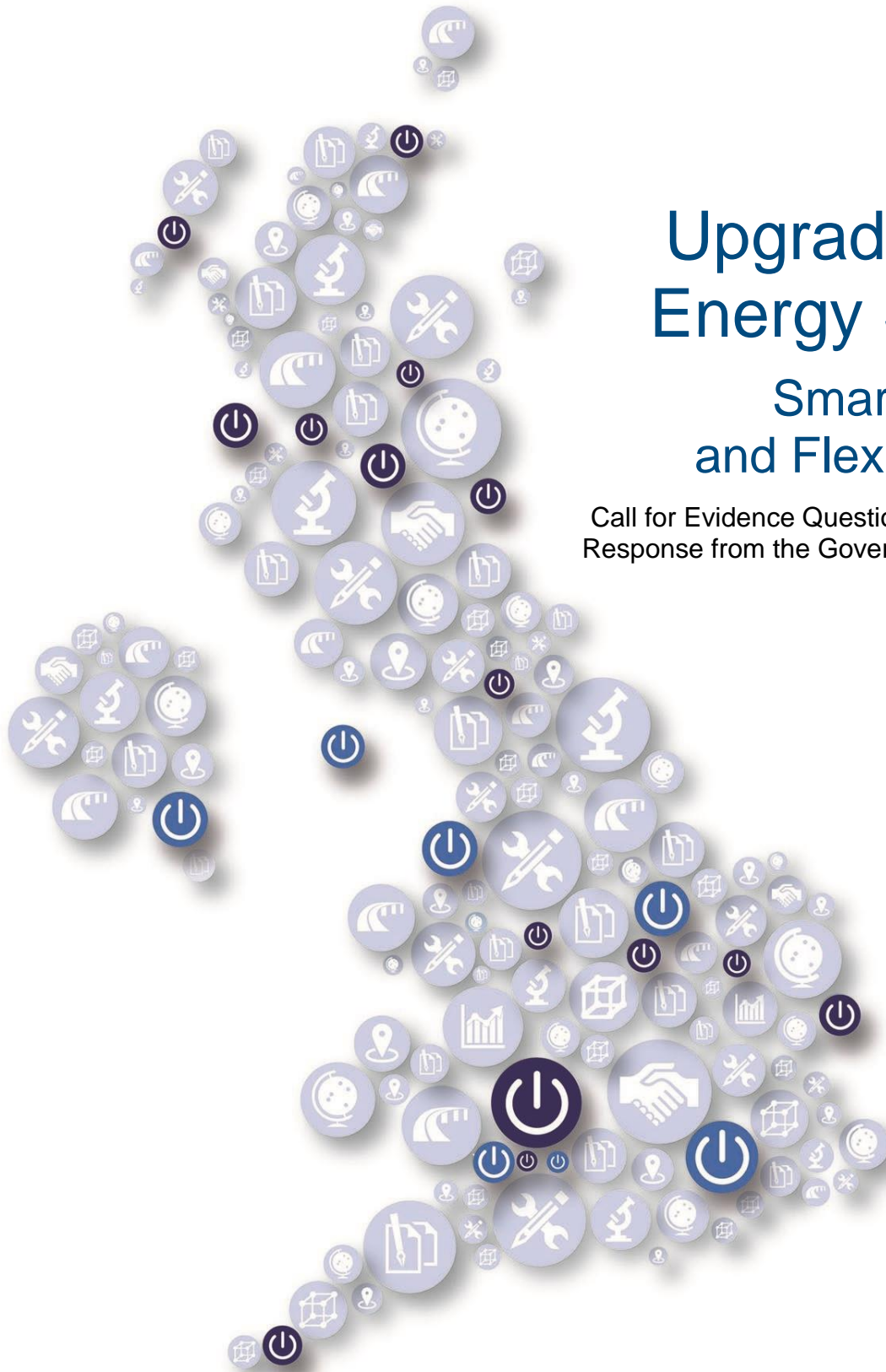




HM Government

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Making a positive difference
for energy consumers



Upgrading Our Energy System

Smart Systems and Flexibility Plan

Call for Evidence Question Summaries and Response from the Government and Ofgem

July 2017

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Call for Evidence question summaries and response from the Government and Ofgem

When Government and Ofgem published our Call for Evidence (CFE) on 10 November 2016,¹ we invited views and evidence in response to a range of questions on moving to a smarter and more flexible electricity system. This document summarises the responses received, and our position on each question. Full responses that are non-confidential are published on the Ofgem website.²

Enabling Storage

Question 1: Have we identified and correctly assessed the main policy and regulatory barriers to the development of storage? Are there any additional barriers faced by industry? Please provide evidence to support your views.

Summary of Stakeholder Responses

This question received 145 responses. A majority of respondents agreed that the CFE correctly assessed the main barriers to storage, while a smaller number either disagreed or did not clearly indicate agreement or disagreement. Across all of these groups, many respondents highlighted the particular importance of delivering regulatory clarity for storage, and addressing costs associated with final consumption levies (FCLs). Areas that respondents felt the CFE had not considered sufficiently are set out below.

A number of respondents highlighted issues with revenue streams for storage as a barrier to deployment and/or investment, which meant the market was not rewarding the full benefits of storage. A majority of these raised the difficulty of establishing a feasible business model based on income from multiple network and system services (for example ancillary services, Capacity Market (CM), load shifting). This was often attributed to:

- the complexity of regulations for different services;
- overly prescriptive conditions for services; and
- short contract lengths available under certain services (e.g. Enhanced Frequency Response (EFR), Firm Frequency Response (FFR)).

¹ <https://www.gov.uk/government/consultations/call-for-evidence-a-smart-flexible-energy-system>;
<https://www.ofgem.gov.uk/publications-and-updates/smart-flexible-energy-system-call-evidence>

² <https://www.ofgem.gov.uk/publications-and-updates/smart-flexible-energy-system-call-evidence>

Some highlighted this as a particular problem for large-scale storage requiring considerable initial investment (e.g. pumped hydro), and suggested a ‘cap-and-floor’ scheme as a solution. A few respondents suggested that periodic changes to energy policy (e.g. around subsidising renewables) can create uncertainty and disincentivise investment. Some others commented that Ofgem’s review of embedded benefits (i.e. charging arrangements for sub-100MW generators connected to distribution networks) had a similar effect.

Although not always framed as a barrier, many respondents also indicated that the Government and Ofgem’s approach to storage has not been technology neutral, focusing too much on batteries. Others suggested that there was insufficient focus on behind-the-meter storage, including barriers to its deployment, and appropriate regulation.

Similarly, some respondents said that the Government needed to ensure ‘whole system thinking’, in particular:

- considering linkages between different energy systems (e.g. heat, gas); and/or
- reforming the energy system to enable flexibility, rather than ‘bolting’ storage and other flexibility solutions onto the current framework.

Other key issues raised were:

- some renewable generators are uncertain whether they would lose accreditation under the Feed-in Tariffs (FITs), Renewables Obligation (RO) or Contracts for Difference (CFD) schemes by co-locating storage devices on their sites;
- the importance of consumer protection and device safety, especially in the domestic market, and appropriate waste battery regulations; and
- inconsistencies and/or uncertainties in the tax treatment of storage (e.g. value-added tax (VAT) and business rates), when compared to some other low carbon technologies.

The Government/Regulator response

Overall, there is clear support for the Government and Ofgem’s focus on the six main barriers considered in the CFE. Our responses to Questions 2-6 outline the actions we will take to address each of these, including issues associated with FCLs (Questions 5 and 6). Below we respond to the additional points raised.

The Government and Ofgem have set out the need for roles and responsibilities to evolve to ensure that flexibility is used to its full potential, and is effectively coordinated across transmission and distribution to deliver the best outcomes for the system as a whole. This includes the continued evolution of Distribution Network Operators (DNOs) to operate as distribution system operators (DSOs), and the changes in System Operator (SO) and Transmission Operator (TO) roles (see responses to Questions 43-46 for further detail).

This should better enable technologies such as storage to provide services across the network.

The Government is also trialling the potential for local flexibility trading to enable cross-vector solutions, such as a heat network taking power off the electricity system to address constraints, and is undertaking work to strengthen analysis of different potential approaches to decarbonising heat over the long-term. Our approach, focused on enabling the market to deliver flexibility, does not limit these future options to decarbonise heat.

The Government and Ofgem recognise that difficulties may exist for emerging flexibility providers, including storage, to establish multiple secure revenue streams in existing markets. Our responses to Questions 11-14 outline the actions that we will take to enable a fair and competitive market for flexibility providers of all sizes. The SO has considered these issues in its recent System Needs and Product Strategy³, which specifically considers improving transparency and reducing the complexity of ancillary services. With respect to the need for a long-term energy policy, a key aim of the Smart Systems and Flexibility Plan is to clarify the Government's and Ofgem's approach to smart energy, delivering as much certainty as possible for industry. Similarly, Ofgem's review of embedded benefits and its Targeted Charging Review (TCR)⁴ aim to deliver long-term clarity on network charging arrangements.

In the CFE and the Smart Systems and Flexibility Plan, the Government and Ofgem have taken a focused approach to the removal of policy and regulatory barriers as they apply to storage. The actions proposed in this document have been designed to address the barriers to storage identified by the Government and Ofgem in consultation with our stakeholders. These include addressing the regulatory barriers faced by larger grid-scale storage, such as pumped hydro and compressed air storage, as well as tackling the issues faced by smaller, behind-the-meter systems. At present, technology costs and the limited availability of Time of Use (ToU)/smart tariffs are greater barriers to behind-the-meter systems than policy or regulatory issues. We are therefore working to encourage the market to offer smart tariffs; details can be found at Questions 15-18. This includes the vital foundation of smart metering and half-hourly settlement to help create attractive conditions for domestic take-up.

We want to provide clarity on how storage can be co-located on renewable generation sites that are accredited for the RO, FITs or CFD schemes, particularly given that the original legislation for these schemes did not specifically reference energy storage. For the RO, there are already generating stations which have storage deployed at the same location which remain accredited, and we expect more to follow. Ofgem will assess any

³ <http://www2.nationalgrid.com/UK/Services/Balancing-services/Future-of-balancing-services/>

⁴ <https://www.ofgem.gov.uk/system/files/docs/2017/03/tcr-consultation-final-13-march-2017.pdf>

storage facilities deployed at accredited sites against the legislative framework. Ofgem has recently updated its guidance on the RO accreditation amendment process,⁵ and intends to provide further guidance later this year, building upon discussions with generators on specific co-location scenarios.

There are also generators with co-located storage receiving FITs support, and Ofgem's guidance for suppliers⁶ sets out the circumstances under which co-location can occur whilst meeting all other eligibility requirements. Ofgem intends to provide further guidance on co-locating storage and FIT installations later this year.

Last year the Government consulted on changes to the CFD contract, and in its response⁷ clarified that storage must be registered in a separate balancing mechanism unit to the CFD generating facility. The CFD contract⁸ does, however, permit storage to be registered in the same balancing mechanism unit as the CFD generating facility if certain conditions are met. This flexibility gives developers the opportunity to come forward with workable proposals for co-location with CFDs. As noted in that response, we will monitor co-location developments under the CFD scheme, and continue to engage on possible solutions that maintain the integrity of the CFD payment mechanism.

We also want to ensure that synergies between a smart energy system and increased deployment of small-scale renewables are maximised. Therefore, as part of its thinking on the development of future policy on small-scale low-carbon generation, the Government will look to ensure the system and consumer benefits of storing electricity for self-consumption and export to the grid at times of peak demand are maximised. This could potentially include the ability for existing generators to take advantage of time-of-export tariffs.

The Government and Ofgem are considering how to ensure that consumers are protected in the transition to a smart energy system, and our approach to this is set out in response to Questions 40-42. We strongly agree that there is a need for a robust health and safety framework for storage, including battery disposal requirements. We welcome the work currently being undertaken by industry in this area, including the British Standards Institute, and the development of a code of practice by the Institution of Engineering and Technology and the Government will be continuing to work with industry to ensure these

⁵ <https://www.ofgem.gov.uk/publications-and-updates/renewables-obligation-guidance-generators>

⁶ https://www.ofgem.gov.uk/system/files/docs/2016/05/fits_guidance_for_licensed_electricity_suppliers_v8.1_0.pdf

⁷ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/589996/FINAL_-_Government_Response_to_the_CFD_Contract_Changes_Consultation.pdf

⁸ <https://www.gov.uk/government/publications/contracts-for-difference-standard-terms-and-conditions-version-2-march-2017>

standards are fit for purpose. The implementation stage of the Each Home Counts review⁹ includes a Home Energy Technology (HET) workstream focusing on standards and consumer protection for a range of technologies including electricity storage. The HET is specifically considering how to incorporate domestic electricity storage within the Each Home Counts Quality Mark, Standards Framework and Information Hub.

The Government will work in partnership with industry to monitor progress and consider taking action where industry identifies regulatory issues.

We recognise the concerns of some stakeholders regarding the tax treatment of storage. The Government keeps all aspects of the tax system, including VAT and business rates, under review through the annual budget process. We welcome further engagement with industry on this area over the coming months.

Question 2: Have we identified and correctly assessed the issues regarding network connections for storage? Have we identified the correct areas where more progress is required? Please provide evidence to support your views.

Summary of Stakeholder Responses

This question received 110 responses. The majority of respondents agreed that we had identified the correct issues and areas for progress. The additional information respondents provided on those issues is summarised below.

Most respondents agreed that promoting storage in the connections queue could be appropriate if there are demonstrable benefits to others in the queue, for example the facilitation of more connections. Some of these respondents suggested that rules would be required to define when this would be acceptable. Those who did not think that this was appropriate argued that there is too much uncertainty on how storage will operate over its lifetime.

Several respondents highlighted the need for greater cooperation and interaction between the SO and DNOs. Many of these referred to the SO's recent tender for 201MW of EFR, which resulted in 19GW of storage connection applications to DNOs, as an example of the need to consider wider system impacts when procuring services. It is also an example of the need to deal with the high numbers of speculative applications for connections (see Assessment and Design (A&D) fees below).

A common theme from almost all respondents was the need for greater transparency from network operators on where to connect. Heat maps showing areas of demand and generation constraint were welcomed and some respondents requested a standardised,

⁹ <https://www.gov.uk/government/publications/each-home-counts-review-of-consumer-advice-protection-standards-and-enforcement-for-energy-efficiency-and-renewable-energy>

technology-agnostic approach by DNOs. It was suggested that heat maps could be improved by updating them more frequently and providing more information about lower voltages.

A number of respondents agreed that flexible connections should be available for storage, with some noting that they must be accompanied by sufficient information to provide investor confidence. Some commented that the operational characteristics of a storage project must be known before DNOs can offer flexible connections – without knowing this, DNOs have to assume maximum import and export requirements. Others cautioned that a flexible connection could preclude flexibility providers from offering certain services that require a firm connection.

A few respondents requested simpler rules for co-locating storage with existing generation connections, and consideration of what should be classified as a material change to a connection agreement. Some suggested that if storage is retrofitted to an existing generation connection and there is no change in export capacity it should count as a non-material change.

Many stakeholders were concerned at the significant amount of capacity held by developments that are not progressing. It was suggested that there should be principles on which DNOs could base a decision to withdraw a connection offer from a customer if developments are not being progressed.

Many stakeholders requested the reinstatement of A&D fees¹⁰ for connection applications, to deter speculative and multiple application requests. However, some respondents countered that because it is unclear how much capacity is available at various locations, they need to submit multiple applications to find sites with available capacity.

Some respondents also noted a need for further clarity for domestic storage connections as the rules that were developed for generation may be inappropriate for domestic storage. Others suggested a class exemption or simply a DNO notification process might be appropriate for domestic storage (with suitable restrictions) instead of the current G83/G59¹¹ process.

The Government/Regulator response

The majority of respondents agreed with our view that improvements are required for storage connections. We expect industry to address these issues in a timely manner. The most notable areas for industry to focus on include: a lack of clarity in the connection

¹⁰ A&D fees are charges which most DNOs levied on connection customers up until 2008. They were designed to cover the costs incurred by DNOs in preparing connection offers.

¹¹ G59 is the regulation for connecting generating plant greater than 16A per phase to the distribution network. G83 is the regulation for connecting any smaller generation to the distribution network.

process for storage connections (including domestic and co-located); a lack of transparency about where to connect; better queue management; speeding up the timescales; and reducing the cost of connecting to the network.

We recognise that over recent months industry has provided more clarity on the process for storage connections. The Energy Networks Association (ENA) and Regen SW published the 'Electricity storage guide for communities and independent developers'¹², and the Institution of Engineering and Technology will publish a code of practice for storage systems later this year.¹³ Both of these will provide guidance on connecting storage of different sizes. The ENA has also addressed a key concern for domestic storage by developing a streamlined process for domestic storage connections, which will be rolled out by all DNOs by the end of summer 2017. UKPN has recently launched a fast track process for small-scale storage applications.¹⁴ A number of other storage connection issues will be considered as part of the ENA Open Networks project.¹⁵ The Government and Ofgem will participate in this through the project's Steering Group.

Industry has also started work to reflect the impact of storage more accurately in connection rules. Industry aims to submit modification proposals on technical requirements for storage connecting to the transmission and distribution system to Ofgem by the end of 2017. The assumptions made in the SO's planning studies for storage connecting to the transmission network are currently being revised. This will allow the SO to make more appropriate assumptions about the impact of storage when assessing connection requests.¹⁶ The SO also intends to publish a heat map this summer, which will help indicate where in the system distributed generation and storage connectees can get a speedy connection.

Issues raised by respondents relating to the time and cost of connections will be addressed through wider work on connections by Ofgem and industry, which will help all connecting customers. Ofgem's recent publication on the status of network constraints outlined Ofgem's expectations for industry to improve the manner in which constraints are managed.¹⁷ The Government has published a call for evidence on allowing DNOs to charge upfront A&D fees¹⁸, and is considering responses and next steps. Our response to Question 45 on the evolution required in the roles of the SO, TO and DNO is also closely linked to this issue and highlights the onus on regulated monopolies to reform the way they plan, operate and engage with other system users.

¹² <https://www.regensw.co.uk/Handlers/Download.ashx?IDMF=79b608de-c368-4960-bf20-6f4ad897f949>

¹³ http://www.theiet.org/resources/standards/eess-cop.cfm?utm_source=redirect&utm_medium=any&utm_campaign=energy-storage-consultation

¹⁴ <http://www.ukpowernetworks.co.uk/internet/en/our-services/list-of-services/electricity-generation/storage-connections/>

¹⁵ <http://www.energynetworks.org/electricity/futures/open-networks-project/open-networks-project-overview/>
(NB This project was formally known as the TSO-DSO project)

¹⁶ <http://www2.nationalgrid.com/UK/Industry-information/Electricity-codes/SQSS/Modifications/GSR022/>

¹⁷ <https://www.ofgem.gov.uk/node/111056>

¹⁸ <https://www.gov.uk/government/consultations/assessment-and-design-fees-call-for-evidence>

Some progress has already been made but we believe that more is required and that industry needs to continue to address the concerns of storage stakeholders. Only some DNOs have published demand capacity maps, and these are not always available in all areas. Similarly, it is not evident that flexible connections for storage are available from all DNOs. We did not receive any clear evidence as to why a DNO or the SO cannot promote storage, or indeed any customer, in a connection queue if it has the objective of helping others in that area to connect more quickly or cheaply. As such, we expect network operators to facilitate this in the appropriate circumstances.

Ofgem will therefore request an update from all network operators outlining the steps and progress they have made to improve the connection process for storage connectees by the end of this year. If it is not evident that sufficient progress is continuing to be made, Ofgem will assess the need for further action. In addition, Ofgem will use the Incentive on Connections Engagement (ICE)¹⁹, a financial incentive developed under the RIIO²⁰ framework, to assess if DNOs are addressing these issues. Under this incentive, DNOs must provide evidence that they are engaging with connection stakeholders and responding to their needs. If DNOs fail to do this, they could incur a penalty.

Question 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.

Summary of Stakeholder Responses

This question received 105 responses. While the majority of respondents agreed that we had identified the correct issues, some respondents raised additional points for consideration.

Respondents tended to agree that storage can benefit the system and that when doing so it should be appropriately rewarded. Many respondents argued that storage needed cost-reflective price signals to incentivise the right response to network needs. It was suggested that dynamic locational and ToU/smart tariffs would facilitate this. Many respondents also argued that storage needed to be treated on a level playing field with other potential providers of flexibility and receive the same price signals.

While some agreed that it was appropriate that storage should pay network charges on both import and export, others considered that the current regime results in storage operators contributing disproportionately to network costs. A small number suggested

¹⁹ <https://www.ofgem.gov.uk/publications-and-updates/direction-issue-incentive-connections-engagement-guidance-document>

²⁰ RIIO (Revenue = Incentives + Innovation + Outputs) is Ofgem's framework for setting price controls for network companies. It is a new performance based model which lasts eight years.

there was a need for a fundamental rethink of network charging to provide the correct incentives for all flexibility.

A number of respondents also stressed the need for consistency between the charging methodologies for transmission and distribution. A few considered that the Balancing Services Use of System (BSUoS) charges penalise transmission-connected storage unfairly and that there should be an exemption (as there is for interconnectors). Some disagreed, saying that they had wider concerns with the structure of BSUoS, affecting parties other than storage, which also needed to be addressed.

Some respondents emphasised the need for simplicity and clarity in the charging regime as complexity and lack of consistency contributes to significant uncertainty of charges, which could impact on the viability of projects.

Nearly all respondents agreed that clarity is needed on the treatment of storage as either intermittent or non-intermittent, which impacts the level of transmission and distribution related charges. Respondents also stressed the need for a consistent GB-wide approach across the DNOs.

Among those who offered a specific view, there was general agreement that storage should be considered non-intermittent. They noted that even though storage is limited in the response it can provide (in terms of battery capacity/state of charge) it is dispatchable and therefore does not create the same challenges for the system as intermittent generation. Others proposed a more flexible approach to classification of assets (including storage) based on how they function on the network, on the basis that it is the asset's dispatch capability rather than technology type that is important.

A small number of respondents linked the question of intermittency to the need for a definition of storage in SQSS and P2/6²¹ and felt that although it may be appropriate to classify storage as non-intermittent for charging purposes, this may not apply to P2/6 classification.

The vast majority of respondents agreed that flexible connection agreements will have a role to play in enabling storage. A summary of responses received on this issue is included in Question 2.

The Government/Regulator response

It is important that network charges do not prevent a level playing field between different providers of flexibility. It is clear from responses to the CFE and from our engagement with

²¹ Security and Quality of Supply Standard (SQSS) and P2/6 are engineering recommendations for the safe and reliable design and operation of the electricity system. The former applies at transmission level and the latter applies at distribution level.

stakeholders that the current network charging arrangements can create a relative disadvantage for storage when competing to provide services.

Ofgem's Targeted Charging Review (TCR)²² consultation re-asserted its view that while storage should pay forward-looking network charges for both import and export, there are instances where storage may currently pay more towards the residual cost of the network than other network users. The consultation sets out a number of proposals to address this. The proposals include removing demand residual charges at transmission and distribution level and reducing BSUoS charges for storage. The proposed changes would apply to standalone storage and storage co-located with generation.

Ofgem believes that the relative disadvantage for storage under the current network charging arrangements is sufficiently material that it should be addressed ahead of any wider changes that may take place as result of the TCR. Ofgem therefore proposes storage charges should be taken forward directly by industry through the code governance process, rather than forming part of a wider significant code review. Ofgem is currently reviewing responses to the TCR, which closed on 5 May, and will publish a response in the summer.

Ofgem recognises that some respondents expressed a preference for a wider-ranging review of network charges, including BSUoS charges. See the response to Question 14 for Ofgem's proposed actions in this area.

The SO has published an update, which states that storage connected to the transmission network will be treated as non-intermittent²³. This will be kept under review as the understanding of the technology develops. Ofgem expects industry to provide guidance on the treatment of storage as intermittent or non-intermittent in the two distribution charging methodologies (Common Distribution Charging Methodology and Extra High Voltage Distribution Charging Methodology) by the end of 2017. We are also monitoring the industry review of engineering recommendation P2/6, which provides an opportunity to consider the classification of storage.

We also highlighted in the CFE the potential for flexible connections to reflect better the benefits of storage to the network. In Question 2, we say that flexible connections should be made available for storage at both transmission and distribution levels. More broadly, the efficient management of constraints on the networks are discussed in our response to Question 45.

²² <https://www.ofgem.gov.uk/system/files/docs/2017/03/tcr-consultation-final-13-march-2017.pdf>

²³ <http://www2.nationalgrid.com/WorkArea/DownloadAsset.aspx?id=8589938785>

Question 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.

Summary of Stakeholder Responses

This question received 144 responses. Nearly all respondents supported the use of storage by network operators if it is a cost-effective solution. Several respondents noted that the RIIO framework should already provide an incentive for network companies to procure services rather than deploy traditional reinforcement in those circumstances.

A few respondents stated that, although network companies can use storage to help manage their networks, the only examples of this at the moment are with DNO-owned storage, which suggests that there is no commercialisation of the use of storage for network reinforcement avoidance.

A number of respondents noted that the recent tender for EFR, which was significantly oversubscribed²⁴, suggests that storage services can be provided competitively. They suggested that there is the potential for network operators to distort the market by rejecting or stalling connections. Some concerns were raised that current unbundling requirements would be insufficient to prevent DNOs (or subsidiaries) owning storage and potentially distorting the market.

The majority of respondents stated that current unbundling requirements for generation should also apply to storage. Many of these respondents acknowledged that in exceptional circumstances – such as where no commercial alternatives are available – it might be appropriate for DNOs to own storage.

A small minority disagreed, noting that if there are no responses to a DNO tender, this could mean it was the wrong solution or a poorly designed tender. They stated a 'no last resort' principle would put the onus on network operators to seek innovative solutions.

Others suggested that if a network company could own storage as a last resort, then it should only be used for efficient and economic operation of network assets, and not for commercial purposes. They also suggested that periodic reviews of the ongoing ownership by the network company would be appropriate. Respondents also suggested that the problem might need to be broken down into 'ownership of the storage equipment', 'operation of the storage equipment' and 'trading and ownership of the stored energy'.

²⁴ 68 projects totalling 1.3GW responded to a 201MW tender.

The Government/Regulator response

The Government and Ofgem firmly believe in the importance of competitive markets for the provision of storage and flexibility services. We think that competitive markets lead to the smartest and most cost-efficient solutions for the energy system and energy consumers. Effective competition will encourage innovative solutions, which keep pace with advances in technology.

The provision of many services required by network operators, such as peak shaving and frequency response, can be provided competitively, and it is important to ensure that this is happening. The strong industry interest in the SO's tender for EFR services clearly demonstrates that there is already a fast developing market for the provision of storage services in GB. We do not believe the ownership or operation of storage by network operators is necessary as it could lead to distortions, and impede the development of a competitive market for flexibility services. We expect flexibility and storage services to be procured by network and system operators in open, competitive tenders in the first instance and for these services to be considered alongside traditional solutions under the current RIIO and SO incentive frameworks.

European Union (EU) unbundling rules prevent transmission owners and the SO from directly owning or operating generation and they require DNOs to ensure full legal unbundling of the operation of generation from their network operator activities. We agree with the view expressed by many respondents that unbundling rules should also apply to storage. Ofgem will ensure that these rules apply to storage and will look at the best way to give effect to this.

We note the concerns that ownership of storage by DNOs could lead to market distortions, even if the operation of the asset is unbundled from the network business. We take these concerns seriously. Although we do not propose to implement full ownership unbundling for storage by DNOs at this stage, we do not consider that network companies should own storage except in exceptional circumstances. Instead, Ofgem will introduce reporting requirements for DNOs that own storage. Such requirements will enable Ofgem to monitor DNO ownership of storage and take further steps should there be an indication of a distortion in the market – including limiting ownership of storage assets by DNOs if required. Ofgem will publish further details on this in the summer. We note the proposals in the European Commission's Clean Energy Package, which prohibit the ownership of storage by DNOs and transmission system operators (TSOs) except in very limited circumstances and with a derogation from the member state.

A number of respondents believe it is important to allow network operators to own and operate storage in certain scenarios, such as when the market cannot provide the service. We recognise that there could be limited scenarios when this may be necessary, but we agree with other respondents that allowing such a last resort principle could also create

risk by removing the incentive from network operators to seek innovative market solutions. Finding the correct balance to this issue is something that Ofgem will seek to take forward in its upcoming publication on storage unbundling this summer.

Question 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.

Summary of Stakeholder Responses

See Question 6.

The Government/Regulator response

See Question 6.

Question 6: Do you agree with any of the proposed definitions of storage? If applicable, how would you amend any of these definitions? Please provide evidence to support your views.

Summary of Stakeholder Responses

Question 5 received 114 responses. Question 6 received 105 responses. A total of 132 organisations responded to one or both questions. Most respondents supported including a definition of storage in primary legislation. However, no clear consensus emerged on the specific regulatory approach: a small majority expressed a preference for the creation of a storage licence that would be separate from generation, while others preferred to see storage remain under the ‘generation’ asset class.

The main arguments in favour of creating a new storage asset class (and an associated storage licence) were:

- recognising in regulation the unique nature of storage (in a similar way to interconnectors), as it operates using existing electricity rather than newly generated electricity (storage does not contribute to the net output of electricity in Great Britain);
- future-proofing the regulations around storage, allowing flexibility around licensing conditions;
- allowing specific rule changes for network charging, final consumption levies (FCLs), and ownership of storage assets for network operators; and
- exempting storage from the current planning rules applied to generation, and defining a new framework for planning consent for storage assets.

The main arguments in favour of confirming storage as a type of generation were:

- ability to achieve all the identified benefits (removing FCLs, regulatory clarity, creation of a specific storage licence) of a separate asset class;
- quicker implementation period to develop a storage-specific licence prior to, or without, primary legislation changes;
- continuity with current treatment of storage and clarity for stakeholders; and
- ease of grandfathering existing projects into the new framework.

There was a broad consensus that if a definition was included in primary legislation, it should remain as high-level and technology-neutral as possible. A few respondents stressed the need to ensure that network assets like capacitors and transformers would not be caught in the definition, as this could lead to unintended consequences for these assets. A large number of respondents agreed that the definition for storage provided by the Electricity Storage Network (ESN) struck the right balance. However, many others raised concerns that other energy vectors (e.g. heat, hydrogen, gas, or potentially hybrid technologies) would be excluded from this definition.

With respect to planning, many respondents highlighted the need to streamline and simplify the process for energy storage projects. A few respondents argued that energy storage projects should not be treated in the same way as generating stations for planning purposes (i.e. treating projects with a capacity greater than 50MW as Nationally Significant Infrastructure Projects). Though more respondents suggested that certain smaller changes to this regime might help to make it more appropriate for storage (e.g. reviewing the way in which the capacity threshold is measured). Some respondents also felt that there is a need for a clearer and more harmonised planning framework and guidance for storage projects across Great Britain (including the assessment criteria, environmental regulations and safety standards).

Other issues raised by respondents include concerns that the regulatory approach presented seemed to focus only on grid-scale storage barriers, or related to the CM rules, embedded benefits, or cap and floor issues (these issues have been addressed in the responses to Question 1, Questions 12-14 and Question 26).

The Government/Regulator response

The Government and Ofgem agree that the lack of clarity on the definition of electricity storage and uncertainties around its precise treatment under the licensing and planning frameworks are a barrier to the deployment of electricity storage assets in Great Britain.

In considering how to classify storage with regards to the electricity system, we recognise that storage can provide the same function to the grid of providing electricity as conventional generation. However, we agree that storage technologies should not always be treated in the same way as other forms of generation, as this would fail to recognise the different services it can bring to the system.

When parliamentary time allows, the Government will introduce legislation to define storage as a distinct subset of generation in the Electricity Act 1989 and related legislation to provide greater clarity for both licensing and planning purposes. Ofgem will consult on a new licence for storage as a subset of generation in Summer 2017, with the aim of introducing it in Summer 2018 (the licence can be introduced before any changes to legislation are made).

The Government and Ofgem agree that the definition of storage provided by the ESN (presented in the CFE) broadly strikes the right balance for primary legislation, and we therefore intend to use it as the basis for defining storage in industry codes, licences and legislation. This definition will only concern storage that provides electricity in Great Britain and will in no way restrict or prohibit other technologies such as power to gas, thermal storage or future innovative solutions.

Defining electricity storage in primary legislation will provide long-term clarity over the treatment of storage under the existing framework, while allowing it to be treated differently to other forms of generation where appropriate, recognising its differences. The Government and Ofgem have decided that defining storage as a subset of generation is preferable to creating an entirely new licensable activity. Storage is similar to generation in many ways, therefore including it as a distinct form of generation will avoid unnecessary duplication of regulations while still allowing specific regulations to be determined for storage assets, in the shortest possible timeframe. It will also provide certainty for storage developers that already hold a generation licence. We will keep this regulatory approach under review to ensure that barriers to storage are addressed appropriately.

Defining electricity storage as a subset of generation in the Electricity Act 1989 will confirm the Government's current position that storage facilities should be treated as a form of electricity generating station for planning purposes. Storage developers and local planning authorities should bear this position in mind when considering whether the construction or operation of proposed new storage facilities requires national planning consent (as set out in the CFE). The Government will also continue to engage with industry, local planning authorities, the devolved administrations and other relevant bodies to review the planning framework for electricity storage and ensure it is fit for purpose. Aspects for review could include the national planning threshold for storage facilities and planning guidance associated with storage.

As is already the case for holders of a generation licence, electricity supplied to holders of this new storage licence will not be considered liable under four FCLs: the RO, FITs, CFD, and CM gross auction costs.

Supplies of electricity are taxed under the main rates of Climate Change Levy (CCL) when consumed by business and public sector consumers. However, some supplies of electricity may qualify for exemption from the main rates of CCL.

The Government considers that electricity storage facilities²⁵ constitute electricity generation. Therefore, electricity storage facilities may be able to take advantage of the CCL exemptions for electricity generators as explained in HMRC's Excise Notice CCL1/3 'Reliefs and special treatments for taxable commodities'²⁶ if they meet the relevant conditions. CCL will still need to be charged when the stored electricity is supplied to the final consumer, again subject to relevant conditions.

Businesses that are entitled to claim a relief from the main rates of CCL need to complete two forms, one that is sent to HMRC and one that is sent to their electricity supplier. Details are available in Notice CCL 1/3²⁷.

Aggregators

Question 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?

Summary of Stakeholder Responses

See Question 8.

Government/Regulator response

See Question 8.

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

Summary of Stakeholder Responses

Question 7 received 71 responses. Question 8 received 74 responses. Respondents' key concerns included the Balancing Services (BS), the Balancing Mechanism (BM)²⁸ and

²⁵ Where the electricity is both imported and exported by the same facility

²⁶ <https://www.gov.uk/government/publications/excise-notice-ccl13-climate-change-levy-reliefs-and-special-treatments-for-taxable-commodities/excise-notice-ccl13-climate-change-levy-reliefs-and-special-treatments-for-taxable-commodities> (Chapter 3).

²⁷ <https://www.gov.uk/government/publications/excise-notice-ccl13-climate-change-levy-reliefs-and-special-treatments-for-taxable-commodities>

consumer protection. A few respondents mentioned barriers in the Capacity Market (CM) and the need for better System Operator (SO) and distribution network operator (DNO) coordination upon instruction of flexibility providers.

Respondents viewed BS as the main route to market for flexibility providers. They identified the following barriers affecting aggregators' ability to operate in this market:

- a large number of products overlap; and different specifications and procurement methods impose a barrier to new entrants; and
- the SO's procurement methods are frequently not market-based (for instance bilaterally contracted) and this affects the ability of aggregators, and distributed generation (DG) resources more generally, to provide services such as Black Start. They also said that there is a lack of transparency with limited information available on Balancing Services, made worse by difficulties in navigating the SO's website.

Some respondents argued that the SO prioritises centralised generators over distribution-connected sources of flexibility. But many respondents were encouraged by the SO's efforts to rationalise the suite of BS products and improve transparency. However, a few respondents urged the SO to increase the pace of change and provide a more ambitious timeline. Countries cited as good cases studies for BS markets were New Zealand, Germany, the United States, Australia, Belgium and Japan.

A large number of respondents argued that aggregators should be allowed access to the BM. The underlying rationale was to establish a level playing field and enhance competition in this part of the market²⁹. Many of these respondents viewed the current supplier licence and/or burdensome Balancing and Settlement Code (BSC) requirements as material barriers. Others argued that BM access should only be for those with a supply licence on grounds that it may not be possible to disentangle energy aggregation from supply without damaging efficiency.

With regard to different aspects of BM access, many respondents argued that aggregators should either become balancing responsible parties (BRPs) and/or that imbalance caused by their actions should be assigned to the party causing it. While parties impacted by such imbalance should have these effects neutralised.

Some respondents argued that aggregators/customers should pay retailers for energy they choose to sell on to the SO rather than consume (payment for unsold energy). Several

²⁸ A few respondents also referred to the wholesale electricity market. As the majority of the responses focused on the BM, we only refer to the BM in this response.

²⁹ The SO for instance reports that the increase in competition in the FFR Static market between July 2015 and July 2016 – which reduced the volume weighted average price of the service by 41%, and resulted in an estimated saving to the consumer of between £6m-£8m – may be to some extent attributed to participation of aggregators.

respondents regarded such payment as immaterial and unnecessary and a few of them mentioned the European Union Clean Energy package, which proposes to prohibit such regulated payments. No respondents gave an opinion on what constitutes an appropriate level of payment for unsold energy. A few respondents said that, left to their own, parties are likely to fail to reach an agreement on the payment for unsold energy.

Several respondents expressed concern about the BSC governance process. In particular that modifications may affect Non-BSC parties but that these parties would not be able to actively participate in the BSC modifications process.

Three recurring consumer protection issues related to consumer confidence, transparency and reputation. Almost all those who addressed this concern argued action was required to provide consumer confidence in interactions with aggregators. Many respondents favoured industry-led action such as a code of conduct, while a smaller number favoured a regulatory approach. Prominent consumer bodies suggested a code of conduct approach may be proportionate for the time being. Areas identified as needing greater transparency included revenues shared with the customer. A few respondents also noted the lack of means to identify highly reputable aggregators.

Some respondents mentioned barriers in the CM, including contract length, pre-qualification criteria and the testing process (see also Question 26). Others said that there needed to be better Distribution System Operator (DSO)-SO coordination in the procurement of aggregated services to solve both transmission- and distribution-level constraints.

The Government/Regulator response

We have seen some progress in integrating demand-side response (DSR) in ancillary services. But we agree with respondents that the current suite of products would benefit from being simplified and rationalised. The SO has set out in their 'System Needs and Product Strategy' (SNAPS)³⁰ document how the future of the ancillary services markets may develop and is consulting on options for simplification and rationalisation.

The SO will need to balance the challenges of meeting present and future system needs in an economically efficient manner while maintaining simplicity, transparency and using a market-based procurement approach. To this end, we are encouraged with the process initiated by the SO as part of the Power Responsive project. The Government and Ofgem will closely monitor Power Responsive and the SO's work through SNAPS to ensure that the SO delivers within a reasonable timescale, while addressing respondents' views as reflected above. Through the future SO incentive work, Ofgem is considering changes to the broader SO regulatory framework to ensure the SO procures and designs the ancillary

³⁰ <http://www2.nationalgrid.com/UK/Services/Balancing-services/Future-of-balancing-services>

services in a way that drives both short- and long-term benefits for consumers and accommodates new business models.³¹

In order to remove barriers to new and innovative business models, Ofgem commissioned analytical work by Charles River Associates³² to determine the merits of providing independent aggregators direct access to the BM and to assess different options. It examined issues raised by respondents, including payment for unsold energy ('compensation'), cross party effects, prospects for access to wholesale markets, and the nature of interaction between the customer/aggregator and retailer.

Ofgem's evidence base leads us to conclude that direct aggregator access to the BM can be efficiently provided with careful design of arrangements. We lay out our proposed approach in our response to Question 9.

More generally, we agree that aggregators and providers of flexibility should play a key role in discussions about future BSC arrangements. We encourage parties to use various platforms to contribute and influence, including National Grid's DSR provider group, and groups discussing relevant BSC modifications, such as P344 (Project Terre) and P354.

We agree with respondents that consumer confidence in practicing DSR, including through contracting with aggregators, is important to support growth in DSR. Consumer bodies that responded advocated the use of a code of conduct. We agree that a proportionate, relatively light touch approach is appropriate for now given the absence of concrete evidence of consumer harm. We explain our proposed approach in our response to Question 9.

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

Summary of Stakeholder Responses

This question received 40 responses.

A code of practice (voluntary or mandatory) approach was preferred by a large number of respondents. Key merits cited included its potential to drive transparency in aggregator

³¹ Ofgem's future SO incentives work is considering for instance the balance of reputational incentives, financial incentives, enforcement actions, revised obligations and other tools that may drive performance.

³² www.ofgem.gov.uk/system/files/docs/2017/07/an_assessment_of_the_economic_value_of_demand-side_participation_in_the_balancing_mechanism_and_an_evaluation_of_options_to_improve_access.pdf

practices, as well as a suggestion that the current lack of evidence of domestic and Small to Medium Enterprise (SME) consumer uptake meant that more interventionist approaches may be premature. The majority of those in favour of this option support the Association for Decentralised Energy (ADE) Code of Conduct.

Views about drawbacks for a voluntary code of practice were that without a regulatory framework it might struggle to ensure compliance. Respondents also felt that further protections would be needed when there is more domestic and SME participation.

Licences were favoured by a small number of respondents. The main benefits suggested were that consumers will be better protected and that a licence will most effectively drive consumer confidence and promote good behaviours amongst aggregators. Other respondents noted drawbacks of this approach, notably that obtaining a licence is expensive and acts as a barrier to innovation.

A watching brief was preferred by a few respondents. They said that this gave greater flexibility to respond to issues as they arise. They also preferred this option given the lack of evidence of consumer detriment. In particular, they felt that as the consumers currently engaging with aggregators are in the industrial and commercial sectors, they considered them adequately informed. In contrast, other respondents considered simply monitoring inadequate in ensuring consumer protection.

An industry-led approach was favoured by most respondents on market access, notably for the Balancing Mechanism (BM). They preferred this approach because they felt that this would minimise the regulatory burden, and would be more likely to identify the main issues and address cross-party effects. A few respondents pointed out a drawback of this approach is that it could exclude some interested parties from the decision-making process and favour incumbent parties' interests, as changes would need to be raised by those currently party to the BM.

Respondents that supported the 'regulator steps in' approach said that this action would balance the interests of all parties and result in a binding decision. Drawbacks given for this approach were that it would likely be disruptive and slow, and not be able to keep pace with rapid market developments.

In terms of the final option, many respondents said that a drawback of simply monitoring developments in relation to market access was that it may not result in direct participation by independent aggregators in the BM. Some merits of monitoring included that it is the least costly and non-disruptive option.

The Government/Regulator response

We broadly agree with what the majority of respondents identified as pros and cons for the approaches to consumer protection we consulted on. While more direct regulation may strengthen consumer protections, we also need to consider whether it is proportionate and

necessary. We need to strike the right balance between detailed consumer protection and allowing for innovative ways of engaging with consumers to develop.

We agree that a relatively light touch approach is currently appropriate given the absence of concrete evidence of consumer harm. We will therefore monitor the development of the ADE's voluntary code of conduct to see if it strikes the right balance in protecting consumers and avoiding disproportionate regulatory burdens for an emerging industry. Should our assessment conclude these protections are not effective, we will re-examine options for further intervention. At the same time, Ofgem will use existing tools – such as the Business Protection from Misleading Marketing Regulations – to protect consumers where necessary.

Work on direct aggregator access to the BM is currently being led and discussed by industry as part of Balancing and Settlement Code (BSC) modification P344 (Project Terre).³³ Ofgem is an 'observer' member of the modification work-group. The modification in its current form proposes the creation of a new BSC entity, which would encompass independent aggregators. This new entity would have direct access to the Terre market and the BM and have the ability to raise modification proposals. The modification process includes two consultations where stakeholders are invited to submit their views, and will be subject to Ofgem's final approval.

Our evidence base leads us to conclude that direct aggregator access to the BM can be efficiently accommodated with careful design of arrangements. Should Ofgem accept modification P344, this would remove the principal barrier to independent aggregator participation in the BM and address our initial rationale for work in this area: to provide access for such an entity if it serves efficiency.³⁴ We will carefully consider whether the proposed modification meets our relevant criteria in reaching a decision. Should the outcome on P344 not provide for creation of a BSC aggregators entity with the ability to raise modifications, Ofgem can designate a third party upon request to give it the ability to bring forward such a change proposal. To guide thinking on code modifications (whether P344 or others) towards the efficient accommodation of aggregators in the BM, Ofgem is publishing a letter which sets out its views on the topic³⁵.

DSR and the use of aggregators is currently happening within the industrial and commercial sector of customers. But the market may evolve into the domestic/SME retail

³³ Project TERRE (Trans European Replacement Reserves Exchange) aims to establish a pan-European market for balancing energy.

³⁴ Creation of such an entity in the BSC would also remove the principal regulatory barrier to wholesale market participation by giving independent aggregators the ability to put forward a modification proposal for Ofgem consideration.

³⁵ <https://www.ofgem.gov.uk/publications-and-updates/independent-aggregators-and-access-energy-market-ofgem-s-view>

segments in due course. We therefore propose to keep the effectiveness of arrangements under review, in particular to consider the appropriateness of market access design to the domestic/SME market segments.

Question 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?

Summary of Stakeholder Responses

This question received 64 responses. The majority of respondents agreed with the view that there could be potential risks to system stability if aggregators' systems are not robust and secure. However, many suggested that the Government and Ofgem, in conjunction with the SO and DNOs, should do more work to assess the scale of the risk at various levels of DSR services on the grid. They said that any regulatory response should be proportionate to the risks identified.

The stability risks identified ranged from potential cyber security risks to potential stability issues if load was switched too quickly. A few respondents identified different risks at the local level, such as overloading local circuits, and at national level where sudden changes in demand may be seen. A small number said that risks would vary depending on how the service was delivered, for example through a smart meter or through Internet of Things (IoT) technology, and the type of consumer (residential or business). Respondents also pointed out that forms of DSR such as refrigeration control could increase demand as soon as the DSR event was over, potentially affecting system stability at the end of a demand curtailment event. Respondents noted the existence of a buffering generating reserve in case of generator failure that would protect against some DSR risks.

Where respondents discussed remedies that would increase system stability with DSR, these were largely based around developing improved technical standards. There was general agreement that standards need to be universally applied, so that all aggregators work on a level playing field. A small number of respondents cited experience in France and Belgium to note that the assessment of system stability needed to be consistent and well understood to avoid disproportionate restrictions of aggregators' activity. There was general agreement that aggregators should be involved in setting standards in this area, e.g. by membership of appropriate technical committees.

For respondents that disagreed with the assertion of potential risk to system stability from aggregators, it was stated that there was a lack of evidence as to the magnitude of the risk and that the level of DSR was currently low compared to the loss of a large generating plant on the network.

The Government/Regulator response

The Government and Ofgem agree with the majority of the respondents that, if aggregators' control systems are not sufficiently robust and secure, there is a future potential threat to network and system stability.

We believe that this risk, although comparatively small now due to the low penetration and type of DSR on the network, will increase with time as the amount of DSR grows to balance an increased amount of renewables and as the role of automated DSR becomes more prevalent in the domestic sector. In the longer term, system stability is recognised as one of the requirements we identified for a future system. These are discussed further in our response to Question 44. Next steps to take forward thinking on potential longer term changes are outlined in the response to Question 46.

We agree that further evidence is required to assess the scale of the risk. Government has commissioned research on this issue to look at the effect of smart solutions on the reliability of the network in the period up to 2030, taking into account increased levels of smart electric vehicle charging and smart electric heating that is expected to meet our decarbonisation target in 2050. The work will inform our engagement with industry on technical standards for smart appliances and aggregator systems.

Furthermore, we agree that any new technical standards to control this risk need to be universally applied so that all aggregators are working to the same standards, and we are engaging with industry to explore options. These standards should allow a coordinated approach to DSR provided for both the benefit of DNOs and the SO.

The Government and Ofgem wish to work with DSR providers, the SO, TOs and DSOs, to ensure any new standards to protect against this risk are proportionate and well understood. As the nature of this threat will vary as the amount and type of DSR on the network increases, the Government and Ofgem will work with stakeholders to monitor risks to system stability.

System Value Pricing

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

Summary of Stakeholder Responses

This question received 103 responses. The main themes to arise were half-hourly settlement (HHS), smart tariffs, smart meters, increased understanding of flexibility services being procured, cost-reflective network charging as important investment signals, and the need for consumer understanding and engagement. More detailed information on these topics is covered in Questions 15-32.

Many of the respondents agreed that in order to fully deliver the benefits of a smart, flexible energy system, improved price signals in a number of areas of the energy system are needed. These included improved forward power market liquidity, ongoing cash out reform, changes to the ancillary service market and the ability to stack value across markets. Many also agreed that smart technologies, such as smart appliances and smart meters were vital in delivering system value pricing and realising the benefits of a smart, flexible energy system. Some respondents highlighted the importance of interoperability and data sharing between appliances to realise these benefits.

A few respondents noted the importance of understanding the consumer impact from the introduction of these enablers, especially for vulnerable consumers. They stated that consumers would need to have access to the necessary hardware and software to allow them to benefit from a smart system, and protections from higher bills may be needed where they cannot participate, or choose not to. Some respondents stated that it is the role of suppliers to understand the implications of these enablers.

In addition to consumer protection, consumer engagement and consumer understanding were listed as enablers in delivering the benefits of a smart, flexible energy system. For example, a few respondents felt that the installation of new, smart technologies would not be enough to automatically deliver benefits. They said savings would only occur with the behaviour change the smart technology enables. Other respondents also pointed to the need for agreed standards to allow better interoperability of home systems. Many respondents also said how fundamental data and digitalisation are in creating an integrated energy system and delivering the benefits that flexibility can offer.

[The Government/Regulator response](#)

We agree that the roll out of smart meters, HHS, smart tariffs and smart appliances will act as enablers to seeing the benefits of a smart, flexible energy system.

The Government is committed to ensuring that every home and small business is offered a smart meter by the end of 2020, delivered as cost effectively as possible. BEIS analysis shows the rollout of smart meters is expected to deliver net benefits of £5.7 billion. Ofgem has agreed with the Government that it will take forward a project to reform electricity settlement in Great Britain, via a Significant Code Review for mandatory HHS for domestic and smaller non-domestic consumers.

The Government is also minded to define regulatory standards as a minimum for smart appliances using, amongst others, the principles of interoperability, data privacy, cyber and grid security, as outlined in section 4.1 of the Call for Evidence (further information at Question 28). The Government will work with stakeholders to extract lessons learned from ongoing and future smart appliance trials, to inform these standards. The Government considers that the regulation of smart appliances will be needed in order to maximise the opportunities for domestic demand-side response (DSR), while managing the risks

associated with smart appliances, and to ensure appropriate consumer protections. Estimates indicate that the cost to manufacturers of including smart functionality in appliances should be minimal.

We believe that consumers should be at the centre of the transition to a smart flexible energy system and, in line with this, consumer engagement and awareness-raising will be important. The Government recognises that vulnerable consumers may be less likely to benefit from smart appliances (whether because of lack of awareness, cost or inability to be flexible, as outlined in Question 32). As noted in the response to Question 39-40, the Government and Ofgem will continue to ensure appropriate consumer protection is in place for these consumers and that consumer engagement remains a key focus.

We agree that data availability and digitalisation are essential in maximising the benefits of a smart, flexible energy system. We recognise that in the future, the energy system will need more skills in the area of data and digitalisation, and, to address this, the Government is incorporating digital transformation into the developing skills pillar of the Industrial Strategy. This will ensure we have the skills we need both now and in the future.

We also recognise the importance of improving price signals across the energy system and are setting out a number of actions in relation to this in our response in Question 13.

Question 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?

Summary of Stakeholder Responses

This question received 79 responses. These included potential or existing providers of flexibility, and those, such as network and system operators, who have awareness of the potential uses for flexibility.

Many more respondents thought it was possible to access the existing revenue streams in the right circumstances than thought that it was currently not possible, although in the former group there were many who did identify barriers to accessing the full range. Many respondents from both groups listed the types of revenue they were able to access, and those they would find most valuable to do so in future. The most common revenue streams cited came from ancillary services, followed by revenues from the wholesale market, with similar numbers referring to revenue from the capacity market (CM), energy balancing and network deferral.

A number of barriers to accessing the most attractive potential revenue streams were highlighted. The most commonly cited was a lack of transparency in ancillary service procurement. Contract exclusivity, or rules that prevented the combination of certain

revenues (e.g. as in the CM), were also frequently mentioned, as was the fact that there are different windows over which different revenue streams could be secured (market fragmentation). Some respondents felt that there were missing markets (e.g. network investment deferral and inertia) and that the revenue landscape was too complex for new entrants and small companies to grasp.

The comment that the framework had been designed for an outdated system was a recurring theme. Some respondents highlighted lack of direct access to the balancing mechanism for aggregators, and CM rules posing barriers. Some respondents thought that ‘triad’³⁶ avoidance was overvalued and as a result blocked the growth of other markets for flexibility. There was a call among a range of respondents for reform, particularly of ancillary services. A significant number called for a ‘blended’ approach to procurement, in which multiple services were procured at the same time by the System Operator (SO), alleviating the need for flexibility providers to stack value. There was a split between respondents over contracting, with equal numbers of respondents calling for longer contracts as called for closer to real time trading of services. Some respondents called for an update of service definitions and design.

The Government/Regulator response

See Question 13.

Question 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?

Summary of Stakeholder Responses

This question received 56 responses. Almost all respondents identified that there were services for which value was not remunerated or was undervalued. A small minority argued that all significant benefits are currently remunerated.

Key themes arising were the lack of transparency and reason behind the current format of the ancillary services markets. A number noted that the requirements were too specific and this limited which technologies could provide the service. Respondents frequently commented that the current process for the procurement of ancillary services is unfair. Some suggested the need to move to a market mechanism whilst others suggested that ancillary services needed to provide longer-term revenue certainty.

Many respondents considered inertia to be a key area where value is missing for a service that they provide. This was also reflected in a number of respondents who commented that

³⁶ The three half-hours of highest demand on the GB electricity transmission system between November and February each year.

payment for reactive power services need to be reviewed. The valuation of other services that were frequently raised were related to voltage control and Black Start.

Constraint management was a frequent area of focus. Some respondents raised concerns around the absence of mechanisms to value network deferral at the distribution level. This was reflected in comments around ensuring this happens fairly through the distribution network operator (DNO) to distribution system operator (DSO) transition. Some respondents said that there needs to be a route to manage local issues through a local platform for procuring flexibility services.

A number of respondents raised concerns around the network charging arrangements and perceived unfairness. There were a number of other comments around the changes in the embedded benefits review and concerns that this reduces certainty in markets.

Furthermore, a number of respondents believed that the CM should be reformed to provide greater value to flexibility providers. Concerns related to the CM typically centred on DSR access and the lack of an expected delivery time length, which has the potential to lead to sanctions for some flexibility sources, like batteries, which can only deliver for specific amounts of time.

Another concern raised was around the lack of value given for the role of flexibility in renewable management.

The Government/Regulator response

In January 2017, the Government, Ofgem and National Grid released a statement on the future of the SO.³⁷ This sets out our view that a more independent SO can realise benefits for consumers by enabling a more secure, competitive and flexible system. Alongside this statement, Ofgem published its proposals on the SO's future role and structure. In July 2017 Ofgem published a working paper updating stakeholders on our latest thinking for the SO's future regulatory framework, its roles and initial guidance on expectations for how the SO may fulfil these roles.³⁸

On 13 June, the SO published a 'System Needs and Product Strategy'³⁹ consultation. This outlines new options for how balancing services can be procured, and potential improvements in meeting future system needs, including inertia, response, reserve, reactive power and Black Start. This therefore covers a number of the issues raised by respondents to our CFE. We expect that the SO will publish the conclusions of this

³⁷ https://www.ofgem.gov.uk/system/files/docs/2017/01/statement_on_the_future_of_electricity_system_operation.pdf

³⁸ <https://www.ofgem.gov.uk/publications-and-updates/future-arrangements-electricity-system-operator-working-paper-future-regulatory-framework>

³⁹ <http://www2.nationalgrid.com/UK/Services/Balancing-services/Future-of-balancing-services>

consultation, and their way forward, by the autumn. The Government and Ofgem will monitor the progress and developments of this work. Alongside this, Ofgem is developing a new regulatory framework for the SO, which will incentivise the SO to ensure that this reform happens in a way that maximises energy consumers' interests.

The Government and Ofgem recognise the key role that flexibility services can play in managing constraints, as noted by some respondents. RIIO 1⁴⁰ already incentivises DNOs to make use of innovative, flexible approaches to manage constraints. This is beginning to happen, but further progress is needed. DNOs must demonstrate how they plan to open up the delivery of network requirements to the market so new solutions such as storage or DSR can compete directly with more traditional network solutions. We consider DNOs' approaches to constraint management may also need to evolve to remain efficient and we will be exploring the need for further guidance on this area in discussion with stakeholders. We expand on this in our response to Question 45.

There is also a potential role for network charges or other access and market arrangements to provide signals for the provision of flexibility services. We expand on this in our response to Question 14.

On concerns regarding the embedded benefits review, Ofgem has announced its decision to lower the payments made to embedded generators to reduce the costs for consumers.⁴¹ Ofgem estimates that changes made to embedded benefits has the potential to save consumers up to £7 billion by 2034 and make the energy system more efficient overall.

The full Government and regulator response on CM issues is set out in Question 26. We will be making a number of short-term changes to the CM in light of comments from respondents and will continue to monitor the market to ensure that it provides a level playing field.

We discuss issues related to aggregators in more detail in Question 7. We believe that aggregators can be efficiently accommodated in the Balancing Mechanism. Industry is bringing forward a modification that will give aggregators' access to the Balancing Mechanism. Ofgem will publish views to guide the thinking in this area towards an efficient outcome.

Finally, on concerns around the issue of flexibility gaining the right remuneration for its role in the management of renewables, see our response to Question 1. We believe that storage can have a fundamental role in the management of the intermittency of

⁴⁰ RIIO (Revenue = Incentives + Innovation + Outputs) is Ofgem's framework for setting price controls for network companies. It is a new performance based model which lasts eight years.

⁴¹ <https://www.ofgem.gov.uk/publications-and-updates/embedded-benefits-consultation-cmp264-and-cmp265-minded-decision-and-draft-impact-assessment>

renewables as storing electricity for self-consumption and export to the grid at peak times would help deliver a smarter, lower cost energy system. It is important that analysis, policy design and incentive levels take this into account.

Question 14: Can you provide evidence to support changes to market and regulatory arrangements that would allow the efficient use of flexibility and what might be the Government's, Ofgem's, and System Operator's role in making these changes?

Summary of Stakeholder Responses

This question received 58 responses. A large number of respondents noted the need for greater accountability and transparency of the procurement of ancillary services. Most of these respondents argued that there is a need for a reform of ancillary services. Many also called for wholesale review of the ancillary services as opposed to incremental change. Further, respondents set out that the SO should assess the cost of tackling future operability challenges such as those identified in the System Operability Framework and take a role in setting out the future market arrangements.

The transition from DNO to DSO roles has been welcomed by many respondents. A large number of respondents noted that there is a role for the DSO to promote flexibility in the distribution network. Many said that there needs to be effective communication and coordination between the SO and DSOs around using flexibility resources. A small number raised the suggestion that the roles and responsibilities could change between the SO and DNOs with the responsibility for coordinating the network operators falling to the SO.

Some respondents saw a role for the Government and/or Ofgem to provide greater certainty in the future direction and developments of the markets. They raised the need for a strategic oversight role and had concerns on the current framework of industry self-governance. They argued that the current system of industry self-governance creates unfairness in the system. They said potential providers of flexibility are not always able to engage because they do not have formal roles and that further scrutiny should be undertaken by Ofgem before modifications are accepted.

Flexibility trading platforms were also discussed by many respondents. It was noted that such platforms could provide price signals for flexibility. A small number believed that there is a role for the Government in setting out the aims for reforms to create flexibility markets, including legislation to set out the frameworks to enable these markets. One response called for a need for peer to peer trading of flexibility to be possible without a central platform. Meanwhile, some respondents expressed concern that further Government intervention in the market could prevent the development of a level playing field. Or that the Government/Ofgem should be prepared to step out of the market once this has been achieved.

On the more immediate policy changes, many commented on the need for CM reform to ensure a level playing field. Some respondents noted the need for greater price certainty in the markets with two respondents proposing the idea of a cap and floor model for large flexibility projects.

The embedded benefits review was raised as an area of concern for a few respondents. They said that Ofgem and the Government need to ensure that the review and its outcomes are fair, and that wider charging issues are addressed.

The Government/Regulator response

We have set out our response to concerns around ancillary services in Question 13. In summary, as part of its future roles of the SO programme, the SO is already undertaking a review of the ancillary services to meet the needs of the system and of providers. Following on from the decision on SO separation, Ofgem is developing the regulatory framework to ensure the SO has appropriate expectations, obligations and incentives to manage the system efficiently.

We recognise that the distribution network is an area where flexibility has the potential to play a key role, now and in the future. The Government and Ofgem are committed to ensuring that there is a smooth, timely transition from DNO to DSO, in which flexible solutions compete on an equal footing with physical upgrades to improve network performance and that the network and system operators co-ordinate effectively in the interests of the system as a whole.

We therefore welcome the Energy Network Association's (ENA's) Open Networks Project⁴², which is focused on facilitating the evolution of roles and developing more coordinated working practices (including in the procurement of ancillary services). It is important that DNOs, the SO and transmission owners (TOs) are as ambitious as possible in transitioning towards evolved roles and we will continue to oversee industry's progress in this area. Further information is set out in response to Question 45.

This transition does not necessarily mean that DSOs, the SO and TOs will need to directly procure all of the flexibility needed to manage the distribution and transmission systems. There could also be a role for charging or other access and market arrangements to provide a signal to users about the value they can provide to the system at different times and locations.

As part of its forthcoming strategy for regulating the future energy system, Ofgem will set out its intention to consider how to provide users with improved signals for the incremental costs or benefits they confer on the network. This includes considering the scope for

⁴² <http://www.energynetworks.org/electricity/futures/open-networks-project/open-networks-project-overview/>

market-based approaches. Ofgem will publish a working paper in autumn and will work with industry to develop the options.

The Government and Ofgem are aware of flexibility trading platforms already being trialled both in the United Kingdom and in the wider international setting, and we hope that the knowledge from these trials will help to inform further policy development in the area and help identify any barriers. Government has developed a competition for a feasibility study on local flexibility trading which will be launched as part of the plan. The aim of completing a feasibility study in this area is to ensure that we understand the impacts of local flexibility trading on the wider system and whether this is able to improve system efficiencies.

In response to the comments on industry self-governance processes, Ofgem has been consulting on streamlining the way codes are governed, so that the big strategic rule changes that benefit consumers most can be delivered quickly and smoothly. Ofgem plans to publish an update letter in summer 2017 setting out our planned next steps.

We recognise concerns around the current revenue certainty in the market. The responses to Question 26 address potential reforms to be made to the CM to provide greater price certainty.

In response to comments on embedded benefits and wider charging issues, we note Question 13 points out Ofgem's recent consultation and decision on embedded benefits. Ofgem will also shortly set out their decision on a proposed Targeted Charging Review.

Finally, in response to concerns about further market intervention, as set out in the CFE, a fundamental aim of our work is to ensure that there is effective markets and competition where participants can compete on a level playing field to ensure the best solution for consumers. Hence, we have focused on removing barriers in the existing markets and ensuring that fairness exists for new entrants.

Smart Tariffs

Question 15: To what extent do you believe the 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 the Government and Ofgem should play a role, examples of the sort of interventions which might be helpful.

Summary of Stakeholder Responses

This question received 110 responses. A large number of respondents felt that there was a role for the Government and/or Ofgem to play in promotion of smart tariffs but views on the level of intervention that would be appropriate varied among respondents. There was some consensus that removing both regulatory and technical barriers to create a level

playing field, as well as supporting innovation to encourage growth, would be the most appropriate role for the Government and Ofgem to play.

Many respondents were in favour of a market-driven approach once the key building blocks (i.e. smart metering and half-hourly settlement (HHS)) were in place. Some respondents did not want the Government or Ofgem to play any role, as they believed that the market would drive itself once the enablers were in place. There were concerns that further interventions could lead to stifling of competition and harm to the market rather than letting natural growth deliver effective business models. Respondents gave the four-tariff rule as an example of a market intervention that had been harmful to the growth of smarter, flexible energy systems.

Several respondents were keen to emphasise that the focus should primarily be around raising consumer awareness of smart tariffs, the potential benefits that could be derived from them and ensuring appropriate safeguards were in place to mitigate any risks that arise from smart tariffs entering the market. Respondents thought mandating smart tariffs could potentially lead to confusion and would be unpopular among consumers. It was suggested that vulnerability and lifestyle factors should be taken into consideration around consumer protections as well as clear messaging on the pros and cons of smart tariffs. Respondents pointed out that the Government or Ofgem are more likely to be seen as impartial sources of information than suppliers and thus can play an important role in raising awareness and securing consumer buy in.

Many respondents also highlighted the importance of creating the right framework for suppliers and new market entrants, including the role for third-party intermediaries, community energy groups and aggregators as part of developments in this area. These views included facilitating a greater understanding of flexibility, creation of market frameworks including lessons learned from the Feed-in Tariffs scheme (FITs) and the Green Deal, and ensuring regulations enable these models to come forward.

The Government/Regulator response

See Question 16.

Question 16: If deemed appropriate, when would it be most sensible for the 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.

Summary of Stakeholder Responses

This question received 80 responses. Many respondents identified the ongoing smart meter rollout, and ongoing work by Ofgem to consider mandatory HHS, as key 'trigger' points for change but responses varied as to whether any further interventions should be done in tandem or after completion of the smart meter rollout. Some respondents suggested that staggered timescales would be appropriate to take into account policy

developments around HHS and smart meters, emerging smart tariffs and new technologies entering the market. Several respondents indicated that further evidence gathering and impact assessment work was needed to determine the potential benefits of smart tariffs, before any intervention by the Government or Ofgem.

A number of respondents raised the issue of removing regulatory barriers and providing a supportive framework to allow the market to innovate and develop. A small number of responses touched upon the need for outcome-based regulation, providing clarity on what is to be delivered to drive the market and inform intervention.

Many respondents suggested that consumer engagement and awareness raising was the most appropriate focus for the Government and Ofgem with emphasis on a proactive communication of the benefits of smart tariffs. Some respondents raised the importance of ensuring that robust safeguards were in place, especially for vulnerable consumers as well as clear information on the implications, affordability and accessibility of smart tariffs, and that they may not be suitable for everyone. Of those who responded on timings for intervention, views were split on the need for action now and the need for action as soon as practicable.

The Government/Regulator response

The Government is committed to ensuring that every home and small business in the country is offered a smart meter by the end of 2020. More information on the smart meter rollout can be found in Question 11. The Government and Ofgem have also taken a number of steps to remove the barriers to smart tariffs, including Ofgem's removal of the four-tariff cap, as part of its future retail regulation project to focus more on regulating the outcomes suppliers must deliver for their customers.

In addition, the changes to industry codes required to deliver elective HHS for domestic and smaller non-domestic consumers were all approved by January 2017 and took effect in June 2017. Ofgem is now working (alongside Government) on consideration of mandatory HHS for these consumers, which would provide incentives for suppliers to reward customers for shifting their demand – for example through offering smart tariffs.

We expect that once these key enablers are in place, along with the availability of smart appliances, smart tariffs will become more widespread. We will continue to assess market provision and consumer take-up of such tariffs, and actively develop our evidence base regarding the system benefits that they bring. It is fundamental that the benefits enabled by smart meters are achieved and passed through to consumers.

We agree with respondents about the importance of consumer engagement and information provision, as well as the emphasis on the vulnerable and lifestyle factors, which could affect smart tariff take-up, and delivery of benefits. We will continue to assess how the market and broader consumer protection landscape develops to ensure

appropriate consumer protections are in place, and take action to intervene where necessary. We have addressed this in further detail in our response to Question 40. On ensuring that community energy groups and other new entrants can access market arrangements, please see Questions 45-46.

Question 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?

Summary of Stakeholder Responses

This question received 38 responses. Respondents noted developments in a number of countries including Denmark, France, Germany, Ireland, Italy, Japan, the Netherlands, New Zealand, Spain, Sweden and various states within Australia and the United States of America. This included examples both of good practice and instances where things had not gone as expected.

A theme raised by several respondents was the importance of consumer education and awareness-raising regarding smart tariffs. A small number flagged the importance of appliance automation and provision of feedback strategies, alongside real-time pricing, if consumers are to understand and change their consumption patterns.

While some respondents felt that the United Kingdom was uniquely placed to foster innovative new solutions in the energy market, others considered that other countries have demonstrated more advanced thinking on the contribution of demand-side response (DSR) and energy storage solutions in the domestic and smaller non-domestic sectors.

A few respondents noted recent developments at European Union (EU) level such as the EU's 'Clean Energy for All Europeans' package of measures⁴³ which includes a proposal that would require all member states to ensure consumers have, on demand, a day-ahead price-based tariff. It was suggested that implementation of the EU Network Codes will help to develop standard approaches and business models that can be implemented across markets.

Several respondents flagged the potential drawbacks of assuming other international examples would be applicable to the Great Britain (GB) context, without first understanding the contextual factors at play both here and there. For example, due to differences in a number of factors including levels of demand linked to summer and winter peaks it could be more appropriate if smart tariffs were developed in a way that reflected the British market context. Others noted that smart tariffs have been introduced in different countries for different reasons. In Spain, for example, they have been introduced to address the

⁴³ http://europa.eu/rapid/press-release_IP-16-4009_en.htm

challenge of peak load from air conditioning; in Ireland, they are in response to wind-dominated generation and high penetration of electric heating.

Finally, a few respondents noted that evidence from abroad suggests that net metering can reduce and/or remove incentives on consumers to provide flexibility.

The Government/Regulator response

We are grateful to respondents for providing a broad range of examples from outside the UK, and will continue to monitor development overseas as our work develops.

While we agree that these examples will not all be directly relevant or transferable to the GB context, the rapid evidence assessment on DSR that we have commissioned has already indicated several examples that are likely to provide particularly salutary lessons as we drive towards a smart, flexible energy future.

We recognise the importance of the EU's 'Clean Energy for All Europeans' package of measures in indicating a likely direction of travel, and will continue to engage with the Commission and other Member States to ensure our policy position – and those of respondents to the call for evidence – are taken into account.

Our approach to consumer awareness raising and engagement can be found in the previous question, as well as the responses to Questions 39-40.

Question 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?

Summary of Stakeholder Responses

This question received 57 responses. Of those who stated a clear view, most agreed with the reasons given for the limited provision and/or low take-up of smart tariffs among larger non-domestic consumers. A small minority disagreed.

Broad themes that were raised by a number of those who agreed included:

- consumers may feel that potential savings from smart tariffs are outweighed by the complexity or resource cost involved in understanding or comparing them;
- understanding energy use is not a priority for most businesses, and decisions on energy tariffs may not be taken by energy experts;
- business consumers may feel they are unable to take advantage of smart tariffs as the nature of their business means they have limited flexibility options;

- third-party intermediaries can influence consumers' tariff choices and they tend to favour simpler tariff offers, which are easier to manage and compare.

From a supplier perspective, some respondents noted that it is difficult and expensive for suppliers to understand the load characteristics or DSR potential of thousands of smaller consumers. On a related note, it was pointed out that as DNOs can define their own peak charging periods it is difficult for suppliers to develop nationwide tariff offers.

A small number of respondents noted that smart tariffs may provide limited benefits for individual tenants of multi-tenanted commercial organisations such as shopping centres, whereas the cumulative benefit if all tenants moved to a smart tariff could be considerable.

A few respondents noted that despite peak-related Time of Use (ToU) distribution charges being in place for several years, there had not been a significant reduction in consumption at the most expensive times. Some felt this was due to both suppliers not passing costs on to consumers, and consumers not reacting to signals as the savings from doing so were not material.

In addition, a few respondents noted that suppliers' offerings are driven by the competitive market and there is currently a lack of competitive pressure to offer smart tariffs.

Of those who disagreed with the reasons given, reasons ranged from respondents having not been offered any smart tariff – not that the choice on offer was limited – to the lack of trained professionals within businesses. They noted that the majority of companies have neither an energy plan nor an energy manager.

The Government/Regulator response

Respondents provided useful insight into barriers we identified in the Call for Evidence (CFE) as well as others that may explain the limited availability and take-up of smart tariffs by larger non-domestic consumers.

We will take these issues and barriers into account, as well as those we identified in the CFE, as we develop policy in this space. In particular, we will reflect on the potential of third-party intermediaries and aggregators in helping to overcome these barriers.

More generally, now that the deadline for transitioning medium and large non-domestic consumers to HHS has passed, Ofgem will consider the positions of suppliers, non-domestic consumers and other parties in order to understand expectations as to whether and how the retail energy market will change as a result.

Please also see the summaries and responses to Questions 37-38, which consider barriers to participation in DSR by large non-domestic consumers, and means of engaging with these consumers.

Smart Distribution Tariffs - Incremental Change

Questions 19-24 focus on distribution charging. This group of questions cover the following areas:

- potential barriers to flexibility due to the current charging frameworks and incremental changes that could overcome these (Questions 19-20);
- problems due to disparities in how different types of distribution connected user are treated (Question 21);
- whether there will be changes to network cost drivers and the need for change in Distribution Use of System (DUoS) charges to reflect this (Question 22);
- the ability of charges to send short and long-term signals (Question 23); and
- the implications of the distribution system operator (DSO) transition for network charges (Question 24).

In all, 97 respondents addressed these questions and the key themes, agreements and disagreements are summarised below. Responses to these questions were nuanced and did not always give clear yes/no answers.

Question 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.

Summary of Stakeholder Responses

This question received 70 responses. Many respondents considered that the current DUoS charging framework is a barrier to flexibility, due to:

- the complexity, uncertainty and lack of transparency of charges, which may disincentivise flexibility providers;
- inconsistencies between the Common Distribution Charging Methodology (CDCM) and the Extra-High Voltage Distribution Charging Methodology (EDCM);⁴⁴
- inconsistencies in the way the CDCM and EDCM are applied by the different distribution network operators (DNOs);
- inconsistencies between the transmission and distribution charging methodologies;

⁴⁴ A common methodology used across DNOs to calculate the charges for users connected at the extra-high voltage levels of the distribution network.

- a lack of rewards for the benefits flexibility can bring to the networks;
- a dampening of incentives for flexibility measures, such as the recent reduction in the differentials between Time of Use (ToU)/smart tariffs;⁴⁵
- a lack of clarity on storage charging, and a current system that was considered to unfairly double-charge storage for both import and export usage;
- the fact that non-half-hourly settled customers are not exposed to ToU charges and can therefore not respond to price signals (though this will change as smart meters are rolled out);
- the current price control approach, which cannot be adjusted for flexibility-related cost reductions.

Several respondents called for a holistic, wider review of charging which should result in a more consistent charging approach between the various elements of the network (transmission, distribution and connections). This could lead to a clearer, more transparent, predictable regime with greater cost-reflectivity.

Respondents proposed solutions such as:

- larger capacity-based charges, including for occasional users of the network, which could be based on maximum demand;
- larger standing charges;
- rising block tariffs;
- more granular ToU/smart tariffs, potentially dynamic;
- locational tariffs;
- a hybrid charging structure, combining capacity and volumetric charges;
- a review of how embedded generation should be treated in terms of distribution charges;
- the implementation of half-hourly settlement (HHS), enabled by the smart meter rollout;⁴⁶

⁴⁵ As per Distribution Connection and Use of System Agreement (DCUSA) code modification DCP228.

⁴⁶ This will increase the number of customers who can respond to variable price signals.

- the introduction of a separate system balancing-type charge to recover the cost of flexibility measures.

However, many respondents also highlighted some adverse impacts of such measures. Many domestic and small business customers can't/don't currently react to variable prices. This could reduce the usefulness of price signals as well as result in unfair outcomes. On the other hand, those large industrial users who have already invested in measures to avoid peak-time use could lose out if changes to the charging structure no longer incentivised load shifting, whilst large baseload users could suffer negative impacts through an increased use of ToU/smart tariffs. Some respondents considered that changes to the charging regime could create risks to investors.

Finally, some respondents advocated simpler rather than more complex charging arrangements.

The Government/Regulator response

See Question 24.

Question 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?

Summary of Stakeholder Responses

This question received 46 responses. There were calls for a holistic charging review (of varying scope) across both transmission and distribution. Respondents also noted that there are inherent trade-offs in changes to distribution charges, for example between better enabling flexibility through distribution tariffs and adding complexity through locational and ToU charges. They highlighted the potential for adverse impacts on consumers who are not in a position to respond flexibly. Several respondents drew attention to ongoing work on industry-led code modifications and reviews of the distribution charging methodologies, the CDCM and the EDCM.

A need to change tariff structures so that more cost recovery is on fixed or capacity charges was frequently mentioned across stakeholder categories. Several respondents suggested three categories of costs to be covered through distribution tariffs. Different definitions were used for these categories. Broadly, these were:

- costs that are driven by network use;
- common costs of the network which, in the short term, are not affected by network user behaviour; and
- distribution system operation costs.

There were some calls for removal of generation credits in generation-dominated areas. A number of respondents noted that non-incremental tariffs should apply to storage and that storage should be treated consistently across all distribution system areas. A few respondents noted that increasing HHS will naturally lead to tariff adjustment even without further intervention.

Several respondents pointed out that network users need access to clear information to enable them to respond to signals in the network charge. A small number of respondents proposed a gradual transition in distribution tariffs in a way that plans for medium-term technological change, with consumer engagement before any rollout of DSR and ToU/smart tariffs. The need for a plan for supporting vulnerable consumers was also highlighted.

The Government/Regulator response

See Question 24.

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

Summary of Stakeholder Responses

This question received 50 responses. Several respondents suggested a harmonised charging approach across all voltage levels, noting that key differences between the EDCM and CDCM can create a boundary issue/geographical disparities, but that these may be addressed through the ongoing work on the EDCM and CDCM reviews. There were also calls from some respondents for the system of generation credits to be reviewed to assess whether they genuinely reflect network benefits. This is because some regions are no longer demand dominated and embedded generation can add to reinforcement costs. Similarly, some respondents argued that the charging arrangements for distributed generation should depend on the impact their connection has on the need for network reinforcement in the area and whether this increases or decreases network capacity or security in the area.

Other respondents felt that the current array of charges for demand and credits for generators are generally appropriately applied. A small number stated that they are aware of inconsistencies both within and in between existing methodologies and welcome more focus on this area.

It was suggested that disparities in treatment are likely to increase as the distinction between the transmission and distribution networks blurs and the network moves to a fundamentally different usage model. A small minority called for the definition of the 132kV network in Scotland as transmission to be revised due to the difficulty it creates in

considering changes to charges and benefits for embedded generators across Great Britain.

It was also noted that there is a further anomaly in the treatment of network charges for communities engaged in peer-to-peer trading, for which a change of approach towards capacity- (rather than unit-) based network charges might be more reflective of the nature of their usage of the distribution system.

The Government/Regulator response

See Question 24.

Smart Distribution Tariffs - Fundamental Change

Question 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 Distribution Use of System (DUoS) charges change as a result?

Summary of Stakeholder Responses

This question received 65 responses. There were mixed views on the extent to which network cost drivers will change as the distribution system evolves.

A small number of respondents noted that higher uptake of solar and electric vehicles may drive a need for more investment at lower voltage levels as well as more costly flexible network management options. An equally small number anticipated that, while information technology, communications and integration cost are likely to increase substantially, these costs may be off-set by avoided investment in traditional generation and reinforcement.

Respondents highlighted that another cost driver could be a change in the 'conservative' assumption of network design based on peak demand.

A number of respondents proposed that DUoS charges should have more of a fixed or capacity element as volumetric charges may become a burden for those not providing flexibility. This is because some groups of users can easily take action to avoid volumetric charges and the recovery of residual network costs will disproportionately fall on those who cannot do so.

Several respondents argued that the deployment of storage will reduce network expenditure and that charges should encourage and reward storage. It was also noted that a stable charging regime may facilitate the rollout of new flexibility technologies. Some respondents argued for reduced network charges for 'islanded' systems that rarely use the network. Others suggested that the characteristics of distributed generation and storage mean their increased deployment will need to be accompanied by more active voltage management, with resulting cost impacts. A small number of respondents foresaw a future

development of three distinct markets within the electricity industry – energy, capacity and system services; network users are likely to continue to participate across these markets.

The Government/Regulator response

See Question 24.

Question 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 Distribution Use of System (DUoS) charges send both short term and long term signals at the same time effectively? Should they do so? And if so, how?

Summary of Stakeholder Responses

This question received 60 responses. Respondents generally felt that DUoS charges provide important long-term investment signals that incentivise customers to avoid behaviour that would drive reinforcements. Some respondents argued that stable and predictable DUoS charges would send efficient investment signals. This view was not shared by all respondents; others argued that DUoS charges do and should send both short-term and long-term signals.

A number of respondents noted that, while it is possible to send short term price signals through DUoS charges, it would add complexity. Several respondents felt separate flexibility charges and services would be a better way to manage short-term system requirements, initially through contracts but eventually through flexibility markets. They argue that the costs and benefits of active network management should be split from longer term cost signals and reflect specific network problems and reinforcement alternates.

Other respondents suggested that short-term signals should be sent via local flexibility markets for demand turn-up and local congestion management, supported by System Operator (SO) coordination to ensure a standardised approach. They advocated use of contracts to manage constraints. A small number of respondents argued that peak management service models could emerge as an alternative to dynamic network charges, and that the regulator should encourage dynamic network management, building on recent innovation projects. It was also argued that, at present, DUoS cannot provide a strong investment signal; however, in a future smarter system it might be efficient to balance demand, generation and storage within limited physical areas of the network. A future DUoS charging regime might have a role in reflecting the economic benefits of balancing assets that are physically close to each other.

A small minority called for a consistent distribution/transmission boundary to improve the longer term locational and investment signals for investment. There was also a call for academic research into the risk of long- and short-term signals swamping each other. It

was also noted that long-term signals can only be effective if there is enough confidence in market stability, while short-term signals depend on the level of automation available.⁴⁷

The Government/Regulator response

See Question 24.

Question 24: In the context of the distribution system operator (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.

Summary of Stakeholder Responses

This question received 47 responses. Many respondents advocated a market-led approach, with DSOs and transmission system operators (TSOs) procuring response from the same resources. A small number proposed that DSO licence areas should emerge as a result of a competitive process, while others proposed different solutions may be practical in the future as more active distributed energy resources are connected. Also highlighted was the importance of coherent design to ensure that relevant price signals are sent once and once only where possible. A small number also commented that DSOs might be better placed than distribution network operators (DNOs) to provide accurate pricing signals to customers as they could offer more dynamic products and pricing.

It was argued that there is scope to use demand-side flexibility to reduce network costs if those costs are made visible and DSOs are prepared to share the cost savings with service providers. But barriers to entry must be kept low, through simple regulation, no need for expensive licences, and DSO willingness to use assets only for as long as they are needed rather than to reserve them “just in case”. Respondents also noted that buyers of flexibility other than the DSO and TSO will also influence the market – such as energy suppliers, community energy groups and other prosumers, and that there may well be scope for flexibility providers to manage portfolio risk by undertaking peer-to-peer trading amongst themselves.

Some called for the cost of services enabling efficient use of the networks to be recovered through DUoS as a normal network cost, enabling continued stability and predictability of charges before the transition to a more complex framework at an appropriate future point.

Others expressed the view that DSOs should not control responsive resources so as not to undermine unbundling, competition and innovation. Nor should they be “gatekeepers” for other actors, as this would create an institutional barrier. Another view was expressed that the differences between a DNO or DSO model should be irrelevant to charging as long as

⁴⁷ The ability of customers to respond to short term signals depends on the level of automation available on their side.

charges reflect the costs of the infrastructure and system operations required to support customers' needs, and other necessary features such as transparency, predictability and stability.

The Government/Regulator response to Questions 19-24

Network charges are designed to incentivise the efficient use of the network. In general, these charges are set to reflect network users' impact on network costs, including current and future investment and reinforcement.

It is important that the price signals sent through forward-looking charges reflect system costs and benefits (to the extent that these signals are not provided through other arrangements), as cost reflective charges will drive efficient use and development of the electricity distribution network. The rollout of smart metering and half-hourly settlement (HHS) means that improved price signals can be sent through distribution tariffs and the charging framework needs to adapt to ensure that it allows efficient and fair recovery of the costs of network provision and that appropriate price signals are sent to network users. Overall, responses to our Call for Evidence (CFE) show support for ongoing changes to the charging or wider framework to better incentivise flexibility measures and reflect the benefits these can bring.

However, these forward-looking charges are generally insufficient to cover the full costs of building, maintaining and operating networks. The balance of revenues is recovered through 'residual' charges, which are designed to 'top-up' network operator revenues to the level allowed under their price controls. At distribution level, this element of the charge is referred to as 'scaling'. It varies between different distribution network operator (DNO) areas, and can be up to half of the overall distribution network charges.

Our work in this space will be informed by the Council of European Energy Regulators (CEER) 'Guidelines of Good practice on Electricity Distribution Network Tariffs', which were published in January 2017.⁴⁸ The heart of the CEER report is a series of 'Principles' and 'Key recommendations' on distribution tariff design.

Our distribution charging framework is designed to adapt over time, both reflecting and influencing changes in how the energy system works. The charging framework is adjusted through industry-led modifications to the relevant codes, with strategic direction set by the regulator. Ofgem also has powers to undertake significant code reviews (SCRs). Code modifications have introduced changes to allow better price signals to be sent to customers relating to the costs of operating and investing in the network. An example is modification DCP179, which took effect in 2015, introducing new Time of Use (ToU) tariffs

⁴⁸ The principles identified are cost reflectivity, non-distortionary, cost recovery, non-discriminatory, transparency, predictability and simplicity. For more information see:

<https://www.ceer.eu/documents/104400/-/-/1bdc6307-7f9a-c6de-6950-f19873959413>

for half-hourly metered customers.⁴⁹ Many respondents to the CFE noted the impact of a recent code modification, DCP228, which changes how DUoS charges are calculated to reduce distortion to the charges, which are intended to reflect the costs of operating and maintaining the network during peak and non-peak time periods.⁵⁰

Ofgem has implemented Code Governance Reforms. These aim to support effective Distribution Connection and Use of System Agreement (DCUSA)⁵¹ panel decisions and recommendations and assist them in developing effective forward work plans.

Many stakeholders, including respondees, have called for a holistic review (of varying scope) of charging for transmission, distribution and system operation/flexibility management. In March 2017, Ofgem proposed to launch an SCR of certain aspects of network charging to help drive some of the changes needed for the new energy system.⁵² This Targeted Charging Review (TCR) covers many of the network charging issues raised in these CFE responses, including recovery of residual network charges, charging arrangements for smaller embedded generation and storage charging arrangements. The TCR addresses a concern from some respondents to the CFE that measures to improve flexibility may cause network costs to be disproportionately recovered from those network users that cannot afford to invest in smart technologies.

In the consultation, Ofgem set out how the TCR could be developed in the context of wider, interrelated work on network charging reform. Other key initiatives of particular relevance to distribution charging are:

- the Distribution Charging Methodologies Forum's reviews of the DNOs' two distribution charging methodologies, the Common Distribution Charging Methodology (CDCM) and the Extra-high Voltage Distribution Charging Methodology (EDCM)⁵³ – these industry reviews are in the second phase of work and will be developing modifications to industry codes, which may take effect from 2020.
- the Energy Network Association's (ENA's) Open Networks Project⁵⁴ – work taken forward by this group has included consideration of the charging requirements of enduring electricity distribution and transmission systems and it has recently produced proposals for further work.

⁴⁹ https://www.ofgem.gov.uk/sites/default/files/docs/2014/10/dcp179_d_0.pdf

⁵⁰ https://www.ofgem.gov.uk/system/files/docs/2016/09/dcp228_decison_letter.pdf

⁵¹ This agreement governs the contractual relationship between DNOs and users of the distribution network.

⁵² <https://www.ofgem.gov.uk/system/files/docs/2017/03/tcr-consultation-final-13-march-2017.pdf>

⁵³ <http://www.energynetworks.org/electricity/regulation/distribution-charging/distribution-charging-working-groups.html>

⁵⁴ See the ENA's report at

<http://www.energynetworks.org/assets/files/news/publications/Reports/TDI%20Report%20v1.0.pdf>.

- National Grid's Review of transmission charging.⁵⁵

To manage the wider interaction of the TCR with this ongoing industry work, Ofgem is establishing a charging coordination group, with wide industry representation to help steer the overall charging reform programme. We expect the existing reviews to continue but to be given a steer on overall direction by the group. We have noted that many respondents consider the complexity of the current distribution charging regime to be a barrier to the development of a flexible system and expect that this will be a consideration in the work of these industry reviews.

The ability of network users to respond to price signals will change over time as smart technologies and processes become more prevalent. There is considerable uncertainty in the pace and the extent of this change, which may affect how trade-offs are made between competing objectives for distribution tariffs.

As part of its forthcoming strategy for regulating the future energy system, Ofgem will set out its intention to consider how to provide users with improved signals for the incremental costs or benefits they confer on the network. This will include considering how distribution charges need to adapt in the future, alongside whether there are other, more market-based approaches (see Question 14). To deliver the full benefits of flexibility, it is important that combined price signals reflect the true value to our energy system of smart technologies and processes.⁵⁶ Coherent design is needed to ensure that price signals are truly representative of the costs and benefits to the system, as this will best support efficient outcomes.

Other Government Policies

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

Summary of Stakeholder Responses

This question received 95 responses. A significant number of these discussed specific issues relating to the Capacity Market (CM) or renewables policy, which are covered in the summaries to Questions 26-27.⁵⁷

⁵⁵ Information can be found at http://www2.nationalgrid.com/UK/Industry-information/System-charges/Electricity-transmission/charging_review/.

⁵⁶ Cost-reflective signals relating to network operation and investment can also be sent through channels other than Use of System charges, such as DSO contracts or connection contracts.

⁵⁷ In addition, a number of responses addressed the issues raised in questions 25-27 collectively which means there may be some double-counting or repetition of our summaries of these questions.

A number of broad themes emerged which were raised by respondents from a wide range of organisations. These included:

- the importance of a consistent, transparent and predictable policy framework to provide market certainty;
- the need to ensure a level playing field across different markets and different types of flexibility;
- calls for the Government to take a holistic approach across the system, considering electricity, heat, gas and transport.

Several respondents flagged the importance of co-location of renewables with storage as key to underpinning the smart energy system of the future, where a small number argued that lack of clarity in Renewables Obligation (RO) legislation presents a barrier to co-location of storage at renewables generating stations (see also Question 1).

Research was cited which suggests a net economic benefit in system integration costs could be realised from a high deployment of solar photovoltaic (PV) coupled with a high deployment of batteries in 2030. Touching on a similar theme, some highlighted the need for the external costs of intermittent and non-dispatchable generation to be internalised, which they felt would provide an incentive for operators of intermittent power generation to contract directly with demand-side response providers.

More broadly, a small number noted that while the GB energy market is advanced in terms of deregulation and competitiveness, the range of parties and complexity of market arrangements suggests complicated commercial arrangements will be needed to reflect different parties' interests. This may slow the transition to a smart energy system.

On a similar point, a few noted that the range of different support schemes aiming to achieve similar objectives means industry consumers find it difficult to understand which schemes would be most beneficial for them to participate in. Similarly, full compatibility was called for between the Feed-in Tariffs (FITs), RO and Contracts for Difference (CFD) schemes, pointing out that a CFD consultation included proposals for a definition for energy storage, while a storage definition already exists in the CM.

A small minority raised the issue of potential 'free-rider' issues as new technologies emerge and patterns of network usage change. They stressed the importance of policy ensuring that consumers pay their fair share of costs relating to network usage.

The Government/Regulator response

Respondents provided useful insight into risks and issues that may hinder the move towards a smart, flexible energy system. We will take these into account as we develop policy in this space and related areas. For example, the Government's Industrial Strategy⁵⁸ includes smart energy as one of its fundamental parts, and on 21 April 2017 an investment of £246 million for the Faraday Challenge was announced to help the UK become a world leader in the design, development and manufacture of batteries for the electrification of vehicles.⁵⁹ See Question 11 for other links to the Industrial Strategy.

We recognise the need to ensure holistic thinking across electricity, heat and transport to protect against unintended consequences or perverse incentives in one or another area. As noted in the response to Question 1, the opening up of local flexibility markets can enable cross-vector solutions such as a heat network taking power off the electricity system to address constraints. Importantly, our approach for delivering a flexible electricity system does not limit future options for decarbonising heat.

Please also see Question 1 for our position on co-location of renewables with storage; Question 35 on hydrogen electrolysis for storage; and Question 44 on whole system impacts.

The Government currently supports the deployment of low carbon electricity through three support schemes: the small-scale FIT, RO⁶⁰ and the CFD. There is already a large degree of compatibility between the schemes. However, each scheme also has its own specific objectives and requirements, which reflect the evolution of Government policy on support for low carbon technologies since the RO was introduced in 2002, as well as the need to ensure that support is affordable for bill payers.

The definitions of 'storage' so far adopted for the CM and for CFDs were adopted for specific policy interventions. The definition proposed as part of the Call for Evidence (CFE) is intended for broader use in the future.

⁵⁸ <https://www.gov.uk/government/consultations/building-our-industrial-strategy>

⁵⁹ This investment is part of the Industrial Strategy Challenge Fund. See: <https://www.gov.uk/government/news/business-secretary-announces-industrial-strategy-challenge-fund-investments>

⁶⁰ The RO closed to all new generating capacity on 31 March 2017.

Question 26: What changes to Capacity Market (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 demand-side response (DSR)) to contribute in light of future smart system developments?

Summary of Stakeholder Responses

This question received 53 responses. There was considerable variety in the views expressed, ranging from those who considered the CM to be an effective, functioning market, where there were already no barriers to entry, to those who thought that the system requires comprehensive review or should be phased out over time.

Allowing DSR to access longer term CM agreements was the most common suggestion. Some suggested five- or seven-year durations as being suitable. Others contrasted the current position with the 15-year agreements available to new-build generation. They noted that such disparity frustrates investment and puts DSR at a disadvantage, citing parallels with the American PJM market arrangements where all resources are awarded the same contract length.

Many respondents commented on the importance of processes linked to metering and testing. Some requested greater consistency of approach. Others took this further, suggesting that less expensive metering and testing should be pursued and that the risk-based testing regime used in the Transitional Arrangements (TA) auctions should be extended across all CM auctions.

A number of respondents felt there should be a removal of restrictions on the ability to stack revenues from ancillary services alongside CM payments: participants should be allowed to deliver other services when not providing capacity to allow the extraction of more value from assets. Linked to this was the suggestion by some that Enhanced Frequency Response (EFR) should be allowed as a relevant ancillary service, alongside Firm Frequency Response (FFR). Another suggestion was that the CM should support flexibility by incentivising projects that provide a quicker response.

Some responses called for greater flexibility in the CM Rules. Suggestions included making it possible to add or replace Meter Point Administration Numbers (MPANs) to Capacity Market Units (CMUs), and allowing component reallocation.

A number of respondents suggested amending the definition of unproven DSR to include load shifting/reduction only and not behind-the-meter generation. Others suggested reviewing the delivery milestones for unproven DSR to maximise time available for recruiting clients and assets, keeping the pre-auction credit cover requirements for DSR lower than for other technologies and implementing a carbon emissions limit that might favour DSR. Some respondents requested the lowering of the 2MW threshold to facilitate participation of smaller applicants.

Several respondents suggested that there should be a review of the de-rating factor for battery storage, which they noted was based on historic performance of pumped storage and is likely to be different for other storage technologies. Some indicated that there should be standards of persistence considered within this because of the concerns about the duration for which battery storage could operate during a stress event.

There was general support for the introduction of secondary trading. Respondents said they want to see policies that ensure an effective, well organised market that safeguards security of supply.

The Government/Regulator response

From the outset, the CM has included design features intended to facilitate the participation of storage and DSR. We have continued to make changes to the CM rules and regulations in light of experience and feedback from stakeholders, including since publication of the CFE.

For example, Ofgem's recent decision on amendments to the CM Rules, published in June 2017,⁶¹ included changes to enable component reallocation from 2018, ahead of the 2018/19 delivery year. The changes will also make EFR a relevant balancing service in order to allow these providers to compete in the CM.

Meanwhile, following the Government's October 2016 consultation,⁶² we have implemented a number of proposals to simplify and clarify the CM. For example, we have extended the Metering Test Certificate deadline to maximise the time available for metering tests and, if necessary, re-testing, and have extended the Meter Test Sampling approach from the TA so that it applies to the early Capacity Auction and enduring regime. We will be consulting on further changes to ensure the Capacity Market fulfils its obligations around security of supply in July.

We continue to see rising levels of DSR and storage winning agreements in the CM, which shows that these technologies are beginning to take their place as a significant resource. We remain committed to making further changes to the CM design, where supported by evidence, to ensure a level playing field for flexibility providers and facilitate, as much as possible, storage and DSR access to the CM.

National Grid and the Electricity Settlements Company (ESC), in conjunction with Ofgem, are currently undertaking a detailed review of metering processes to not only ensure a

⁶¹ <https://www.ofgem.gov.uk/publications-and-updates/decision-statutory-consultation-amendments-capacity-market-rules-1>

⁶² <https://www.gov.uk/government/consultations/capacity-market-proposals-to-simplify-and-improve-accessibility-in-future-capacity-auctions>

streamlined approach but to maximise each delivery partner's expertise. As part of this work National Grid and ESC have agreed a framework for working closely on the implementation of change, to provide Industry and the Government confidence in delivery, prior to and post Ofgem and BEIS consultations.

We acknowledge the calls for DSR access to longer term agreements. This needs to be balanced against value for money for consumers – longer contracts should be awarded only where there is a clear and strong rationale for doing so. From the start of the CM, new build generating capacity demonstrated the case that it needed access to longer term agreements to assist with financing high capex projects. Insufficient evidence has been provided to date on how upfront DSR costs compare against the existing expenditure thresholds.

We do not believe there is a need to lower the 2MW threshold in the main auctions. We had set the eligibility threshold for the second TA at 500kW to try and encourage the participation of smaller applicants but the auction did not attract any direct participants with a capacity less than 2MW. Smaller units can continue to participate in the auction via aggregators and we are mindful of the need to consider the cost to our delivery bodies of administering very small units.

As noted in the Government Response to the 2016 Consultation,⁶³ we are continuing to gather evidence to inform our review of the pre-auction credit cover requirements for unproven DSR. We will come forward with proposals in due course.

We note the European Commission recently proposed to include within State aid guidelines a decarbonisation requirement as part of future CM design. The Government will engage with the Commission as it develops these proposals.

We are aware there are issues with the existing de-rating factors for battery storage and potential security of supply concerns arising from their limited duration. The Government has published consultation proposals alongside this Plan.

We believe there may be merit in reviewing the definition of DSR, so it applies to turn-down resources only, and the delivery milestones for Unproven DSR, so that, to the extent possible, the existence or otherwise of the Unproven DSR is crystallised ahead of the T-1 auction for that delivery year. We have published consultation proposals on new delivery milestones alongside this Plan and will reflect on the definition of DSR further and, if appropriate, will come forward with proposals for consultation in due course.

⁶³ <https://www.gov.uk/government/consultations/capacity-market-proposals-to-simplify-and-improve-accessibility-in-future-capacity-auctions>

Question 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?

Summary of Stakeholder Responses

This question received 65 responses. One of the main recurring themes was the need for a technology-neutral approach, with various measures suggested to encourage competition and reduce prices. It was argued that using the Levelised Cost of Energy to compare technologies ignores key elements required to drive policy thinking for a clean and flexible energy system. Several respondents supported an evaluation of technologies that accounts for their overall system impacts, including their full costs and benefits, followed by the introduction of a cost-reflective charging methodology. This would then need to be reflected in the support available under renewable support schemes.

There were several suggestions for revising the CFD scheme, including offering equal contract lengths for all technologies and holding regular auctions. Some suggested carbon pricing and wider system costs could be included in CFD strike prices to achieve a “subsidy free” or “Market Stabilisation Mechanism” on the rationale that this would ensure the right investments are made by market mechanisms and encourage delivery at lowest overall cost. It was argued that increased quantities of intermittent renewable generation has resulted in increasing spend on back-up generation and system balancing services. One suggestion to contain this cost was to have it internalised, giving intermittent generation operators the incentive to contract directly with DSR providers.

A number of respondents suggested that incentives should be provided to secure more reliable and flexible generation sources for balancing system demand. This could include flexible technologies such as on-site energy storage, which would open up the CFD market to energy storage devices.

The view that distributed generation (DG) was undervalued was expressed by several respondents, who argued that it can make important network contributions and provide the same capacity as storage or more traditional assets. It was noted that DG has provided a more robust distribution system in North Scotland.

There was also significant support for the role of batteries in addressing the perceived issues with the intermittency of renewable generation, for example through dynamic frequency response and load shifting. Several respondents also stressed the need to look for innovative solutions beyond current practices. It was also noted that any Government incentives should be based on a transparent framework and be explicit about the level and longevity of support to encourage investment. Several respondents stated their support for half-hourly settlement (HHS). New provisions to facilitate HHS on an elective basis were introduced in June 2017.

The Government/Regulator response

The long-term aim of the CFD scheme is to deliver new low carbon generation through technology neutral competition and, as technology prices converge, to allow the market to decide. To this end, we have introduced a system that allows projects with similar characteristics to compete with each other to drive value for money for consumers. A key principle to enable this is to ensure that contract terms – including duration – are compatible for all technologies directly competing, with slight variance only where necessary. We continue to consider if there are further changes that would support competition between technologies, as well as considering how the CFD scheme can deliver continued investment in low carbon technologies as the costs of renewable technologies approach “subsidy-free” levels.

The Government response to the consultation⁶⁴ on CFD contracts and regulations published on 8 February 2017 made clear that storage is allowable alongside CFD-supported generation, provided it meets the metering requirements in the contract. This ensures that the CFD does not hold back the development of storage facilities associated with new renewable generation, even though the CFD scheme is not an appropriate mechanism to support storage directly, as it is not itself a form of low carbon generation.

The Feed-in Tariff scheme (FITs) has been hugely successful in attracting investment in small-scale renewable electricity deployment. This scheme has consistently maintained a technology-neutral approach by adopting the same methodology for calculating incentives for all eligible installations. As mentioned by many respondents, it is inherently difficult to identify and assess the whole system costs and benefits of small-scale generation. The Government will continue to monitor developments in this area and update our methodology if appropriate.

As costs continue to decline, mature generation technologies such as onshore wind and solar photovoltaic (PV) may soon be able to deploy without subsidy, and the falling cost of battery storage may lead to the market itself being able to address the issue of intermittency.

It is expected that HHS in combination with the rollout of smart meters will allow suppliers to offer new and innovative Time of Use (ToU)/export tariffs to encourage FIT generators to store surplus generation and export to the grid during periods of peak demand. This could aid system flexibility and mitigate any system costs associated with intermittent generation.

⁶⁴ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/589996/FINAL_-_Government_Response_to_the_CFD_Contract_Changes_Consultation.pdf

Smart Appliances

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

Summary of Stakeholder Responses

This question received 90 responses. A large majority of respondents agreed with the four principles proposed. A prominent theme from respondents was that any regulation to underpin these principles should be clear and proportionate, to allow for innovation within a free, developing market, based on international models.

For most respondents, interoperability was the key principle. The responses, including from manufacturers, indicated an awareness of the need for interoperability. Several respondents felt there was no need for legislation on this principle, as there were already sufficient market drivers for industry to develop this. Others indicated regulation should be minimal, to allow for market development. One respondent objected to this principle as unrealistic since the market is so new, it cannot develop a standard.

Respondents saw data privacy as very important. A few emphasised the need for consumer control and transparency while another noted the trade-off between this principle and interoperability.

Several respondents felt that data privacy was too limited a concept, and should be expanded to a consumer security principle to cover cyber security issues. Although respondents pointed out that standards do exist to deal with this issue, they said they must be applied properly in order to be effective.

Improved grid security was generally supported but there were conflicting views on who is best placed to take mitigating actions between distribution network operators (DNOs) and consumers, and how this could best be ensured. Some respondents suggested ways that consumers could help such as through smart plugs or heat pumps and appliances with delay-start functions and variable price triggers.

Respondents indicated energy consumption was a useful principle to guide the industry going forward. They felt, however, that it was not as important as the other three principles, as the focus of smart appliances is their ability to communicate and modulate energy consumption so a slight increase in consumption over non-smart appliances is to be expected; and appliances will become more energy efficient overall as they are developed over time.

There was a general theme in responses that more evidence is needed to understand energy consumption and grid security in order for them to be guiding principles.

Many respondents provided suggestions for additions to the principles put forward in the Call for Evidence (CFE). A theme from these was a consumer-centred principle. The recommended focus of this principle was varied; some focussed on consumer control of appliances, while others supported automation. Practical concerns such as cost and accessibility, health and safety and appliance maintenance were also raised.

A small number of respondents suggested exploration of smart appliance use for gas.

The Government/Regulator response

See Question 32.

Question 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)**

Summary of Stakeholder Responses

This question received 69 responses. Overall, respondents were in favour of regulation, assigning liability and encouraging market development for smart appliances.

While a small minority suggested the market was already too far developed to regulate effectively, many others suggested the focus should be on defining ‘smart’, incentivising consumers, creating a value proposition for the goods, and considering smart appliance cost and the benefits to consumers before considering regulating them. A scrappage scheme was suggested by a minority in order to speed up the process towards a smart appliance deployment.

Respondents indicated regulations should focus on privacy and interoperability, but not be too detailed or undertaken too soon, to avoid limiting market flexibility and innovation.

Most respondents supported Option A – labelling. Labelling was considered beneficial by respondents because it provides clear information to a consumer in a form that they are used to, encouraging a free, informed choice to take up smart appliances. A theme in responses indicated a label would encourage innovation and development in industry.

Several respondents noted the risk of the ineffectiveness of labels, i.e. consumers ignoring labels, suffering information overload, or receiving misleading information.

Many respondents felt that Option B – regulation – would become appropriate following a labelling approach to drive uptake. Energy efficiency regulations of buildings was cited as an example of regulation following a lighter touch labelling scheme. Other respondents supported immediate regulation of smart appliances to protect consumers, and speed up the transition towards smart appliances.

Certain respondents favoured Option C – requiring appliances to be smart – as it has worked in other sectors before, for example, accelerating the transition to digital TVs and low carbon technology integration, with the additional benefit of mass production decreasing the cost of making the products smart.

The main concern with Option C stated by those opposed to it was that it removed a choice for consumers, although a small number of respondents did indicate that consumers choose whether or not to use the smart aspect of their appliance. A counterargument given to this was that if you have to actively choose to use the smart aspect of an appliance, consumers, particularly the technologically unaware, may not switch on the smart aspect of an appliance, so the shift towards smart appliances may not be fully achieved. Another point from respondents was that industry is likely to oppose it so Option C would be undeliverable. In addition, there was concern that there would be no incentive to innovate, so industry could stagnate.

The Government/Regulator response

See Question 32.

Question 30: Do you have any evidence to support actions focused on any particular category of appliance?

- **Wet appliances (dishwashers, washing machines, washer-dryers, tumble dryers)**
- **Cold appliances (refrigeration units, freezers)**
- **Heating, ventilation and air conditioning (HVAC)**
- **Battery storage systems**
- **Others (please specify)**

Summary of Stakeholder Responses

This question received 62 responses. Responses brought up two broad points. First, more smart appliance trials should be undertaken, building on current local trials. Second, action to support smart appliances should be decided with reference to the potential energy saving of the appliance and its demand-side response (DSR) potential.

Most respondents to the wet appliances category supported action on the argument that wet goods are the most flexible and have high energy consumption. A small number noted

that this may not reduce energy prices for consumers, as often wet appliances are used off-peak.

Local trials undertaken by some respondents found that smart wet appliances do encourage behaviour change. A small number indicated that more incentives were needed for behaviour change to occur than simply energy bill savings.

A few respondents raised the fire risk from wet appliances. Functions to delay, interrupt and manually override were suggested by some respondents to ensure proper smart and consumer control, although concern about human error was also expressed.

Some respondents said cold appliances were the best class of appliance to focus on, and a number of others agreed they had potential because of the flexibility of these products and their high potential to save energy.

A few respondents expressed concern about the effectiveness of using cold appliances for DSR, for example, consumer unwillingness to use appliances that they cannot control or about which they have health and safety concerns, or cold appliances being already so energy efficient that the energy efficiency principle for smart appliances may have minimal impact here.

The focus of respondents on HVAC was on heating. Most respondents think that commercial use of smart HVAC has a greater potential for DSR than domestic use. Some respondents felt that HVAC is the best option for reducing energy consumption peaks across the country, due to the scale of the load, particularly given the potential future electrification of heat.

Several respondents suggested building regulations for new homes were the way in which smart HVAC on domestic premises could be implemented.

A small number of respondents said HVAC installation standards are important to inspire consumer confidence in and understanding of them, and to ensure it fitted into the system.

Respondents expressed support for battery storage as it offers control and convenience to consumers, and shifts load effectively, without requiring flexibility. Several respondents said thermal energy storage could be used as an interim measure when smart heating is not on for some time during the day in a smart buildings.

A small number of respondents emphasised the need for regulation on interoperability to avoid consumers getting 'locked in' to a particular appliance, based on their experience with smart thermostats.

The Government/Regulator response

See Question 32.

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

Summary of Stakeholder Responses

This question received 68 responses, the vast majority of whom felt there were additional barriers. The CFE listed three main barriers to the uptake of smart appliances (lacking financial incentives, lock-in risk, and consumer concern about price, autonomy, performance or privacy).

Several respondents re-stressed the price element, and others emphasised the lack of financial incentives (for manufacturers and consumers) to develop or take up smart appliances, some giving the example that without domestic half-hourly settlement (HHS) suppliers are not incentivised to offer Time of Use (ToU)/smart tariffs.

The overwhelming feeling amongst respondents was that the main barrier to smart appliance uptake is lack of consumer awareness of what smart appliances are, how they work, and suspicion towards them, particularly with regard to data privacy, and how suppliers and DNOs will interact with them.

Respondents recommended information campaigns containing clear, concise information, targeted at different demographics to properly engage them to mitigate this risk. A small number suggested that this should be supported by trials showing quantitative benefits, or gaining more information from more developed markets, such as the United States and Japan.

Respondents believed this information should come from a trusted source which, for a handful of different respondents, would be local groups.

A number of respondents believed consumer lifestyle may prevent smart appliance uptake, as consumer convenience will take precedence. Others were concerned by health and safety issues such as fire safety.

A few respondents pointed out the risk that smart appliance use could create a new electricity consumption peak, if all consumers' appliances shifted their load away from higher price periods (existing peaks) to cheaper periods. Some suggested developing a centralised registration system for smart appliances whereby load-shifting could be monitored to avoid this risk and maximise energy savings for consumers.

A small number of respondents felt that, due to the lack of a clear market for smart appliances, innovation would be slow, and so uptake hindered.

Some respondents felt that the slow time lag of consumers changing appliances will be a barrier to their swift uptake.

Others indicated that installation was a barrier to taking up smart appliances. Current regulations are too complex and unclear, which puts consumers off.

Some respondents felt that regulation could help avoid these issues, whereas others felt that regulation added more costs.

The Government/Regulator response

See Question 32.

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

Summary of Stakeholder Responses

This question received 67 responses. Several respondents noted that 'vulnerable consumers' is a loose term and should be considered in more depth.

Respondents indicated concern that vulnerable consumers may benefit most from a smart energy system but are the least likely to because of lack of access to smart appliances, often due to cost, information about their use, or ability to be flexible. Concern about mis-selling to vulnerable consumers was expressed by several respondents.

Respondents suggested the following types of solutions:

- awareness: Several respondents emphasised the need to engage actively with vulnerable consumers, to help them understand the hardware and the software and where it fits into the system in a clear, concise way. Others explained the role for local groups in this effort, to ensure ongoing support.
- standards: A few respondents suggested standards for installers and energy suppliers to ensure vulnerable consumers are not abused. A small number of respondents suggested other solutions, such as the use of Equality Act 2010 to ensure vulnerable consumers are properly assisted by suppliers, or central registration of smart appliances so they can be monitored to ensure consumers are gaining benefit from the system.
- financial help: Some respondents suggested financial grants to support the uptake of smart appliances, with a small number suggesting combining this with a scrappage scheme for old appliances to ensure quick replacement. Another suggestion was putting batteries in every home to support flexibility. A few suggested conducting further research to develop ways to reallocate costs so all benefit from the system.

Several respondents also mentioned dynamic ToU tariffs and pre-paid smart meters to support this; others suggested developing a special tariff for vulnerable consumers.

A small number suggested automation of all smart appliances to ensure vulnerable consumers benefited from the system; others felt that just some appliances should be automated, such as freezers. Some suggested manual control was important for vulnerable consumers.

A few respondents suggested incorporating smart appliances into building regulations, or requiring landlords to provide basic ones. Energy efficiency measures were cited as an example of this approach working.

Some respondents raised risks beyond those to vulnerable consumers, with some mentioning long-term security of supply, and others the risk of ToU tariffs not being in place before smart appliances become more widely available, so consumers may not get the benefit.

The Government/Regulator response to Questions 28-32

The consumer will be front and centre of our consideration of smart appliances.

We consider that regulation could deliver the opportunities and manage the risks to consumers associated with smart appliances, and to ensure appropriate consumer protections.

Such regulation could focus on appliances with the greatest opportunity for DSR (those which consume high levels of energy, and which are most suitable for flexible consumer use). We consider these to include cold and wet appliances, HVAC and battery storage.

The Government intends to consult on seeking powers to set standards for smart appliances and will collaborate with industry to develop appropriate standards in relation to, amongst others, interoperability, data privacy, cyber and grid security. Details of the standards for flexible, energy intensive smart appliances could be enshrined in secondary legislation. We intend to produce an impact assessment and consult on options in the coming months.

The Government is minded to define a minimum standard for smart appliances, using, amongst others, the principles outlined in section 4.1 of the CFE as guidance. Given the consultation responses, there will be a particular focus on cyber security, covering both data privacy and grid security. Any requirements on data privacy will reflect and avoid duplication of existing legislation in this area, including the Data Protection Act 1998 and the upcoming General Data Protection Regulation and any relevant requirements contained in supply licences. The Government will work with respondents to extract lessons learned from ongoing and future smart appliance trials to inform this standard.

The Government expects that working with stakeholders to define a minimum standard will be most useful for industry, without creating excessive red-tape or stifling innovation in a developing market, about which respondents expressed concern.

Respondents' concern about UK standard alignment with international and European Union equivalents, and their concern about potential health and safety risks⁶⁵ for unsupervised appliances, will be taken into account in the process of standard creation, and will help to shape our smart appliances policy focus.

The Government will consider the introduction of a smart appliance label, to indicate compliance with the standard and to encourage consumer awareness. Appliances that do not meet the standard would not be able to use the label.

Consumer information campaigns and engagement might be important to support the transition towards a smart flexible system. They can help to overcome the barrier to smart appliance uptake of consumer confusion, apathy and mistrust that many respondents indicated. Consumer lifestyle choices would be an important aspect of this promotion.

As consumer awareness and demand grows on the back of smart energy enablers such as the rollout of smart meters (see Question 11), HHS (see Question 16) and the introduction of smart tariffs (see Question 15), we expect a smart appliance market to develop, meeting concerns expressed in the responses. We expect that this will, in turn, encourage development and innovation in this field.

Respondents indicated that without additional support and focus, vulnerable consumers may be less likely to benefit from smart appliances (whether because of lack of awareness, cost or inability to be flexible) but must be able to participate in this market, should they want to. The Government will explore avenues by which these barriers can be minimised.

Ultra Low Emission Vehicles

Question 33: How might Government and industry best engage electric vehicle users to promote smart charging for system benefit?

Summary of Stakeholder Responses

This question received 59 responses. A strong theme raised by many respondents was the need for a distinct electric vehicle (EV) Time of Use (ToU)/smart tariff to be offered in the market. However, some argued that tariffs alone may not be sufficient to manage loads on some local networks, and other interventions or offers would be required. Whilst some

⁶⁵ The Government considers consumer safety to be a priority, and is taking action to ensure it. For example, the Working Group on Product Recalls and Safety was set up in October 2016 to advise the Government on how to improve recalls and reduce fires in white goods, the recommendations for which were given in Parliament on 19 July 2017: <http://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Lords/2017-07-19/HLWS74/>

suggested the Government could provide incentives, many thought the Government should not intervene as once tariffs become available in the longer term, consumers would respond.

There was a common view raised by many respondents that providing consumers with an ability to 'opt out' of smart charging and not forcing it on them was important. They felt imposing smart charging could damage consumer confidence in EVs and risk fewer people purchasing them.

Another strong theme raised by many respondents was the need for the Government to engage more with consumers through coordinated messaging, with many highlighting the Go Ultra Low campaign⁶⁶ as a model. Whilst all these respondents thought that this campaign should be Government led, many thought that it should be a wider coordinated campaign including vehicle manufacturers and energy suppliers to promote the benefits of smart charging to the consumer and the energy system. This would have the intention of encouraging a lifestyle change in terms of energy-conscious living and empowerment to make a difference, particularly with younger people. Some respondents also suggested that the timing of providing information to EV owners on switching tariffs (such as how long after they purchase their EV) was important.

Different ways to incentivise EV uptake and smart charging of EVs was also a clear theme. There was broad agreement that some sort of Government incentive would help get smart charging and, in particular, vehicle-to-grid (V2G), off the ground. Others proposed a more favourable tax regime for EVs, and a small number of respondents suggested that EVs should be sold with a 'lifetime cost' of ownership to demonstrate the savings made from smart-charging the vehicle.

Other themes were on how involved distribution network operators (DNOs) and vehicle manufacturers should be. Many saw a clear role for DNOs in managing demand such as through providing incentives for consumers to charge during the off-peak. However, just as many respondents thought they should remain neutral operators within the energy system, leaving demand management to energy companies.

Finally, some respondents suggested the interaction between solar photovoltaic (PV) installations and EV uptake should be considered, and a small number of respondents felt that it was important that other grid users should not have to pay for grid upgrades caused by the rollout of EVs.

⁶⁶ <https://www.goultralow.com/>

The Government/Regulator response

Currently, the availability of ToU/smart tariffs is limited, but the smart meter rollout and half-hourly settlement (HHS) reform (covered in Questions 11 and 16) are expected to improve availability of these offers. The Government is working with energy suppliers and wider stakeholders (including through the EV Network Group⁶⁷) to help bring forward these offers as soon as possible. The Government agrees with the majority of respondents that current plans for incentivising smart charging, including broader plans to promote improved price signals, smart meters and related infrastructure, means that further taxpayer funded incentives should not be necessary.

The Government is also seeking to ensure that information on available tariffs is made available to EV owners, and at times when they are most likely to be engaged on switching. As part of this following a trial conducted last summer⁶⁸, the Office for Low Emission Vehicles (OLEV)⁶⁹ is planning to email recipients of the Plug-in Car Grant (PiCG)⁷⁰ advising them to consider switching tariff after they have purchased a new EV. The Government will also work with vehicle manufacturers and the energy industry to coordinate how best to communicate the benefits of smart charging.

The Government agrees the consumer proposition for smart charging is very important and will continue to work with stakeholders – including through the Consumers, Vehicles and Energy Integration⁷¹ and Electric Nation⁷² projects. These projects are trialling consumer smart charging propositions – to ensure that consumer preferences are a central consideration for any smart charging proposals. Smart charging has the potential to unlock significant system value, and it is important that consumers see smart charging as a benefit, not a detractor, from owning an EV so as to support continued take-up.

In order to ensure that the UK has the technical capability to provide smart, dynamic charging, the Government has announced plans, following broad support received during consultation, to take powers in the Automated and Electric Vehicle Bill⁷³ for regulation of infrastructure to support smart charging. These powers are intended to be wide enough that, should we use them, the Government can ensure chargepoints support the development of smart tariffs and any DNO-related offers.

⁶⁷ <http://www.lowcvp.org.uk/projects/fuels-working-group/EVNetworkGroup.htm>

⁶⁸ <https://www.nature.com/articles/nenergy201773>

⁶⁹ <https://www.gov.uk/government/organisations/office-for-low-emission-vehicles>

⁷⁰ <https://www.gov.uk/plug-in-car-van-grants/what-youll-get>

⁷¹ <http://www.eti.co.uk/programmes/transport-ldv/consumers-vehicles-and-energy-integration-cvei>

⁷² <http://www.electricnation.org.uk/>

⁷³ <https://www.gov.uk/government/publications/queens-speech-2017-what-it-means-for-you/queens-speech-2017-what-it-means-for-you>

Question 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 (EV) battery for putting electricity back into homes, businesses or the network?**

Summary of Stakeholder Responses

This question received 52 responses. A key barrier raised by respondents was that there is currently no clear way to extract value for smart charging or vehicle-to-grid (V2G) services. Many felt, though, that this was something that would change as smart meters are rolled out and when HHS reform is introduced. This should then provide the structures for ToU/smart tariffs, which would make it more worthwhile for EV users to modulate the time that they charge. For V2G and frequency response services, many felt that the market was still too embryonic for there to be a value chain and that more research was needed, although some did indicate active plans for application of this technology.

A key barrier highlighted for V2G services was that currently EV manufacturer warranties on the EV battery may not include V2G. Respondents felt that EV manufacturers should make assurances around battery life and warranty to support their use in the energy system, and a small number suggested that aggregators should be required to have approval from a vehicle manufacturer to use an EV's battery for balancing services. Many also felt that V2G chargers are too expensive. Issues around accessing vehicle batteries for services, and the cost and availability of appropriate charging infrastructure, were seen as major barriers in getting V2G trials off the ground.

Other barriers mentioned were around the EV infrastructure itself, including lack of chargepoints, limited capabilities for smart charging, and interoperability. A majority expressed the need for a common set of standards to be developed for all EV chargepoints.

The Government/Regulator response

With regard to continuing to increase the number of EVs, the Government remains firmly committed to encouraging uptake. 100,000 vehicles have been supported to date under the Plug-in Car Grant⁷⁴, and around 12,000 public chargepoints are available across the country. Government funding of £600m for promoting ultra-low emission vehicles (ULEVs) was further increased with an additional £290m awarded as part of the autumn statement in 2016, with £70m of this additional funding to be used for increasing and improving chargepoint provision.

⁷⁴ <https://www.gov.uk/government/statistical-data-sets/all-vehicles-veh01>

On the issue of EV battery degradation and warranties, whilst the Government recognises the legitimate concern that V2G cycling of the battery could increase battery degradation, cycling is not the only factor to impact on battery life. Some emerging evidence suggests that V2G has the potential in some cases to actually reduce battery degradation⁷⁵.

Furthermore, we are aware that some manufacturers are already sufficiently confident in their understanding of V2G battery impacts to allow their EVs to be used for V2G services.

There are currently some small-scale projects looking at V2G⁷⁶. However, we consider there to be strong potential for larger scale exploration of this technology, including testing of consumer needs, vehicle battery considerations, stacking of services and availability of charging infrastructure. The Government therefore has launched a £20m innovation competition with Innovate UK to address these challenges.⁷⁷

The Government agrees that it is essential that the consumer is not put off from owning an EV because of difficulties around accessing and connecting to charging infrastructure. We also can see merit in ensuring that powers to require smart charging capability for chargepoints supports interoperability. Ideally we would like the market to determine workable solutions to these issues, but are taking powers as part of the Automated and Electric Vehicle Bill that would enable the Government to implement regulations if necessary.

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

Summary of Stakeholder Responses

This question received 31 responses. Of those who commented, a majority felt that the technology had potential, while others believed it was not worth doing. Some felt that it was currently too expensive with the highest cost being from the electrolyser, but that this would get cheaper in the longer term.

There were concerns from some around the methods of hydrogen production, particularly if the hydrogen is produced from hydrocarbons. Other themes included concerns related to the efficiency of converting electricity to hydrogen and then back again. Other barriers identified were:

- high capital costs and uncertainty in the outlook for hydrogen markets; and
- that constraint payments to renewable generators dis-incentivise commercial investment in this technology.

⁷⁵ http://wrap.warwick.ac.uk/78775/1/WRAP_1271878-wmg-260416-batteries-02-00013.pdf

⁷⁶ <http://www.cenex.co.uk/vehicle-to-grid/efes/>

⁷⁷ <https://www.gov.uk/government/news/electric-vehicle-to-grid-technologies-apply-for-business-funding>

Positive views expressed by respondents included many who thought that the technology could allow for easy storage of hydrogen, and could be scaled up relatively easily. So they felt it could play a key role in grid storage in the future.

Moreover, many commented that storing hydrogen converted from electricity through water electrolysis has the potential to utilise nearly all excess renewable energy. They said this would help to reduce carbon emissions while also offering grid balancing services.

The Government/Regulator response

The Government is currently examining the technical, economic and environmental characteristics of all forms of hydrogen generation, some of which may offer cheaper solutions than those currently deployed. We recognise that electrolysis has the potential to offer an economically viable and low-carbon hydrogen generation option, particularly for regions with high levels of renewable generation and periods of constraint. The Government will continue to explore how hydrogen from electrolysis can deliver grid storage capability at scale.

Consumer Engagement with DSR

Question 36: Can you provide any evidence demonstrating how large non-domestic consumers currently find out about and provide demand-side response (DSR) services?

Summary of Stakeholder Responses

This question received 42 responses. Some respondents referred to recent surveys (including those by the Energyst and by Ofgem) in providing evidence to support their answers.

Aggregators were the most commonly identified source of information. Some noted that a list of aggregators is on the System Operator's (SO's) website, while another commented that the quality of information from aggregators can be highly variable. Some aggregators reported that the majority of their business (70-95%) is from proactively contacting customers rather than waiting to hear from them. Some of these said that many of their prospective customers have also been contacted by other aggregators.

The SO was the next most commonly identified source. Some respondents mentioned the initiatives through the Power Responsive campaign that promote Demand-side response (DSR), often in collaboration with multiple industry parties.

The third most common source was suppliers. Some suppliers highlighted that they specifically target their large industrial and commercial customers for DSR. Some respondents highlighted the role of industry events, representative groups (such as the

Major Energy Users Council) and third-party intermediaries (TPIs)/brokers. Often, industry events will be a route for procurers or TPIs to meet prospective customers.

Other respondents identified distribution network operators (DNOs) as a route to market for DSR. They highlighted that this is likely to become more common with the evolution to distribution system operator (DSO) roles. One DNO said that they would soon be launching a DSR campaign for one of its licence areas.

Other sources included the trade press, industry reports, the Government/Regulator publications and internet searches.

A small number of respondents commented on the difficulty for some businesses in finding out about opportunities. Some highlighted the problems that the public sector has in engaging with DSR.

A small number also commented on the long lead-time for DSR provision beyond first finding out about services, citing periods of 6-18 months. Part of this may be driven by the lack of compatibility of existing DSR schemes with the needs of the business.

The Government/Regulator response

See Question 38.

Question 37: Do you recognise the barriers we have identified to large non-domestic customers providing demand-side response (DSR)? Can you provide evidence of additional barriers that we have not identified?

Summary of Stakeholder Responses

This question received 47 responses. All respondents recognised (at least broadly) the barriers identified. Some discussed the scope for overcoming them, while others commented on the implications of the barriers.

Under cultural barriers, respondents noted a low level of awareness of certain DSR-enabling technologies, while others suggested that businesses do not know about opportunities because those procuring DSR have not contacted them. This may be related to another barrier identified, where procurers note the difficulty in finding the right person within the business to make the decision. Some respondents added further evidence on the complexity of the offers available, with a small number expressing concern that the possibility of contracting directly with a DNO will only add to this complexity from a consumer perspective.

Under regulatory barriers, respondents suggested additional barriers. Some respondents considered the Capacity Market (CM) administration burdensome (see also Question 26), while others highlighted the lack of a code of conduct for aggregators. Another barrier

identified was the inability to access the wholesale market or Balancing Mechanism (BM) without going through a supplier.

Some respondents noted the impact of regulatory uncertainty on the value of DSR. Issues included the changes to the value of Distribution Use of System (DUoS) red zone avoidance, Ofgem's review of embedded benefits and the plans for the SO to simplify its ancillary services. Some felt the lack of ability to combine certain products for a particular DSR capability was unnecessarily restrictive. A small number of respondents were concerned about EU regulations potentially limiting future DSO involvement in DSR.

For commercial barriers, respondents highlighted the up-front work required to sign up to a DSR scheme. They noted that environmental regulations regarding back-up generation have the potential to conflict with security of supply goals and that the potential for DSR varies geographically.

In terms of structural barriers, respondents generally agreed with the barriers we had identified, noting the relatively high up-front costs of schemes, particularly compared with the relatively low value of energy price-driven savings. Others highlighted concerns with allowing third party control of processes.

A few respondents highlighted a difference between perceived or temporary barriers, which can be addressed through education/information, compared with more fundamental barriers. Commercial and structural barriers are in this latter category.

Some respondents did not agree with all barriers, such as the barrier relating to getting an export connection. Or they said that, rather than lack of knowledge, lack of engagement was driven by the low value on offer to businesses.

The Government/Regulator response

See Question 38.

Question 38: Do you think that existing initiatives are the best way to engage large non-domestic consumers with demand-side response (DSR)? If not, what else do you think we should be doing?

Summary of Stakeholder Responses

This question received 46 responses. Of those answering the first part of the question, respondents answering yes and no were roughly equally split.

A few respondents suggested that nothing more is needed provided the market conditions are effective. Many supported building on existing engagement. It was suggested that the challenge is less about ensuring that customers find out about DSR, than ensuring that the DSR programmes are open to novel propositions.

Some respondents referred to regulatory certainty. Some advocated fewer interventions, others noted the need to look at existing reviews (such as those on charging) in a more comprehensive manner.

A number referred to the need to reach a wider range of businesses. A small number advocated educating energy managers on DSR as part of the Energy Savings Opportunity Scheme (ESOS) audits while another suggestion was that Ofgem should have a role in supporting local government in promoting DSR.

There were frequent calls for simplification of DSR schemes, including some of the ancillary services procured by the SO. Others requested greater clarity over how the different products interact. Some respondents identified: that a simpler approach would avoid the need to engage third parties to help interpret the schemes; that the SO and Power Responsive websites may be difficult to navigate for newcomers to DSR; and that any reduction in complexity should not be at the expense of widening the variety of resources that can participate.

Other respondents focused on widening schemes to offer other routes to market, acknowledging that any increased complexity would need to be managed. They said this could in part be achieved by closer coordination between transmission and distribution operators. An alternative approach suggested by some was a dedicated 'flexibility market', possibly enabled by trading platforms. A few respondents advocated longer-term contracts to increase certainty, including contracts for the CM.

Some respondents commented on the role of regionally-specific DSR opportunities. This included using metering information to target customers⁷⁸ and an incentive mechanism to encourage DNOs to promote DSR.

Clarifying the role of aggregators came up in a number of responses, including through a code of conduct and an authoritative online resource.

Respondents highlighting the role of suppliers suggested that DSR should be part of the supply contract rather than need engagement with a separate mechanism. Another suggestion was an obligation on the SO or suppliers to procure certain amounts of DSR, with the potential for this to be offset by flexibility credits.

A few respondents advocated specific schemes, including a storage demonstration at scale to incentivise DSR and that new demand turn-down DSR needs specific help to compete with incumbents.

⁷⁸ Noting data protection provisions that may need to be amended to enable this.

The Government/Regulator response

Responses to Question 36 provided evidence that largely confirmed our awareness of routes for consumer information on DSR opportunities. They highlighted the important role of cross-sector initiatives such as Power Responsive in raising awareness and reaching a wide group of potential customers.

Responses to Question 37 broadly supported the barriers we had identified and elaborated on them. Additional ones for us to consider include: regulatory uncertainty; the potential for additional complexity with new routes to market (e.g. DNOs); inability to directly access the wholesale market and balancing mechanism; and the inability to combine certain products to stack value from the same asset(s).

In answering Question 38, not all respondents referred to action for the Government and/or Ofgem, with many commenting on how existing initiatives can be improved. For some issues raised, there is a role for the Government and/or Ofgem, as summarised in the following paragraphs.

Ofgem has launched a Targeted Charging Review (TCR), which identifies its principles for charging for residual cost recovery. When setting out the next steps for the review, Ofgem plans to produce a complementary accessible guide for large non-domestic DSR providers on the potential impact of the areas being taken forward. This should help address stakeholders' concerns over complexity and the potential impact of any regulatory changes in this area.

Reform of balancing services (including simplification and the ability to stack value) is one of the priorities of Power Responsive. Power Responsive plans to continue to deliver sector-specific training on DSR for large consumers. The regulatory framework for the SO is covered in response to Question 13. This also explains that Ofgem is developing a new regulatory framework for the SO, which will incentivise the SO to ensure that reforms happens in a way that maximises energy consumers' interests.

Our response to Question 9, related to aggregators, sets out that there is already work in process that could enable direct access to the BM for independent aggregators. This will have some relevant lessons for those large non-domestic consumers who wish to directly access markets for their flexibility. We also continue to engage with the Association for Decentralised Energy (ADE) on its proposed Code of Conduct for aggregators.

The full Government and regulator response on the CM issues is set out in Question 26. We have made a number of short-term changes to the CM in light of comments from respondents and will continue to monitor the market to ensure that it provides a level playing field.

The Government and regulator response to Questions 45-46 address the potential for increasing distribution-level use of flexibility. This can include DSR from large non-domestic consumers where most efficient.

Overall, stakeholders think that Power Responsive is effective as a means to engage large non-domestic consumers on DSR. The Government and Ofgem will continue to steer and contribute to Power Responsive as active members. We believe that additional engagement with large non-domestic consumers by the Government and Ofgem would duplicate, and be less effective, than this cross-sector initiative. The Government will, though, consider the case for the inclusion of DSR awareness as part of Energy Savings Opportunity Scheme (ESOS) audits. Meanwhile, the Crown Commercial Service continues to engage with public sector partners.

Ofgem is analysing existing annual DSR surveys to track progress/concerns, while minimising the burden on businesses. If we consider further action is required beyond that identified above, then we will identify the gaps and the measures that should be taken in response. Otherwise, the issues raised can be most effectively dealt with by related work, as summarised above.

Question 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)?

Summary of Stakeholder Responses

This question received 77 responses. Many respondents felt that engagement with domestic and smaller non-domestic consumers should begin now or as soon as feasible. A significant number of respondents said that information provision and active consumer engagement should start taking place as the smart meter rollout hits critical mass. Framing the rollout of smart meters as part of a wider smart energy system enabler, with accurate, clear and tailored information that empowers consumers, was also suggested by a number of respondents to support optimal outcomes. Smart Energy GB's potential role in this was raised by some respondents, as was the role of community/local energy groups.

The importance of ensuring that engagement is conducted at trigger points that are relevant to consumers' lives was also made by a number of respondents. For example, when they are moving home, buying an electric vehicle (EV), or getting smart meters installed. In addition to smart meters and half-hourly settlement (HHS), respondents pointed out other key trigger points including:

- the opportunity presented by EV uptake to engage in smart energy behaviour in relation to battery-charging;
- the emergence of smart appliances on the mainstream market;

- the option to have automated DSR, which can offer returns with minimal impact on usage or behaviour patterns.

A few respondents proposed approaches to planning and targeting consumer engagement, including working backwards from the future consumer's perspective and prioritising the actions needed as a means of encouraging take-up of demand flexibility. Others suggested targeting DSR promotions at proactive customers as well as those with existing on-site generation.

Using EVs to manage local load and generation constraints was raised as a DSR opportunity. A significant number of respondents raised the role of aggregators and third-party intermediaries, who can provide consumers with a greater opportunity to participate in DSR.

The Government/Regulator response

The Government and Ofgem agree that domestic and smaller non-domestic consumers will need to be informed and engaged if they are to participate at scale in a smart, flexible energy system. We believe that focused engagement should occur as the necessary enablers come into place to secure the participation of these consumers at scale. For example, as the current smart meter rollout approaches completion and we start to see the widespread uptake of EVs and smart appliances.

There could be a role for national scale information provision on smart energy in due course. We will monitor how the market develops and in due course assess the case for an organisation to take on this broad communications role, as the smart meter rollout comes to fruition. This should be combined with strong engagement on the ground via local and community organisations, including through established outreach programmes like the Big Energy Saving Network.

Consumer Protection and Cyber Security

Question 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**

Summary of Stakeholder Responses

This question received 77 responses, though it should be noted that not all respondents addressed all areas. A number of respondents indicated that they saw a role for the Government or Ofgem to provide an appropriate regulatory framework. Respondents stressed that any regulatory oversight by the Government or Ofgem should be proportionate, so as not to act as a barrier to the realisation of the benefits of a smart, flexible energy system. Several respondents also emphasised the Government's and/or Ofgem's role to lead in the communications and messaging around consumer awareness. Respondents also raised a number of issues including an emphasis on the need for further protections around consumer rights and data, cyber security, the impact on manufacturing, commercial confidentiality, and interoperability.

In addition, a significant number of respondents referenced learning lessons from the smart meter rollout and Smart Energy GB's awareness-raising activities to inform future activities. A few respondents raised the prospect of accreditation schemes and/or codes of practice as a means to provide additional consumer protection measures. A small number presented scenarios around how to engage consumers, as well as potential methods on testing consumers' consent to dynamic tariffs and load control.

Those that addressed the areas listed in the CFE raised the following points:

- **Social Impacts** – issues were raised around vulnerability and lifestyle factors as well as the safeguards that need to be implemented. Most respondents agreed that a greater degree of engagement would be required for vulnerable consumers and that sufficient support where necessary should be given for them to understand the implications of engaging with smart products and services. A few stakeholders also raised the importance of proper recourse to complaints procedures in case things went wrong for consumers.

- Data and Privacy – respondents referenced the Smart Meter Data Access and Privacy framework as a good approach. However, some respondents raised concerns around regulations that could act as barriers to innovation (e.g. by introducing limits to data sharing between parties). Some respondents noted the need to ensure compliance with the European Union’s General Data Protection Regulation, which comes into effect from May 2018, particularly around consent, data sharing and transparency provisions it contains.
- Informed Consumers – referring to both Small to Medium Enterprise (SME) and domestic consumers, a number of respondents emphasised the importance of clear and simple messaging of products available and the role of third-party intermediaries (TPIs), especially when it came to data sharing. Some stressed that there should not be any penalties for those that did not engage with smart energy.
- Preventing Abuses – aside from issues raised previously in the sections above, there was support for TPIs to be regulated in some form either via accreditation, codes of practice or licensing.

The Government/Regulator response

The Government and Ofgem believe that there are no reasons specific to smart energy that mean that the landscape for consumer protection under current market arrangements is insufficient, but we need to ensure that regulatory arrangements remain fit for purpose as we transition to a smart energy system. Alongside generally applicable law, e.g. on data protection and consumer rights, Ofgem are already working so that specific requirements on established market players, such as suppliers and switching sites, remain appropriate as the market evolves. This includes amending the marketing supply licence conditions, to focus them on the outcomes that need to be delivered, which amongst other things should help address the potential for mis-selling in a market with more complex smart tariffs.

Electric vehicles (EVs), smart appliances and energy aggregators are new or emerging elements in a smart energy system. As detailed in this document, we are taking action to regulate EV chargepoints so that consumers are not locked out of future smart offers (see Questions 33-34). We are developing policy on standards for smart appliances to ensure interoperability, data privacy and cyber security (see Questions 28-32). And we will continue engaging with the Association for Decentralised Energy (ADE) in their work to deliver a voluntary Code of Conduct for independent aggregators (see Questions 7-9). We have also set out our approach to informing and engaging domestic and SME consumers on smart energy (see Question 39).

The Government and Ofgem will continue to consider the interests of vulnerable consumers as the number of smart tariffs in the market and their uptake increases (see Question 32). More broadly, we will continue to assess how the market and consumer protection landscape develops to ensure appropriate consumer protection is in place.

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

Summary of Stakeholder Responses

See Question 42.

The Government/Regulator response

See Question 42.

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

Summary of Stakeholder Responses

Question 41 received 53 responses. Question 42 received 39 responses. A total of 60 organisations responded to one or both questions.

A number of respondents raised the risk of large numbers of connected devices switching load simultaneously, which would compromise power system integrity.

Several respondents provided examples – both actual and theoretical – of connected devices engaging in Distributed Denial of Service (DDoS) attacks (i.e. the flooding of internet servers to take down network infrastructure or websites), and/or being at risk of compromise remotely. In addition, a few respondents noted that once they have been compromised via cyber attack, smart devices could attack other services and systems (e.g. web services). Others noted that cyber incidents could affect consumers' trust in, and take-up of, smart devices.

By contrast, some respondents did not consider that smart technologies presented a particular risk to the integrity of the energy system. They did not provide evidence explaining why they held this view.

In light of the various examples cited of attacks on both connected devices in premises and other aspects of the energy system, respondents generally felt that the likelihood of attackers exploiting any weaknesses in devices or systems to carry out cyber attacks was very high.

In terms of managing the risks, key points made by respondents included:

- risk assessments need to be an ongoing process to ensure that the most critical risks are addressed;
- the level of end-to-end security, from smart devices to back-office systems and applications, will determine the likelihood of risks materialising;

- The risk that the regulatory regime is not sufficiently agile to respond as cyber threats change needs addressing.

A number of respondents stressed that security protections should be created as an integral part of the system design and not added as an afterthought.

A few respondents felt that all threats can be reduced if the right measures are in place, and the probability that smart technologies are used to compromise the energy system can be maintained at an acceptably low level. Others noted that whilst existing standards and processes help mitigate the threat of cyber attack, it may be necessary to introduce a more dedicated focus to keep ahead of potential future attacks.

Respondents raised a number of points that they considered would help ensure cyber security, including:

- the level of protection should be driven by the need for information access and the level of control required. For the most important messages, two-party control should be considered to ensure no single point of compromise;
- the need for encryption/access control and incident and vulnerability reporting, with encryption based on internationally recognised standards;
- the importance of firmware updates and patching to ensure equipment that has already been deployed remains secure;
- the need for clear cyber security requirements for both 'traditional' operational technology devices and new communications-enabled devices.

The Government/Regulator response

We agree with the majority of views expressed regarding the nature and high level of threat from cyber attacks as we move towards a smart energy system. As well as the threats posed to the energy system itself, we are mindful that cybersecurity issues can adversely affect consumer confidence in, and acceptance of, smart energy applications. Therefore there is a role for Government, Ofgem and industry to ensure the risks are addressed proportionately.

We agree that security protections need to be designed in from the start. The smart metering infrastructure was designed with robust security architecture based on international standards and common industry good practice,⁷⁹ backed by relevant regulatory and technical requirements. We will draw from our experience in this area in

⁷⁹ For example, encryption of sensitive data, protection from viruses and malware, access control, tamper alerts on meters, two-party authorisation of important messages to the meters and system monitoring.

future applications. For example, as noted above in our response to Question 32, we will take steps to ensure that proposed standards for smart appliances will incorporate appropriate cyber security provisions, taking into account the latest international technical standards in this area.

We will also reflect on the individual points and suggested actions made by respondents in taking the work on cyber security forward.

In addition, as noted in our response to Question 10, we have commissioned work to assess what level of proliferation of connected in-home devices/appliances could potentially create disruption or loss of electricity supply, either nationally or locally. This will inform our engagement with industry on technical standards for smart appliances and industry systems, including those used by demand-side response (DSR) and storage providers. Further to the work we commissioned, we are considering appropriate cyber security standards in the demand response system.

The roles of different parties in the system and network operation

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

Summary of Stakeholder Responses

This question received 59 responses. Many respondents commented on the drivers for change. Some respondents suggested additional drivers be recognised. A number felt climate change and the pursuit of low carbon technologies should be explicitly recognised as a high-level driver for system change. A few suggested changing quality of supply (including challenges around voltage and harmonics) be included. Others felt it important to recognise drivers around increasing interconnection and the development of the European energy market. The wide availability of data and changes in consumer choices and behaviour were also suggested.

Some respondents offered comments on the existing drivers set out in the CFE. In relation to the emergence of new flexible technologies, some felt it important to draw out storage explicitly as a driver for change and as a flexibility solution. A small number of respondents highlighted the importance of recognising the value traditional flexible technologies add in providing system security. In relation to the 'changing demand' driver, a few respondents described an overall pattern of energy demand reduction (including apparent demand reduction caused by embedded generation).

There were limited comments on the 'impacts' of these drivers for change, but respondents urged careful consideration of cross sector technologies, with the potential to have an impact both on the power and gas distribution and transmission systems. Many

noted the need for a greater focus in general on the energy system as a whole, across gas and electricity.

Nearly all respondents agreed with the proposed emerging system requirements. In particular, many agreed with creating a 'level playing field', ensuring visibility and transparency, and making efficient use of new technologies and flexible resources. A range of additional system requirements were also suggested. Many called for a dynamic and cost-reflective set of price signals, reflective of whole system value, to influence consumption and generation patterns in line with network requirements. A small number supported including an adequate greenhouse gas price. Others suggested system requirements include data and cyber security, the need to build a clear understanding of future supply characteristics, effective forecasting, and the need for the system to accommodate local models and to facilitate participation from a wide variety of actors (including consumers and others with limited energy market expertise).

A few respondents however, did not agree with the emerging system requirements identified. One commented that figure 1 did not consider the energy system as a whole, whilst another felt that it failed to recognise that this change will be driven by consumers. Another felt it did not distinguish sufficiently between the needs of different parties and voltage levels.

A small minority of respondents called for acknowledgment of the implications for all existing parties with an interest in system and network operation, including independent DNOs and private network owners.

The Government/Regulator response

See Question 44.

Question 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?**

Summary of Stakeholder Responses

This question received 36 responses. Respondents highlighted that there is uncertainty around future network costs and the need for large changes to support the evolution of roles. A few respondents recommended the 'Transform Model'⁸⁰ as a route to understand

⁸⁰ The Transform model was developed by EA Technology through the Smart Grid Forum. More details are available [here](#)

the challenges while some respondents pointed to the SO's System Operability Framework to understand the costs of changes. Others felt there to be insufficient data currently available on the whole system and its complexities, arguing this can make informed decisions difficult.

Those responses that focused on active management of the distribution network argued that there are potential benefits in the use of local services to manage local constraints. Respondents confirmed that there has been a rapid growth in distributed generation, which has meant that networks have become constrained in many areas. Some respondents described the impacts of constraints on projects, and the benefits of flexible approaches.

DNOs confirmed there have been significant increases in flexible connection offers accepted. DNOs in particular highlighted the benefits that have been delivered through active network management (ANM) schemes and see this as a valuable option for future network management. Some respondents emphasised the negative impacts that can result from curtailment. Very few felt ANM to be unnecessary.

A range of respondents agreed with the need for coordination, and the potential negative impacts that could result from the absence of it. Some emphasised its increasing importance as the levels of ANM grow. A couple talked more specifically about the risk of conflicting SO/DSO signals, although there were felt to be few instances at present where this had materialised. Some respondents described the need for a framework for coordinated use of DSR, with others describing ways in which this could be set up (e.g. use of local solutions to manage local constraints, before being combined to support transmission network requirements). One respondent felt some segregation between SO and DSO would continue to be important to ensure fair valuation of flexibility.

Many respondents highlighted the fast rate of change anticipated in the energy system through the introduction of electric vehicles and the potential costs this could add, particularly to DNOs. It was noted by a small number that the Government policy can have a significant impact on the rate and nature of change while others highlighted the significant uncertainty over uptake trajectories in general.

The Government/Regulator response

We welcome the range of comments made on our understanding of the drivers for change, system impacts and emerging system requirements. We also welcome the data and experience provided in relation to the scale of potential impacts and efficiency savings.

We are intending to continue to use the system requirements, and the comments received in relation to them, as a tool for understanding where policy reform is needed and what it needs to achieve.

Information on the scale of impacts, and on the efficiency savings which could be achieved through improved coordination, are important determinants of the urgency and scale of

reform necessary. We agree that there are carbon saving benefits to be gained from more efficient use of existing generation, network and demand assets. This was one of the key benefits identified in the call for evidence, and will be one way we evaluate the success of our proposals. The Committee on Climate Change's recent annual progress report to Parliament, and the accompanying report by Pöyry and Imperial College London on the 'Roadmap for flexibility services to 2030', include some highly relevant analysis in this area.⁸¹ There will be a need for network and system operators to clearly identify where they could take action to deliver these monetary and carbon savings.

We agree with many of the drivers identified. For example, new actors and technologies on both sides of the meter will be important to consider. We also agree with many of the impacts. In particular, with the need for a cross sector holistic approach when developing the energy system. It is important that any reforms, including that industry will be undertaking, maximise benefits to consumers by supporting an integrated approach with the gas, heat and transport sectors, as we decarbonise. A range of bodies are undertaking thinking in this area, including the Energy Systems Catapult⁸², the National Infrastructure Commission⁸³ and the National Centre for Energy Systems Integration⁸⁴. We will ensure that learning from this work, and interactions between sectors more widely, are considered as we progress thinking on longer term reforms.

We also agree with many of the system requirements suggested.

More cost reflective signals, which internalise the true costs and benefits of actions, are central to enabling optimal levels of flexibility to come onto the system, in turn enabling efficient use of system resources at a local and system wide level. We outline further thinking and next steps in this area in our response to Questions 11-14.

Data and cyber security is equally critical for system resilience as we make the transition to a smarter, more flexible system and is discussed further in our response to Questions 41-43.

We agree with the range of suggestions made on the need for improved visibility and transparency, and ways in which these could be achieved. It is important that network and system operators, connectees and service providers all have appropriate visibility of the current and future network, and the services needed to manage it. Responses to Question 44 also highlighted the complexities involved in understanding the system, and the limitations on available data around the scale of system impacts and potential efficiency savings. Network and system operators must develop their visibility and understanding

⁸¹ <https://www.theccc.org.uk/publications/>

⁸² <https://es.catapult.org.uk/>

⁸³ <https://www.gov.uk/government/publications/national-infrastructure-assessment-call-for-evidence>

⁸⁴ <http://www.ncl.ac.uk/cesi/>

across these areas, and provide appropriate transparency to other market participants. There is a need for the Energy Network Association's (ENA's) Open Networks Project,⁸⁵ and for individual parties, to actively consider how further progress can be made in this area.

We agree with the importance of acknowledging the variety of needs and opportunities that exist across voltage levels. In general, we think there should be a strong emphasis on exploring the extent to which these system requirements can be addressed through market based approaches. Part of this is about designing approaches that facilitate participation from a wide variety of actors, including those at a local level or with more limited expertise. Further detail on our expectations and proposed next steps in the near and longer term are provided in response to Questions 45 and 46.

As we and industry progress our thinking on evolving roles and necessary reforms, the implications of changes for parties such as independent DNOs and private wire networks, will be an important consideration.

We will use the range of feedback and supporting evidence gathered across Questions 43 and 44 to inform our thinking, and to ensure that we are considering the right criteria when assessing the need for, developing, and evaluating, policy reforms.

Question 45: With regard to the need for immediate action:

- **Do you agree with the proposed roles of distribution system operators (DSOs) and the need for increased coordination between DSOs, the System Operator (SO) and transmission owners (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.**

Summary of Stakeholder Responses

This question received 100 responses. Of these, the vast majority agreed to the proposed roles of DSOs. Most respondents highlighted the importance of coordination and a significant minority highlighted further scope for co-ordinated system-wide use of resources in particular. However, some argued the current focus is too limited to network

⁸⁵ <http://www.energynetworks.org/electricity/futures/open-networks-project/open-networks-project-overview/>

companies and should be more inclusive of third parties. Some respondents highlighted the need to consider any potential conflicts of interest which might be associated with the use of active network solutions and the transition to evolved roles, to ensure new arrangements do not inappropriately favour large incumbents.

Many respondents felt that as part of the transition, there would be benefit in increased transparency, both for network operators and wider stakeholders, to facilitate better use of flexibility on a whole-system basis.

A small minority of respondents answered 'no' to Question 45a, some of whom were concerned about the potential longer term changes described, covered further in Question 46. Several respondents asked for further detail/clarity on the specific roles and responsibilities of DSOs, and on the boundaries between the SO and TOs. Several respondents raised the question of how uniform DSO roles have to be, considering differing requirements in different network areas.

Many respondents agreed that the further progress we described is both necessary and possible over the coming year, and felt industry to be best placed to carry forward these activities through a variety of approaches, particularly through the Energy Networks Association's (ENA's) Open Networks Project.⁸⁶ Many also thought that a more "hands-on" approach from Ofgem was needed to further encourage network companies and mentioned the need to set out clear deliverables and timescales for the transition. Some respondents believed the current pace may be too slow and further encouragement would be needed to achieve faster progress.

Several respondents felt that consideration needed to be given to a broader set of stakeholders to develop solutions and an appropriate framework.

A few respondents disagreed and were concerned that DNOs would not be sufficiently empowered to deliver the change at the rate required.

A large number of respondents had views on local/flexibility market models and called for further work in this area.

Nearly a quarter of respondents identified barriers although these covered a range of areas. Broadly, points identified related to:

- use of innovative solutions: the view that larger incentives would be needed to encourage effective network management and the use of flexibility solutions on a business as usual basis;

⁸⁶ Formally known as the TSO-DSO project. This builds on past work under the ENA's Transmission Distribution Interface group.

- connections and constraints: barriers relating to the current distribution connections arrangements;
- whole systems outcomes: some questioned whether RIIO encourages rollout of innovative solutions across boundaries;
- some respondents felt there were barriers relating to the charging regime;
- need for Ofgem to obligate DNOs/establish overriding principles and a need to remove commercial barriers to decentralised service providers.

Although areas for further work were identified, a majority of network and system operators considered the current framework to be largely fit for purpose to deliver the immediate actions identified.

Several respondents felt the SO should be more independent.

A small number of respondents believed that Ofgem should also further consider the role of independent DNOs (IDNOs).

The Government/Regulator response

We welcome the broad agreement on the nature of the evolution required in system and network operator roles. This is needed to ensure these parties continue to meet their obligations in the context of an evolving system.

In the immediate term, we believe the onus is on the regulated monopolies to develop timely and appropriate reforms to the way they plan, operate and engage with each other, and the wider market. They have incentives as well as obligations to do so. The ENA's Open Networks Project⁸⁷ is a key vehicle to do this. The recent decision by ENA members to expand the resource and capability of this group, and to increase and broaden stakeholder input, is an important and welcome step. We fully agree that efficient system and network operation is dependent not only on the role that regulated entities play, but also on harnessing the contribution that can be made by other parties. Reforms must reflect this. It is critical that all parties, including IDNOs, fully engage to support progress and ensure that a whole system view is taken.

We also recently set out our expectations regarding how the SO should work with other network companies to ensure a whole system view on network planning and operation, improving end-to-end system resilience, and ensuring the most efficient solutions are taken forward.⁸⁸ We are encouraged to see progress is being made through both the ENA

⁸⁷ <http://www.energynetworks.org/electricity/futures/open-networks-project/open-networks-project-overview/>

⁸⁸ <https://www.ofgem.gov.uk/publications-and-updates/future-arrangements-electricity-system-operator-its-role-and-structure>

Open Networks Project and the Future Role of the SO programme. It is critical these initiatives remain closely joined up to deliver the changes that are required.

We have already set out the need for a report this year, setting out what changes will be made and what further work will be undertaken to deliver the immediate term evolution of roles. We believe that the ENA's Open Networks Project is best placed to deliver this. Amongst other things, we expect the report to demonstrate how parties will deliver:

- the opening up of the delivery of network requirements to the market so new solutions such as storage or DSR can compete directly with more traditional network solutions, including as an alternative to reinforcement. These needs will also need to be signalled well in advance.
- mechanisms for transmission and distribution coordination, which enable whole system network requirements to be identified and acted upon efficiently, in the best interests of consumers.

There will be an important role for stakeholder forums (such as the ENA's Open Networks Project Advisory Group⁸⁹ and/or the Smart Systems Forum) to contribute stakeholder perspectives to the development of the report and the associated reforms. It will be also be important for the work of the Open Networks project to build on and leverage the wealth of thinking conducted to date.⁹⁰

Wherever possible, near term reforms must be developed with a view to supporting the potential range of longer term approaches. Ofgem and the Government will continue to sit on the Steering Group for the ENA's Open Networks Project to monitor the pace and nature of progress, and to ensure that it remains co-ordinated with longer-term thinking. We will also remain vigilant to potential conflicts of interest that could arise as roles evolve. We have already taken steps to address these in relation to the future role of the SO⁹¹, and will keep the need for further action under review.

We have considered the barriers stakeholders raised relating to the evolution of roles, and routes that might be available to address them. We discuss a range of these below.⁹² We believe that the current regulatory framework is likely to remain broadly suitable to deliver

⁸⁹ <http://www.energynetworks.org/electricity/futures/open-networks-project/open-networks-project-stakeholder-engagement.html>

⁹⁰ Including the work of the [Smart Grid Forum](#), and the IET/Energy System Catapult's [Future Power System Architecture](#) project, amongst others

⁹¹ <https://www.ofgem.gov.uk/publications-and-updates/decision-electricity-system-operator-incentives-april-2017-modification-standard-and-special-licence-conditions-transmission-licence>

⁹² Please note that others are discussed elsewhere in this document. For instance, charging is discussed in the response to Questions 19-24 and Question 46.

desired outcomes in RIIO⁹³ 1, but consider some regulatory clarifications and changes are likely to be valuable.

We appreciate concerns raised by some stakeholders that DNOs may not yet be making efficient use of new approaches in their day to day activity. We share these concerns and believe that a cultural change, throughout network businesses, is necessary. The efficient use of new technologies, providers and solutions is a key tenet of the DSO transition and further progress must be made.

We believe it is important for network and system operators to remain subject to balanced regulatory incentives that encourage them to reduce total costs, by using the most efficient solution in each circumstance. Efficient decisions must be supported by informed consideration and facilitation of the full range of solutions. For example: consideration of market-based flexible solutions, ahead of decisions to build; transparency for flexibility providers on service needs, including visibility on where they can locate to provide services, and annual projections of long-term future procurement requirements (and the level of associated certainty) across all network and system services; and thorough use of innovation learning. Progress must be supported by appropriate expertise, processes, and meaningful cross-party working, to ensure that lessons are being learned from implementing new arrangements on the ground.

We are already seeing some evidence of this change. For example, emerging DNO use of tendering for flexible alternatives to investment⁹⁴, new approaches to bringing forward new capacity in constrained areas (such as through consortia), as well as trials on DSR, storage and energy efficiency. The SO has also been working to ensure a level playing field for different providers through their Power Responsive⁹⁵ and Future of Balancing Services⁹⁶ initiatives. We welcome further progress from all. This includes TOs and also IDNOs, who must ensure they are making efficient use of new approaches on their networks.

One particular area where DNO progress is needed is on distribution constraint management and connections arrangements. We believe that the current constraint management and connections arrangements may hinder identification of the most efficient solution in some cases, and may not create clear signals for efficient investment.

⁹³ RIIO (Revenue = Incentives + Innovation + Outputs) is Ofgem's framework for setting price controls for network companies. It is a new performance based model which lasts eight years.

⁹⁴ <http://news.ssen.co.uk/news/all-articles/2016/12/ssen-opens-constraint-managed-zone/>

⁹⁵ <http://powerresponsive.com/>

⁹⁶ <http://www2.nationalgrid.com/UK/Services/Balancing-services/Future-of-balancing-services/>

Connection approaches will need to develop - accommodating emerging solutions and providers, while supporting evolving customer and system needs through the efficient use of capacity system-wide. We think progress is needed in several areas:

- there is a need for better information provision on the demand for, and availability of, capacity, and for industry to develop robust and comprehensive indicators of constraints.
- there is a need to establish a fair and streamlined process for more flexible management of the connection queue (building on the DNOs' work to date)
- active network management can enable more connection, but the associated contracts frequently do not offer the certainty some customers need, or support the provision of services as much as they might. Industry will need to consider how the framework can meet customers' needs consistently, whatever their connection type.
- where there is demand for more capacity, investment triggers are not sufficiently clear - to network operators, connecting customers or others who could bring forward new capacity. Network operators must help customers understand the routes available to bring forward new capacity where it is needed.⁹⁷

Ofgem published an update on constraints⁹⁸ earlier this year, covering both distribution and transmission. It described the need for continued improvements to the connections process; more efficient allocation of available capacity; and transparent, accessible processes to bring forward new capacity where required (whether through operational solutions or network investment). We expect the network monopolies to make rapid progress in these areas. We support work initiated through the ENA to develop the connections framework and improve other aspects of constraint management in a coordinated way, including across the transmission and distribution boundary.

It will be important for industry to ensure evolving arrangements are as robust to future changes as possible, particularly in view of the range of potential longer term approaches outlined in chapter 5 of the CFE. We expect continued progress on trialling new approaches could have value.

⁹⁷ This should build on work and trials to date under Quicker, more efficient distribution connections (QMEC). An update it is included in Ofgem's [publication](#) on networks constraints earlier this year.

⁹⁸ <https://www.ofgem.gov.uk/system/files/docs/2017/02/unlocking-the-capacity-of-the-electricity-networks-overview.pdf>

Ofgem will consider whether further guidance could support improvements in this area. It will also take into account feedback from stakeholders, including under the DNOs' Incentive on Connections Engagement⁹⁹.

Whilst the requirement for co-ordinated networks is not new (being set out in section 9 of the Electricity Act 1989 for instance), it is important that system and network operators are clear about what is expected of them. Ofgem will be considering the range of routes available to do this, and have already modified standard condition C16 in National Grid's licence.¹⁰⁰

Under RIIO, and the SO regulatory framework, each network and system operator is incentivised to take actions that enable them to deliver their roles and outputs at reduced cost.¹⁰¹ Whole system solutions are needed where savings (and associated benefits) can be realised for the system overall. Whole system solutions should generally produce a simultaneous benefit for one or more network or system operator. As long as those benefitting from a cross system solution are able to transfer funding to those that face a cost from implementing it, the optimal actions from a whole system perspective should result. For example, if the DSO could take an action which allows the TO to save money, the TO can fund the DSO to do it, lowering whole system costs. There is potential for these opportunities for cost savings to arise both across voltage levels and across geographical boundaries (e.g. DSO-DSO and TO-TO).¹⁰²

A range of routes already exist for funding to be transferred between network and system operators. These include the new mechanism for SO-TO transfers, developed through Ofgem's work on SO incentives.¹⁰³ There are also routes for funding applications to be made where benefits extend beyond price control periods (subject to relevant criteria being met). In the case of the SO, Ofgem will be thinking about this further as part of the review of SO regulatory arrangements. We intend to engage with network and system operators

⁹⁹ <https://www.ofgem.gov.uk/publications-and-updates/incentive-connections-engagement-ice-guidance-document-decision>

¹⁰⁰ <https://www.ofgem.gov.uk/publications-and-updates/decision-electricity-system-operator-incentives-april-2017-modification-standard-and-special-licence-conditions-transmission-licence>

¹⁰¹ For example, when DNOs identify new approaches that allow them to make savings in delivering outputs, a sharing factor is applied which allows both DNOs and consumers to benefit, incentivising the adoption of the most efficient solution. The RIIO framework uses a totex approach so that companies are incentivised to adopt the most efficient solution from both opex and capex alternatives. The RIIO framework also includes a range of innovation funding mechanisms to drive learning and roll-out.

¹⁰² Although the focus of this section is on the whole electricity system, across all voltage levels, we anticipate a need for more thinking to be undertaken, by both industry and Ofgem, on the future need for coordination across the electricity and gas systems, and the extent to which this may be able to deliver benefits.

¹⁰³ See appendix 1:

https://www.ofgem.gov.uk/system/files/docs/2016/08/electricity_system_operator_incentives_from_2017.pdf

over the coming year to discuss the range of funding routes and any guidance or changes that may be necessary to support their use.

We will continue to take a close interest in progress the industry makes in delivering the immediate term evolution in roles, across the areas outlined above.¹⁰⁴ We intend to work with industry over the course of this year to monitor developments, progress thinking and test our understanding of where regulatory action is needed, taking any necessary steps as soon as possible following this.

Ofgem's current view is that changes at RIIO ED1 mid-period review will not be needed in this policy area. Subject to a range of regulatory clarifications and changes being made in the areas set out above, we consider the regulatory framework should remain broadly suitable to enable, incentivise and fund desired outcomes throughout RIIO 1. We will also actively consider what changes are likely to be beneficial at RIIO 2 and beyond, discussed in further detail in our response to Question 46.

Question 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?**

Summary of Stakeholder Responses

This question received 86 responses. An overwhelming majority felt that further changes to roles and/or arrangements are likely to be necessary, with many citing the continued growth of distributed resources and the growing need for flexibility on the system. Many respondents thought change should begin immediately, although others felt that more time was needed for further evolution of roles and technology. Some respondents called for clarity ahead of the RIIO ED2 price control.

¹⁰⁴ <https://www.ofgem.gov.uk/system/files/docs/2017/02/unlocking-the-capacity-of-the-electricity-networks-overview.pdf>

Significantly, more respondents stated that the models covered the right range of possibilities, than felt that they did not. A few felt it was too early to say, with some of these (and others) instead setting out general principles they felt should be adhered to. Some indicated support for a strategy or vision, while others highlighted different approaches would be needed by location, to ensure benefits outweighed costs of change. A significant number also called for an increased emphasis on certain elements, in particular local markets or community energy. Some emphasised the need to align elements of arrangements across transmission and distribution (e.g. planning, connections payment structure) while others highlighted broader concerns with charging arrangements and called for a holistic review. A significant number of stakeholders advocated 'fundamental' over 'incremental' reform, needing to consider the feasibility of different approaches as well as benefits. Many of these (as well as others) saw a need for new bodies or governance, (e.g. to oversee or coordinate change or activities in the system) with some respondents highlighting concerns over conflicts of interest in the SO or DSO roles.

Of the models, many stressed the importance of DSO/SO cooperation, with no respondents arguing the converse. Many also stressed the importance of market signals (including a small number who advocated locational pricing or access reform). However, in this case a significant minority was sceptical, feeling that these signals could be difficult to get right, insufficient on their own, or calling for an outright move away from market arrangements. A few respondents had strong views over roles in system operation, with equal numbers calling for an expanded DSO remit and an expanded SO one. A number highlighted that elements of the arrangements, such as platforms, could be delivered by third parties. Many respondents (including network companies) highlighted the need for elements across all models to be combined.

General concerns across all models were raised about both the need to minimise complexity and to contain costs, with some generators wary of any new charge to pay for DSO activities (while some DSOs advocated the creation of just such a charge).

Many respondents were conscious of innovation, both citing specific existing trials and international experience, and calling for 'learning by doing' and further trials before final decisions are made. Some respondents counselled against a one-size-fits all approach, advocating the need to design reforms on a modular basis, with regulatory arrangements allowing for this evolution.

The Government/Regulator response

Material changes are needed in the way that system and network operation is managed, and roles will need to evolve to deliver them. As set out in Question 45, we think substantial progress is possible in the short-term, during RIIO 1. However, we agree with stakeholders that further changes are likely to be needed in the longer-term. Further work will be necessary to determine the nature of this. This will include monitoring immediate term progress, and the pace and nature of system change, alongside further analysis on

the options and benefits case for reform. The need for further work is reflected in the wide variety of views and concerns expressed by respondents over the illustrative reform models. Analysis to determine next steps will need to take account of international learning, and the conclusions of relevant industry work to date, such as from the Institution of Engineering and Technology's Future Power System Architecture project.¹⁰⁵

As set out in Question 14, Ofgem will be setting out in its forthcoming strategy for regulating the future energy system its intention to consider how to provide users with improved signals about the costs or benefits for the network of their usage at different times and locations. This will include considering market-based options. Ofgem will publish a working paper in autumn and will work with industry to develop the options.

Ofgem will also be actively considering whether further changes may be needed to the roles and regulatory arrangements for DSOs, the SO and TOs, with a view to ensuring any changes are adequately reflected and incentivised through the next round of the network company price controls (RIIO 2).¹⁰⁶ This includes any changes that could better enable the delivery of efficient outcomes for the system as a whole, or to ensure potential conflicts of interest are effectively managed. Ofgem will also be working with industry to consider whether there are other associated changes that might be needed, for instance to support co-optimised transmission and distribution ancillary services arrangements (currently being looked at through the ENA's Open Network's project and the Future Role of the SO programme).

Ofgem and the Government believe that focus of efforts should be on evolving the roles of existing parties, broadly retaining the current split of responsibilities.¹⁰⁷ However, we remain open to the idea of reconsidering more fundamental change to the division of roles and responsibilities between parties at a future juncture, in light of progress and/or the emergence of new evidence.

There are significant linkages between potential changes to signals for network usage through charging or other arrangements, and network companies' roles and arrangements for procuring services. Ofgem, working with industry, will work to ensure that these links are understood and managed effectively.

This work will need to be informed and developed in conjunction with stakeholders. In 2011, we jointly established the Smart Grid Forum as a platform for industry and other key stakeholders, such as local community representatives, to engage on the significant

¹⁰⁵ <http://www.theiet.org/sectors/energy/resources/fpsa/index.cfm?origin=reportdocs>

¹⁰⁶ <https://www.ofgem.gov.uk/publications-and-updates/open-letter-riio-2-framework>

¹⁰⁷ Please note that this does not preclude an additional role for third parties in supporting coordinated system and network operation where this can provide benefits. For instance, in our Call for Evidence we described the potential for independent local platform operators to support some models of service procurement.

challenges and opportunities posed by Great Britain's move to a low-carbon energy system. We have recently decided to merge this group with the Electricity Strategic Networks Group, and believe that the new forum - the Smart Systems Forum - should be a key group to progress thinking on longer term change. Other relevant groups include the charging coordination group that Ofgem is establishing, and the Energy Network Association's (ENA's) Open Networks project, amongst others.

Alongside engagement with stakeholder groups, Ofgem intends to share thinking and consult more widely at key junctures.

Alongside further analysis, we see trials as an important route to build learning, and ultimately inform decisions that are made. Regulated monopolies must ensure that any trials remain compliant with the principles of competition law, and their wider legal and regulatory obligations at all times. A range of relevant trials are already ongoing including the Power Potential project¹⁰⁸ funded through Ofgem's Network Innovation Competition, and Centrica's local energy market trial¹⁰⁹ being supported through European funding. As part of this plan, the Government has launched an innovation competition, looking at how markets might be designed to better support access to flexibility for local and system wide needs.

Innovation

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

Summary of Stakeholder Responses

See Question 48.

The Government/Regulator response

See Question 48.

Question 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.

Summary of Stakeholder Responses

Question 47 received 83 responses. Question 48 received 95 responses. A total of 178 organisations responded to one or both questions. Key themes that arose in terms of

¹⁰⁸ <https://www.ofgem.gov.uk/publications-and-updates/electricity-nic-submission-national-grid-electricity-transmission-transmission-distribution-interface-tdi-2-0>

¹⁰⁹ <http://www.centrica.com/cornwall>

support for innovation were to continue to fund innovation pilots but to remove any advantages incumbents may have.

Respondents welcomed the funding already available from Ofgem's Electricity Network Innovation Competition (NIC) and, its precursor, the Low Carbon Networks Fund (LCNF) highlighted in the CFE. Respondents stated that these funding streams were essential in understanding opportunities, risks and practicalities of utilising flexibility. Distribution Network Operators' access to innovation funding has produced benefits by supporting the design, development, and trialling of new smart technologies and commercial arrangements, which are now becoming business as usual in the UK.

However, some respondents suggested that ensuring other parties can also access innovation funding is also vital in supporting the development of innovation. Some suggestions to enable this were to encourage collaboration between major energy players and Small to Medium Enterprises (SMEs) in the low carbon space.

Some respondents welcomed the launch of Ofgem's new Innovation Link service, which provides informal feedback to innovative businesses on the regulatory implications of their ideas, and the regulatory sandbox, which will allow innovators to trial new ideas subject to conditions, without incurring all the usual regulatory requirements.

In regard to the innovation themes identified in the CFE, the majority of respondents agreed on the four themes of storage, DSR, vehicle to grid and markets for flexibility.

Respondents did, however, identify the importance of taking a whole system approach and not to consider each of these innovation strands in isolation. Respondents stressed that understanding how these innovation areas interact is essential, as this will enable further benefits or conflicts to be identified, allowing changes to be made to policy and regulation to address these. A small number suggested that in order to take a systemic approach multiple innovation projects should be trialled together.

When identifying innovation themes that were not discussed in the CFE, respondents highlighted community energy and heat projects. Some are looking to support local energy, including community schemes, to support those least able to adopt smart technologies and recommended the Government do the same. Others commented that the electrification of heat could provide another important source of flexibility, and further research and innovation should be conducted to understand how heat could be valued in a smart, flexible energy system.

The Government/Regulator response

We are pleased to see so many respondents utilising innovation funding available through Ofgem's NIC (and the precursor scheme, the LCNF) to develop new ways of delivering a smart, flexible energy system, as well as the work of network companies through the RIIO¹¹⁰ Network Innovation Allowance (NIA).

In 2016, Ofgem reviewed the NIA and the NIC funding mechanisms in RIIO to make these even more effective and further increase the value for money to consumers. As a result of the review, some changes have been made. First, a new obligation has been put in place on network companies to issue a call for ideas from third parties each year to enhance the involvement of third parties in the NIC scheme. Alongside this, the number of full submissions a RIIO network company can make to the NIC has been increased from two to four, if the additional bids involve a partnership with a third party based on its idea. Ofgem are strongly of the view that greater third party participation will help increase the pool of technology and ideas, and ultimately the quality of projects funded under the NIC.

Second, a new requirement on the RIIO network companies has been introduced to take a more strategic view and to work together to develop a network innovation strategy. We think a strategy will help focus innovation activities on key energy challenges, and ensure learning is shared more widely and help avoid duplication.

We are also pleased to see that many respondents agree with the innovation themes of storage, DSR, vehicle-to-grid and flexibility trading outlined in the CFE.

We recognise that these funding streams are more accessible for certain respondents and the Government already allocated up to £70 million towards smart innovation projects. In addition, as part of the Industrial Strategy Challenge Fund, on 21 April 2017 the Government announced an investment of £246m for the Faraday Challenge, which is focusing on the design and manufacture of better batteries for electric vehicles.

In January this year Government launched three innovation competitions:¹¹¹ two on energy storage, with up to £9 million available to reduce the costs for energy storage technologies and a further £600,000 to support feasibility studies for a potential first-of-a-kind, large scale future storage demonstrator. Alongside this, Government launched a competition with up to £7.6 million available for innovative demonstrations of energy DSR technologies in UK business or public sector organisation to reduce their energy use in peak times and

¹¹⁰ RIIO (Revenue = Incentives + Innovation + Outputs) is Ofgem's framework for setting price controls for network companies. It is a new performance based model which lasts eight years.

¹¹¹ <https://www.gov.uk/guidance/funding-for-innovative-smart-energy-systems>

provide flexibility to the energy system. Government have also launched a £20 million vehicle to grid innovation¹¹² competition in July 2017.

As part of this publication Government have launched an additional innovation competition which allocates £0.6 million for a feasibility studies on local flexibility trading.¹¹³ In the coming months Government also intend to launch a competition on domestic DSR.

Ofgem has supported over 60 innovators through its Innovation Link service since its launch in December 2016. Ofgem sought expressions of interest in a regulatory sandbox in February 2017. We welcome the positive response from the industry on this initiative.

The Government and Ofgem welcome the comments from respondents on the need for a whole system approach to innovation. We are aware of the links between smart energy and heat, and the importance of not innovating in isolation. We recognise the benefits that electrification of heat can deliver to our energy system, but also the challenges it can bring, and we are working to ensure whole system benefits can be realised through innovation projects. We also recognise the need for a smart energy system to develop in a way that integrates a range of routes to participation, including recognising the requirements of local energy providers. The Government's local flexibility trading competition will support innovation in this area.

¹¹² <https://apply-for-innovation-funding.service.gov.uk/competition/32/overview>

¹¹³ <https://www.gov.uk/guidance/funding-for-innovative-smart-energy-systems>

Use of terms

Terms

Smart: something enabled by new technology or new uses of technology, in particular technology (often communications) that enables automatic control

Smart Energy System: a system that intelligently integrates the actions of all users connected to it, including new parties, in order to efficiently deliver secure, sustainable and economic electricity supplies

Flexibility: the ability to modify generation and/or consumption patterns in reaction to an external signal (such as a change in price, or a message)

List of acronyms

A&D: Assessment and Design (fees)

ADE: Association for Decentralised Energy

ANM: Active network management

BEIS: Department for Business, Energy and Industrial Strategy

BM: Balancing Mechanism

BRP: Balancing Responsible Party

BS: Balancing Services

BSC: Balancing and Settlement Code

BSUoS: Balancing Services Use of System

CCL: Climate Change Levy

CDCM: Common Distribution Charging Methodology

CEER: Council of European Energy Regulators

CFD: Contracts for Difference

CFE: Call for Evidence (on a Smart, Flexible Energy System)

CM: Capacity Market

CMA: Competition and Markets Authority

CMU: Capacity Market Unit

DCUSA: Distribution Connection and Use of System Agreement

DDoS: Distributed Denial of Service

DG: Distributed generation

DNO: Distribution network operator

DSO: Distribution system operator

DSR: Demand-side response

DUoS: Distribution Use of System (charges)

EDCM: Extra-high Voltage Distribution Charging Methodology

EFR: Enhanced Frequency Response

ENA: Energy Networks Association

ESC: Electricity Settlements Company

ESN: Electricity Storage Network

ESOS: Energy Savings Opportunity Scheme

EV: Electric vehicle

FCL: Final consumption levy

FFR: Firm Frequency Response

FITs: Feed-in Tariffs scheme

HET: Home Energy Technology

HHS: Half-hourly settlement

HVAC: Heating, ventilation and air conditioning

ICE: Incentive on Connections Engagement

IDNO: Independent distribution network operator

IoT: Internet of Things

LCNF: Low Carbon Networks Fund

MPANs: Meter Point Administration Numbers

NIA: Network Innovation Allowance

NIC: National Infrastructure Commission

Ofgem: Office of Gas and Electricity Markets

OLEV: Office of Low Emission Vehicles

PiCG: Plug-in Car Grant

PV: Photovoltaic

RIIO: Revenue = Incentives + Innovation + Outputs

RO: Renewables Obligation

SCR: Significant Code Review

SME: Small and Medium Enterprise

SNAPS: System Needs and Product Strategy

SO: System Operator

SOF: System Operability Framework

SQSS: Security and Quality of Supply Standard

TA: Transitional Arrangements

TCR: Targeted Charging Review

TNUoS: Transmission Network Use of System (charges)

TO: Transmission Owner

ToU: Time of Use (tariffs)

TPI: Third party intermediary

TSO: Transmission System Operator

ULEV: Ultra-low emission vehicles

V2G: Vehicle-to-grid

VAT: Value-added tax



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