REA response to BEIS/Ofgem Call for Evidence on a Smart, Flexible Energy System

The Renewable Energy Association (REA) is pleased to submit this response to the above consultation. The REA represents a wide variety of organisations, including generators, project developers, fuel and power suppliers, investors, equipment producers and service providers. Members range in size from major multinationals to sole traders. There are over 700 corporate members of the REA, making it the largest renewable energy trade association in the UK, including nearly 100 energy storage members, also making it the largest trade body for the energy storage industry.

Introduction & Summary

This autumn the REA published its updated report, *Energy Storage in the UK, A Market Overview*, which provides the only listing of energy storage projects in the UK market. Based on this and further assumptions, we believe the UK could see 12 GWh of energy storage installed by 2020 (based on installations co-located at renewables sites, connected to EV charging points, behind the meter at small scale, and larger, grid connected projects), and this forms the backdrop to our response to this consultation as it is only with effective policy in place that this can be achieved.

- Network charging methodology reform is vital, and this should be via a full review of the grid charging mechanisms (a 'Significant Code Review'). BEIS and Ofgem are supporting the status quo when a move to new methodologies could unlock multiple advantages for the system. Government should consider enabling more innovative new energy system supply options such as local balancing through market platforms and local supply models. Linked to this is the move from DNO to DSO models and the enabling role of the SO.

- A definition for energy storage is essential (the preferred way of implementing this to be determined), and this should be implemented in a timely manner following previous detailed discussions in the area.

The accompanying Summary brief contains our main points. Our responses to the individual questions follow below.

Removing policy and regulatory barriers

1. **Are the right policy and regulatory barriers identified?**
   The barriers identified incorporate the major blockages to the flexibility agenda in the UK at present and represent several areas to start working on. It is important to note that in addition to grid connected storage, domestic energy storage and domestic flexibility of all forms can create significant benefits to low voltage networks not necessarily inherent in the larger forms of storage. While the barriers to domestic flexibility are similar to those facing grid connected storage, the specific details are different, and the call for evidence needs to tackle these barriers explicitly. Two examples are the

introduction of half hourly settlement and potential barriers from over-application of G/59 / G/83 – both issues where we know Ofgem and BEIS are very supportive but which need continued support.
Speed is an important element in tackling these barriers and many, such as a definition, need to be addressed quickly in order to unlock the benefits from the solutions on offer. We have a concern that some of the solutions identified and actions proposed will not be implemented quickly enough to reflect the speed of the market and allow the UK to keep pace with other countries in this space, as such this should be treated as a priority.

2. Are the right connection issues identified?

The right connection issues are identified and we especially welcome the recognition that storage devices could be used to benefit other customers connecting locally. However, the issue of queue management is also crucial and this could be examined in further detail; for example, whether storage projects should be permitted to skip the queue due to the advantages they accrue to the whole system, formal rules should be introduced around how and when this can happen. The guiding principles should be firstly ensuring orderly and fair queue management and secondly only allowing storage projects to 'skip' the queue if they can demonstrably show that they improve grid constraints.
Maps of constrained areas in terms of generation installations are already published, which given the drivers to install more renewables in the UK makes sense. However, there is not a specific drive to install more storage per se, the priority is to increase system flexibility and allow the system to benefit from the technical benefits of storage, which doesn't mean we necessarily need large amounts of storage specifically. Ofgem should not block DNOs from publishing 'heat maps' showing the best places to install energy storage, and should ensure that DNOs are utilising system flexibility in locations where it is more cost effective to do so than high cost conventional reinforcement. Flexibility providers need to be able to assess where the benefits to the system are from installing flexible capacity, therefore more detailed and up to date heat maps are essential.

Domestic scale flexibility (e.g. energy storage, Electric Vehicles) face a barrier from the over-zealous application of rules introduced for generation.
We appreciate the support that BEIS, Ofgem and the ENA have provided to prevent potential over-regulation, for example, the application of G/59 and G/83 to behind the meter storage which does not export and is prima facie beneficial to the network. If the benefits of domestic flexibility are to be maximised, then continued support is required to immediately remove any barriers to behind the meter flexibility that does not export (and prevent any new barriers) and in the medium term to remove any potential barriers to behind the meter domestic flexibility exporting.

Data on storage device connection applications and commissioned projects on a national basis is vital to DNOs and the System Operator and should be used to enable greater information sharing across the networks. New systems, processes and databases need to be put in place to ensure this. For example in the UK there has historically been a disconnect between the DNOs' picture of solar PV generation and the SO's visibility, and such problems should be pre-empted for storage.

3. **Are the right network charging issues identified? Are flexible connections one solution?**

There is a need to consider the grid charging system and methodology in a holistic and joined up way. A Significant Code Review should be launched for distribution network charging mechanisms as current initiatives such as the review of embedded benefits take only a piecemeal approach to the subject.

The Call for Evidence is right to identify double charging of grid levies as a major issue and one which can be resolved relatively quickly. It should be noted however (particularly for evidence when relating to final levy consumptions) that storage devices are a final consumer of energy in terms of their net import and export throughout a day due to system losses. Storage should be treated on a level playing field with other users of the grid network, such as interconnection capacity, which does not pay some of the charges faced by storage devices. The network security of supply standards P2/6 is very important - this process has started but needs to be clarified and weight given to calls by ourselves and others for storage to be included.

4. **Do you agree with our assessment that network operators could use storage to support their networks?**

Are there sufficient existing safeguards to enable the development of a competitive market for storage?
Are there any circumstances in which network companies should own storage?
Please provide evidence to support your views

Storage and other forms of flexibility such as DSR, are a cost effective way of supporting networks. Currently there are several barriers to preventing storage from providing full value to consumers. The key barriers are facilitating multiple contracts and availability of long term (7 year +) contracts. It should be noted that, for network support contracts, consumers need regulatory certainty so long term contracts provide certainty to both user and provider. Also, network companies should include an option to relocate storage assets to an alternative location in their network should this represent greater value. So, whilst there is still a place for price (or market) based flexibility (see call for evidence 3.1 3a), contractual flexibility is needed to encourage initial investment.

DNO/ DSO ownership of storage is challenging, for example, as discussed elsewhere (see question 12), storage needs to access as many value sources as possible of which arbitrage would be a key component. Whether there could be consumer support for DNOs buying and selling energy is a key question.

A change in DNO mindset is necessary for these traditionally structured and operated organisations to understand that they don't need to increase their asset base in order to increase revenue, in other words for them to realise the benefit in procuring flexible capacity.

One solution could be to add a stipulation on storage to the DNO licence conditions and set a threshold, like the existing de-minimis value for generator ownership, for the size of storage asset that DNOs can own. DNO's could be

incentivised to make use of DSR contracts in a similar way to the way that they currently make money by buying traditional network assets such as transformers and cables.

To ensure optimum value to consumers we need to see open market processes, such as auctions, in order to secure capacity and future services.

The experience of our members suggests that there may be a bias towards certain asset classes among some DNOs (for example, a preference for the procurement of DSR from diesel generators rather than a technology neutral approach). Therefore it is important to push for the establishment of an open market rather than to allow DNOs to procure assets.

As a result, there should also be limitations on the revenue and use of these assets and it should be noted that their primary aim is supporting the network, not (currently) system operator/arbitraging roles for example. Regulating the behaviour or control of the devices (similar to how trading algorithms in banking are regulated for example) would allow the lowest cost to the consumer, as the knowledge in asset deployment is not lost, neither is their access to low cost capital. Regulated in the correct way the potential issue of distorted monopolies could be resolved.

Our members are of the view that the regulated asset nature of DNOs means that they could distort the market for storage if competing directly with commercial providers, and that therefore they should procure storage using longer term contracts, but not directly own the assets. The European Commission's Clean Energy Package reflects similar views by stipulating that DNOs cannot own and operate storage assets unless a detailed assessment has been done and no commercial offerings are available in a particular location.

The relevant section's wording is as follows:

EU 'Winter Package', December 2016, Article 36 - Ownership of storage facilities

1. Distribution system operators shall not be allowed to own, develop, manage or operate energy storage facilities.
2. By way of derogation from paragraph 1, Member States may allow distribution system operators to own, develop, manage or operate storage facilities only if the following conditions are fulfilled:
(a) other parties, following an open and transparent tendering procedure, have not expressed their interest to own, develop, manage or operate storage facilities;
(b) such facilities are necessary for the distribution system operators to fulfil its obligations under this regulation for the efficient, reliable and secure operation of the distribution system; and
(c) the regulatory authority has assessed the necessity of such derogation taking into account the conditions under points (a) and (b) of this paragraph and has granted its approval.
3. Articles 35 and Article 56 shall apply to distribution system operators engaged in ownership, development, operation or management of energy storage facilities.
4. Regulatory authorities shall perform at regular intervals or at least every five years a public consultation in order to re-assess the potential interest of market parties to invest, develop, operate or manage energy storage facilities. In case the public consultation indicates that third parties are able to own, develop, operate or manage

such facilities, Member States shall ensure that distribution system operators' activities in this regard are phased-out.

Similar provisions are contained for the Transmission System Operator in relation to the ownership of storage assets.

5. **Are the right regulatory approaches identified?** *[These are: 1.no change- continue with storage as generation asset for licensing purposes; 2. introduce a modified generation licence with storage as a subset of generation; 3. add a storage definition in primary legislation as a subset of generation; or 4. add storage definition in primary legislation as a new activity with its own licence]*

   Yes, however there are continuing concerns regarding the timeframe necessary to make any change and faster options should be evaluated.

   As previously argued, the industry would benefit from a short term 'fix' to give confidence progress is being made and to unlock some of the deployment possible, and a longer term solution will likely also be required, involving amending or creating new provisions in primary legislation.

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

   The 'lead' proposed definition has been discussed in various meetings and seminars and has gained support among industry, so in the interests of industry unity it is worth supporting. The key aspect is taking action now to ensure a definition is in place and not stall the progress needed for any longer.

   We note that the reason for its reference to electricity only is that the electricity network is seen as the low hanging fruit for regulatory changes and also the network currently presenting barriers to the market. We expressed in various fora that it is important to include heat and transport in the longer term and not to exclude these forms of storage and associated uses. However, we accept that electricity represents the sector most relevant for a definition due to the regulations and legislative framework operated in (eg electricity grid codes to comply with).

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?

Aggregators should be allowed to participate in all markets that they are physically able to take part in. Entry barriers should be kept to a minimum wherever possible, as the proper integration of aggregators can provide numerous system benefits.

It should be noted that the forthcoming 'Project Terre' initiative will enable aggregators to access the market by 2018. This will enable national TSOs across Europe to procure reserve capacity for 15 minutes or less and is being implemented via BSC code modification P344. Therefore, there may not be a massive need to change other existing rules and regulations in the meantime.

Consumer protection is a vital concern and we would note the potentially very serious implications of miss-selling to consumers reliant on 'always on' lighting/heating/cooling (for example medicine refrigeration) and such consumers must be safeguarded. Our sister organisation the Renewable Energy Consumer Code (RECC) will be providing more detailed comments on consumer protection.

8. What are your views on these different approaches to dealing with the barriers set out above?
We would note the above point that Project Terre and the associated existing changes may mean that several of the necessary changes are already in train.

9. What are your views on the pros and cons of the options outlined in Table 5? Please provide evidence for your answers.
The main decision criteria may be time and sustainability of a solution. To leverage the impact of distributed energy resources, which are brought to markets via aggregators, and to realise the cost-savings to consumers as soon as possible, an industry-led change could be prudent in the short- to medium-term. This would allow the system operator and the industry to jointly find an interim solution for the integration of DER. Such an interim solution could mitigate the risk of unforeseen and negative effects and would allow and leave space for a certain learning-process in the still developing area of aggregators. In the long run a process driven by the regulator should be implemented. Even though this process may take longer, this will ensure that aggregators are recognised as actors in the energy sector on a level-playing field with other existing market actors. Due to the nature of aggregators it is however necessary to prevent overregulation and the setting up of market access barriers to aggregators. The new Ofgem 'Innovation Link' process could be useful in identifying regulatory barriers and potential fixes in the short term.

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?
System stability is the driving factor in planning and operating the electricity system. It is therefore important to highlight that aggregators are an important tool in order to add flexibility and create a more stable and resilient electricity system. Thus it is essential to exchange information between aggregators and system operators both at transmission and distribution levels, so that system operators can leverage the DER of the aggregator and improve the resilience of the system. This does, however, require a greater scale of information sharing between TSO and DSOs. This might include sharing of information on technical details of the aggregated DERs, such as restrictions in the operation, load points, power gradients, state-of-charge limitations etc. Thus information exchange has to be organised and non-discriminatory in order not to create unnecessary market entry barriers.

There has been a relevant executive order made in the USA (FERC order RM16-23, executed 17/11/16) to DNOs and TSOs, instructing them to change their tariffs explicitly to accommodate storage providers and aggregators. The measure requires

the grid operators to design a tariff to accommodate aggregators' participation in the organised wholesale electricity market and defines DER aggregators as a type of market participant that can participate in the organised wholesale electricity markets under the model that best accommodates them.
While such an Order would not be directly translatable to the UK due to different regulatory regimes, this illustrates how other countries recognise the value provided by aggregators and storage.

Providing price signals for flexibility

11. What types of enablers do you think could make accessing flexibility, and seeing a benefit from offering it, easier in future?
How 'system value pricing' can be ensured for market players in the short to medium term is at the heart of the likely future changes - National Grid and DNOs have a key role to play, perhaps in creating platforms where flexibility providers can bid for contracts for specific services.

The current proposals for P344 under Project Terre should be considered in this light- given the likely changes that will be required to meet the implementation.

Quantifying flexibility consistently throughout the industry and having a common framework for understanding the benefits of flexibility is key. There is work that stakeholders have done in this area which could be utilised more efficiently. Another option is to examine what the system needs and price the benefits accordingly - the approach adopted by the US East Coast PJM mechanism by using 'Pay for Performance' to incentivise storage (via market services) because storage can in some respects respond quicker than conventional technologies and quick response was what the system required. In the UK, National Grid has driven the EFR initiative in the same way as an example. Market enablers should be open to all technologies eligible to provide the same benefits.

We are aware of industry initiatives to standardise and bring together elements of the wider Ancillary Services market, and this is another area which could be reformed to help deliver value for storage providers. For example streamlining and reforming the eight different mechanisms for procuring frequency response in the UK. This would also be part of the requirement under the draft EU Balancing Code (article 25).

The Single Irish Electricity Market (ISEM) have recently introduced an innovative method of simplification and services procurement. Eleven balancing and ancillary services have been separately allocated funding and separate auctions will run for each service. This improves the transparency and simplicity of the market and similar steps could be taken in the GB market.

For domestic flexibility including smart appliances, domestic energy storage and EVs, the lack of half hourly settlement is creating a barrier to accessing differential DUoS pricing and DNO DSR and may also be a barrier in other value streams, for example transmission charging, the capacity mechanism and some National Grid ancillary services.

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?

Combining different revenue streams is key to enabling energy storage projects to play a part in the market. The ability to do so differs and there are some impediments in place to this.

For example, stacking revenue streams from the Capacity Market alongside the EFR, FFR and other ancillary services is vital. We and others have identified some barriers already, proposing changes to the Capacity Market rules, and we propose that BEIS commission a set of lawyers or advisers to cross check the contracts of all eligible schemes to identify where any barriers exist and recommend how they could be removed, for example where a contract does not allow delivery under different services alongside the specific mechanism.

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?

Speed of response in terms of the provision of additional capacity or grid regulation services is currently under-valued (except for in the Enhanced Frequency Response market) – for example the PJM capacity market in the east coast US has a 'Pay for Performance' structure which recognises the added value of fast responding capacity and compensates for it appropriately. This has enabled more flexibility services to be procured and is now one of the leading markets for energy storage.

A number of potential value sources are either not accessible to storage or are only accessible on a constrained basis. These include the following;

Capacity Market – Whilst storage can access the Capacity Market it faces constraints on doing so. Provision of most services offered by storage means that it is optimal to build 6 hours or less of MWh output at full capacity[1]. Flow batteries and other forms of storage that can build additional MWh capacity at relatively manageable additional cost are not subject to this constraint. The primary need for capacity is unlikely to be for more than 6 hours but if the period of system stress is initiated early in the day then storage may fail to be "available" under Capacity Market rules for the entire period as there is no 'deadline' stipulated on providing supplies into the mechanism. Whilst this can be managed by storage accepting a penalty, this creates unnecessary risk for storage and makes financing difficult to secure.

Mandatory services – The SO manages the GB electricity system by taking advantage of a number of mandatory services. Some of these are paid for and some not. Some of those that are paid for are subject to limited or no market testing. These services include reactive power where mandatory provision runs alongside an auction which has not had a successful market bid for several years. This is because the total funding for reactive capability is capped.

[1] For example charging for more than 6 hours and then discharging for 6 hours is unlikely to justify the additional investment. Also peak demand that causes the need for additional network assets is unlikely to extend beyond several hours per day so again the additional investment in more than 6 hours capacity cannot be justified.

Provision of inertia is a service that has no payments associated with it, as inertia is provided as a consequence of thermal plant running, but is a valuable property of electricity systems especially relatively smaller island systems. The importance of inertia will increase in future as synchronous generation is replaced by asynchronous generation which does not provide inertia. The purchase of Ancillary Services currently suffers from BSUoS being imposed on generators and some mandatory services not being subject to market testing. A transition to a market based, rather than mandatory provision, is long overdue and the SO should be asked to set out a road map for an early transition from mandatory to market.

For domestic flexibility including smart appliances, domestic energy storage and EV's, the lack of half hourly settlement is creating a barrier to accessing differential DUoS pricing and DNO DSR and may also be a barrier in other value streams, for example transmission charging, the capacity mechanism and some National Grid ancillary services.

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?

This issue is covered in detail in our responses to other questions, for example reforms to the Capacity Market such as 'Pay for Performance' are one key enabler to adequately reward flexible capacity providers, and these can be driven by BEIS or Ofgem.

For domestic flexibility including smart appliances, domestic energy storage and EV's, the lack of half hourly settlement is creating a barrier to accessing differential DUoS pricing and DNO DSR and may also be a barrier in other value streams, for example transmission charging, the capacity mechanism and some National Grid ancillary services.

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.

Government should commit to the roll out of half hourly domestic and small commercial settlement and metering as a first step, which will enable smart tariffs for these groups- time of use tariffs could be a powerful tool for unlocking flexible capacity from these sectors and opening up the market, without any public subsidy. Appropriate consumer safeguards should be included to protect the most vulnerable, and these can be easily implemented.

For domestic flexibility including smart appliances, domestic energy storage and EVs, the lack of half hourly settlement is creating a barrier to accessing differential DUoS pricing and DNO DSR and may also be a barrier in other value streams, for example transmission charging, the capacity mechanism and some National Grid ancillary services.

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.
Government should commit to the target of half hourly settlement being in place together with smart meters by 2020.

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?
Other respondents are better placed to provide evidence in this case, however we would note that international experience suggests that "net metering" tariffs can result in the removal or reduction of incentive for flexibility. Proper tariffs settled on half hourly price signals are preferable on this basis.

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?
We recognise the main barriers identified (these are a lack of smart appliances and automation for consumers, preference for simpler tariffs, a perception of only being financially worthwhile for large sites for businesses and believe this constitutes a starting point for addressing low uptake in the sector. There is also a need to consider the impact of Third Party Intermediaries (TPIs) in this market segment and the impact of simpler tariffs being easier to manage and compare.

Smart grid system charges

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.
A full review of current grid charging methodologies is required, via a Significant Code Review (SCR), none of these grid charging questions can be looked at in isolation.
There are two proposed or recently implemented changes which act/could act as barriers: grid access rule change DCP 228, which flattens out the differences between access charges at different times of day, and mostly reduces the business case for storage at C&I sites, and the review of Embedded Benefits (currently illustrated through CMPs 264, 265, 269 and 270), which could remove or reduce the Embedded Benefit for some or all distribution network connectees and therefore seriously weaken the business case for energy storage projects at the grid-connected level.

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?
We believe that a full scale review of grid access charging is necessary, via an Ofgem-initiated Significant Code Review (SCR) that considers all the issues as a whole, rather than in isolation as in the current Embedded Benefits review.

Please see Annex A for more on the need for a full scale review of grid charges & Embedded Benefits.

21. How problematic and urgent are any disparities between the treatment of different types of distribution connected users? An example could be that in the

Common Distribution Charging Methodology generators are paid 'charges' which would suggest they add no network cost and only net demand.
We believe that a full scale review of grid access charging is necessary, via an Ofgem-initiated Significant Code Review (SCR) that considers all the issues as a whole, rather than in isolation as in the current Embedded Benefits review. We note that National Grid have themselves recently set out their view that such a full scale review would be a better option than the current proposed piecemeal changes. In December Ofgem also put out their minded to position that they would not undertake a full review but rather choose form one of the existing proposed industry changes following the CUSC panel's review of the CMPs. This is short-sighted and contrary to development of a stable renewable and storage industry in the UK.

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?
There is likely to be a change in the network costs for managing the distribution networks as more variable renewable generation is added to the system and demand loads change due to the projected electrification of heat and transport. At the same time, projected increases in Transmission network costs have been estimated as several billions in the near to mid-term and will further incentivise connections to the distribution network.

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?
As stated, a full scale review of the grid charging regime is essential via a Significant Code Review (SCR) initiated by Ofgem, these issues cannot be looked at in isolation. Also noting National Grid's expected consultation into fixed and sunk network costs, a full scale review becomes even more essential.

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.
As stated, a full scale review of the grid charging regime is essential via a Significant Code Review (SCR) initiated by Ofgem, these issues cannot be looked at in isolation. Also noting National Grid's expected consultation into fixed and sunk network costs, a full scale review becomes even more essential.

Interaction with Renewable policies & the Capacity Market

25. Can you provide evidence to show how existing Government policies can help or hinder the transition to a smart energy future?
This response is confined to renewable support and the Capacity Market policies - renewable energy policy can be a significant driver towards more flexibility on the system. As for the Capacity Market (CM): numerous reforms such as longer term contracts, Pay for Performance, time limit on expected delivery periods will help and current policy does hinder flexibility, as evidenced by the first new-build storage CM contracts only having been awarded after three auctions, and those for projects receiving EFR contracts in addition.

Changes necessary to support renewables include: ensuring full compatibility with the FiT, RO and CfD programmes regarding metering and operations. Changes have been consulted on regarding the CfD scheme, however it is vital that any proposed changes here match up with the changes made to any other support schemes- see our response to Q27. At the small-scale level, The call for evidence suggests that smart meters combined with smart time of use tariffs for both consumption AND generation are required prior to the phase out of deemed export tariffs. We agree that deemed export arrangements should not be removed until proper half hourly settled tariffs are available to consumers that take into account the value of energy consumed and generated in each half hour. Introduction of full half hourly settled generation and consumption tariffs could create a level playing field where customers are compensated fairly for their generation and provide appropriate incentives to store energy on-site where appropriate.

The CfD consultation included proposals for a definition for energy storage, while a storage definition already exists in the Capacity Market. It is very important for companies combining revenue streams and mechanisms, as well as investors, that all the definitions align otherwise unintended consequences will result.

The REA's suggestions for a 'Market Stabilisation Mechanism CfD' would be one way to combine support for renewables and on-site energy storage, while taking into account whole system costs and decarbonisation. See Annex B for more details.

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?

Reforms are needed to the Capacity Market to better enable storage to participate, as follows:

- Removing any restrictions on 'stacking' revenues for energy storage projects – ie allowing these projects to receive income streams from multiple sources – by supporting a review of where the barriers exist in the contracts at present and acting to remove these.
- Strong consideration should be given to how to provide guidance to energy storage projects to how to size projects, for example a minimum duration period, so these projects know how long they would need to supply power for under a CM warning. This could be provided by either modifying the de-rating factor of storage CMUs or the duration of the qualification test.. Storage projects risk oversizing their plants or not being able to receive finance because of the risk of non-delivery fines under the current arrangements, which could lead to inefficient over-sized storage projects at greater cost to the consumer and a loss of potential benefits to the system without this fast-responding capacity. As part of the assessment on whether to initiate such a change, consideration should be given as to whether a change will:
    1. Unduly distort competition between different technology providers or not; and/or
    2. Unduly transfer risk from capacity providers to consumers or not
- Storage projects could be further incentivised by allowing higher payments to compensate those projects able to provide quicker response therefore

valuing the premium flexibility service provided (so-called 'Pay for Performance', as seen in the US PJM market) and additional services to the grid such as frequency response.

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

Firstly, as stated, it is vital that the various definitions and metering/operational approaches match up across the various support schemes.

Secondly, on the domestic renewable scale (the Feed-in Tariff scheme), the call for evidence suggests that smart meters combined with smart time of use tariffs for both consumption AND generation are required prior to removal of deemed export tariffs. We agree that deemed export arrangements should not be removed until proper half hourly settled tariffs are available to consumers that take into account the value of energy consumed and generated in each half hour. Introduction of full half hourly settled generation and consumption tariffs could create a level playing field where customers are compensated fairly for their generation and provide appropriate incentives to store energy on-site where appropriate.

Thirdly, in terms of more fundamental measures, the so-called 'Market Stabilisation Mechanism CfD' is a mechanism which would fully account for the wider system integration costs and carbon benefits of renewable generation (in summary, providing a Strike Price on the basis of the marginal fossil fuel plant (ie price required by a new-build gas power plant) + System impact cost +/- Carbon cost), via a strike price which factors in these elements.

We believe renewables could be combined with support for on-site energy storage devices, to incentivise flexibility technologies while also countering some of the concerns with variable output renewables. I.e. an solar farm would bid into the mechanism on the basis of co-located energy storage on the same site – energy storage devices on their own would not be eligible for a CfD contract.

In practice this would mean support assigned to wind + storage and solar + storage CfD projects, as well as biomass, energy from waste and other forms of renewables. Each would have a different strike price, to recognise the impact on the system and net carbon emissions. If storage could also truly stack revenues and play into ancillary services markets, then this could in theory lead to lower strike prices for co-located projects and therefore lead to savings for consumers on CfD contracts. For example, using entirely theoretical figures, a solar farm able to bid at £70/MWh without storage revenues could bid in at £65/MWh when the on-site storage revenues are included in the business model.

Please find further details attached in Annex B - REA Market Stability Mechanism CfD position paper, summer 2016.

Other options could be available, such as via the Capacity Market, which industry would be happy to work with Government to develop.

Consumer benefits

28. Do you agree with the 4 principles for smart appliances set out above [interoperability, data privacy, grid security, energy consumption]?
Yes, to a certain extent as long as they do not become overly burdensome- some degree of coordination and common standards/framework will provide a vital touch point for considering a wide array of technologies and appliances. Appliances should not be encouraged and accepted simply because they are new, but should be required to meet some essential criteria. We have recently seen hackers utilise 'zombie' smart appliances to carry out coordinated cyber-attacks on targets and this threat needs to be countered. Similarly, there is little point installing smart energy devices if they are energy intensive in their operation, however it should be noted that the wider system benefits such appliances can deliver may outweigh a simplistic energy consumption impact test in some cases.

Any regulation should be proportionate to the likely risk which is very small at this stage in the market. We make the following specific comments on each standard below:

Interoperability – regulation should focus on ensuring that smart meters and associated infrastructure operate on open standards. If the value of interoperating is great enough then appliance manufacturers will adopt these standards.

Data privacy – we note that consumers are already protected by legislation. For appliances, consumers have a free choice to buy appliances (or not) in a competitive market (where there is already considerable regulation on data privacy). Since consumers are opting in, then it would be disproportionate to apply the same regulation which is applied to the mandatory smart meter roll out or situations where there is no choice but to purchase the product.

Grid security – this is obviously important however taking into account the relative size of smart appliance deployment in the coming years, compared to the size of the grid, it is important to keep any regulation strictly in proportion with risks and allow regulation to develop as the market evolves.

Energy consumption – the economics of "smart" for all smart appliances depend on ensuring that they are as low cost and efficient as possible. Domestic energy storage for example is only viable if the cost of any energy consumption (resulting from the efficiency factor) is outweighed by the demand, therefore we agree with this and note that it should not inherently be an issue.

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

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

The question is how much we want to force consumers to adopt new technologies. Experience from energy efficiency policy is that regulating on consumers' behalf to ensure an ever improving set of standards has dramatically reduced energy

consumption and delivered efficiencies, and lessons can be learned from this approach in terms of adopting smart technology in appliances. The alternative of providing no central direction or coordination will lead to individual manufacturers adopting different approaches and potentially convergent outcomes.

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)**

We note member feedback form some consumer trials that show 'wet' appliances (eg dishwashers, washing machines) are the only appliances associated with behaviour change among consumers.

Introducing additional regulation measures suggested in this section of the call for evidence could represent additional barriers to entry, contrary to the objectives. This is because the cost of additional regulation far outweighs the benefits, especially at this stage of market development. Notwithstanding consumer protection issues, any standards should emerge naturally at appropriate times as the market develops. Additional obligations should not be placed on new entrants in markets which are nascent and already difficult to enter.

For example, if it were a requirement under interoperability to add certain communications components, but there was no benefit (yet) from doing so, this could make the economics of smart appliances worse not better. It would be more productive to mandate communications standards to enable access to smart tariffs. There would then be a natural incentive to add the communications components.

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

Good quality installation and proper usage guidance and technical and health & safety guidelines are essential to grow a sustainable market. The REA and partners are working on this area at present as an area industry can progress without direct Government involvement. For example see the upcoming technical installation guidelines for battery storage systems. Discussions are also underway regarding fire safety. Another major area creating barriers to the uptake of smart appliances such as storage is the approach taken by DNOs regarding the installation of small scale domestic and commercial storage systems, through requirements such as G100 notification, which requires urgent progress, although discussions are ongoing and progress has been made.

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

As above, adequate and enforced quality standards are essential, as is the system for ensuring high standards of workmanship. Consumer codes such as the RECC code for renewable installations are also important for consumer protection and

strong consideration should be given to requiring domestic energy storage product installers to be RECC members.

Smart appliances- battery storage systems: there is a need to head off a potential problem arising from the lack of a Government support scheme for small-scale battery storage (note: this is stating a fact, not calling for a subsidy measure). This arises from the fact that there is no central database of all storage projects, as associated with the FIT, RO, RHI and CfD schemes. The individual DNOs will maintain records as part of the G59 process, but these will not be automatically available to other parties and the SO. Therefore, as with the grid-scale storage installations, there is currently no national record of where storage is being installed, of what capacity, and the associated technical capabilities. Consideration should be given to overcoming this lack of knowledge and consistent information. There is a fundamental need to know where flexibility/energy storage capacity is located in order to manage it.

Electric & Ultra Low Emission Vehicles

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

Smart tariffs and half hourly metering will be one way to manage pressure from on the grid from EV charging activities – once time signals are embedded this will serve to incentivise charging at off-peak times.

For domestic flexibility including smart appliances, domestic energy storage and EV's, the lack of half hourly settlement is creating a barrier to accessing differential DUoS pricing and DNO DSR and may also be a barrier in other value streams, for example transmission charging, the capacity mechanism and some National Grid ancillary services.

The area needs joined up thinking as the charging companies tend to be separate from the EV manufacturers. Most of the charging companies aim to source clean energy but this is on an ad-hoc basis without a clear framework. Some are finding a shortage of clean electricity and are worried as to what happens when the EV market starts to expand at pace. Businesses' strategy on charging locations is changing as new EVs have a 300 mile range and this is heading to 400 miles. Charging stations with fast charge should reflect where petrol stations are located presently. Likewise now that 15 minute fast chargers are available in the market, EV owners should not leave their cars in special charging bays any longer than it takes to charge the vehicle. For example, Tesla now penalise their customers by charging a fee for every minute after charging is complete.

There is speculation that charging will get faster in the near future however because EV owners always want the battery to be full, so they plug in every time they stop, while some only need a few minutes of charge so should not leave the vehicle.

One area of promise is the use of solar canopies and carports with bi-directional EV chargers as this can provide direct charging using low carbon sources. These can be combined with battery storage to reduce system stress and manage flows on and off the grid. DNOs must start to expect this type of installation and be encouraged to aid their deployment.

The public needs to be educated on this and therefore Government and industry should work together on a marketing plan, perhaps through the lowCVP.

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?**

As with much of the storage and flexibility transition, the position of the DNOs and SO will be crucial in terms of two-way chargers and the flow of electricity onto and off the network in a managed way. Engagement should start early with these groups, alongside industry and innovators.

For domestic flexibility including smart appliances, domestic energy storage and EV's, the lack of half hourly settlement is creating a barrier to accessing differential DUoS pricing and DNO DSR and may also be a barrier in other value streams, for example transmission charging, the capacity mechanism and some National Grid ancillary services.

Many of the same issues apply as above however all multiple fast charging EV sites require storage on-site. This storage, when not used by vehicles can provide grid support and likewise it will be possible to have smart parking bays where an EV parked for a day could be communicating with the grid and swapping electricity. This does not need fast chargers but purely good software to ensure the car has the right amount of charge that the customer will specify before leaving the vehicle. Industry and Government need to work together on this to make it happen. This is also the same with car to home storage, which requires smart operating systems needing little input by the EV / house owner. All above parties need to work together otherwise every EV will contain a full charge in the battery at key times in the day when they could be providing services to the grid. As the industry heads to 100kWh batteries this will be a massive amount of electricity in store. This is worth exploring further, as the average car journey is still under 20 miles / day. The majority of EV owners will plug in at home to top up their battery, and smart software and a good price for services to the grid should make this a no brainer. Aggregators need to link with those running charging stations to come up with the intelligent software systems. EV manufacturers are engaged in designing and building vehicles and will expect other industries to make this happen.

Aggregators, charging operators and probably DNOs need to be encouraged to work together. Government's role should be to make it happen and set parameters-perhaps in the form of criteria for storage capacity transferred from car to grid and vice versa. The new business models could result in new types of companies and funders are looking at this at present, determining the exact form. It would be helpful for Government to give a 'push' and create the direction of travel for industry to follow as this will unlock investment.

It is worth noting as an aside, that electric vehicle manufacturing will increasingly take place next to the electric vehicle battery plants themselves, and therefore there is a need to incentivise EV battery production as much as EVs.

35. What barriers (regulatory or otherwise) are there to the use of hydrogen water electrolysis as a renewable energy storage medium?
Commercial electrolyser Hydrogen Refuelling Stations can generate hydrogen for Fuel Cell vehicle refuelling during the valleys in the UK's energy demand profile and help absorb surplus renewables. That is, the time of electricity use can be completely decoupled in time from when the consumer wants to inject energy into the vehicle. This means that the electrolyser operation can correspond with periods of high renewable generation and low demand, provide long duration absorption, stay off during peak periods and not be influenced directly by consumer behaviour/schedules. Aggregating such loads to facilitate hydrogen mobility is a clear possibility for the transport sector and is very distinct from EV charging issues.

The industry have deployed three stations ('electrolyser-HRS') to date, with four more due to commission this year, with more to follow, including large ones for a Fuel Cell bus depot. There is a national target of 1150 stations by 2030 according to UKH2Mobility predictions and an ultimate potential of about 8000 sites (i.e. the roughly the same number of petrol stations in the U.K.). So this will amount to a significant total load (a few hundred MW by the late 2020s, several GW by 2040) which is a trend that should be exploited to enable further renewables integration. In addition, the electrolysers have sub-second up/down response times so when considered in terms of overall flexibility for the grid operator, they can participate in a wide range of future services.

Demand Side Response Engagement

36. Can you provide any evidence demonstrating how large non-domestic consumers currently find out about and provide DSR services?
DSR Companies frequently approach large target companies who would benefit from their services, having been pre-identified by desktop analysis. Provision of DSR services is usually provided via an intermediary such as an aggregator in the market.

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 barriers identified cover the main areas.

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?
If the underlying market conditions and price signals are effective, the existing market structures should lead to more large non-domestic customers increasing their uptake of DSR.

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)?
The trigger point is related to the uptake of more variable renewable capacity, but also the delivery of inflexible must-run baseload capacity such as new nuclear plants - which must be kept running at all times - therefore demand may need to flex to make up for all forms of inflexible generation. Our shift to a low carbon energy system creates the necessary impetus and we should not wait for certain milestones per se, but rather recognise the inherent value of these services now.

Consumer protection in moving to a flexible system

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**

There is a case for all storage device installers to be RECC members, and MCS accredited, as with micro-renewables. This would drive improved standards and consumer protection, reducing the risk of consumer harm. The Renewable Energy Consumer Code (RECC) is a sister organisation to the REA, set up as a not for profit consumer-protection body for those consumers installing small-scale renewables. A key requirement of the MCS is that installers belong to a consumer code approved by the chartered institute of trading standards. As such a code, RECC has close to 3000 members and registered installers. Many of these members are seeking to sell, energy storage devices or may in the future, and are subject to code provisions in doing so. However, there is no requirement to be MCS-certified or a RECC member to sell and/or install storage devices per se.

Social impact stakeholders such as Citizens Advice and Age UK should be consulted on the social aspects of these policy provisions.

Preventing abuses also requires robust guidance and technical standards, such as the Code of Practice currently being developed for battery storage installations. The findings of the Each Home Counts review into consumer protection in the low carbon sector, although lacking a legislative basis, should be implemented for energy storage devices.

41. Can you provide evidence demonstrating how smart technologies (domestic or industrial/commercial) could compromise the energy system and how likely this is?
Other groups are better placed to respond to this question therefore we do not comment here.

42. What risks would you highlight in the context of securing the energy system? Please provide evidence on the current likelihood and impact.
There could be risks from cyber security threats and software glitches, but these should be recognised and resources assigned to deal with them, from the outset. Discussions and work with the UK's new cyber security centre should be undertaken at an early stage as part of this, to understand the risks and potential fixes.

The roles of different parties in 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 figure provides a good summary of the drivers for change in this space.

44. Do you have any data which illustrates:

a) the current scale and cost of the system impacts described in table 7, and how these might change in the future?
b) the potential efficiency savings which could be achieved, now and in the future, through a more co-ordinated approach to managing these impacts?
Overarching figures for the system benefits of increased flexibility have been modelled in various reports, including the National Infrastructure Commission Smart Power report indicating consumer savings of £8bn a year by 2035, but we are not aware of a breakdown by each GSP area.

45. With regard to the need for immediate action:
a) Do you agree with the proposed roles of DSOs and the need for increased coordination between DSOs, the SO and TOs in delivering efficient network planning and local/system-wide use of resources?
b) How could industry best carry these activities forward? Do you agree the further progress we describe is both necessary and possible over the coming year?
c) Are there any legal or regulatory barriers (e.g. including appropriate incentives), to the immediate actions we identify as necessary? If so, please state and prioritise them.
Greater coordination between TO, SO, and DNO/DSOs is essential in the UK energy market, not least for more efficient network planning. There is a general lack of awareness and visibility on the move from DNOs to DSOs in the UK and greater clarity on specific roles and responsibilities is necessary.

The transition from DNO to DSO needs to take place but will require development of new regulatory arrangements and a transfer of resources from hardware (that has limited innate smart capability) to people, IT systems, DSR and storage. This transfer will not be straightforward and at this stage it is challenging to establish the optimum transitional path and therefore is unlikely to be appropriate to proscribe the approach that DSOs should take. The transition though does need to be accelerated. The first step is to create a licence obligation on DNOs that they must make the transition where the end goal is set out as being able to demonstrate that each network challenge is addressed with the optimum combination of hardware/ people/ IT/ DSR/ storage. This could be described as the "optimum network" obligation which should also be included in National Grid's licence.
The expectation should be that in the short term the DNO/DSOs should evaluate which route is best for them and this should include trialling. Approaches could be as set out in the call for evidence and could involve DNOs sub-contracting DSO activities to the (transmission) SO, setting up a JV or simply greater co-ordination between the two parties. Currently only the latter is under consideration which limits the opportunities.

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

iii. do you have any initial thoughts on the potential benefits, costs and risks of the models?
As set out above a single DSO model is unlikely to be proven for some time, but at some point such a model (or a series of obligations/ constraints) may become clear and at that time further regulatory change will be appropriate. Note the "optimum network" obligation is the exception as this should be implemented immediately although with a recognition that it will take time to deliver on.

The transition to DSOs will require robust pro-active regulation with the 'stick' and 'carrot' clearly visible to all potential DSOs. These could be in the shape of higher permitted earnings per kWh as opposed to earnings per regulatory asset base and on the compunction side a clear threat to DNOs that slow progress may result in them being forced to auction off distribution systems to new entrants or other DSOs that have already demonstrated that they can make the transition.

The UK's competitive market structure and our robust networks actually discourage the implementation of storage and DSR, it could be argued. For example US suppliers who also own networks can buy a combined service. This feature means that the development of storage in the UK will need more regulatory input than has been the case in other markets, however on the other hand the ultimate rewards are likely to be greater.

Innovation

47. Can you give specific examples of types of support that would be most effective in bringing forward innovation in these areas?
UK businesses have consistently faced a 'Valley of Death' in the commercialisation of new products and services. Support from Government has been good for R&D stage projects, however for projects which are near to market or just launched, there has been a lack of adequate financing and investment. Government could therefore support later-stage projects with debt support, or provide equity backing in order to give longer term stability to young companies, allowing them to expand and take advantage of the many opportunities available with reduced pressure on immediate financial results. The REA recently partnered the FCO on a trade delegation to India and saw at first hand the enormous opportunities available in international markets, but also that these take time and patience to access.

The Green Investment Bank could for example consider taking such direct equity stakes as part of their investments.

In addition, in overseas markets, local partner introductions, 'vetting'and logistical support would provide useful support for UK firms.

In terms of technologies, demonstration funding should be considered (to raise efficiencies and bring down costs) for grid-scale storage technologies such as Liquid Air Energy Storage and Compressed Air Energy Storage, both of which could be cheaper than most forms of conventional batteries when delivered at commercial i.e. >50 MW scale. These high energy technologies can provide valuable balancing services to the network at scale, reducing reliance on interconnection capacity. This is of value to the system as National Grid in its most recent Future Energy Scenarios envisions a significant amount (c.20GW) of interconnector capacity, however when

looking at where this capacity comes from, there have been recent supply problems from France following breakdowns on the nuclear fleet, and other neighbours themselves rely on imports of electricity.

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.

It should be noted that BEIS and Ofgem's innovation funding has been welcomed by industry and has played an important role in growing the industry, which industry acknowledges.

Consideration should be given as to whether it is worth funding multiple flexibility trading platforms or whether a single platform would be more efficient.

There is scope for innovation to bring down costs in storage technologies, and a broad range of technologies should be supported. It is also important to invest in the systems and IT networks that go with these business models and technologies. Vehicle to grid technology could be an area where the UK can steal a march on competitors and there could be scope for R&D funding for hydrogen applications- where the UK has some IP and industrial leaders.