to be receptive to working with us, even where there are relatively limited benefits from participation. We therefore believe that some customers may prefer to provide these services directly to DSOs, rather than via third parties, and see it as essential that this route to market is not curtailed, either by GB or EU regulations.

As we transition to DSOs, we believe DSOs should have appropriate incentivisation or allowances to allow a wider engagement across their customer base to promote DSR uptake. Of these two funding mechanisms, we believe incentivisation to be the most appropriate as it will encourage increased innovation in this market space.

We recognise that some parties are concerned that DSOs moving into this role may limit the development of competition in the Aggregation market. However, we do not believe this needs to be the case and see opportunities for a wide range of models to emerge, some of which may be direct to the DSO but others may use Independent Aggregators, Community Energy models or 'self-balancing', depending on customers' preference and ability to engage with the opportunities as they are presented.

Ultimately, we believe that DSOs should balance the network to the local GSP to ensure that such actions take account of constraints and other issues affecting the distribution networks, which other players (including the TSO, supplier and independent aggregators) do not have visibility of and the continually changing nature of the distribution network would make it difficult to provide.

We note the current EU consultations seek to exclude DSOs from selling aggregated DSR services to SO and other market participants. We do not believe this is an appropriate exclusion and risks stifling the embryonic DSR market in the UK. We would point to our CLASS project as an example of significant value delivery to end customers through DSO participation in service provision.

We welcome the opportunity to discuss how this market can be encouraged to evolve in a competitive manner, whilst minimising potential negative impacts on NOs.

Q37: Do you recognise the barriers we have identified to large non-domestic customers providing DSR? Can you provide evidence of additional barriers that we have not identified?

Please see reply to 36 above.

Q38: Do you think that existing initiatives are the best way to engage large non-domestic consumers with DSR? If not, what else do you think we should be doing?

Please see reply to 36 above.

Q39: When does engaging/informing domestic and smaller non-domestic consumers about the transition to a smarter energy system become a top priority and why (i.e. in terms of trigger points)?

Our CLASS project demonstrates that DSR can be achieved at very significant scale without the need for direct bilateral contracts. Such an approach offers significant capacity to the market and, through the RIIO-ED1 framework, returns value to customers immediately.

This and other similar DSR services we are developing offer the most efficient route to wide scale DSR adoption for existing demand. CLASS provides DSR from all loads including commercial and industrial customers.

Given the potential scale of the transition required to facilitate a smart and flexible energy system, we believe it is important to make the best use of existing assets as well as

investigating new and emerging technologies. For us, CLASS and similar services we are developing are a logical way of increasing Flexibility in the system with minimum cost and inconvenience to customers and is therefore in the interests of all of our customers. We believe it is important that the value of such technologies is exploited at scale and in a co-ordinated manner. We would welcome the opportunity to discuss our ideas on how this could best be achieved in more detail.

The adoption of other forms of DSR in the Small to Medium Enterprises (SME) and residential sectors will be, in our view, triggered by LCT adoption. Without the presence of these significant loads (in terms of the level demand and the duration of operation) there is insufficient controllable demand to warrant the cost to achieve participation. This has been demonstrated by several LCNF projects.

However, as outlined above, we do believe that the case for more co-ordinated and targeted energy efficiency measures is much stronger and offers customers sustained affordability, social and environmental benefits. Energy efficiency is a core strand in UK energy policy and we believe the potential for DNOs to assist is considerable. In addition to the benefits of energy reduction, building this relationship would facilitate the adoption of DSR in these sectors once LCTs are adopted.

Questions: Consumer protection and cyber security

Q40: Please provide views on what interventions might be necessary to ensure consumer protection in the following areas: Social impacts; Data and privacy; Informed consumers; Preventing abuses; Other?

We have covered a number of these social and information issues in our response above. We believe these are critical to the safe and successful introduction of technologies such as EVs but also to engaging customers in the energy market.

In respect of data and privacy, our work through the ENA has shown that there is a direct relationship between the granularity of information available to parties and the value it offers. Our work shows that absolute privacy is difficult to achieve and can negate considerable value.

We believe trusted parties such as DNOs have an important role to play in delivering value for customers and a fundamental review is required of the strategy for access to data. Without a significant change in direction, a number of important enablers such as smart metering risk not attaining their potential benefit. Engaging on topics such as energy efficiency has the potential to further build our relationships with our customers and assist them in understanding how we use information, often overcoming some initial concerns regarding data protection and privacy. We would be pleased to have the opportunity to discuss this further in more detail.

Q41: Can you provide evidence demonstrating how smart technologies (domestic or industrial/commercial) could compromise the energy system and how likely this is?

Considerable work has been done on the need for higher end control systems used by the TSO and DNOs to have appropriate and robust protection against attack.

Other than the core Data Communications Company (DCC) infrastructure, we do not as yet consider any other control system to be sufficiently widespread to be capable of causing disruption if successfully compromised. To some extent, diversity of systems and providers acts to limit exposure to security breaches.

We consider it prudent to monitor and if needed curtail the volume of demand or generation accessible via any one route. This is we believe a role for the DSO to manage in area but would benefit from collaborative cross sector industry work including manufacturers.

Q42: What risks would you highlight in the context of securing the energy system? Please provide evidence on the current likelihood and impact.

Domestic appliances such as heating controllers, kettles, toasters, CCTV etc. could be subverted by third parties to cause local problems. Typically security is very poor on these devices and we have already seen a 'botnet'[13] of such devices used to cause a denial of service attack on Internet Service Providers. They typically use a domestic wi-fi network which is separate to the Smart Meter communications network. These devices could be manipulated to disconnect or turn on unexpectedly for example. Whilst annoying for the customer (and therefore something we would be keen to avoid), they are unlikely to affect the energy system beyond the customer's premises.

Devices such as smart EV chargers or Heat Pump controllers and control equipment on other larger loads such Industrial devices often also have poor security. Third party manipulation of such devices is more worrying and has the potential to both disrupt local networks or even system frequency. It is of note that there are examples of wind farm equipment being directly connected to the Internet and so vulnerable to attack.

Technologies such as virtual power plants and other forms of aggregated DSR platforms normally utilise IP based communications over public or other open networks. Whilst the volume of demand /generation controlled now is generally modest (~ 20MW), these are clearly risks to networks and the system if these grow in significance and are not adequately protected against hostile third parties. The cost of such protection should be borne by the service provider as is the case for network operators.

We would advise that such services should be reviewed by the cyber security subgroup of Energy Emergencies Executive Committee (E3C) to advise on relevant security standards. There is currently an exercise being carried out by the E3C Cyber Group to examine the cyber risks to the energy supply at a UK level. This group would therefore be well placed to advise on appropriate measures disaggregated by the risk presented.

Work within E3C also highlights the most significant risk is a 'rogue insider' where a disgruntled or otherwise motivated individual, who has the knowledge and access privileges, can cause significant impact to the energy systems. This risk is applicable to all members of the supply chain and requires appropriate investment in mitigation such as screening and other pro-active measures. This is something that we take very seriously and have already implemented enhanced employee screening, system access restrictions and periodic audits.

All security measures are part of normal operating costs required to provide secure reliable power supplies. As such costs should be appropriate to risk and fully represented in any CBA work.

[13] A botnet is a network of private computers infected with malicious software and controlled as a group without the owners' knowledge.

Questions: Roles and responsibilities

Q43: Do you agree with the emerging system requirements we have identified (set out in Figure 1)? Are any missing?

We agree that the requirements identified cover the main areas of work albeit at the highest level. We note that in respect of the allocation of responsibilities, the EU network codes have significant impact and it is not clear in the CfE that consideration has been given as to how these interact with the developing roles.

Whilst industry working groups sponsored by the Grid and Distribution Code Review Panels (GCRP and DCRP respectively) are examining how best to implement EU legislation, we believe the Codes themselves are a significant legal driver for change and significant by their absence from the systems requirements section of this chapter of the CfE.

We are mindful that the EU network codes afford the TSO significant ability to mandate submission of data from DSOs, but that the two-way data flow is more limited. Data flows fundamentally underpin efficient planning and operational decision-making and hence are a significant requirement. Provision of accurate, timely data can be a significant cost driver and we believe there is a need to ensure data costs, which are ultimately paid by customers, are efficient.

Q44: Do you have any data which illustrates: a) the current scale and cost of the system impacts described in table 7, and how these might change in the future? b) the potential efficiency savings which could be achieved, now and in the future, through a more co-ordinated approach to managing these impacts?

Our work on P2[14] contains significant information and analysis of the benefits of a wide range of technologies and approaches versus the counterfactual. This work was commissioned by DCRP, which we also chair, in response to the change drivers identified in the report and in addition the challenges posed by the widespread adoption of LCTs, such as EVs, by customers.

Whilst LCT adoption is covered elsewhere in the CfE, we believe the challenges are so significant they should be included in Figure 1 to give a fuller picture of the change drivers.

We note that, whilst the work on P2 includes development of revisions to distribution planning standards to incorporate all known commercial and active technical solutions identified, this work does not as yet encompass transmission's Security and Quality of Supply Standard (SQSS). It is vital that planning standards are co-ordinated across transmission and distribution and we intend to raise this issue at the GCRP for potential parallel work on SQSS.

Q45: With regard to the need for immediate action: a) Do you agree with the proposed roles of DSOs and the need for increased coordination between DSOs, the SO and TOs in delivering efficient network planning and local/system-wide use of resources? b) How could industry best carry these activities forward? Do you agree the further progress we describe is both necessary and possible over the coming year? c) Are there any legal or regulatory barriers (e.g. including appropriate incentives), to the immediate actions we identify as necessary? If so, please state and prioritise them.

Immediate Actions:

The analysis presented and the suggested models appear to be centred on the current challenges encountered by and related to DG as opposed to the wider spectrum of LCTs that

[14] More information available at http://www.dcode.org.uk/dcrp-er-p2-working-group.html

will be adopted by network users in the future. This, in our view, inappropriately focuses the discussion of roles on DG and risks adopting suboptimal solutions for the fuller challenge in the medium to longer-term.

Turning first to questions around co-ordination between parties, we agree that this is currently inadequate and requires urgent cross-industry work. This work should include DNOs, Independent Distribution Network Operators (IDNOs), Transmission Owners (TOs) and the TSO. To this end, we have requested that the terms of reference and governance of the ENA's TDI group are revised and strengthened to more adequately progress these issues. We are committed to the revised work programme for the TDI steering group to ensure more effective outcomes from this work. We are also mindful of the ongoing consultation process for CATO and this can in certain areas have a material impact on distribution issues. We see this work being best conducted through the ENA but with appropriate oversight and engagement from OFGEM and BEIS and with opportunities for non-members to also contribute their views.

We are mindful of helpful thinking emerging from the Future Systems Power Architect (FSPA) on which we sit and other groups. Whilst these are useful as thought pieces, they do not in our view form a sufficiently comprehensive basis from which to progress. We are however promoting a role for such groups as stakeholders to feed into and challenge the thinking of the ENA's TDI group to ensure the value of this work is not lost.

Given that interaction between NOs is also governed to some considerable extent by the EU codes, we would recommend that the GCRP and DCRP panels be requested to review the existing party interactions in a co-ordinated work programme. It is then up to industry parties to progress the necessary work at pace.

We would view the development of interactions as a significant evolution in the short to medium term as opposed to a fundamental realignment of obligations on parties. We believe this is within the capability of industry parties but will require some strategic direction. We agree that the suggested priorities provide this direction and are sufficient for the next stage of work. We would further recommend that ENA Electricity Networks Futures Group (ENFG) be requested to manage the programme of work and to review the existing TDI, P2 and other related work plans to ensure alignment and that sufficient progress is being made.

We do not believe there any legal or regulatory barriers to delivering the immediate actions identified. Whilst it is likely that regulatory clarity will be required from time to time as work progresses, we are encouraged that this has been both prompt and forthcoming when identified to the Authority. We would cite our recent CLASS discussions as an excellent example of this co-operation.

One area where we do see considerable merit in commencing work promptly is in relation to charging. As described in our covering letter and in response to Q19, we see a number of fundamental issues with the current charging arrangements that, whilst not immediate problems per se, will become barriers to the development of a smart and flexible energy system. Given experience to date, we expect such a review to take a prolonged period to complete. In light of the likely lead time, we urge Ofgem and BEIS to consider commencing this work imminently to ensure that this is completed and appropriate transitory arrangements implemented to ensure that the outcomes do not distort the future markets for Flexibility.

The procurement models presented are indeed helpful. Our starting point for all commercial network and system balancing services is that the market should be transparent and open to all. There are, however, important technical risks arising from unconstrained action by any party in changing load and generation levels. We believe that DSOs and TSO must have visibility of planned or anticipated contract actions (as discussed above) at a technical level to ensure networks do not become unbalanced. Work needs to be undertaken on the method for providing a suitable level detail of transparency to ensure enablement costs are

efficient. Our thoughts on this matter have been informed by the work of Workstream Six of the Smart Grid Forum which concluded that such visibility was an essential component of an effective smart grid. We do not consider that the ongoing work on EU code implementation has as yet adequately addressed this issue and we will raise it in the appropriate forum. It is however a structural market requirement and hence we would value the opportunity to discuss our thoughts on this area in more detail. Whilst we do not believe this is an immediate requirement per se, we have included it in this section as we anticipate there being a significantly long lead time to deliver such a platform that is appropriately tested and market ready.

Emerging (short- to medium-term) role of the DSO

Turning now to the emerging role of the DSO, we would see this as going significantly beyond the high level functions identified. In our view, the emerging role of the DSO will focus on the effective and efficient provision and balancing of network capacity. However, we do distinguish how we use the term balancing in this sense from many of the actions currently undertaken by the TSO.

The TSO's balancing activities focus heavily on ensuring that the commercial positions of the users of the transmission system are balanced to ensure that generation matches demand at quite a macro level, using system frequency as a key indicator of the level of balance achieved. By contrast, we envisage DSOs focussing much more on localised and regional balancing of network capacity to ensure that the users of the networks benefit from the optimisation of existing capacity, without unduly stressing the assets and that the requirement for additional capacity is driven by users' requirements. The focus for DSOs will therefore be more on the technical constraints of the network, using thermal and voltage limits, for example, as key indicators of the level of balance achieved by the DSOs. Whilst a differing focus, appropriate structures and governance should mean that these emerging actions by the DSOs assist the TSO in maintaining the macro system balance, the DSOs focus will be primarily local.

Our work has identified the following additional roles

- Network access

  In our view the balancing of capacity networks will be a 24 x 7 function utilising commercial and traditional means. This will require DSOs to manage access to the network for construction and maintenance outages in much the same manner as performed by the TSO, in conjunction with the TOs. We see DSOs as having a significant role in protecting flexible customers from inappropriate outage requests either from its own DNO-type activities or from IDNOs. Setting out efficient network outage plans requires DSOs to make decisions that balance security for all connected customers, with cost and the impact on flexible customers such as DSR, DG and storage operators. Without proper consideration of the appropriate balance between these factors there is a significant risk that Flexibility providers are commercially disadvantaged leading to a potential reduction in the volumes of flexible demand and/or generation. We have undertaken work to develop new service metrics and mechanisms to do this in a systematic manner and would welcome an opportunity to discuss our thoughts in more detail.

- Determining Point of Connection

  Our work also shows that DSOs will interact in both the new connections service chain; particularly in determining the point of connection, and associated ongoing operating terms. In addition we would see the regional DSO interacting and indeed potentially managing capacity within embedded IDNO areas. We have been at the forefront of enabling both Independent Connection Provider (ICP) operation and IDNO growth and these two important developments will, by necessity, require some level of DSO

involvement. We would be pleased to have the opportunity to discuss our thoughts in more detail.

- Determining efficient levels of Network Resilience

  Our work on P2 shows that security and capacity are intrinsically linked once commercial and active solutions are adopted. This is a fundamental point on the future role of the DSO and whilst reflected to some extent in SQSS is as yet absent from DSO discussions including the CfE. We would see the future role of the DSO including determining efficient levels of supply security (resilience) for customers. This has historically been regulated on an incremental glide path basis but our recent work on developing much more sophisticated approaches to determining and using the Value of Lost Load (VoLL) shows that efficient levels of security can be calculated and hence provided via commercial or technical means. We would see DSOs assuming responsibility for determining both capacity and security issues within an appropriate regulatory framework.

  VoLL underpins all network asset risk investments and hence we would envisage the role of the DSO including identifying the need for investment to adequately manage resilience risks for customers. This could include investment to alleviate or mitigate High Impact Low Probability (HILP) events and quality of supply improvements.

  We would be grateful for an opportunity to explain our proposals in more detail.

- Losses

  All Investments (including asset based and commercial solutions) related to capacity should appropriately consider electrical losses. Losses are a material issue in any CBA and, as DSOs will be ensuring the provision of capacity and resilience, they will inevitably be at the centre of decisions related to losses management. We see DSOs as having a central role in determining losses related investments including incremental investments (‘upsizing’) and targeted losses reduction programmes.

- Making most of network assets

  In order to ensure that the transition to a smart and flexible energy system is delivered as efficiently and effectively as possible, we believe it is vital to consider all options to make the most of network assets. Developments such as CLASS demonstrate some of the latent Flexibility that exists within the current asset base and we believe it is important that such options continue to be explored and developed to minimise the costs and disruption experienced by our customers.

- Charging for the services used

  We believe that DSO will have an important role to play in charging and that the structure of charging needs fundamental review; driven both by changing customer needs, innovation and the proliferation of commercial solutions for network capacity balancing. In order to ensure that customers are treated equitably, we believe it is critical that the charging arrangements for electricity networks evolve to reflect the services customers require from the networks. As described in response to Q19, we believe it is important to move away from the status quo to a framework that is truly cost reflective by capturing services provided such as voltage stability, power quality and fault level. We believe that this, combined with a capacity based charging structure, would start to tackle many of the concerns being expressed by emerging and existing parties.

  Again we would be keen to have an opportunity to present our thoughts in detail.

- Service provision

  We also see the DSO as being a participant in markets facilitated by others, ie providing services to support the TSO in the efficient operation of its macro system balancing roles and to network users who may require additional, value adding but non-essential services. We are concerned that some of the mainland European DSO models do not allow the latter functions to exist within the same body as the overall data aggregator for energy usage which they often define broadly as the DSO. In our view this is an important omission and the adoption of an overly constrained role for the DSO risks value loss for UK customers and may fail to recognise the unique model for energy market facilitation adopted by the UK. This is an important area of national influencing where UK risks loss of value given its relatively more advanced energy market structure.

- Management of local Transmission capacity

  In respect to their relationship to the TSO and ultimately the TO / CATO, we believe that the DSO has an important role to play in the decisions around regional transmission capacity management. For example at GSP sites, the DSO would be balancing TO capacity against DNO / IDNO transfer capacity, customer demand, customer generation, storage operation and a host of commercial options. TO investment at relevant boundaries is in our view a relevant issue for DSOs who are best placed to manage customers' interests. This does not hold as true further up the national transmission system but on local transmission DSOs should have a role in determining asset capacity and hence the charges borne by the distribution network users at these interfaces through Transmission Exit Charges.

Q46: With regard to further future changes to arrangements: a) Do you consider that further changes to roles and arrangements are likely to be necessary? Please provide reasons. If so, when do you consider they would be needed? Why? b) What are your views on the different models, including: i. whether the models presented illustrate the right range of potential arrangements to act as a basis for further thinking and analysis? Are there any other models/trials we should be aware of? ii. which other changes or arrangements might be needed to support the adoption of different models? iii. do you have any initial thoughts on the potential benefits, costs and risks of the models?

Please see our answer to 45 above regarding the roles and remit of relevant parties.

We do not see the models presented as mutually exclusive and we certainly foresee elements of all three being necessary.

Turning first to TSO : DSO operations, whilst there are a range of potential models that could be used to establish DSOs, aligning DSOs with the regional DNOs seems the most logical to us in the first instance. This approach would enable the incremental growth of the role and techniques associated as different network capacity constraints emerge. It will also enable regulators to use comparative efficiency regulation to assess the effectiveness of the commercial balancing of networks and thereby ensure that the approaches adopted are in the best interests of customers. Use of such comparable efficiency within the current regulatory model has proven hugely valuable for customers, delivering network costs 17% below those at the time of privatisation[15]. We believe that DSOs, as regulated entities, will need to have increased commercial flexibility to act in the interests of customers but should also be exposed to performance and efficiency incentives, including comparative efficiency tests, to ensure that their decision making remains aligned with their customers' interests.

[15] Ofgem, https://www.ofgem.gov.uk/network-regulation-riio-model/energy-network-how-it-works-you, correct as at December 2016

Regional deployment brings the added benefit of a thorough understanding of the underlying asset base, allowing DSOs to quickly and proactively implement solutions to the specific challenges faced by their networks, rather than adopting a more generic approach that is less likely to be efficient in the long-term.

Such tests are not in our view meaningfully applicable to the TSO and hence we would favour a larger role for the DSO with (as outlined in response to Q45) the DSO having a material involvement in the authorisation of regional TO network capacity particularly at interface points. The backbone transmission system would be more difficult for DSOs to be actively involved in, although the advent of CATO may offer some opportunities for DSOs to be able to more effectively contribute to this debate.

Whilst boundary balancing between transmission and distribution will always require discussions between both TSO and DSO, we see less value for customers in TSO involvement in distribution activities. We are concerned that the powers afforded to TSOs under measures such as the EU Network Code on Requirements for Generators (RfG) afford considerable powers to TSOs in respect of reactive power limits and other technical parameters. We would recommend that exercising of such powers by the TSO must be justified by an appropriate CBA and the detail of which should be available to DSOs; so that they are able to effectively look at lower cost solutions for their customers.

We foresee that market pricing signals will have an important role to play in both transmission and distribution but will not alone ensure efficient development of networks. In order for the UK to achieve its renewable energy and LCT ambitions, we foresee DSOs managing investment ahead of need within an agreed regulatory framework. This is an important strategic issue and we see joint TSO and DSO work being key to ensuring efficiency for customers. We note however that the current disjoint between the strategy development and commencement for the RIIO-T1 and ED1 periods has created some challenges in ensuring all parties are fully aligned on objectives. We recommend that this be considered further and would be grateful for an opportunity to flesh out our thoughts.

Finally, we would highlight that the regulated network business model has served the UK well delivering significant costs reductions and greatly improved supply reliability for customers.

In securing the transition to DSO and a more flexible energy system for customers, we believe network businesses are best placed to establish strategic direction of travel, ensure timely progress is made and provide the technical and financial infrastructure required. Comparative efficiency regulation offers policy makers a proven reliable mechanism through which these essential components for success can be assured.

Questions: Innovation

Q47: Can you give specific examples of types of support that would be most effective in bringing forward innovation in these areas?

We believe the funding available to NOs has been effective in bringing forward innovation to meet the needs and challenges faced by our network. Our C2C and ANM projects (funded by the Low Carbon Networks Fund (LCNF)) and a significant number of our projects funded by the Innovation Funding Incentive (IFI) and the Network Innovation Allowance (NIA) have already successfully transitioned into Business as Usual (BaU). We also expect CLASS will shortly transition into BaU. We do however consider that some of the challenges such as commercial services transparency do require innovative thinking to deliver these at an efficient cost. To this end, we would see an expansion in the scope of Network Innovation Competition (NIC) governance rules as a useful vehicle for enabling such work.

We recognise the current consultations from Ofgem in relation to the NIC and NIA governance arrangements and will be responding separately to these in due course. However, our initial thoughts are that the proposals seem overly restrictive in their scope and do not as yet allow true whole system innovation projects. We also note that the increasing tendency to place innovation risks on shareholders, which we believe is unlikely to give rise to innovation activity where returns are less certain, such as innovative market revisions.

We also think it is important that support be considered in its widest sense. We are keen to support evolving market models as our customers consider new and innovative solutions. However, it is often appropriate to test these ideas before embarking on significant change of industry governance. We greatly appreciate the discussions to date with Ofgem on our proposed solution for Local Energy Schemes and think that similar willingness to consider derogations or other methods to provide flexibility in the regulatory regime to allow such developments to be proven, without necessarily being under an innovation-funded project, will be invaluable. The opportunity to engage with Ofgem and BEIS on these projects is important to us in ensuring our continued ability to respond to the opportunities to innovate in the interests of our customers, without necessarily needing the funding and formal channel of the likes of LCNF/NIA/NIC.

Q48: Do you think these are the right areas for innovation funding support? Please state reasons or, if possible, provide evidence to support your answer.

We would support the areas of innovation work identified. In addition we think additional work in the community energy and energy efficiency sectors are warranted. However, we do think there is merit in the funding support remaining sufficiently flexible to allow NOs to target other areas as needs emerge.