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By email only to: smartermarkets@ofgem.gov.uk

Dear Ben

Creating the right environment for demand-side response

Thank you for the opportunity to comment on the above consultation. I am writing on behalf of our three distribution network operators: Eastern Power Networks plc, London Power Networks plc and South Eastern Power Networks plc. They are referred to as UK Power Networks in this response.

We believe the consultation is timely in that it addresses a number of issues that are critical to the effective deployment of demand-side response (DSR). We believe DSR has a particularly important role to play in facilitating affordable decarbonisation of electricity production and electrification of heat and transport. As the consultation notes, creating the right environment in terms of regulatory, commercial and market arrangements, and not least in terms of creating consumer awareness and interest, is key to releasing the potential for DSR to play a full role in reducing the need for investment in distribution and transmission network capacity, and generation plant.

Of particular importance will be ensuring that multiple uses of DSR by different market players does not constrain the scope of DSR to provide multiple services. In terms of contracts for DSR services with industrial and larger commercial consumers, these have the potential to provide ancillary services to both Distribution Network Operators (DNOs) and the System Operator. This is an important synergy to exploit and we believe that potential conflicts can be resolved by appropriate analysis of risk and through flexible multipartite contracts. At the domestic and SME level, the challenge will be to create an appetite by consumers to engage with time-of-use (and ideally dynamic time-of-use) tariffs, and for such tariffs to better reflect the marginal costs of both network capacity and generation operation. Further details and specific answers to your questions can be found in the attached appendix.

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I hope the above feedback is beneficial. If you have any queries please do not hesitate to contact Paul Measday in the first instance.

Yours sincerely

Keith Hutton Head of Regulation
UK Power Networks

Copy: Paul Measday, UK Power Networks
Dave Openshaw, UK Power Networks

Appendix

Precondition 1 – industry parties need to be confident that there is value for them in demand-side response to justify the investment

Question 1: Are there any additional key challenges associated with revealing the value of demand-side response across the system? If so, please identify and explain these challenges.

The consultation accurately describes the challenges surrounding potential cross-party synergies and conflicts, and the consumer engagement challenges, in leveraging the full 'whole system' value of demand-side response (DSR). However, the document perhaps understates the value of DSR in the context of the future electricity system and the demands placed on it – on the one hand by electrification of heat and transport, and, on the other hand, by intermittent, zero marginal cost, low inertia generation.

We agree that electric vehicles and heat pumps might enable consumers to use electricity more flexibly; however in the absence of incentives or the practical means to do so it is quite probable that the combined impacts of home electric vehicle charging and electric heating could give rise to a disproportionate increase in winter weekday evening peak demand (and hence annual system peak demand). If so, that would have onerous implications in terms of the need for distribution and transmission network capacity, and also for the economic dispatch of generation in terms both of marginal operating cost and carbon merit. In other words it is likely that low efficiency fossil-fuelled peaking plant would need to be retained or new peaking plant built (for example OCGTs). The effect would be exacerbated by the fact that transmission and distribution network system losses would increase disproportionately to the peak demand[1] and hence give rise to a need for even greater generation capacity and upstream network capacity at peak times.

In terms of generation, the impact of intermittency combined with limited forecasting capability (i.e. of wind and solar PV generation) on system balancing (pre and post gate closure) would be to increase the cost of balancing the system. Forecasting errors might reasonably be expected to increase leading to suppliers incurring higher and more volatile imbalance charges (especially in respect of 'system buy' prices). Post gate closure, the System Operator might be expected to have greater need for ancillary services such as STOR and Fast Reserve to make good shortfalls in centrally dispatched generation or unexpectedly high net demands due to less predictable outputs of distributed generation (e.g. onshore wind) and micro-generation (e.g. solar PV).

Moreover, the impact of lower system inertia at times when less synchronous generation is supplying demand (for example in summertime) will be to make the system more susceptible to transient events (e.g. faults) and 'small signal' perturbations such as sudden changes in demand or generation output. The system will hence become less stable with higher rates of change of system frequency and greater risk of frequency collapse (exacerbated by a tendency for small distributed generation to trip off under falling frequency conditions thereby further increasing the

[1] Network losses are in the form of fixed losses (associated with transforming electricity) which do not vary with demand and variable losses which vary with the square of demand (or more accurately load in amps). Hence a 20% increase in load through a given conductor of fixed electrical resistance would give rise a 44% increase in electrical losses in that conductor. Note that under DECC's 4th carbon budget 'high' scenario the combined impact of electric vehicle charging and heat pumps would be to increase electrical consumption by some 49.5TWh p.a. by 2030 - an increase of around 19%.

generation shortfall). It follows that the System Operator is likely to require additional frequency response services.

In conclusion the challenge must be to fully leverage the value of DSR insofar as it can provide hedging and ancillary services. That in turn means ensuring that all relevant parties, e.g. suppliers, DNOs, the System Operator, and commercial aggregators (acting either as intermediaries or independently as virtual power plant operators) are able to approach consumers who can provide the required response with an appropriate tariff offering or contract proposal, and subsequently secure sufficient data from those consumers to enable them to assess the level of DSR provided.

Question 2: Can current regulatory and commercial arrangements provide the means to secure demand-side response being delivered? If not, what will regulatory and commercial arrangements need to deliver in future?

The most immediate barriers to securing adequate levels of, and the full benefits from, DSR are:

- the current lack of necessary smart metering infrastructure (for profile class 1 to 4 consumers);
- a currently inadequate tariff-based pricing structure which is unable to reflect the marginal costs of either network capacity or generation operation with anything like the required degree of granularity; and
- the current settlement arrangements for profile class 1 to 4 consumers based on super customer profiles rather than actual half-hourly data.

The smart metering barrier will be largely resolved by 2020, albeit it is not yet clear to what extent the SME opt-out provision will prove to be a limitation to the potential scope for DSR at this level.

However, the remaining two barriers depend on the developments to the existing commercial (market) arrangements. For DSR at this level to be effective, there needs to be a tariff structure that better reflects the marginal costs of network capacity and generation output at different times of day and year, and indeed under varying levels of output from intermittent generation. For example DUoS charges should reflect the fact that network capacity is driven by peak demand and hence higher charges would logically apply at those times. Meanwhile, given a future higher but more variable contribution from intermittent generation, energy charges should reflect the marginal cost of output nearer to real time.

It follows that time of use tariffs will be of greater importance in future and will need to be capable of greater granularity than (for example) current E7 and E10 tariffs. It also follows that tariff prices should incorporate DUoS charge variations (i.e. they should be passed through to consumers and not socialised) and that half-hourly settlement based on actual aggregated half hour by half hour consumption (as opposed to an assumed profile) will be necessary. One potential barrier to introducing time-of-use tariffs based on half-hourly settlement is that suppliers will be unable to access individual consumer consumption data at this level of granularity without the express permission of the consumers concerned. It follows that suppliers might be reluctant to design tariffs for universal application at least unless a greater level of disaggregation of half-hourly data is available to them.

Assuming these barriers are removed or circumnavigated, the issue will be to ensure that tariffs can be designed with sufficient functionality (i.e. sufficiently flexible time banding and price variation) whilst, nevertheless, retaining sufficient simplicity for consumers to engage positively with them.

For larger industrial and commercial consumers, the DSR arrangements might be tariff or contract based. Industrial and Commercial consumers who can either shift demand or use standby generation to lop demand might in future play a valuable role in providing ancillary services such as network support to DNOs whilst providing reserve services such as STOR to the System Operator. The commercial challenge is to ensure that the provision of one service does not necessarily preclude the other. This is addressed in our response to Question 3 below.

In terms of regulatory arrangements, from a DNO perspective, contracting for DSR services as an alternative to network reinforcement must be sufficiently incentivised by regulation (for example through the IQI cost-efficiency sharing mechanism). It will also be important to recognise the legitimacy of DSR arrangements from a distribution licence compliance perspective (i.e. DSR contribution to network capacity). DNOs are already able to consider the capacity contribution of any appropriate distributed generation on a probabilistic basis (without necessarily having a contract in place) and a similar approach to DSR would therefore be logical[2]. Moreover, the risk to DNOs of a DSR contract being terminated also needs to be formally recognised, especially as it might typically take more than a year for a DNO to either negotiate an alternative contract or put in place conventional reinforcement. In the meantime, the DNO might need to rely on derogation and so the principle should be that derogation under such circumstances would be automatic.

Question 3: Is current work on improving clarity around interactions between industry parties sufficient? If not, what further work is needed to provide this clarity?

In the case of large industrial and commercial consumers who are able to either shift demand or use standby generation to lop demand there is the potential for leveraging this capability for both distribution network support and system balancing services (as well as transmission network support through triad response). For example by precooling buildings or charging cold storage systems earlier in the day, at off-peak times, this can create headroom for turning down demand at peak times if called on to do so. Furthermore, whilst standby generation might be diesel-fuelled in most cases, it might nevertheless confer a net carbon benefit by offsetting the need for national capacity in generation peaking plant and by avoiding the embedded carbon cost of network infrastructure.

However, multiple calls by different parties for DSR services can lead to the full capability of the DSR to be constrained if, for example, one party insists on exclusivity due to concerns that multiple party contracts might put at risk the dependability of the DSR service. Contracts should be able to accommodate the risk that the dispatch of DSR by one operator (e.g. a DNO to address an unplanned network outage) might then deplete the capacity of DSR able to subsequently provide a further contracted service (e.g. STOR) later that day. The risk of such a coincidence is small (and can be assessed through analysis) and hence should not preclude a consumer benefiting by offering both services, or from different parties securing economic DSR resources.

For example, a DNO might contract with an industrial or commercial consumer to provide post-fault network support for a network at the limits of firm capacity as required by Engineering Recommendation (ER) P2/6. Adequate DSR capacity to avoid major system reinforcement might be as little as a few MVA for a few consecutive hours to enable the network to meet the peak demand period for that day. The probability of dispatching the DSR in these circumstances is very small. If therefore the consumer was also able to offer a DSR service to the System Operator (e.g. through a commercial aggregator who would include that consumer within an overall portfolio of

[2] The contribution of DSR to firm capacity assessments is included in the terms of reference for a current industry review of ER P2/6.

ancillary service providers) that would provide the consumer with a greater incentive to offer the service.

The DNO would be at a very small risk that the DSR service might not be available if dispatched earlier that day by the System Operator, but probably at less risk than assuming the availability of any un-contracted DG support as provided for under ER P2/6. Whilst the System Operator might equally be at risk if the DNO had previously dispatched the service, that risk would generally be mitigated by the fact that a commercial aggregator would typically have a surplus of capacity available across his portfolio to allow for such (and other) contingencies. Moreover, leaving aside transmission network constraints, the System Operator in general will be relaxed about the locality or network connection point of the ancillary service, whereas the DNO will generally have a very specific geographically-defined need.

Failure to address potential constraints on multiple uses of DSR due to concerns over risk of availability for any specific use could result in a potentially valuable resource being underutilised with the obvious consequences for whole system costs.

Precondition 2 – the value of demand-side response services needs to be effectively signalled to customers

Question 4: Are there any additional key challenges associated with effectively signalling the value of demand-side response to consumers? If so, please identify and explain these challenges.

As noted in our response to Question 1 above, it will be important to ensure that DSR is properly valued by the industry at large from a whole system perspective and recognising the future challenges (and DSR opportunities) surrounding network constraint management, system balancing, and peak demand curtailment. A further benefit is that of flexing demand to better align nearer to real time with the available output from low carbon, zero marginal cost generation.

Peak demand curtailment from a DNO perspective is essentially a matter of improving network load factors (average load/peak load) in order to make for better utilisation of available network capacity without resorting to network reinforcement. Given a reasonable level of understanding of the default behaviour of consumers (i.e. the way in which they would use electricity, including for electric home heating and electric vehicle home charging) then for domestic (current profile class 1 and 2) consumers, static time-of use tariffs could be designed to provide the necessary price incentives to create a flatter demand profile.

However, for the latter objective to be effective then prices and/or time bands would have to be more flexible to reflect the forecast (typically day-ahead) output from wind and to a lesser extent solar PV generation. It follows that time-of-use tariffs would need to be more dynamic reflecting day-on-day and within-day variations in wind generation output.

Moreover, given the potential market spot price implications of large volumes of zero marginal cost (but variable) generation then a marginal cost-based pricing structure would include strong time-banded price signals. The tariff would be closer to a critical peak pricing (CPP) tariff with order-of-magnitude differences between high and low prices. UK Power Networks in conjunction with EDF Energy is trialling such a tariff in conjunction with our current ‘Low Carbon London’ LCNF Tier 2 project. This tariff is a day-ahead CPP tariff whereby some c.1,100 consumers participating in the trial are advised at least 24 hours ahead of the pricing structure over the following day. There are three ‘fixed’ prices but their time bands are infinitely variable (though numbers of tariff price level

changes are limited to enable the tariff to be manageable by domestic consumers). The unit (kWh) price levels are currently 67.2p high, 11.76p normal and 3.99p low.

Albeit early in the trial period, notable consumer behaviour alignment with price is observable when compared with the control group. The tariff is conceived as a wind-following tariff and the day-ahead pricing/time-banding structure is based on historic day-on-day variations in actual wind patterns. No smart appliances or externally controlled load switching are involved; the consumer behaviour is purely down to day-ahead planning.

Whilst the tariff shows encouraging potential, it is only through the cooperation of EDF Energy that UK Power Networks as a DNO has been able to commission this trial. In terms of its wider applicability, we believe it demonstrates that whilst the price signals need to be strong, there is sufficient flexibility in the current demand profile of domestic consumers to play an important role in the future electricity market. The proviso is that there are no regulatory barriers to introducing necessarily more complex (i.e. dynamic) tariffs or to very strong price signals provided that 'peak' price signals are balanced by very low 'off-peak' signals.

Question 5: Do you agree that signals to customers need to improve in order for customers to realise the full value of demand-side response? Does improving these signals require incremental adaptation of current arrangements, or a new set of arrangements?

Given the provisions outlined in our answers to previous questions in this consultation (in particular question 4 above) we do not believe that further fundamental measures to improve signals are necessary. For example, whilst we note the statement in paragraph 3.37 of the consultation that the costs of delivering energy through electricity networks can depend on the level of investment needed at each location, we do not advocate intra-DNO licence area regional DUoS charges for profile class 1 to 4 consumers. Whilst such regional charges might be appropriate for larger consumers charged under the EDCM, for residential and SME consumers this might be perceived as an example of 'post-code lottery'. It might for example be considered unacceptable for low income family to pay higher DUoS charges than a wealthy family simply because the former is connected to a part of a network with lower capacity headroom.

Similarly, in the event of a low income consumer wishing to benefit from a more economic low carbon technology application such as a heat pump, or from a feed-in tariff associated with a solar PV installation, it might be considered unacceptable for that consumer to have to meet part of the cost of any network reinforcement whereas a more wealthy consumer might incur no such charges if connected to a network with greater capacity headroom. The exception would be if the appliance (such as a heat pump or PV inverter) was of such poor quality as to give rise to network power quality problems.

Whilst there is some logic in locational DUoS charging, it is somewhat mitigated in practice by the fact that consumers generally cannot respond to locational price signals. What they can do is to respond to time-of-day price signals. Given that responding to time-of-day price signals would be helpful in terms of improving network load factors, and hence available capacity headroom generally, including on upstream higher voltage networks where aggregated demand from lower voltage networks is more diversified, then the need for locational signalling for profile class 1 to 4 consumers is questionable and undoubtedly problematic in terms of political acceptability.

Question 6: To what extent can current or new arrangements better accommodate cross-party impacts resulting from the use of demand-side response?

For larger consumers, the provision already exists for DNOs to contract for DSR either directly or through commercial aggregators for DSR services. The issue at stake here however is that such bilateral arrangements (or tripartite where the consumer also contracts to provide a reserve service such as STOR) if carried out at scale would leave suppliers susceptible to imbalance charges. Ultimately the arrangements should embrace and reconcile the impact (beneficial or otherwise) of DSR on all affected parties. The objective would be to maximise available synergies whilst minimising potential conflicts. In so doing the true value of DSR would be reflected in the market and hence its potential more easily exploited.

Whist a capacity mechanism might be a means to trade DSR and hence its market value reflected by its marginal cost value to individual market participants, the concern would be as expressed above, i.e. that the arrangements should not preclude a DSR resource concurrently providing more than one service (i.e. where the risk of conflict is assessed and found to be small compared with the benefit in terms of avoided costs of alternative measures).

At the domestic / SME level, the ENA/Energy UK discussion paper referred to in the consultation provides some useful insights into how the current industry supplier hub-based structure might adapt to provide a more workable market for DSR reconciling the needs of both suppliers and DNOs. However, the question remains open as to how incentivised or indeed empowered suppliers are to introduce more complex time-of-use tariffs; and even then what incentive they have to reflect any time-of-use DUoS price signal in their charges to consumers.

Precondition 3 – customers need to be aware of and able to access the opportunities

Question 7: Are there any additional key challenges associated with customer awareness and access to opportunities around demand-side response? If so please identify and explain these challenges.

Consumer awareness of DSR, or indeed the rationale for time-of-use tariffs, is currently low. The rollout of smart metering provides a clear opportunity for consumer engagement and a limited opportunity to introduce the concept of energy pricing and the potential advantages (to consumers) of time-of-use tariffs enabled by smart meters.

However, wide-scale awareness, let alone acceptance, of time-of-use pricing (especially dynamic pricing which might prove particularly important in future with high levels of zero marginal cost but intermittent generation supplying the GB system) will require a well-considered and sustained campaign of consumer awareness and an ability for the industry to regain consumer trust and generate consumer interest.

That said, there is a general level of awareness by consumers of the concept of peak pricing. Most consumers will be aware of (and the rationale for) premium prices for peak rail travel and for some mobile phone services. Other obvious examples are peak period holiday accommodation and air flight charges. Hence whilst the rationale for peak electricity charges is initially less intuitive, there are familiar and clearly understood analogies that consumers should be able to readily grasp at least in the context of static time-of-use charges.

The rationale for dynamic charging will be less easy to grasp – and the varying charges associated with CPP tariffs might be particularly concerning. Consumers are likely to feel the need for some

protection before embarking on such a tariff at least until such time that they have gained sufficient experience to feel confident that they can manage their consumption effectively and hence benefit financially.

One helpful approach might be to explain to consumers the carbon emission benefits of DSR and of responding to time-of-use tariff signals (especially dynamic tariff price signals). A justified belief that such tariffs genuinely enable a higher contribution to be made by low carbon generation, and hence carbon emissions, might provide an additional 'soft' incentive for consumers to engage.

Question 8: Is any additional work needed to explore the role of third parties in helping customers to access and assess demand-side response offerings?

Commercial aggregators have already made a significant impact in the market – particularly in the ancillary services market. It remains to be seen whether they or other third party intermediaries (TPIs) will perceive an opportunity on the back of smart metering to extend their portfolios to domestic and SME consumers. The concept of a virtual power plant operator is not new and might therefore be a model that becomes more widely explored once the smart meter mass rollout begins.

What will be important, however, is that TPIs are not unreasonably excluded from accessing DCC services, provided they are able to demonstrate requisite levels of data privacy and security. Access by TPIs to smart meter auxiliary switches to control specific types of demand might also be necessary and hence there will be a need to reconcile any security conflicts with multiple parties potentially having access to common devices and hence transmitting 'critical' message through the DCC.

Question 9: Are there additional preconditions for delivering the right environment for demand-side response? If so, please explain what these are and why they are important, as well as attaching a priority relative to those challenges we have already identified.

The consultation describes the key preconditions for effective deployment of DSR. However a detail, we would emphasise is the need to ensure that the national smart metering programme creates the necessary enabling structure for DSR at domestic and SME level. In particular, failure to ensure interoperability between suppliers' interim (pre-SMETS2) and final solutions will potentially diminish the scope for DSR, as might an ineffective HAN solution (e.g. one which was unable to support the required messaging or price signalling for dynamic time-of-use tariffs). As stated previously, ensuring access by TPIs to the smart metering system (subject to meeting the requirements of the Smart Energy Code) will also be important for ensuring competition and innovation. A further requirement will be ensuring that suitable security-accredited smart appliances are able to communicate with the smart metering system.

Question 10: Do you agree with the priority and timing we have attached to addressing each of the key challenges identified above?

Subject to our answer to Question 9 above, we agree with the list of challenges and priorities for market development and, broadly agree with the suggested relativity between priorities. However we emphasise the ultimate importance (even if it is not regarded as currently the highest priority) of addressing potential cross-party conflicts and/or failures to leverage DSR synergies between parties and for different system purposes. We believe this is the key to releasing the full market value and hence potential of DSR.