WESTERN POWER DISTRIBUTION

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BEIS/Ofgem call for evidence – WPD's response

1. 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.

The main barriers to the development of storage have been identified in the document as:

- network connections;
- network charging;
- final consumption levies;
- planning; and
- regulatory clarity.

We have also identified the following additional relevant issues:

- Regulated network business ownership - Another potential barrier to the development of the storage market may be the restrictions around DNO ownership (further discussed in the response to question 4).
- Storage owner revenue stacking - The requirement for ancillary service providers to provide the SO with 24/7 availability will drive storage towards the points on the DNO network where there are no restrictions on operation. At these locations the storage is highly unlikely to be able to assist the DNO in managing its network restrictions and this exclusivity requirement needs to be removed to deliver greater availability of flexibility. Where the times of constraint on the DNO network would prevent the service being provided at time of greatest need by the SO then a first call option is appropriate, however, if the time of constraint on the DNO network is unlikely to have a major impact on the SO service provision then the storage operator is missing an opportunity. The ongoing innovation projects concerning storage and flexibility services should help provide evidence for how often service requests from different parties are likely to coincide.
- Cost - Storage, especially batteries, are currently a significant multiple of the cost of other forms of flexibility to deliver most reserve services (e.g. Generators and Load Banks). The potential for mass manufacture to drive down prices is evident. A shortage of manufacturing capacity drove Tesla to build its own facility. However global shortages of precious materials such as Nickel, Lithium and Cobalt may mean that prices plateau before an economic level is reached.
- Technology maturity - The first generation of energy storage trialled by DNOs under LCNF has proven to be somewhat unreliable. The risk of unavailability and early decommissioning is still high. Manufacturers will no doubt improve on the quality of devices as the technology matures and lessons from operational experience can feed back into products.
- Network security standards (P2) – currently the distribution demand security standard is silent on the treatment of storage in terms of its contribution to demand security. The current review of P2 has sought to address this within its scope.

2. 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.

The issues for network connections for storage have been identified in table 3 as:

1. Lack of clarity over the process, both for new connections and upgrades to existing connections.
2. Lack of clarity over the network locations where DNO services are likely to be required.
3. Connection costs
4. Lack of fully firm connection locations
5. Storage queuing mechanism potentially missing opportunities to assist generator connections in the queue.

WPD has already taken steps to improve the provision of information to those seeking new connections, for example by holding regular connections surgeries and by extending the range of information available alongside the generation connection maps to show the scale of other applications in the process. While the storage queuing mechanism may be potentially missing opportunities to assist generator connections in the queue, it must also be considered that many applications for storage or generation do not progress to connection. Deployment of energy storage will only assist the electricity network if both the maximum output power and energy storage capacity of the device are equally matched with the type of generator and nature of grid constraint. For example, a solar PV generation connection may require 1MW more than the network can easily accept during the middle of the day. However the constraint may last from 10am to 2pm, four hours. Meaning the storage system would need 1MW of power output but 4MWh of energy storage capacity. The cost of storage is highly sensitive to energy storage capacity. WPD's SolarStorage is exploring the power to energy ratios required to enable a number of flexibility services. Any mechanism put in place must not impose a burden that is disproportionate to the value it generates.

3. 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.

Storage becomes more valuable to the network when connected to constrained parts of the network as it would allow more flexibility to the generators and demand already connected (and to be connected in the future). However ancillary service rules can restrict the operating mode a battery can run in.

Alternative connection agreements have been popular for generation on constrained networks, where there has been a willingness to accept export restrictions in order to reduce the time and cost of the conventional reinforcement which would otherwise be necessary. It is likely that alternative connection agreements could be welcomed by storage operators.

The recent EFR service tendered by National Grid required storage operators to have an unconstrained standard connection to the electricity network. Given the high interest in EFR and the relatively low prices, it would seem possible to allow providers with under 100% availability by procuring marginally higher volumes overall either directly or via aggregators. Service sharing by DSOs and the SO could mitigate any risk of under delivery. Such an arrangement would allow storage to locate where revenue for all system services can be stacked. It would also allow storage to be coordinated with any other constraints in force at that moment in time (such as Active Network Management) to ensure that the desired impact is achieved.

There is an additional risk to the electricity network from storage which is not discussed in the Call for Evidence. If the battery should inadvertently export during a high generation time, or import during a high demand time, the storage unit's very fast response could cause serious short term overloads and/or voltage infringements. Modifications to DNO control and protection systems may be necessary. Connection charges may therefore be higher for battery systems than slower acting demand or generation of a similar capacity.

4. 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 network operators could use storage to support their networks. This is evidenced by a number of innovation projects, such as the use of storage by UKPN to avoid network reinforcement at Leighton Buzzard and The Orkney Energy Storage Park instigated by SSE. WPD's own projects Sola Bristol and FALCON have demonstrated the technical abilities of storage to assist with network management and we will deliver new learning from our Solar Storage innovation project during 2017.

DNOs should not be precluded from owning and operating storage. Opportunities to install storage should be first offered to commercial storage developers but where there is market failure, potentially due to location then the DNO should be allowed to provide the storage solution.

To ensure a competitive market for storage can develop unhindered there are a number of safeguards which could be implemented as outlined in the table below.

Competitive storage market feature.	Comment
Access to information about SO service requirements	DNO has no advantage currently. Greater data exchange in the future is not expected to create an uneven playing field as monthly balancing service reports are already published.
Access to information about DNO service requirements	The DNO could be at an advantage if this information were not published. The DNOs should therefore publish heat maps to direct storage developers towards locations where DNOs may benefit.
Access to information about other parties willing to purchase flexibility services.	The DNO could be at an advantage in selecting locations where flexibility services may be attractive to customers on alternative connection agreements who experience constraints. The scale of these types of connections and frequency of constraints being triggered is deminimis.
Non-preferential treatment to obtain a network connection	DNO connections would be provided on the same basis as to an external customer.

DNOs in Italy and Belgium are already allowed to own and operate storage subject to conditions that ensure value for money for the customer and avoid distortion of the market.

In order for the costs of DNO owned/operated storage to be compared on an equal basis with non DNO owned / operated storage there should be no restrictions on how the storage can be used by the DNO, when not being used to manage the DNO constraint. i.e. the same options for revenue stacking should be available.

WPD consider that storage would be as integral to the operation of our network as any other asset and should therefore sit within our regulated asset base. Commercial operation of the battery could be in a similar way to existing DNO non-regulated activities. This approach has been demonstrated within ENW's CLASS project and has been subsequently approved by Ofgem as a Directly Remunerated Service in the DNO licence (DRS8 in special condition CRC 5C). It ensures customers are rewarded if network assets are able to provide a wider system benefit than intended through traditional design. The current deminimis limit is set at 2.5% of investment and 2.5% of revenue generated.

5. 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.

We support the use of a defined category for storage and an industry defined mode of operation to inform usage profiles, enabling it to be analysed and treated appropriately. The treatment of storage as an

uncontrolled combination of generation and load is already resulting in the issues identified in the call for evidence and adds further unknowns to the planning assessments undertaken by DNOs.

With regard to final consumption levies, we support approaches to remove double payment by storage.

Our own Solar Storage project has highlighted some areas for improvement in the local authority planning permission process.

Firstly, there did not seem to be a mechanism to allow minor changes to "the red line" to be covered by Non Material Amendments, but rather a new application had to be submitted. Secondly, the range of assessments may be disproportionate for units that have a small footprint / physical size and it may be appropriate to create a simplified process for units meeting certain criteria, in a similar way to having different planning requirements for permitted development including temporary/portable structures.

Given the concern that the uncertainty over future load forecasts, or other network development could lead to stranded assets, it may be useful to distinguish between storage that can or cannot be relocated at a reasonable cost. From a DNO perspective, there may be value in encouraging a larger number of smaller storage installations, as this is more likely to provide storage at locations that are useful to DNOs and at the same time limit the local uncertainty in forecasting.

6. 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.

The definitions of storage as used by the capacity market and the Energy Storage Network both capture the essential attributes of storage. Either definition is acceptable. It is important to distinguish between storage that can or cannot export energy back onto the network as it is likely that these two forms will have different uses and should be treated differently.

7. 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?

As highlighted in point 42 of the call for evidence, there are multiple different forms of aggregators. The possession of a supply licence is one differentiator; however there are several others such as the ownership structure of generation assets.

As the DSR market expands we believe it is appropriate for aggregators to have some form of licence from the regulator. The license would set out consumer protections (such as a requirement to treat customers fairly and to be technology agnostic) rather than get involved in pricing or specific commercial matters. Such a licence could also mandate the aggregator companies to not prevent customers revenue stacking, including accessing DSO services.

As part of many innovation trials WPD has been in contact with aggregators and other market participants. These trials have investigated the provision of DSR services from demand, generation and storage. Our answers reflect our learning from all these perspectives.

- Balancing Services: Many service providers have highlighted concerns over the number, variety and complexity of services. They perceive DSO programmes add further complexity. A key concern is their desire to stack revenues from services and avoid inadvertent breaches in contracts with SO and DSO buyers. WPD strongly supports the work of Power Responsive to simplify the market and help providers to access multiple services. A larger pool of DSR resources should allow for customer propositions to be greatly simplified. Categories of Reserve, Rapid Reserve and Reactive Power may be sufficient.
- Balancing Mechanism: WPD has limited experience of providers seeking to access value through the balancing mechanism. However as a principle we support customers having access to multiple revenue streams without undue restrictions.
- Other market barriers: No comment.
- Consumer protection: WPD has engaged with several customers who have highlighted negative experiences with aggregators. The most common concern is the very different valuations by different companies of the same assets and devices. This is usually due to the aggregators having a lower cost to serve for some customers than others or preferring some technologies over others. Our work with the customer base has shown this has led to reduced trust and potential participation in the DSR market.

As demonstrated in our FALCON innovation project, through the coordination of DNO and SO services, the stacking of revenues can allow for the efficient use of services for DNO constraint management whilst having no detrimental impact on national balancing services. This approach will allow DNOs to avoid or defer reinforcement. WPD's latest trials, including WPD's SYNC and ENTIRE projects, will help deliver the business processes to roll out shared SO/DSO programmes.

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

See response to question 7.

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

As discussed in our response to question 7, WPD believes aggregators should be licenced by Ofgem. WPD do not believe a voluntary code of practice would go far enough to protect customers. Licensing aggregators would build consumer confidence and support the development of the DSR market.

10. 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?

WPD agrees that as automated control of loads and generation becomes more prevalent there is an increase in risk to system security. Whilst networks are designed for the dynamic effects of large loads or generators switching on or off individually, the combined effects of several sites switching simultaneously could affect the network. This is of particular concern where there are clusters of flexible load within sections of network as simultaneous switching has the potential to overload networks that have been design with an assumption of diversity between loads. Informing DNOs of planned actions in both planning and operational time scales would allow for suitable mitigation to be taken.

The cyber security risk increases with the size of each system. WPD would suggest the introduction of consistent auditing and testing across systems of a significant size. Recent tests have indicated some issues to address in customer systems connected to our network. This could also be a feature of an aggregator license. Wider involvement with organisations and government security agencies may also be beneficial.

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

We are currently working with Centrica on a project based in Cornwall. "Local Energy Market" aims to create an energy flexibility marketplace for customers in Cornwall. We hope that the platform can simplify the process of putting buyers and sellers of flexibility services in touch with each other. It may help sellers assess the potential market for their services and would allow them to offer their services directly rather than through an aggregator.

It will allow WPD to aggregate flexibility from Distributed Energy Resources (such as renewables, demand and storage) and use them to support the distribution and transmission system. A full range of forecasting, recruitment, despatch, metering and settlement capabilities will be developed alongside the facilities to share information with National Grid or other flexibility service purchasers. A supporting WPD Project, "Plugs and Sockets" will develop the DNO specific elements of the system and enable us to communicate with the commercial platform for trading services with other energy suppliers and aggregators.

A further enabler could be a change to the technical design criteria of networks. At the current time whilst Distributed Energy Resources have minimum flexibility requirements inbuilt, the network does not need to be designed or operated to allow this full capability to be used. For example a Distributed Generator is required

to operate at a 0.95 lead or lag power factor due to conditions in Statement of Works responses from the System Operator and are a requirement in the EU Requirements for Generators Network Code. However a DNO minimum cost scheme may require it to only be operated at a fixed power factor.

WPD already offers alternative connection agreements for distributed generation, including energy storage. A "Timed" connection requires a customer to maintain their export to within a set amount at different times of the day and year. An "Export Limited" connection allows a customer to cap their export to the system allowing them to install onsite renewables without upgrading the distribution network. We are currently developing similar arrangements for demand customers and those interested in increasing import capacity for onsite energy storage.

WPD has increased the availability of data provided to customers seeking capacity, with Statement of Works and Generation Capacity Registers published on our website. Following stakeholder feedback, we are also refreshing the way we display our network capacity heatmap information, so that we can provide more granular data to customers for both import and export connections.

12. 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?

ENA's Shared Services Group identified that there is limited conflict between the uses of DSR for System Balancing and mitigating Distribution constraints. Any conflicts were typically contractual. The group have since mapped out potential conflicts in more detail by considering the range of DSO services and SO services. In some cases conflicts are avoided naturally as services operate at different times of the year or day. Where conflicts do occur, these are often resolved by providing adequate advance notice. Where advance notice does not resolve the issue, then the best course of action may be to procure services with a safety margin to cover these occurrences rather than to use penalty clauses to enforce exclusivity.

Within our FALCON project trials, WPD developed a single framework for sharing services with customers contracted into the SO Flexible STOR programme. Unfortunately the volumes of Flexible contracted DSR are insufficient and actually falling. All other contracts developed by the SO were drafted on the basis of exclusive access to participating assets. The group has removed the exclusivity clause from new contracts and this will result in the barrier being removed over time.

However updating existing contracts to remove this exclusivity clause is more difficult to achieve since the legal issues are complex and as yet no existing contracts have been amended.

Through our ENTIRE innovation project, we are now developing with National Grid an alternative trial where WPD will act as an "aggregator of aggregators". This will enable us to provide fully optimised shared services which will allow customers to revenue stack services whilst meeting the criteria of the DSO and SO. It could also provide a stepping stone to future regional SO balancing arrangements.

13. 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?

See answer to question 12.

14. Can you provide evidence to support any changes to market and regulatory arrangements that you consider necessary to allow the efficient use of flexibility. What might be the Government's, Ofgem's, and System Operator's roles in making these changes?

Since it was the first to procure DSR services in its role as SO, National Grid his established many of the principles on which operational, technical and commercial standards are based. The transition to a more distributed energy system may require more fundamental change to the way the system is balanced. It is therefore likely that a restructure of system operation, regulation and markets will be necessary.

The DSO should have responsibility for system regional balancing within certain parameters. This would include management of constraints at certain Transmission system boundaries. This would be extending the principle being established under the EU Demand Connection Network Code which will result in envelopes of operation for reactive power to be controlled by the DSO at the DNO/TO boundary. The national SO responsibilities would be simplified allowing greater focus on centralised reserve for unplanned incidents.

15. 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.

The competitive domestic supply market should be allowed to develop without undue government or regulatory restrictions. Control of smart appliances and access to smart tariffs (and packages) could be a key differentiator between suppliers. It is also likely to lead to the introduction of new entrants to the market, boosting competition.

The focus should therefore be on consumer protection issues and ensuring compliance with international standards. The latter, to ensure interoperability when switching suppliers.

The list of appliances considered to be "smart" should be extended to include additional categories of distributed generation and hot water storage systems. These have a substantial installation base and in most cases can be operated as flexibly as the new low carbon technologies.

16. 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.

See answer to question 15.

17. 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.

18. 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?

Distribution tariffs with a RED AMBER GREEN type structure have existed since April 2010 for HV and LV non domestic customers. To date the proportion of total consumption falling in the high priced RED band has not fallen significantly. In some cases we are aware that suppliers are not always passing these DUoS cost profiles onto end users. In other cases we are aware that customers are not reacting to them as the absolute savings are not material to their operations.

A recently approved change to DCUSA (under change proposal 228 - revenue matching) was subject to the DCUSA consultation process and an Ofgem consultation. It will significantly reduce the price differential between the bands. Ofgem's decision to simplify the tariff regime recognised that "some larger industrial consumers have responded to price signals generated from the current CDCM methodology and that DCP228 is likely to dilute the case for this type of response."

Further analysis of the reasons why non-domestic customers fail to react to DUoS may be beneficial prior to the design of new smart tariffs by suppliers.

19. 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.

We acknowledge that in an idealised situation distribution charges would be cost reflective of local, neighbourhood, regional and wider system constraints. However our own stakeholder engagement work consistently shows that customers desire stability in their charges to match other long term investment decisions.

Since the immediate future is so uncertain, especially with a lack of long term detail in UK energy policy and unpredictable uptake of new low carbon technologies, it is likely that network congestion is likely to change significantly over the ED1 and ED2 periods. Hence highly cost reflective charges would suffer from volatility.

We therefore propose moving to simpler rather than more complex charging arrangements. This may be in the interim until the extent and pace of change is better understood. The concept we propose is based on a long term fixed charging model with rebates for customers offering balancing services to the DSO. For example, customers electing to offer reactive power support, flexible response from generation/load or other ancillary services could receive a rebate. Some customers may be able to provide multiple services to the DSO in return for a larger rebate. By providing a straightforward financial benefit to customers actively providing services back to the DSO there is be a clear pathway and incentive participate.

Such an arrangement would be welcomed by most customers for the stability in prices it would bring whilst encouraging them to access balancing services. Such stability is likely to lead to higher confidence of investors in the flexibility and energy market. It would also allow Ofgem to focus on targeted reviews of particular areas of concern (e.g. Storage) without the burden of trying to incorporate changes to the current arrangements.

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

The Call for Evidence suggests that distribution charges could include an element of maximum demand in addition to capacity and consumption. Moving to a connection agreement which describes an annual net profile at the point of connection is a logical way of achieving the aim of allowing customers to minimise reinforcement costs. . For example, a customer may have a predictable pattern of electricity usage across a day / year meaning they would be happy to have a variable limit on their maximum import or export capacity. The difference between this limit and that of a conventional fixed capacity connection could then be released to other system users. Similarly, allowing customers to choose their own required level of network utilisation would avoid unnecessary investments in capacity for new connections.

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

We are aware of inconsistencies in the existing, and between, EDCM and CDCM methodologies. We therefore welcome the focus in this area. However as per our response to question 19 suggest that a simpler and more transparent charging regime is more appropriate at this time. Any more complex and cost reflective methodology introduced today is likely to have unintended consequences as the UK energy system undergoes transformation.

22. 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?

A review of connection and charging arrangements is needed with greater alignment of commercial arrangements between Transmission and Distribution to ensure that appropriate signals are to be given to connectees. This will need to include some form of connect and manage arrangement at the Distribution level to both facilitate timely and cost efficient connections and an appropriate balance between build/non-build options.

Distribution network costs will continue to be largely dominated by their resilience to outage and the maximum demand they can support. We therefore support any smart tariffs introduced by suppliers that lead to a reduction in peaks and corresponding increase in utilisation. Changes to tariffs which have the potential to significantly alter customer load profiles should therefore be subject to consultation and prior notification by the Suppliers before introduction.

Other areas where cost drivers could differ to today are the extent to which DNOs own and manage Energy Storage and EV infrastructure.

23. 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?

Please see our response to question 19 which includes our proposal for a simpler for of DUoS which would achieve both long and short term objectives.

24. 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.

Contained within our responses to question 19 to 22.

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

We take the opportunity to highlight two areas. Firstly the practice of “deeming” network export under the Feed-In Tariff has made it difficult for DNOs to understand the impact on the system (detrimental or beneficial). Some consumers have exploited the loophole caused by deeming by fitting their own equipment

to avoid actually exporting. It would be impossible to operate an optimised microgrid whilst deemed arrangements are in place.

Secondly, there is a risk that in an attempt to avoid conventional reinforcement that network losses will increase. Technical losses have a fixed relationship with both utilisation and peaks. Hence a goal of a fully optimised smart system may have the consequence of being less efficient than the passive system of today. The cost of losses used in evaluating options needs to take account of the changing mix of generation, in particular the effect of increasing levels of low carbon sources.

26. 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?

No response

27. 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?

Please see our response to questions 19 to 22. Costs and benefits to a smart system can be attributed to demand and storage, not just distributed generation.

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

Yes, these four principles set out a good grounding for the development of smart appliances. We would look to expand the definition of grid security to include requirements of the dependability/availability of the service, as well as the cyber-security and grid stability elements outlined in the call for evidence.

29. What evidence do you have in favour of or against any of the options set out to incentivise/ensure that these principles are followed? Please select below which options you would like to submit evidence for, specify if these relate to a particular sector(s), and use the text box/attachments to provide your evidence.

Option A: Smart appliance labelling

No evidence

Option B: Regulate smart appliances

In the example of Small Scale Embedded Generators (SSEGs), where regulation (G83, ESQCR) has been enacted to ensure devices are compliant before connection to the network, we have seen the successful integration of a significant number (over 500MW/175,000 installs of G83 PV within our regions) of Low Carbon Technologies (LCTs), proving that appropriate regulation mandating technical compliance is not a barrier to LCTs.

Option C: Require appliances to be smart

ENA Engineering Recommendation P28 details the planning limits for voltage fluctuations cause by domestic equipment in the UK. This standard limits the size of equipment that can be simultaneously switched dependant on the impedance of the surrounding network. Product standards could be used to provide some randomisation of operating times to prevent sudden changes in system loading. This solution has been used successfully in the Radio Teleswitch system. As there is a finite technical limit as to the aggregate amount of flexible appliances that can act in unison, the requirement of the appliance to be smart will not always translate to that service being permitted to be utilised, dependant on the saturation of other smart appliances on the network.

Other/none of the above (please explain why)

No Response

30. Do you have any evidence to support actions focused on any particular category of appliance? Please select below which category or categories of appliances you would like to submit evidence for, and use the text box/attachments to provide your evidence:

Wet appliances (dishwashers, washing machines, washer-dryers, tumble dryers)

No Response

Cold appliances (refrigeration units, freezers)

No Response

Heating, ventilation and air conditioning

The existing average domestic electricity consumption for a gas centrally heated property is 3,100kWh per annum, with a gas consumption of 12,500kWh. If these properties are moved to electro-heat, then even an efficient heat-pump with a coefficient of performance of 3.5 will require an additional 3,571kWh of electricity per annum, predominately occurring throughout the coldest, darkest months. In addition, at lower temperatures heat pumps use a supplementary heat element to boost output which can add significantly to overall demand. This additional requirement of electrical energy will be a challenge for the energy system to supply and so the ability for operators to modulate this at times of peak demand would be advantageous.

Battery storage systems

Battery storage system which aim to maximise customer prosumption of their own on-site generation have little impact on the distribution network, however battery storage systems which aim to maximise value from arbitrage or selling ancillary services can often increase the resultant loading, pushing networks out of technical limits. The ability for operators to modulate this at times of peak loading would be advantageous.

To maximise the potential benefits to customers, the providers of these flexibility services should not be limited to a particular technology (Battery) but be available to any technology capable of meeting the technical requirements (Capacitors, Flywheels, Hydrogen etc.)

Others (please specify)

The Modern Transport Bill proposes a requirement for all vehicles to be ultra-low emission by 2050. A significant mix of these could be electric vehicles which may be capable of having their charging managed or providing vehicle to grid services. The ability to control these devices would offer the same benefits as the integration of storage, but at a more disaggregated level. Without this control there is likely to be a requirement to reinforce the network at significant cost.

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

Conflicts of actions between those calling on flexibility services provided by smart appliances must be identified, including the capability of the local networks to accommodate the actions. Diversity of load on the networks is one of the critical assumptions which form the basis for its entire design and architecture. Thermal ratings of equipment, levels of exceedance of voltage and security of supply all rely on network diversity being maintained. Any changes to the natural diversity of customer behaviour could have significant impacts on the ability of distribution networks to operate within limits requiring the reinforcement of the network at significant cost.

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

WPD is keen to explore the other options for enhancing the network that flexibility services may be able to provide in lieu of conventional reinforcement. Whilst the provider or operator of these flexibility services will have an important role to play, it should be the end customer who is the ultimate beneficiary of a smart, flexible energy system.

Potential models of smart, flexible energy systems that require customer investment in systems or opting into certain tariffs may reduce the uptake within vulnerable customer segments and exclude them from sharing the benefits, which is not an issue in the current volumetric arrangements for distribution charges.

33. How might Government and industry best engage electric vehicle users to promote smart charging for system benefits?

Government has already enabled the networks industry, through the LCNF/NIA, to analyse the potential impacts and costs of unabated electric vehicle charging and it is clear that smart charging could significantly reduce the whole system cost for delivering energy for electric vehicle charging. At present, there is no public visibility of this message or of the requirements for the energy system to change, so we would welcome the Government to lead on public engagement for this transition.

WPD's CarConnect NIA project is developing the commercial frameworks and customer proposition for managed charging services through the use of third party aggregators, under the customer facing brand Electric Nation. The customer acceptability of these propositions will be disseminated to Government and industry as the project progresses and we are committed to integrate any successful outcomes into our business as they develop.

WPD's LV Connect and Manage NIA Project is developing the technical capability to pass load control signals through the distribution network directly to a customer's equipment, to manage clusters of low carbon technologies which occur ahead of planned reinforcement.

WPD continues to engage with OEMs, local councils and Government departments to accelerate the uptake of EVs and ensure the customer journey around electrification of transport is smooth. WPD have worked closely with OLEV to provide technical expertise on V2G service provision and advice on strategic infrastructure development.

34. 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

An effective and competitive market should ultimately dictate the availability and pricing of the smart charging propositions and tariffs. However, to foster the initial uptake, we would welcome Government intervention in the regulation of charging infrastructure for electric vehicles. Standards are important to ensure customers have consistent access to provide system services. The current approach is leading to wide variations in technical capability across the UK. Currently there is no open protocol or platform developed to enable DSOs or SO to access the flexibility. We consider that a regulated approach to charging infrastructure provision is most appropriate and that the DNOs are well placed to provide the investment funding and manage construction works.

WPD are keen to explore the viability of management of network constraints using commercial contracts, but the flow of value through to the end customer may not be transparent, depending on the agreements between customers and operators of flexibility services. WPD are already actively working on projects that explore the smart charging topic (Electric Boulevards, CarConnect Electric Nation and LV Connect & Manage).

To manage network constraints, power, capacity and location of the flexibility service is crucial. There may be sensitives that need exploring in how DNOs and providers of these services share this customer data.

There is no defined principle of access put forward for managing the allocation of capacity to customers. DNOs may be able to do this on a 'technical best' approach, to maximise the optimisation of the network.

utilisation of an electric vehicle battery for putting electricity back into homes, businesses or the network?

Existing regulations only permit 16A of export out of whole current metered properties and all devices able to export energy and run in parallel with the network need to be assessed and agreed by the network operator.

Technical limitations on the network will restrict the amount of capacity available for export from a connection. This capacity may be shared between a number of variable intermittent energy sources.

Enabling prosumption of customer demand with energy from the electric vehicle would require additional monitoring equipment within the charging equipment or from the smart meter. The LV Connect & Manage solution we are testing will be able to provide this functionality if the customer elects for a connection variant. Smart Meters may require additional functionality or changes to how the data is recovered/sent to the DSO.

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

WPD supports a cross-vector approach for enabling a low carbon transition and understands the synergies that electricity and hydrogen networks can bring if developed in tandem. There are regulatory barriers currently in place which make development of cross-vector infrastructure systems difficult, specifically if there is a flow of value from one network to another. We would support working with Government to address these barriers.

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

WPD has engaged with several large non-domestic consumers as part of its innovation portfolio. This highlighted a very large variety in the way businesses treat and interact with energy. This can be quite significant even within certain sectors. This variability translates to their awareness of DSR as well as wider energy related topics. As identified in the FALCON innovation project, some customers are very unaware of their energy costs and required initial engagement on basic energy costs before progressing to discussions on DSR. At the other end of the spectrum, several organisations are actively looking for opportunities. We have had many direct enquiries about our SYNC and ENTIRE projects. We would be happy to share further information regarding these enquiries directly.

Another key route for information is through aggregators. Although the feedback from our customers indicates the quality of advice they receive is highly variable. (See responses to question7 and 9 for more detail).

For these reasons we actively support the Power Responsive national campaign. We will shortly launch our own DSR awareness campaign, "Flexible Power", with our non-domestic customers in the East Midlands.

37. 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?

WPD agrees with the barriers identified. In general this comes down to the identification of truly flexible load. This must reflect both the technical capability of the process or organisation as well as the commercial risks and rewards. Many technically flexible processes may be limited by the commercial implications of the required actions. To date this has pushed most flexibility contracts towards generation assets rather than genuine load shifting.

WPD would also like to highlight the work done as part of the ENA shared services group which has been looking to address some of the areas of concern such as the clarification and coordination of DSO and SO led services.

WPD has also identified several additional barriers to participation in DSR services:

- Confusion over the interaction of different DSR products. As part of the feedback following the joint Demand Turn Up (DTU) trial some customers highlighted a lack of understanding over the interactions with other services.
- Confusion over service use cases. During the DTU trial an article in the trade press highlighted that some potential service providers had misunderstood the use case and hence the value proposition.
- Confusion/ lack of trust over values promised by aggregators. Several customers have highlighted the confusion caused by high variation in the valuation of assets and services by different aggregators.
- Investment risk. Customers in the FALCON trial highlighted the issues with short term contracts. The uncertainty beyond the contracts period pushes customers to recover investments within a single contract, pushing up the price of participation. A DNO will naturally contract over longer timescales which may help address this issue. In particular under our proposed regional DSO model.

38. 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 our response to question 36.

39. 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)?

As highlighted in section 22 of the Call for Evidence, many of the building blocks for a fully optimised LV microgrid and domestic DSR are not currently in place. Further the scale of potential load growth from electric heating and cars will probably be too much for even the smartest LV grid to support. Costs for technology based solutions would also need to be substantially lower.

Properly designed smart tariffs will reduce the scale of system peaks, but there is likely to be a longer term need to deploy higher capacity conventional infrastructure (substations, lines and cables) in many places. Smart grid solutions such as dynamic asset rating are largely invisible to the customer and will allow us to delay investment decisions until greater certainty on future needs exists. Further smart solutions such as network meshing will also be used as an interim solution to allow construction works, with their associated disruption, to be communicated to customers in advance.

Due to highly uncertain forecasts for the uptake of Low Carbon Technologies it is difficult to provide a clear timescale for when we should communicate the need to transition to a smarter and bigger electricity system. Widespread works to upgrade LV distribution network is however not anticipated within ED1. We are already delivering work to address isolated clusters of Low Carbon Technologies.

Even with the building blocks of smart meters and HH settlement, demand shifting may be challenging due to low customer interest. Analysis from our Sunshine Tariff innovation project showed that even where there is customer interest, active participation is not achieved without automation technology. Our ECHO project showed a low tolerance by customers for technology solutions which were either unreliable or had too big an impact on their day to day lives.

40. Please provide views on what interventions might be necessary to ensure consumer protection in the following areas:

- **Social impacts**

Vulnerable or fuel poor customer who may be less likely to access smart appliances, or understand smart tariffs, may face higher energy bills as a result. To avoid exclusion, Ofgem, the government or other agencies could consider subsidies for smart appliances, and funding for advice on lifestyle changes to benefit from smart tariffs and DSR markets.

- **Data and privacy**

We are already working with Ofgem on data privacy arrangements. We agree that customers need to be confident that their data is secure in order to participate in the new arrangements.

- **Informed consumers**

We agree that customers need to be informed about the new opportunities arising from the smart energy system. We would suggest targeting schools and social media. The behaviour of every household will need to change, not just the bill payer.

- **Preventing abuses**

In our dealing with large customers during innovation projects, a lack of trust between customers and new entrants became a barrier to participation. For domestic and small/medium sized business customers to participate in new commercial arrangements such as aggregators or third party intermediaries, some form of regulation and licensing is needed.

- **Other**

None

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

WPD has worked with a number of Government departments to ensure resilience and robustness of the energy networks, including collaboration on cyber security issues. We are already working with government departments and others to understand the major threats to our ICS infrastructure and are working on resolving some of the potential issues. We would be happy to share this information as appropriate.

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

WPD works closely with our suppliers of software and systems to identify and resolve vulnerabilities. As with other Critical National Infrastructure organisations we liaise regularly with Government and the Security Services. We would be happy to share further details of our approach to Cyber Security management and testing protocols through a bilateral discussion.

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

We agree with the drivers for system change detailed in the paper.

Regarding the emerging system requirements:

- We agree that all parties should have appropriate visibility of the existing and future network, but there is also a need for the network operator to have visibility of proposed actions by others that will change flows on the network. In this regard, visibility platforms are needed to give parties ability to

plan and respond to system requirements. The price discovery that will result from these platforms will allow economic decisions to be made between procuring flexibility and more traditional 'build' solutions. As described in response to question 11 we are currently working with Centrica on a project based in Cornwall called the "Local Energy Market" which is a trial platform solution.

- To ensure that efficient use of system resources is made, consideration needs to be given to connection arrangements. At present the lowest cost solution to allow connection is usually required but this can restrict full use of the flexible capability available. E.g. generating plant has a power factor requirement to be able to operate at 0.95 lead/lag but the lowest cost connection may limit how much of this range can be used. Increased understanding of the value of flexibility will be needed to justify more robust connection arrangements so that this flexibility can be accessed.
- A review of connection and charging arrangements is needed with greater alignment of commercial arrangements between Transmission and Distribution to ensure that appropriate signals are to be given to connectees. This will need to include some form of connect and manage arrangement at the Distribution level to both facilitate timely and cost efficient connections and an appropriate balance between build/non-build options.
- Revised system security standard (P2) – storage, demand side response and flexible generation all can contribute to system security together with dynamic network ratings and active network management. The contribution that different types of generation make to both distribution and transmission system security needs to be reviewed along with guidance on how much ANM/DSR should be allowed before reinforcement takes place to limit the disruption caused should active management fail.
- Forecasting – methods to develop day, week and longer term forecasts of system loading need to be developed to allow the signals to be given to the market and allow procurement of appropriate response for flexible providers.
- IDNOs – as well as the interface between DSO and SO a framework will also need to be developed on the interface between DSO and IDNO networks to ensure that customers connected to those networks are given te same opportunities as those connected to DSO networks.

44. 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?

Our innovative solutions are achieving accelerated connections and reduced costs by enabling customers to connect new DG to our network, avoiding significant reinforcement costs but using innovative commercial arrangements coupled with new technologies and the acceptance of some curtailment.

We can do this with lower overall costs to both the customer and our business and this is shown in the financial summary below. We believe this is a significant step and the fact that many of our peers are now adopting these techniques demonstrates how this innovation has helped customers.

Our website has a section dedicated to alternative connections where customers can get information about helping them to connect to our network. We are looking into new variants for Energy Storage, Electric Vehicles and Heat Pumps.

	MVA Released	Avoided costs (£m)	
		Customer	WPD
Active Network Management	20.4	1.25	0.95
Soft Intertrip	40.7	2.58	1.36
Timed Connections	22.1	1.3	0.32
Totals	83.2	5.13	2.63

Active Network Management (ANM) is being progressively rolled out across our network.

The use of ANM is currently being extended to incorporate SO requirements for both issues of capacity at the GSP interface between WPD and NGET as well as providing a route to address a transmission system boundary issue in the South West. This is providing an economic and rapidly deployable solution to a relatively 'low probability high impact' event occurring on the transmission network. This requirement emerged due to the volume of DG that has connected or accepted offers for connection in the South West.

Currently, the commercial arrangement on our network for active network management connections is to use a 'last in first off (LIFO)' arrangement to give greater certainty, however this may become an issue in future where SO contracts for new services at distribution level as there could be parties at a position in the LIFO stack who would be constrained and not able to provide these services. A move to the connect and manage arrangement used for transmission connected generation to the distribution level would allow the 'use' order of resources to be on a lowest cost level, including that of the SO rather than connection order.

It would be totally impractical for a DSO to assess the impact on its active distribution network from every SO call for a flexibility service in real time. Therefore contracts for network support from distribution connected customers will, in most circumstances, have to transfer to the DSO. The DSO will still be able to provide the SO with the services they need.

b) the potential efficiency savings which could be achieved, now and in the future, through a more co-ordinated approach to managing these impacts?

The potential benefits of flexibility and a transition to a DSO are highly dependent on the rate of growth of intermittent generation, storage and the uptake of end use low carbon technologies such as electric vehicles. A significant driver of these growths is the cost of the technologies which is falling as volumes of uptake increase. Whilst published studies to date have shown a wide range of benefits, they all show a positive value in a more actively managed network using flexibility from both demand and generation. These studies indicate that savings in the tens of millions of pounds to low hundreds of millions of pounds per annum are realistic saving that could be achieved across GB compared to a system developed for passive operation.

The ENA High Volts Working Group is currently working on the process of assessing potential solutions to the change in reactive power absorption on the network which is leading to voltage management issues on the transmission network to find the lowest cost whole system solutions.

Alongside this, there is also a group being set up under the ENA TDI group to determine the process for whole system integrated planning.

45. 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?

WPD has worked closely with National Grid TO and SO teams over several years. We jointly developed the ICCP secure communication link between DNO and National Grid control rooms through an LCNF project in 2011. This link has been used by other DNO Innovation projects and forms the basis of planned inter-system data sharing/constraint management in South Wales and South West England. Customer connection offers which depend on this collaboration have already been accepted by customers.

All of our Innovation Projects involving Demand Side Response have been carried out with the full involvement of National Grid. FALCON was the first LCNF project to report on the importance of 'revenue stacking' for customers.

Project SYNC has been operated in parallel with the SO's Demand Turn Up (DTU) service during summer 2016. SYNC has again proven the value of coordinating SO and DSO actions. In summer 2017 the DTU service will again be used to reduce the need for local generation constraints as well as assisting with system balancing. This collaborative programme has already been shared at the 'Power Responsive' working group.

Project ENTIRE is establishing a core WPD capability in Demand Side Response. The necessary forecasting, contracting, despatch, metering and settlement functions will be developed whilst alleviating winter demand congestion in the South-East Midlands. The project will establish a local marketing campaign to raise awareness of Demand Side response with I &C customers. A value stacking service will be offered under our soon to be launched "Flexible Power" campaign.

In addition, coordination between WPD and the SO and TO is also being expanded via the following processes:

- TDI group – we are an active participant and chair this group that is seeking to improve the coordination and whole system approach in a number of areas. Enhancements to the way this activity is organised and managed will shortly take place to improve coordination (see response to question below)
- Statement of Works requirements – we are running the trail of an improved statement of works process ('Appendix G') to improve the assessment of the impact of DG connections on the transmission network. This process involves both more detailed and regular information exchange between us and the SO.
- We have started a regional development programme in the South West with the SO. The purpose of this is to take a whole system approach to both the future planning and operation of the system in the South West.
- Active Network Management has been introduced on parts of the WPD network to facilitate connections. We are now expanding this to incorporate transmission system requirements both the address GSP transfer limits and to address a potential issue at a transmission system boundary.

In addition to the interface between DSO, SO and TO, consideration will need to be given to how to integrate IDNOs to ensure that customers connected to those networks have access to the same opportunities as those connected to DSO networks.

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?

Whilst progress is being made on current issues at the interface between DNOs and the TO/SO via the ENA TDI group, more needs to be done and a fast pace of change is required. Via the ENA DNOs and NGET have agreed that in addition to the work already being carried out by the workgroups under the TDI process, further areas will be considered to provide a fuller development of the revised roles and capabilities required by network operators. Some of the further areas that have been identified include:

- Agreeing an industry approach for the development, assessment and contracting of wider system and distribution network related services. Assessment and decision making processes for investment affecting the T-D boundary.
- Establishing operational processes for the utilisation of distribution solutions.
- Identifying and agreeing data exchange requirements and processes for T-D activities.
- Defining the role of the DSO in the short-medium term and developing templates across DNOs for interactions with the SO.

The ENA's T-D work programme is being reviewed against the following objectives for 2017.

1. T-D Process – development of improved T-D processes around connections, planning, shared TSO/DSO services and operation. Where feasible, these are in place by September 2017.
2. Customer Experience – assessment of the gaps between the experience our customers currently receive and what they would like and identification of any further changes to close the gaps.
3. DNO to DSO Transition – development of a more detailed view of the required transition from DNO to DSO including the impacts on existing organisation capability.

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.

The main regulatory issues that need to be addressed in consultation with the industry are to lay out the objectives and timetable for commercial and charging reform to align with the development of DSO activities, these include:

- Clarification of and if necessary changes to the connection, import and export rights granted to connected parties
- Decision on form of connect and manage arrangement necessary at Distribution level
- Greater alignment of the charging arrangements and commercial terms of those connected at transmission and distribution levels in the network.
- Decision on overall framework on boundary of SO activities between DSO and SO

46. 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?

Yes, the majority of future flexibility will come from distribution connected parties and coordination of this will be required to ensure that distribution network capability is not exceeded by use of these resources by the SO. This will require visibility of planned SO action by DSOs so that issues or limitations to use can be highlighted to ensure that continued system reliability.

The growth in the amount of DG and other LCTs (electric vehicles and heating) will drive the timescale of required changes. We have started scenario planning work for our areas to produce an envelope of potential growth in network use to start to understand when system issues are likely to occur. The growth in DG, EV and electric heating are key technologies which will drive the need for change but are also the technologies most likely to be able provide the flexibility needed.

Our future vision for becoming a DSO includes:

- Deliver local system operation to increase network reliability and economic outcome
- Become an active network manager and benefit from greater transparency to improve asset management and safety
- Develop local flexibility and ancillary services
- Deliver price efficiency through more intelligent network management
- Use data analytics and communication systems to provide greater transparency supporting decision making
- Be a facilitator for third party service providers
- Be at the forefront of technology development
- Build on local community presence and existing customer relationships

Combining these together will enable us to:

- Capture the full value of distributed generation, storage, microgrids, EVs, and demand response
- Extend system operation into an integrated and automated system
- Provide value added services at an efficient price

In summary our DSO business priorities are to:

- Expand the existing roll out and application of Active Network Management to the higher voltage networks, prioritising areas which are the most likely to benefit. From this we can optimise investment decisions, deliver greater network flexibility and maximise customer connection choice.
- Protect the integrity and safety of lower voltage networks. We will be looking to maximise the use of smart meter data, apply additional network sensing where relevant and implement simple control schemes. We aim to develop wider flexibility for the use of import/export capping as an alternative to conventional solutions only reinforcing the networks when these solutions cannot deliver what is required.

- Co-ordinate with the SO by helping to establish visibility platforms for suppliers, aggregators and customers to allow the development of flexibility services shared between DSO and SO. This will include the requirement to raise the awareness of DSR and to help customers to value stack where appropriate.

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?

The models presented give a good range of the high level options available.

There are two dimensions in the development of a DSO:

The first is greater control over system operation. This includes delivery of local system operation to increase network reliability and overall efficiency. This will be delivered by active network management using local flexibility and ancillary services. These ancillary services will include a number of those currently procured by the SO with the DSO also providing a service to the SO including:

- Frequency response
- Reserve
- Reactive power
- Settlements
- Demand side response

The second dimension is new services and platforms. These platforms could be provided by the DSO or a third party with the DSO using these to provide visibility of the services and flexibility that it requires to efficiently manage the network. I this regard we have recently announced a large EU funded project with Centrica to create a local energy market platform in Cornwall. The scope of our involvement is still in detailed development but is likely to include identification of flexibility service requirements and encouraging more efficient use of the local assets.

ii which other changes or arrangements might be needed to support the adoption of different models?

As part of the charging reform, something similar to a balancing servicing revenue stream will be required at the distribution level to facilitate the DSO procuring services. Changes will also needed to the regulatory framework to ensure that comparisons of conventional reinforcement versus flexibility service costs are consistently applied. This would also ensure the DSO appropriately incentivised.

iii do you have any initial thoughts on the potential benefits, costs and risks of the models?

Whilst the first two models may be able to provide a clearer division of responsibilities between SO and DSOs, the third model is more likely to produce a more coordinated approach to whole system planning and operation within a region as one party has overall responsibility to ensure efficient delivery. As the majority of flexibility will be embedded in the distribution network and there is a need to ensure that the distribution

network capabilities are not exceeded by the use of this flexibility there is a benefit in the DSO taking on an enhanced regional responsibility covering some transmission network constraints.

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

The current support arrangements for network innovation are broadly fit for purpose. EPSRC grants are effective at stimulating R&D within the UK academic community. InnovateUK through regular calls supports SMEs and others in the development and demonstration of innovative solutions within our supply chain. The relatively new Energy Systems Catapult shows some promise in supporting larger scale innovation projects, particularly where the solution is cross energy vector involving, heat, mobility or non-electricity fuels. Within the regulated networks sector the Network Innovation Allowance (NIA) and Network Innovation Competition (NIC) have successfully initiated relevant and timely innovation testing. Finally our major private sector supply chain suppliers invest heavily in R&D and new solutions on a purely commercial basis.

We make the following observations in the specific areas identified in the Call for Evidence:

- NIA/NIC

The mechanism is working well and is building upon the proven value for money Low Carbon Network Fund (LCNF) programme. Minor improvements could be made to the scheme to facilitate cross energy vector projects (eg. Hydrogen) and removing restrictions on low or high Technology Readiness Level (TRL) solutions where justified. Ofgem manage the Governance arrangements for NIA/NIC and have adequate process in place to review and update as needed. We support their recently published proposed changes to the NIC rules, in particular mandating all network companies to open up annual NIC applications to third parties.

- Commercial and Residential Demand Side Response (DSR)

There are many projects investigating technology solutions and customer attitude to assess the benefit of DSR. WPD has completed testing at an individual household, community and in the I&C sector with a variety of customer types. The projects have demonstrated a variety of domestic customer DSR propositions ranging from pure price signals (eg. ECHO) to specific campaigns in communities (eg. Community Energy Action). Projects have tested a variety of automated solutions (eg. Sunshine Tariff) and other technologies such as Home Energy Storage (eg. SoLa BRISTOL).

As such we consider innovation funding support to have been sufficient in this space. We have also recently launched projects to test DSR with future low carbon technologies such as electric cars and hybrid heating systems.

- Flexibility trading/optimisation platforms

For larger customers (I&C), under NIA and LCNF, we have tested DSR services using reserve generation (FALCON), demand turn up (SYNC) and are now launching our Flexible Power campaign (ENTIRE) to alleviate real congestion on part of our Midlands network. Testing has covered a variety of payment models including

direct payments and peer to peer facilitation. Further, we are partnered with Centrica to help deliver the recently announced Local Energy Market in Cornwall.

- Storage Costs

We have no specific comments on the need for additional support in this area, although we are aware the supply chain are investing heavily in research and development for a global market. Vehicles are likely to behind the acceleration of storage technology into the energy sector. We support the work of the Boeing IVHM Centre at Cranfield University and are members of the Cenex Advisory Board to ensure opportunities for cross sector collaboration are identified and exploited.

- Vehicle to Grid (V2G) demonstration

We acknowledge the potential of V2G to revolutionise the energy system. Our Electric Nation NIA project is the largest electric vehicle controlled trial in the world and will incorporate V2G in the project as cars and chargers become available. We have high confidence that V2G will develop quickly. Equipment and wiring standards will need to evolve quickly. Some intervention and support may help UK businesses be at the forefront of this change.

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

As described in our response to question 47 we have not identified any significant gaps in innovation funding. However the environment is evolving rapidly and consumer changes in their electricity use may accelerate load (or generation) growth to a rate not experienced before. We suggest that sufficient breadth in innovation programmes is essential to be prepared for unexpected issues. Greater certainty over longer term funding would ensure DNOs embed research capability as a permanent activity.

WPD focus will continue to be balanced between assessing innovative technologies, innovative market designs, and innovative customer solutions, at all voltage levels and for all customer groups.