

Removing policy and Regulatory Barriers

Enabling Storage

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?

The future arrangements must be able to support a broad range of flexibility products and services, and their provision, from a wide range of providers. To ensure the most economic and efficient mix is achieved we need market led solutions where there is a level playing field for all flexibility providers and technologies – i.e. no specific arrangements for particular technologies or types of provider. Provided there is a level playing field then markets will deliver appropriate price signals and incentives to develop flexibility in the system economically and without the need for subsidies. Therefore, it is crucial that a fair and consistent approach is applied across the evolving energy market for all market participants and technologies.

On this basis, we agree with most of the main policy and regulatory storage barriers identified in the call for evidence. In particular, the final consumption levies, as applied to storage. These are inconsistent with other forms of generation and create a regulatory barrier.

In practice, the more material barrier to storage playing an increasing role in flexibility is a commercial one, namely the current lack of market contracts available. This was illustrated by National Grid's EFR tender – a market led solution that was oversubscribed materially and also reasserted in a recent straw poll during a UKPN LCNF dissemination event. Those present identified revenue uncertainty as the number one barrier, more of a barrier than Capex or Opex costs.

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?

Greater transparency from the DNOs on where connections for storage (and other flexibility technologies) are needed together with the specific operational characteristics required to deliver network benefits. Some networks have provided “heat maps” but more transparency and clarity is required.

Bringing on storage and other flexibility products and services, ahead of the connection queue could be considered where there is a defined benefit to the network. E.g. it facilitates the connections of more users as a direct result. In practice this could result in an increase in conditional connection agreements for storage in constrained areas.

The connection application process should be developed in a fair and pragmatic manner and in consultation with stakeholders, to better manage the connection queues in the distribution networks and facilitate the release of connection agreements that are no longer required.

The current review of the P2 network planning standard has outlined several options for a new connections approach, some of which may have an adverse impact on some flexible technologies, including storage. Ofgem needs to ensure P2 adopts the principles of technology (and provider) neutrality to ensure there is a level playing field that can facilitate a range of flexibility services.

To ensure providers can leverage synergies across their products and services, a consistent approach for the treatment of flexibility, across all DNOs, is also important. This should include connections, definition, treatment, security of supply and engineering standards.

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.

Charging arrangements should be cost reflective and technology neutral to facilitate a level playing field across all technologies. Storage, and its operational characteristics, should be integrated into the current market arrangements rather than special arrangements that could lead to distortions. We agree that this can be achieved relatively quickly by Ofgem and the networks to minimise uncertainty. We support changes that better reflect the value and costs of storage (and other flexibility products) through the use of flexible connections and charging arrangements. We also agree that storage facilities should be treated as non-intermittent generation.

We agree with BEIS and Ofgem that the current network charges are correct for storage. Network charges should be cost reflective and therefore apply to both the import and export of electricity by storage as they use the networks twice. This principle has been successfully applied to Pumped Hydro [storage] for many years without issue.

Similarly, the approach to BSUoS should also be technology neutral and cost reflective to avoid distortions. High BSUoS costs impacts all generation/flexibility technologies utilised during system stress events; any solution needs to be consistent with the principles outline above. Flexibility providers should reflect any additional BSUoS costs into their prices/tenders for their products or services to ensure the most efficient service(s) are procured by the networks. We do not agree to a reduction in BSUoS costs for storage as this will simply reflect in higher costs for the remaining parties, including consumers, and a less efficient energy system.

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?

The future electricity system will need more flexibility services to maintain security of supply and a market for such services is the best way to deliver this cost effectively and efficiently. We agree that storage and other forms of flexibility have an important role to play and can be used to support network operations. Flexibility providers should be able to sell their services where it is the most profitable for them (e.g. balancing, system services, frequency response, congestion management, network contracts as an alternative to grid reinforcement, etc.).

Aligned positions and transparent, non-discriminatory processes between Transmission System Operator, DNOs, Suppliers and other flexibility providers are all needed to facilitate the emerging system flexibility economically and efficiently.

National Grid's EFR tender demonstrated that there are already many storage providers available to fulfil market tenders. The DNOs should be tendering for industry players, including storage providers, to minimise re-enforcements or alleviate constraints on their current networks and encourage more flexibility providers.

Networks have a role as neutral market facilitators but not as commercial service providers as this would distort the market and raise conflict of interest concerns; therefore networks should not own storage. We do not agree that DNOs can own storage as a last resort if there are no suitable storage providers. If there

are no responses to a DNO tender, this probably means that a solution with storage is untenable or the tender is poorly designed. A “no last resort” provision would incentivise the DNO to tender appropriately and seek innovative solutions with providers.

Notwithstanding the above, if it is considered allowable for DNOs to own storage as a last resort, this should only go ahead, if it can be shown by the DNO that the storage investment will provide an overall benefit to consumers, and the storage facility is being used by the DNO for network purposes only.

DNOs should not be providing services to the SO directly. Customers have already funded the DNO through the price control and so cannot then be expected to also fund the SO to procure services from the DNO. This would cost customers considerably more than if services are provided by a third party (who would have to fund their own activity). DSOs cannot, and should not, be on both sides of the market. They have a key role to play in designing flexibility services and buying them competitively from the market, but they should not be allowed to participate on the supply side (i.e. sell services to themselves or the TSO, either directly or through an affiliate), in the interests of effective competition.

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.

The future definition of storage should be applied consistently across the industry. To ensure a stable and consistent approach, the regulatory treatment for storage should either be as currently (option a) where storage is not separately defined in the Electricity Act 1989, but is treated as generation by Government and Ofgem, or option b, where storage is defined as a subset of generation in a modified generation licence. Option b would result in the ability for additional characteristics, for example demand profiles, to be taken into consideration, if required.

We do not support the introduction of a separate licence condition as the associated changes to primary legislation could take years to implement, create uncertainty in the sector, and deter investors. Additionally, having a separate licence condition, with storage definitions embedded in legislation, risks constraining future storage innovation and/ or technology developments.

For planning purposes, a storage installation’s energy capacity is a more appropriate measure than its maximum output/power. Capacity (in MWh, rather than MW) more accurately reflects the size of the plant.

6. Do you agree with any of the proposed definitions of storage? If applicable, how would you amend any of these definitions?

We believe there should be a consistent definition of storage across the industry. Based on our experience to date, we have not found the CM definition of “storage facility” to be an issue for pure storage solutions, but the use of “mainly or wholly” may cause challenges for future hybrid storage systems, so this area may need further consideration.

Aggregators

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?

Balancing services

The main barriers to aggregators are receding with the advent of new and mixed frequency of tenders. For example: the “demand turn-up” product offers a fixed annual tender and a more flexible twice a week tender. This is more efficient for both parties, as National Grid is not tied into having more turn up facility than it requires at any one time, and aggregators can bid in when they are available. Having a range of markets that accommodates many different types of service providers and technologies is beneficial as it creates more competition and facilitates more engagement from service providers.

To maintain a level playing field, there should be a consistent approach to market participants and their status as a BSC party. All aggregators should be BSC signatories, as this provides a well-defined existing framework for dealing with any adverse impacts on third parties. In the medium to longer term, Ofgem and the industry should contemplate appropriate changes to industry codes to better reflect the changing roles and interactions of market participants.

Extracting value from the balancing mechanism and wholesale market

There should be a level playing field for all market players in the balancing mechanism and within the wholesale market. By ensuring all aggregators become BSC parties, they will be exposed to any changes in the system stability that result from over-utilisation of aggregation services. If all aggregators are BSC parties, they will have a natural incentive to adapt their systems and processes in order to minimise their exposure to BSC imbalance charges.

The BSC is a well-established industry framework and its processes provide a set of rules, a well understood change process and equal access. If all aggregators are not required to operate within the BSC rules their actions could have significant consequences on other BSC parties and/or consumers with limited recourse to remedial action and/or compensation. We anticipate this would require further industry changes to address adding unnecessary complications.

Regarding the Balancing Mechanism: flexibility providers such as aggregators should be able to sell their services where it is the most profitable for them (e.g. balancing, system services, congestion management, network contracts as an alternative to grid reinforcement, etc.). This means the Balancing Market may need to change to take account of the need for flexibility services; the number and range of balancing players; and to solve operational constraints of TSOs and DSOs which may conflict.

To develop products and services, flexibility providers require sufficient information about the system needs, from both the TSO and the DNOs, in order to make informed choices. There also needs to be a level playing field for all flexibility providers and technologies – no technology specific arrangements

Other market barriers

Our understanding of Government’s position on multi-year capacity agreements is they should only be available to CMUs incurring material capex, because the investment case would be difficult to justify in the absence of longer term surety of revenue. DSR is not capital intensive, so the justification for offering long

term surety of revenue is less clear than it is for New Build (or Refurbishing) generation. In principle, if capital intensive DSR solutions were commonplace, we could see a case for longer term agreements, subject to the same capital expenditure thresholds being in place (~£130/kW for a 3 year agreement; ~£255/kW for a 15 year agreement). However, in practice, as DSR is not capital intensive, it would not qualify for long term agreements anyway, because the required capex would not be incurred. We do not foresee a need for change in this area.

Consumer protection

Barriers around consumer protection have been addressed to some extent in the European Clean Energy Package draft proposals, with assurances being prepared for customers that wish to enter or exit a contract. Additionally, the introduction of an aggregator code of conduct and for aggregators to become BSC signatories should provide additional protection for consumers.

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

There needs to be a consistent approach for market participants and equal protection for all parties. We support the requirement for all aggregators to become BSC signatories to ensure a level playing field across all parties providing products and services to National Grid. Ofgem and the industry should contemplate appropriate changes to industry codes to better reflect the changing roles and interactions of market participants.

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

We support the work currently being undertaken by the ADE for an aggregator code of conduct in the non-domestic arena. However, in order for the aggregator market to develop effectively and to provide protection to other market players, we believe a level playing field is necessary for all aggregator services. This includes all aggregators becoming signatories of the BSC to ensure that all market players have to comply with the same market rules.

As a result, we support aspects of an industry led change (aggregator code of conduct) as well as aspects of the regulator steps in (aggregators becoming BSC signatories) as the best overall solution. We believe there should be some rigour around the appointment of aggregators to ensure both consumers and other market players are protected from aggregator actions. By requiring all aggregators to become BSC parties, we level the playing field and ensure a consistent approach for all market providers. This also removes the current incentive for aggregators not to become BSC signatories which could pose significant issues in the future, once the aggregator market becomes more developed. Ofgem and the industry should contemplate appropriate changes to industry codes to better reflect the changing roles and interactions of market participants.

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?

Yes, as described in the document there are a range of actions that could help protect system stability and without the detail it is not possible to comment further at this stage. However, regardless of solution, it is important that all aggregators are required to participate. The simplest way of delivering the latter is to

ensure that all aggregators are BSC signatories and required to operate within the BSC rules which, in the future, would accommodate the processes to protect system stability.

Providing Price Signals for Flexibility

System Value Pricing

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

We agree with the enablers outlined in the document, namely, half hourly settlement, smart tariffs and smart distribution tariffs provided these are market led developments rather than enforced regulatory change. It is important that the right signals are introduced at the right time to enable markets to evolve in a sustainable and cost-effective manner. For example, we are supportive of HH settlement for all but only when the social impacts across all customers are known and a large proportion of customers can benefit from the change. Additionally, we support Ofgem's current stance of facilitating elective HH settlement for Q1 next year as the right step to avoid holding back innovation, but without placing a large cost across all customers (which mandatory HH settlement would inevitably accrue).

We agree that the system should make the best use of the flexibility available from a wide range of providers, from generation to DSR. We need market based solutions to be allowed to evolve as this will allow the different technologies and providers to compete on a level playing field, providing an economic and efficient solution for networks.

It is important to recognise that different types of resources excel at different forms of flexibility, and have different cost profiles. Unlike commodities traded in existing electricity markets, flexibility is a commodity with multiple attributes e.g. capacity, ramp rate, duration and lead time for delivery. Buyers may value the different attributes differently and similarly, flexibility sellers may have different cost profiles associated with the provision of each attribute depending on the technology they utilise.

The future arrangements must be able to support a wide range of flexibility products and services and provision from a wide range of providers – from the end consumer through to large interconnectors. To ensure the most economic and efficient mix is achieved we need a market led solution where:

- Flexibility providers have sufficient information about the system needs, from both the TSO and the DNOs, in order to make informed choices on their offerings
- There is a level playing field for all flexibility providers and technologies – no technology specific arrangements
- Markets are left to deliver appropriate price signals and incentives to develop flexibility in the system.
- The networks have a major role to play in developing flexibility products and buying these products competitively from the market.
- There are aligned positions and transparent, non-discriminatory processes between Transmission System Operator (TSO), Distribution System Operators (DSOs), Suppliers and other flexibility providers on how to deal with the emerging system flexibility.
- Flexibility providers should be able to sell their services where it is the most profitable for them (e.g. balancing, system services, congestion management, network contracts as an alternative to grid reinforcement, etc.). This means the Balancing Market may need to change to take account of the

need for flexibility services; the number and range of balancing players; and to solve operational constraints of TSOs and DSOs which may conflict.

Wholesale reform of the energy and balancing markets are not absolutely necessary and evolution, with the engagement of all stakeholders, will be less disruptive and create less uncertainty for the market.

As an overriding principle, we believe in market led solutions, therefore if there were sufficient market tenders for flexibility this would encourage and develop the flexibility market. DNOs should not be providing services to the SO directly. Customers have already funded the DNO through the price control and so cannot then be expected to also fund the SO to procure services from the DNO. This would cost customers considerably more than if services are provided by a third party (who would have to fund their own activity). TSO and DSOs cannot, and should not, be on both sides of the market. They have a key role to play in designing flexibility services and buying them competitively from the market, but they should not be allowed to participate on the supply side (i.e. sell services to themselves or each other, either directly or through an affiliate), in the interests of effective competition.

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?

When building an optimised run strategy, flexibility providers will look to provide a combination of one or more balancing services, peak generation (or demand reduction) and capacity. The current methodology in the Capacity Market for inferring delivery volume from DSR (which includes generation located on a customer site) creates barriers to DSR capacity providers who also wish to provide peak generation (or demand reduction). This is because DSR delivery volume is inferred from incremental delivery over and above what was delivered in corresponding historic settlement periods, where the DSR may also have been delivering. In short, the current methodology for measuring DSR delivery in the CM will tend to understate (or ignore) actual DSR delivery volume. Centrica has submitted a Capacity Market rule change proposal (CP225), which aims to remove barriers to generation on a customer site that wishes to provide peak generation and participate in the CM (details of our proposal can be found [here](#)).

The current ancillary services procured by National Grid tend to be discrete and mutually exclusive. National Grid has recently commenced a work stream looking at the feasibility of harmonising and allowing greater overlap between these discrete services. We look forward to working with National Grid and other stakeholders to improve the synergies and overlap between the current suite of ancillary services in the course of 2017. This should ultimately make it easier for flexibility providers to offer a broader spectrum of flexibility services to National Grid than currently.

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?

Using storage as an example, there are limited opportunities for flexibility providers to support DNOs with issues such as inertia/reactive power/voltage control. Infrequent market tenders prevent us from capturing the full value of our technology's capability to support these areas.

Additionally, automation is a key enabler of flexibility, but due to the current size of the flexibility market it is difficult to make investment decisions without scale.

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?

The DNOs should be publishing system operability frameworks for their networks, this will inform the market on where to develop products and service for future DNO requirements and what the potential value of these products and services are.

Smart Tariffs

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 market should be allowed to develop and offer the most appropriate smart tariffs that are attractive to customers. We do not believe that Government or Ofgem should play a role in developing smart tariffs or intervening in the market. If charges are cost reflective and the market principles and price signals are correct, this should facilitate the development and uptake of smart tariffs.

Both Government and Ofgem should avoid inhibiting the development of innovative smart tariffs via regulation. The CMA stated that Ofgem constrained innovation via its "simpler choices" Retail Market Review (RMR) rules. The constraint on innovation and differentiation created an Adverse Effect on Competition (AEC). BEIS and Ofgem should pay careful heed to the CMA's conclusions in this area and ensure that regulation does not undermine innovative or smart tariffs. To this end we welcome Ofgem's aim to rely more on principles than prescriptive rules.

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.

We support HH settlement for all, if and when the benefits outweigh the costs. This needs to follow a thorough impact assessment, including a distributional analysis looking at the impacts on different types of customers. It is likely that the benefits will not outweigh the costs for some time. We support Ofgem's current stance of facilitating elective HH settlement for Q1 next year as the right step to avoid holding back innovation, but without placing a large cost across all customers (which mandatory HH settlement would inevitably cause). We will continue to support Ofgem's work on further settlement reform to help determine the optimal level of reform and timescales to deliver the most cost-efficient outcomes for customers.

Suppliers are already entering the smart tariff market. These offers will continue to be developed and competition in smart tariffs will increase over time bringing innovation and customer choice. Ofgem/Government do not need to drive the market.

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?

We are currently undertaking work in the comparison of smart tariffs in different countries. Early results have shown that due to the differences in jurisdictions, market drivers, arrangements and systems as well as differences in the demand linked to summer and winter peaks, it would be more appropriate for smart tariffs to evolve and develop within and for the UK market. Suppliers are already entering the smart tariff market, and these offers will continue to be developed and competition in smart tariffs will increase over time bringing innovation and customer choice. Ofgem/Government do not need to drive the market.

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?

Yes, we recognise the reasons identified in the call for evidence why large non-domestic consumers may not be offered or take up smart tariffs. We believe that from the reasons outlined in the call for evidence, the main barrier is a lack of substantial differentials between peak and off peak wholesale prices that results in consumer inertia.

Smart Distribution Tariffs – Incremental Change

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.

Distribution charges are not currently acting as a barrier. The Common Distribution Charging Methodology (CDCM) is a reasonable approach to charging and reflects the differentials between voltage levels and different time periods. It does not, however, reflect the differentials between seasons and between locations. The locational aspect does mean that some part of network will get the wrong signal (e.g. that part may peak at night, whereas the network overall peaks at tea-time).

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?

It is appropriate that distribution charges should provide forward looking cost signals to users of the network as the current models seek to do, but incremental changes could be made to improve these cost signals. A balance is required between cost-reflectivity and the level of complexity in tariff structure. For instance, it may be impractical to have locational charges for all customers. Some potential developments are:

Seasonal time of day charging for CDCM:

- Currently, the incremental costs derived by the CDCM are converted to average unit rates for broad tariff groups (single rate or two-rate for NHH customers and three-rate for HH customers). The rates apply all through the year which means that the cost signal is diluted for the months where the network is most constrained and too strong for months where there is less constraints. Moving to seasonal time of day multi-rate tariffs for all CDCM tariff groups will produce tariffs which better reflect the costs of using the distribution system through the year and would facilitate the development of a flexible system.
- There are currently two industry change proposals which would deliver this. DCP 268 seeks to move all CDCM tariffs onto a three-rate regime, whilst DCP 169 seeks to allow the move to a seasonal approach to unit charges.

CDCM Generation charges:

- The CDCM assumes that the network is demand dominated however this is not always the case. There will be pockets of the network that are generation dominated and this is likely to increase in the future. In these areas, giving credits to generation output will produce the wrong signal and will lead to greater overall network costs. Further work could be done to identify those areas of the network that are generation dominated and credits reduced or removed (and potentially charges introduced).

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.

Customers connected to the distribution system are charged either via the Common Distribution Charging Methodology (CDCM) or the Extra High Voltage Distribution Charging Methodology (EDCM). Both methodologies are based on the principle of providing forward looking incremental cost signals to users. The key difference between the two methodologies being that the CDCM, which applies to customers connected at low voltage and high voltage, produces average prices for broad tariff groups, whilst the EDCM, which applies to customers connected at extra high voltage levels, produces locational site specific charges to each customer.

Key differences between the EDCM & CDCM can create a boundary issue where the level of distribution charges can differ significantly either side of the EDCM/CDCM boundary

Generation (EDCM vs CDCM)

- All CDCM generators receive a credit compared to 9% of EDCM generators. This is because the CDCM is assumes the network is demand dominated whereas the EDCM only provides credits to generators where they can be relied upon to provide a genuine long term benefit in their specific location.
- Although EDCM generation 'charges' are relatively small (c. 0.05p/kVA/day for capacity plus a fixed charge averaging c. 10k/yr), the fact that all CDCM generators receive credits can still create a significant differential in distribution charges for a generator connecting either side of the EDCM/CDCM boundary.

Demand (EDCM vs CDCM)

- EDCM produces site specific forward looking cost signals and the CDCM produces average forward looking cost signals. This can create a boundary issue with distribution charges potentially very different either side of the EDCM/CDCM boundary.
- EDCM and CDCM tariff structures, whilst they look similar, recover revenue in significantly different proportions i.e. for HV connected CDCM customer and an average EDCM customer:
 - Fixed charges: average c. £400/yr for CDCM (range of £215 -£850), compares to average c. £3,800/yr for EDCM (range of £0 - £287,000)
 - Capacity charges: average c. 4.43p/kVA/day for CDCM (range of 2.03p – 11.28), compares to average c. 2.83p/kVA/day for EDCM (range 0.00p – 19.01).
 - Unit Charges: three rate ToD for CDCM applying throughout the year with average red rate of 7.76 p/kWh (range 1.92 – 19.17). EDCM applies a single unit rate to seasonal peak with average rate of c. 0.83p/kWh (range 0.00 – 114.29).
 - Reactive power charges: apply to CDCM when above an allowed threshold. Charge is small, c. 0.2p/kVAh, but reactive charges are not levied to EDCM.

- Majority of CDCM revenue collected via the year round ToD unit rates (c.60%), for EDCM the vast majority is collected via capacity charges.

EDCM (FCP vs LRIC)

- Within the EDCM, there are two 'sub' methodologies used by different DNOs across the country (six areas use FCP, and eight use LRIC). Whilst both methodologies seek to create appropriate location specific forward looking cost signals, and both have their pros & cons, they can and will produce different cost signals for the same network. It is not ideal to have different methodologies producing different cost signals in different parts of the country.

Smart Distribution Tariffs – Fundamental Change

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?

Overall, we do not anticipate immediate substantive changes but there may be localised issues.

- Increased connection of distributed generation is likely to produce pockets of localised generation dominated areas where the demand dominated assumption underpinning the CDCM is less appropriate. Longer term, the CDCM may need to evolve to take account of generation dominated areas at lower levels of the distribution system to ensure that users receive appropriate cost signals.
- Similarly, there will be localised pockets of demand where peak is not related to system peak (i.e. in areas with high concentration of storage heating or electric vehicle charging points), where the average charges from the CDCM may not be providing the correct signals. Longer term the charging methodology may need to produce more localised charging signals for demand customers.

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?

- Network charges should reflect long run incremental costs of asset investment in the distribution network.
- Short term (real time) constraint management is best managed by contracting with individual users who are able to adjust import/export – via aggregators, bilateral contracts or a trading platform.
- Customer reaction to pricing signals is not contractually backed up and so cannot be relied upon to manage short-term issues.
- Dynamic (real time) DUOS charging would add much more risk to fixed Supply tariffs (risk premium) as costs would not be known in advance (and cannot be purchased in advance).
- If the role of the DSO goes beyond the provision of an economic and efficient distribution network (e.g. with responsibilities beyond the local network) then this role should be independent of the DNO.

- Reflecting short term signals is likely to be poor value for customers. Price control allowances are fixed in the short-term and so any reduction in network charges to reflect changes in behaviour will be funded by customers in general (rather than the DNO who has been funded to manage the network).

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.

Network charging is about investments and so a long-run incremental model will remain appropriate.

Short-term issues should be managed via separate contracts (ancillary, bi-lateral, and platform). DNOs should not be providing services to the SO. Customers have already funded the DNO through the price control and so cannot then be expected to also fund the SO to procure services from the DNO. This would cost customers considerably more than if services are provided by a third party (who would have to fund their own activity). In addition, as the DNO has much better visibility of the distribution network's current and future system requirements they would have an unfair advantage over other flexibility provider. This may deter competition and/or distort the market.

Other Government policies

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

Enhanced capital allowances

The Energy Technology List (ETL) administered by Government and the Carbon Trust provides a list of qualifying technologies eligible for Enhanced Capital Allowances (ECAs).

The ETL framework provides an important tax incentive for investors in energy efficient technology. It helps mitigate the high, up-front capital costs associated with some technologies which can act as a barrier to investment, especially in the business sector.

Energy Saving Opportunity Scheme (ESOS)

Major effort is still required to improve business energy efficiency nationally, and we believe ECAs have an important role to play in improving the commercial attractiveness of certain energy efficiency investments for business while also supporting the development of the market for distributed energy systems.

We support the introduction of the ESOS energy assessment scheme, but more encouragement, to act on the opportunities identified, are needed. To facilitate this, there should be a review of the actions currently being taken by organisations as a result of recommendations detailed within their ESOS audits. The review should bring together all organisations, Ofgem, Government and other market players to encourage organisations to use their energy audits to understand their energy usage and take action by using affordable technology to deliver reductions.

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?

We support Capacity Market Rule changes to facilitate participation of Generating Units located on Customer sites, in particular higher load factor units that are regularly in merit. Current Rules for Generating CMUs and DSR CMUs both represent barriers to participation by these units. Barriers to on-site customer generation in the CM inhibit the uptake and efficient use of flexible generation and storage, and ultimately the transition to a smart, flexible energy system.

Centrica has submitted a CM rule change proposal (CP225), which aims to remove barriers to on-site customer generation in the CM. Details of our proposal can be found [here](#).

We believe CP225 would facilitate participation of flexible generation and storage located on customer sites in equal measure. We hope our proposal can enable a constructive way forward for on-site customer generation in the CM and welcome stakeholder views on it.

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?

The integration of renewable generation into the market should be a system wide, technology neutral solution. The most appropriate way to achieve this is a cost reflective charging methodology which would mitigate the types of issues raised in the call for evidence.

Smart Appliances

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

- **Yes**
- **No (please explain)**

We agree that the 4 principles set out for smart appliances in the document are a good foundation in this area. Of the four we consider data privacy and grid security need to be prioritised and further work may be required as this market develops i.e. appliance abstraction (what can be controlled and how that control is managed). We have the following comments for each of the 4 principles:

Interoperability – we agree that some form of common standard should enable the ecosystem and benefits outlined within the document. The standards should be optional and not forced to avoid stifling innovation at this early stage. The standard should be selected from one of the global standards available as it would be inefficient to create bespoke standards for the UK.

Data privacy – we agree that consumer privacy should be respected and appropriate privacy safeguards should be in place for consumers, with consent sought for 3rd party access to information. However, the current regime appears overly burdensome, and may prevent consumers from benefiting, or realising how they can benefit, from allowing access to their data. A balance needs to be struck to ensure consumers are able to make informed choices.

Grid security – we agree that a high bar is needed for grid security, including careful co-ordination of appliances to avoid network load issues. In general, we believe that smart appliances used appropriately should help with grid security.

Energy consumption – we agree that additional energy consumption of the appliance arising from the ability to respond to signals should be negligible (unless the smart appliance is designed to respond to a turn-up service).

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.

- **Smart appliance labelling**
- **Regulate smart appliances**
- **Require appliances to be smart**
- **Other/none of the above (please explain why)**

Data labelling for smart appliances is the most appropriate way forward to ensure continued development and innovation. Any labelling requirement should be technology or platform neutral, and should be coupled with a consumer communication plan on the benefits of smart appliances to ensure consumers are fully informed and able to make the most appropriate choices. For example, if customers are aware of the cost of using their washing machine they may change their behaviours -use it less frequently and load it more efficiently.

At this stage, disproportionate regulation could stifle innovation in this fast developing area. Smart appliances need to evolve over time without the restrictions imposed by regulation.

Some smart appliances can notify the consumers or service companies of any malfunctioning and/or predict maintenance requirements, enabling faster and more timely repairs for the consumer. A good example of this is British Gas' Hive products and technology.

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)**
- **Cold appliances (refrigeration units, freezers)**
- **Heating, ventilation and air conditioning**
- **Battery storage systems**
- **Others (please specify)**

Actions should be focussed on appliances that can be made "smart" relatively quickly, at low cost and can provide the "smart" benefits with little or no impact on the customer (or customer interaction i.e. does not rely on behavioural changes).

Cold appliances and heating, ventilation and air conditioning have electricity loads and operating characteristics that are more likely to fall within the criteria identified above. Success in these areas and case studies will help promote consumer acceptance of smart appliances. Once there is a degree of customer momentum, focus can then be extended towards wet appliances where the loads are often greater and potentially more valuable, but a degree of behavioural change may be required to optimise the consumer benefits (e.g. load shifting).

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

To realise the benefits of some smart appliances, customers may need to be half-hourly settled. This will be enabled by the changes Ofgem are making this year to facilitate elective HHS.

We support the implementation of HH settlement but only when the social impacts across all customers is known and a large proportion of customers can benefit from the change. On this basis, we agree with Ofgem's current position of facilitating elective HH settlement for Q1 2018 as this will allow innovation, without placing a large cost across all customers (which mandatory HH settlement would inevitably accrue).

Public trust of smart appliances and their controls will be key to their early adoption and acceptance. Ideally, these smart controls will be convenient, simple and automated (not rely on customer actions). Consumers may also want to have the option to override an external control signal (as long as there are no safety issues), even though this could reduce the benefits of the smart appliance.

There may be a price barrier in the take up of smart appliance for certain groups. This could result in them being unable to realise the benefits from the appliances themselves as well as any automated TOU/DSR incentives.

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

The connected home, or internet of things, has huge potential to make the lives of people in vulnerable circumstances easier, but the benefits will depend on the circumstances or characteristics which make a customer vulnerable in the first place.

One example is mental ill-health. We know from research conducted with mental health charities that many people who experience anxiety, paranoia and other related types of ill health can be nervous about having connected devices in their homes, such as Smart meters, and may want to know what the data will be used for and whether there are health implications from the technology, for example. At the same time, people who are unable to leave their homes during episodes of mental ill-health can benefit hugely from technology which can top-up PAYG services.

Physical ill-health and disability can also play a part. People with sight loss will no longer have to rely on others to read their meters when the first RNIB-approved Smart IHDs are available in 2017, while boilers which self-report their service needs will be an unquestionable benefit for those unable to read the pressure gauge.

Existing risks which may be mitigated as a result of Smart data may include:

- self-disconnection (mitigated by the ability of people to top up without leaving the home, and by suppliers' enhanced ability to detect unusual vending patterns)
- people with dementia failing to keep their homes warm due to confusion (mitigated by British Gas' HIVE type remote monitoring for carers)
- scammers entering the home posing as meter readers
- detriment due to boilers failing unexpectedly

New risks which could be created might include:

- disengagement by people with mental health issues and people vulnerable for cultural/language reasons or age
- new forms of scamming by hackers
- over-reliance on technology

We would recommend that Ofgem/BEIS draw in a wide range of stakeholders to discuss and debate these issues at an industry-wide level to tease out the issues at an early stage rather than leaving it to each market entrant to work out these problems for themselves.

Ultra Low Emission Vehicles

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

We believe electric vehicle users should be able to opt in to smart charging on a voluntary basis, in return for incentives that ultimately reflect the value of the flexibility they provide.

Any scheme involving mandatory curtailment is likely to create customer acceptance issues which could derail the uptake of EVs and must be avoided.

Various industry trials have shown electric vehicle users are willing to move EV charging consumption from peak in response to ToU tariffs. We believe ToU tariffs are the most appropriate model to deliver system benefits from smart EV charging. UK electricity suppliers are already engaging residential customers with ToU tariffs and these will become more relevant to EV charging as smart-metering and half-hourly settlement are rolled out.

Smart EV charging is best delivered by market participants (such as suppliers and aggregators) with DNOs acting as neutral market facilitators rather than as commercial service providers.

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

The main barriers to EV customers adopting smart charging techniques or the utilisation of the vehicle battery is the current mileage range of electric vehicles and the owner's fear that the vehicle may become unavailable in times of emergencies. Current EV charging apps allow a user to delay the start of charging and inform them the time before a full charge is reached, but many charging facilities provide trickle charging which takes a considerable time to fully charge an EV, this limits the potential for shifting charging start time.

Additionally, there may also be battery life or warranty issues with the utilisation of an EV battery to export to the network at peak times, which would inhibit consumers from facilitating these contracts.

Once the EV market becomes more developed, removing some of these barriers (increased mileage range); there should be a market led solution to reward EV customers to charge their vehicle avoiding peak demand periods.

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

Consumer Engagement with DSR

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

National Grid's Power Responsive campaign has been a key communication and education vehicle to I&C customers as have, to a lesser extent, industry bodies such as MEUC and ADE. Aggregators and Utilities companies offering DSR services have also been very active in demonstrating the opportunities bilaterally, at conferences and at industry events across a broad range of sectors. Brokers are also starting to become a partner channel for DSR services and at British Gas we have also been contacting our larger business supply customers to explain to them the opportunities and benefits associated with DSR.

Most I&C customers who are aware of DSR (often through the routes described above) will either approach a number of companies offering DSR services (Aggregators or Utilities) or will have been contacted by those companies directly. Tendering for DSR is not yet a common practice but consumers are becoming increasingly aware of the opportunities of leveraging competition in the marketplace. It is not unusual for the very largest I&C customers to have in-house capability to deliver some services themselves without the need of a third party.

DSR to the majority of customers today means Triad avoidance and STOR participation and to a lesser extent the Capacity Market delivered predominantly through back-up (diesel) generation. Larger and more sophisticated energy users can shift or curtail their consumption to reduce their energy costs and some have focussed purely on more technically challenging National Grid services such as FFR that are harder to implement but more valuable.

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?

The British Chambers of Commerce (in association with British Gas) published an Energy Insight report in 2016; the report sought the view of more than 2100 businesses on Energy Efficiency related matters. Over half the businesses stated that grants or tax breaks would help them become more energy efficient, with less than 8% wanting further information and only 4% financing options.

In summary the major barriers are:

- Materiality: The incentives to participate in DSR are just not high enough to make a business "get out of bed" and take action
- Certainty: The business case for action is based on a large number of revenues none of which are guaranteed beyond the pay-back period and many of which are changed frequently or under threat
- Complexity: The way in which the business case stacks up is complicated; they often need to combine TRIAD and DUOS savings with income from FR, CM etc. this is for a business whose core focus is not energy, it takes a long time and a lot of effort to understand these markets well enough for many large companies to be prepared to invest.

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?

No, as mentioned previously, the current major barrier to large customers contracting for smart tariffs or to provide DSR is a lack of significant differential between wholesale prices. There needs to be a greater emphasis by government on encouraging measures to enable large consumers to understand their energy consumption and advocate technology that can allow them to become more flexible – again the priority

should be changes that are quick, low cost and do not directly impact the business involved. Adopting these changes as a priority will help educate and encourage adoption of other changes that may be more costly or involve longer payback timescales.

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)?

When there is sufficient demand to set a price that is attractive to providers, a market will evolve and customers will be encouraged to engage by the range of suppliers, aggregators and other providers. There may be a role for Ofgem/Government on letting customers know about DSR and how it can save them money.

Consumer protection and cyber security

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

- **Social impacts**
- **Data and privacy**
- **Informed consumers**
- **Preventing abuses**
- **Other**

British Gas/Centrica are committed to ensuring appropriate levels of consumer protection continue to apply within the context of a smart, more flexible energy system. We are keen to spread the word on smart energy and engage consumers in conversations and in demonstrating the benefits of a smart and flexible energy system.

To increase knowledge about the potential social impacts of the move to a more flexible, smart energy system, British Gas is taking a leading role in the Vulnerable Customers Energy Efficiency (VCEE) project (also referred to as 'energywise'). The project was awarded funds from Ofgem's 2013 Low Carbon Network Fund competition and is led by UK Power Networks and brings together experts including an academic institution, social housing landlords, a national fuel poverty charity and community specialists. The project takes place in Tower Hamlets, London and involves up to 550 households who are social tenants and whose property has an EPC rating of C to G. A key part of the project will be to install smart meters for vulnerable fuel poor customers in order to collect consumption information and in so doing to help to understand the way fuel poor and vulnerable customers use their energy. The project has the following aims, which are particularly pertinent to questions about the social impacts of a more flexible smart energy system raised in the BEIS/Ofgem Call for Evidence:

- Engage fuel poor customers to understand how they can benefit from energy efficiency and participate in demand side response;
- Understand the willingness and ability of fuel poor/vulnerable customers to shift their energy usage to cheaper time periods under a Time of Use (ToU) tariff, and quantify the impact that this might have on the need to reinforce the network infrastructure; and
- Understand the challenges and best approaches to engaging with these groups of customers.

We would be happy to share further information about this project.

From a data privacy perspective we agree with the statement on having appropriate privacy safeguards in place for customers and that “The smart metering data access and privacy framework provides an example in this space, by ensuring consumers have control over who has access to their energy consumption data from smart meters and for which purposes”. However, the current regime may be overly burdensome, and may prevent customers from benefiting, or realising how they could benefit, from allowing access to their data. Whilst we support BEIS’s planned smart data privacy review in 2018, we believe it may come too late in the smart rollout and, any beneficial amendments won’t be implemented until the majority of smart metering installations have already taken place. Any privacy framework should allow for industry parties to demonstrate the benefits to consumers of sharing their data and allow this to happen easily. There should be a balance struck between this and ensuring that the customer is always informed of who is using their data and the purposes it is being used for. Any uses of personal data should be compliant with current and future privacy laws and regulations.

On a related issue, a major change to the data protection framework has come through the new data protection requirements under the General Data Protection Regulation (“GDPR”), which entered into force on 24 May 2016 and will apply from 25 May 2018. The regulation seeks to strengthen the rights of consumers by giving them greater control over the use of their data by businesses. As such, the regulation will affect every business entity that holds or uses personal data from the EU, both inside and outside of Europe. Centrica, alongside other suppliers, is concerned that some proposals set out in the GDPR, are inconsistent with the technological developments that are taking place in our market and, in some instances, could impede innovation and customer engagement. This is particularly true for smart technology. In particular we note there will be implementation issues regarding provisions relating to:

- The right to be forgotten – a requirement for full erasure of customer data if requested by a customer.
- Consent and profiling – constraints around how customers can be aggregated which could negatively impact “big data” opportunities.
- Sanctions and liability – a potential fine framework many times higher than that currently in force.

It is unclear at this stage how the UK Government envisages reconciling certain aspects of the GDPR with developments it is driving in the wider energy market, and what its expectations will be in terms of compliance.

We agree with Ofgem that suppliers should make it as easy as possible for customers to make informed choices. We support Ofgem introducing a ‘narrow’ principle that encourages suppliers to consider the characteristics and preferences of customers and the comparability of their tariffs. We believe ‘narrow’ principles are more likely to achieve Ofgem’s desired customer outcomes and deliver regulatory certainty for suppliers because these principles apply to discrete policy areas and are targeted at a well-defined and identifiable market failure.

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

Centrica is aware of the increasing cyber security risks with the rising of internet of things. We are currently running a project (DIET) sponsored by Innovate UK to examine the likely of tampering and fraud committed on smart meter. Results for Project DIET are due in 2018. In addition, we are also supporting the government sponsored PETRAS project to examine the cyber security risks with internet of things. Results of PETRAS are due in 2019.

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

Centrica is aware of the increasing cyber security risks with the rising of internet of things. We are currently running a project (DIET) sponsored by Innovate UK to examine the likely of tampering and fraud committed on smart meter. Results for Project DIET are due in 2018. In addition, we are also supporting the government sponsored PETRAS project to examine the cyber security risks with internet of things. Results of PETRAS are due in 2019.

The roles of different parties in the system and network operation

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

The emerging system requirements are all elements that the network owners should be undertaking already, or should already have been factored into their plans and already included in their price control submissions.

44. Do you have any data which illustrates:

- **the current scale and cost of the system impacts described in table 7, and how these might change in the future?**
- **the potential efficiency savings which could be achieved, now and in the future, through a more co-ordinated approach to managing these impacts?**

We do not have any data, but we do have views on these costs.

- One of National Grid's major expenses is due to running plant for voltage control. National Grid may have specific industry information for costs in this area and they have also purchased new equipment in an attempt to reduce costs for voltage control.
- National Grid's other large costs result from managing inertia, this mainly occurs overnight and it results from low levels of actual demand, so, in the main, it is not impacted by increasing levels of embedded generation.
- Due to the significant increases in embedded generation, National Grid have had increasing issues in predicting peak demand levels. This can result in unnecessary balancing actions taken as a result of this uncertainty.
- Lastly, solar generation is generally not visible or metered to enable National Grid to accurately forecast generation levels, this can lead to difference in daylight demand levels and can also lead to unnecessary balancing actions.

45. With regard to the need for immediate action:

- **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?**
- **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?**
- **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 DNO role is broadly unchanged by the definition in this consultation. The DNO should have a role in *facilitating*, rather than *delivering*, efficient system wide use of resources. However, if the responsibility for system-wide efficiency develops to include a local SO (in addition to the national TSO) then this entity should be independent of the DNO. If not, the DNO would potentially have competing drivers as, under RIIO, the DNO has strong incentives to deliver the *local* network requirements as efficiently as possible which may conflict with *system-wide* requirements.

As part of the DNO price controls the assessment of how efficient the business network plans are should include considering the degree of adoption of market based solutions.

The DNOs should continually review and enhance what is published regarding the long term impacts to their system and the solutions they require in order to be able to mitigate these impacts. These provide signals to flexibility providers of the products and services required in the future.

We agree that addressing the need for increased coordination between the DNOs, TOs and TSO and clarifying roles and responsibilities should be a priority. Given the wide-ranging impacts and interests we recommend that Ofgem/BEIS draw on a wide range of stakeholders to discuss and debate these issues at an industry-wide level to tease out the issues at an early stage rather than leaving it to the networks to develop solutions in isolation and without substantial engagement of the wider stakeholders.

46. With regard to further future changes to arrangements:

- **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?**
- **What are your views on the different models, including:**
 - **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?**
 - **which other changes or arrangements might be needed to support the adoption of different models?**
 - **do you have any initial thoughts on the potential benefits, costs and risks of the models?**

The electricity system is undergoing a fundamental, structural change. We are moving away from the linear flow of electricity from large generators, through networks and onto to passive consumers to a system where generation is more distributed and variable, where consumers can better monitor and manage their energy use, and where new technologies and business models can thrive. The future electricity system will need more flexibility services to maintain security of supply and a market for such services is the best way to deliver this cost effectively and efficiently.

It is difficult to know what future system will look like (or by when) as this will depend on the pace and nature of the changes (system and technology) coming down the track. That said we know we will need to produce and consume energy more flexibly and doing this economically and efficiently will allow consumers to make significant cost savings

We need to start incentivising the provision of flexibility economically and efficiently and market led arrangements are best placed to deliver this outcome. At this stage it is important that we try and keep our flexibility supply options open and diverse, and decisions made now should look to least regret solutions whilst the market solution is allowed to evolve.

In practice, this means we need to set out the principles we would like to see in our future arrangements rather than mandate, either by regulation or government policy, what the solution looks like. A set of sound

principles will provide clarity for decision making and investment whilst not prematurely closing avenues that may be beneficial longer term.

We have set out below our view of the roles, responsibilities and relationships between the TSO, DNOs and DSOs:

- The TSO should have overall responsibility for national system security while DSOs should have responsibility for the secure operation of their distribution networks. This means that the TSO will need to continue to have the leading responsibility for national balancing, frequency control and system restoration, whereas DSOs will maintain their responsibility for congestion and voltage management on their networks.
- As an increasing share of generation connects to DSO one of the major operational challenges for the TSO will be maintaining overall system security. Scarcity of system services will become more acute in the future necessitating new operational arrangements between the TSO and DSOs to unlock the capabilities of DER and DSR and maintain security of the distribution and transmission networks.
- In particular, the TSO will need far more visibility of all the DER/DSR connected to the distribution network (and the deployment of emerging technologies such as electrical vehicles and storage). Visibility will help the TSO maintain security of supply, lessen demand forecast errors and limit increases in reserve margins driven by growing uncertainty; benefiting consumers by increasing the overall cost-efficiency of the system.
- DER/DSR should be integrated into the market on equitable and transparent terms with those offered to generation and storage. This will require opening all markets to DER/DSR on a non-discriminatory basis and creating suitable products and services to allow markets to deliver appropriate price signals and incentives to develop DER/DSR.
- Learning from the TSO experience, DSOs should have a clearly defined set of procurement principles. For example, when instructing balancing actions/calling balancing services the DSO should be obliged to:
 - To contract for balancing services in a non-discriminatory manner – after relevant price and technical differences have been taken into account;
 - To purchase from the most economical sources available having regard to the quality, quantity and nature of such services;
 - Where there is sufficient competition, will procure that service via an appropriate competitive process;
 - Where there is insufficient competition, contract on a negotiated bilateral basis;
 - Advertise and tender if balancing services are required over a relatively long term.
- TSO and DSOs cannot, and should not, be on both sides of the market. They have a key role to play in designing flexibility services and buying them competitively from the market, but they should not be allowed to participate on the supply side (i.e. sell services to themselves, or each other, either directly or through an affiliate), in the interests of effective competition.

The most direct example of Centrica's interest in these issues is shown in our recent announcement that we are establishing a Local Energy Market (LEM) in Cornwall.

The Cornwall LEM Programme is a £19m initiative, funded by a £13m grant from European Regional Development Funding and a £6m investment from Centrica's Distributed Energy & Power division. It aims to address distribution network constraints using flexible demand, generation, and storage, reducing the

need for (or deferring investment in) network reinforcement. The three year trial is being delivered in partnership with Western Power Distribution, National Grid, and Exeter University.

Our LEM programme aligns with the policy and regulatory objectives outlined in the Call for Evidence. It is designed to simulate and test some of the key aspects of a local, nodal, market-based approach to driving flexibility. On the basis of our research, and working with consultants with international experience, we agree with Ofgem and BEIS that there is value in transparent and integrated markets, where prices (both national and locational) are driven by market forces.

To that end, while DNOs should of course take a more active role in network management, as regulated monopolies they should not capture emerging and competitive markets (e.g., playing the role of an aggregator). Instead, DNOs should seek to increasingly procure the network management services they require through local, competitive, and independent platforms. DNO's should be obliged to openly provide physical network data (including detailed constraints information) to better inform the efficacy of independent flexibility platforms. Such platforms have low barriers to entry for new market participants, driving efficiency and value gains for customers whilst providing a simple, coordinated platform for consumers to access multiple markets (TSO, DNO, wholesale market etc). Of course, such markets may have wider implications for current electricity markets, and this must be kept in mind.

Centrica is pleased to see Ofgem and BEIS are actively engaging with potential future market models. While it is still too early to tell which model (or combination of models) will best enable the smart and flexible system we need, Centrica hopes to answer some of these questions through the LEM programme. Ensuring research benefit for Ofgem and BEIS from the LEM programme is also important to us, and we welcome input from both bodies on their key research objectives for the project.

Innovation

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

Currently there has been a piecemeal approach to innovation with different players undertaking work in very different and specific areas. In the future funding should be concentrated across multiple technologies to bring innovation across the industry together – multi vector energy trials. The British Chambers of Commerce report (published in 2016 in association with British Gas) highlighted the need for the enhanced capital allowance scheme to be revised and simplified. This could be used to encourage the update of innovative products and build development in successful areas.

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.

We support the availability of innovation funding support to be open to the entire industry (rather than in association with or led by a DNO). In addition to the areas mentioned in the call for evidence, projects or trials covering microgrids/virtual microgrids, on site load/generation balancing, smart city applications and blockchain applications should also be considered.