Smarter UK
techUK's Smart Infrastructure Initiative

Call for Evidence | A Smart, Flexible Energy System

SmarterUK response to BEIS & Ofgem

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SmarterUK | The national champion for smart infrastructure development

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About SmarterUK

SmarterUK welcomes the opportunity to provide input to the Department for Business, Energy & Industrial Strategy and Ofgem Call for Evidence on A Smart, Flexible Energy System.

SmarterUK is the national champion for smart infrastructure development. We bring together companies from across the smart infrastructure value chain. Our vision is to connect parts of the UK economy on the cusp of the 'smart' revolution. In doing so, we hope to drive the uptake of solutions that will deliver a sustainable, low carbon transition that provides value to UK Plc and its citizens.

SmarterUK is a techUK smart infrastructure initiative. techUK is the industry voice of the UK tech sector, representing more than 900 companies who collectively employ over 800,000 people, about half of all tech jobs in the UK. These companies range from innovative start-ups to leading FTSE 100 companies. The majority of techUK members are small and medium sized businesses.

Executive Summary

The UK faces large challenges in order to deliver a sustainable, affordable and secure power supply. This will require substantial investment over the next two decades. Technology, known collectively as the Smart Grid, can help deliver this at much lower costs as well as resulting in a more flexible energy system. Successful deployment of the Smart Grid could result in savings of £19bn by 2050 and GVA of £13bn and exports of £5bn by 2030.[1] In order to deliver a successful Smart Grid industry requires strong strategic leadership, increased consumer engagement and a comprehensive policy and regulatory framework that not only incentivises but prioritises innovation.
This Call for Evidence provides welcome clarity on Government's long term intentions, which alongside the upcoming Emissions Reduction Plan and Industrial Strategy will drive the successful transition towards a low carbon economy. Allowing the UK to secure prosperity and competitiveness alongside delivering energy resilience and environmental benefits cost-effectively.

By focusing on flexibility and realigning towards a whole systems approach Government has sent a strong signal that dealing with the energy trilemma is no longer about trade-offs between the three pillars. Instead we are starting to see acceptance that the trilemma is giving away to a virtuous circle where progressive action in one area can be complementary and optimise activities in another and so on.

Key points and recommendations

- The transition to a smart energy system provides an opportunity for the UK to be a leader in technology and service development, allowing us to take competitive

[1] See SmartGridGB, Smart Grid: a race worth winning? April 2012

advantage, developing skills and services that can be exported globally. There are growth opportunities across the whole value chain from initial generation, through to supply, and down to demand.

- Low-cost, reliable and secure power supply is absolutely critical for ensuring UK competitiveness as we move towards an increasingly digitalised economy.[2] In defining the policies and regulations that will drive transformation Government must ensure wider implications for the UK tech sector as customers are taken into account.

- The current regime does not treat technologies equally. This Call for Evidence is an important first step in 'levelling the playing field', removing commercial and regulatory barriers in the existing market arrangements, and creating policy framework that optimises opportunities for flexibility. Competitive markets will then deliver the best outcomes. However, to provide certainty, and stimulate market players and investors to move in the right direction, Government must continue to define the intended shape of our future energy system setting out a roadmap, including measures of success, in realising this new architecture. A lack of certainty around the transition and how progress and effectiveness are measured could act as barriers to the success of the smart energy agenda.

- Project timescales will require a commitment beyond the current Government and whilst demonstrators will highlight the potential opportunity of an innovation it is only time which will tell if the market is willing to accommodate. To drive forward progress innovation funding should look to target trials at scale, aimed at accelerating the commercialisation of new business models and technologies.

- In delivering a new energy system architecture government must account for the wider political landscape within which the system operates, this includes but is not limited to actions within the environment, transport, local government and the economy. A view of the UK's changing position in the EU and the impact this may have on the sector should also be taken into account.

- Consumers must continue to be at the heart of the low carbon transition and government must ensure that mechanisms are in place to better facilitate engagement, going beyond current activities. In driving greater customer engagement Government should seek to incentivise those who can benefit but not disadvantage those who can't.
  New services should be developed with the consumer in mind. This means ensuring consumers understand the services, the benefits it can offer, and how to use it. This will be incredibly important in realising the additional benefits of the smart meter rollout. Consumer participation in the deployment and use of smart meters is critical but

[2] Data Centres are energy intensive but data is a highly mobile commodity. The sector is therefore very vulnerable to overseas competition. There are substantial economic benefits to hosting data centres and the Government must help ensure that their requirements for a secure, cost-effective, energy supply is met.

cannot be taken for granted. More needs to be done to empower and incentivise consumers to manage their demand, adopt new technologies and minimise costs to their benefit and that of the electricity system as a whole. Smart meters will be the first piece of smart energy technology in the majority of people's homes, it is important the experience is positive and momentum towards further smart grid technologies is captured.

- Building the UK's smart energy future will require security by design, ensuring that added connectivity does not lead to reduced resilience. Development of a smart energy system will be incremental and it will be important that a whole systems approach looking, not just at security in infrastructure, but also the security of the technology in businesses and homes.

System Value Pricing

SmarterUK welcomes recognition of the significance of 'stacking value' across market participants – however, this paper implies that changes may extend existing mechanisms rather than look at the market design required to release full value for the consumers. By defaulting back to balancing mechanisms, balancing services and the wholesale market, there is a failure to recognise:

- the potential value to DNOs of demand side flexibility in managing infrastructural constraints
- 'off network' benefits for third parties such as avoided costs of disruption due to network reinforcement,
  the potential contribution of DSR to a low carbon economy.

There is also a need to identify and explore use cases where the benefit to some market participants could be detrimental to others and how that needs to be managed particularly if flexibility services are to become tradable.

In addition see page 9, 'Consumer Engagement with DSR' for comments on Data Centres and DSR.

Smart Tariffs

Q15 To what extent do you believe Government and Ofgem should play a role in promoting smart tariffs or enabling new business models in this area? Please provide a rationale for your answer, and, if you feel Government and Ofgem should play a role, examples of the sort of interventions which might be helpful.

The provision of smart tariffs must come from energy suppliers and partners working together to not just design the technical architectures for smart tariffs, but also to get consumer buy-in.

Government's role should be to urgently remove barriers to smart tariffs, such as half-hourly settlement, enabling new business models to develop. Government should also establish rules that will ensure those who are unable to participate in this new market are not disadvantaged. In particular government will need to work closely with industry and

consumer groups, ensuring that the social equity element of current pricing mechanisms evolves to be appropriate for a more dynamic pricing environment.
It is not necessary for all consumers to be on a time-of-use tariff (TOU) to see significant system savings and benefits. If one in five households signed-up to a new peak 4-7pm incentive scheme/tariff, shifting 25% of peak demand to off-peak periods, the electricity system could avoid investment in a 850MW[3] power generation plant (which can cost around £568m to build and £19.7m per year to run)[4]. If three-quarters of households in the UK signed up and shifted 25% of peak demand to off-peak periods, then the peak energy savings could allow avoided investment in 3.2GW of generation capacity (over half of coal capacity contracted under the latest Capacity Market auctions for winter 2020/2021)[5].

Mandating TOU tariffs is likely to have a negative impact on consumer perceptions. It should be left for the market to deliver the model based on consumer demand. Already suppliers are adopting innovative new business models with both British Gas and Green Energy UK having launched new smart domestic tariffs offering free/cheaper energy at certain times. Ofgem and BEIS should therefore continue to focus on settlement reform. We support Government's plans to enable half-hourly settlements in 2017.

However, it will take time to implement new architectures and there is a risk that additional costs to the consumer, resulting from changes to supplier billing systems, would outweigh the advantages. There needs to be a robust cost benefit analysis looking at the current maturity of the market in terms of consumer ability to take advantage of smart tariffs before a final decision is made.

A problem with TOU tariffs is that there is a risk a consumer could end up paying more for their electricity. Whilst this may be economically efficient, in the short term it could inhibit the take-up of new ToU tariffs given the inevitable negative press reaction. There are alternatives that government should consider promoting under the umbrella of 'smart'. A number of industry players have trialled non-price incentive schemes, maximum demand tariffs and block pricing projects with an impact on the peak consumption of users whilst minimising certain risks of higher bills.[6]

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[3] Elexon profile data for profile class 1 consumption between 4 and 7pm = 723.5kWh (1 customer - average 1.982kWh per day). So 25% savings = 0.495kWh = 0.165kW across the three hour peak; 850MW divided by 0.165kW is 5.1 million. So if 5 million households (1 in 5) reduced peak consumption by 25% then this could avoid investment in an 850MW CCGT plant saving fixed costs of £568.5m; and then fixed operating costs of £19.7m per year (£591m over 30 year lifetime).
See https://www.elexon.co.uk/wp-content/uploads/2012/01/Average_Profiling_data_201314_evaluated@10yearNET_v1.0.xlsx

[4] According to BEIS analysis 850MW plant would have capital costs of (med case) = 668.9 * 1000 * 850 = £568.5m; then fixed operating costs of £19.7m per year.
See Parsons Brinckerhoff for DECC; Electricity Generation Cost Model – 2011 Update Revision 1; August 2011,

[5] Under the latest UK capacity market auction results for winter 2020/21 Coal was awarded 5833 MW of capacity under 1 year contacts.
See https://sandbag.org.uk/wp-content/uploads/2016/12/Sandbag-CM-analysis.pdf

[6] It should be noted that max demand and block pricing tariffs do risk higher bills where a consumer continues to use, or increases consumption at the peak times.

Smart metering equipment technical specifications provide suppliers with the ability to

1) Increment a counter and send an alert when an 'instantaneous use' threshold (kW) is crossed
2) maintain additional 'Block Registers' to allow rising or falling block tariffs within different time periods

Whilst the realisation of benefits will differ depending on individual consumer circumstances, these types of tariffs offer alternative mechanisms for consumer engagement which could support the management of additional services which will take pressure off the grid. For example maximum demand tariffs could be a useful tool to limit the impact of home-based EV charging points and electric heating.

It is important that consumers are able to understand the various tariff options available to them and have sufficient opportunity to engage in a tariff that fits their circumstances. Whilst there is a concern that expanding available options too much will add complexity and confuse customers who may well decide to disengage; if we are to realise the true benefits of the smart energy system there must be flexibility for the market to develop appropriate business models. SmarterUK supports CMA recommendations to remove restrictions to tariff types in order to promote greater tariff competition and innovation. In implementing this Government and industry must work closely with consumer organisations to ensure simplicity and the ability for wide spread engagement.

Whilst ToU tariffs offer one mechanism through which to drive greater domestic flexibility there are significant opportunities arising from the removal of barriers to ToU settlement. ToU settlement enables the full value from ToU tariffs to be realised, whilst providing suppliers with a range of options on how to offer tariffs to consumers. This approach allows for innovative new business models, supporting not only engaged consumers, but also allowing for models which share benefits more equitably.

To encourage innovation and support greater competitiveness Government must also work with the tech sector to promote an increased awareness and understanding of the available options, allowing non-traditional companies to explore opportunities.

Smart Distribution Tariffs

As we shift to a smarter, more flexible energy system, and the role of DNOs moves towards system management, smarter use of distribution tariffs will be necessary to enable cost-reflective recovery of costs associated with network use and management.

Clearer price signals will give distributed generators the signals required to justify investment in new infrastructure or services, as well as encourage consumers to offer flexibility through greater cost reflectivity.

It is important however, to consider whether changes to DUoS charges will translate into real benefits for consumers or simply add additional cost and complexity.

In determining new charging structures Government must ensure that energy costs are not disproportionally increased. Changes must also not run counter to the intended outcomes of

the smart power agenda. Government should undertake a whole systems review of charging structures, ensuring the impacts of changes across multiple vectors is understood.

Other Government Policies

Technology has the potential to play a key role in addressing the energy trilemma of affordability, security of supply and decarbonisation. But in making the transition it is important that policy incentives are aligned.

For example, when considering housing stock emissions and energy efficiency, improvements in building fabric efficiency needs to be prioritised alongside drivers to increase take up of smart thermostats and intelligent heating systems. Infrastructure and technology innovation must be considered side by side.

Coordination and consistency of policy, alongside greater transparency, clearly defined ambitions, and direction will be absolutely key to maximising the benefits of the transition to a smart, flexible and low carbon energy future.

Government should include a thorough analysis of the role of technology and it's interaction with emission reduction policies in the upcoming Emissions Reduction Plan acknowledging the ability of technology to support more diverse solutions across every sector of the economy.

Smart Appliances

Q28. Do you agree with the 4 principles for smart appliances set out above (interoperability, data privacy, grid security, energy consumption)?

Yes.

There is however a broader point around security that extends beyond the grid. As the recent distributed denial of serve (DDoS) attack on Dyn[7] showed attackers can utilise IoT-enabled devices to co-ordinate a sustained attack against domain name system (DNS) infrastructure leading to internet server outages.

All smart appliances regardless of communication technology must ensue appropriate levels of security across all infrastructures. This is a key tenant of techUK's recently launched 'Trust Principles in an IoT World'.[8] The Trust Principles are a set of principles which aim to guide industry best practice. Industry needs to earn the right to derive value from data by demonstrating transparency, integrity and security, showing the benefits of data usage to the public and in turn building consumer confidence and willingness to adopt devices.

[7] See http://dyn.com/blog/dyn-analysis-summary-of-friday-october-21-attack/
[8] See http://www.techuk.org/insights/news/item/10031-iot-trust-principles

It is important that Government engage with industry on issues of security, ensuring the highest level of resilience whilst also balancing the need for cost effective devices that will enable the further realisation of the smart energy agenda.

Q29. What evidence do you have in favour of or against any of the options set out to incentivise/ensure that these principles are followed?

Adding smart functionality to appliances adds cost. To achieve consumer take-up it is essential that consumers have incentives to not only buy smart appliances, but to connect them and to use them in conjunction with energy and DSR schemes to use less at peak times. The Government needs, therefore, to create the market conditions where energy suppliers and smart appliance manufacturers are able to work together to create attractive propositions to customers. Government should not seek to enforce functionality consumers before value can be realised.

A better approach is to encourage smart appliance manufacturers to include smart energy functions in appliances by stimulating demand. Incentives could be offered to appliance manufacturers who sell, and to consumers who buy, smart highly energy efficient appliances. Given the global nature of appliance sales, any regulation that requires smart functions in only one market is unlikely to have a positive impact as large global manufacturers will charge higher prices in the UK for appliances which are specific to UK standards. It is there important that the UK push for the establishment of international standards and continue to take a leading role in their development. This will become increasingly important once the UK has left the EU.

A possible model can be found in the predecessors to the Green Deal, CERT and the Energy Efficiency Commitments, placed obligations on energy suppliers to deliver energy efficiency improvements in people's homes. Under CERT, three energy suppliers promoted a range of energy efficient consumer electronics, including televisions, set top boxes, computers, digital radios and imaging equipment, which suppliers found to be a cost-effective approach to support meeting their targets. Suppliers typically contributed capital to research and development into product efficiency, or directly subsidised the cost of the product itself. In 2011, savings of 8.5 Mt CO2 were reported, representing 4.7% of all CERT activity.[9] Evidence suggests that these schemes were successful, not only at driving uptake of efficient models, but also at achieving long-lasting transformations towards higher efficiency standards within electrical appliance markets. In one example, ahead of the demise of analogue broadcasting, one energy supplier worked with manufacturers to switch digital converters and televisions to integrated digital televisions because they required less energy. It helped stimulate sales of integrated digital televisions from 1.09m units to 6m in the final year, with total sales of 9.2m. It meant every iDTV sold in the UK was supported by the energy supplier.[10]

Whilst there were some concerns raised by stakeholders over its complexity and lack of transparency, many stakeholders still expressed support for a scheme, but one that supported

[9] https://www.ofgem.gov.uk/sites/default/files/docs/2011/02/cert-update-q11_0.pdf
[10] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42587/899-ia-cert-role-appliances-consumer-electroni.pdf

only the most innovative products on the market until a certain degree of market penetration had been achieved. It therefore serves as a potentially useful model to consider to drive consumer demand and uptake, perhaps offering financial incentives on the back of sign-up to time of use tariffs.

It is too early to select common protocols for the market and it is in fact not necessary to ensure interoperability. Already smart appliance manufacturers are working on open source projects that will enable devices to communicate with one another regardless of manufacturer, operating system, chipset or physical transport. Over time the market will decide on a leader. In order to facilitate this any label would need to be sufficiently vague to allow for flexibility and innovation, which may well undermine its usefulness and provide a consumer with no additional insight. Instead focus should be on standardising the types of data manufacturers need to send and read for particular functions to occur. This ensures APIs (Application Programming Interfaces) can talk to each other and read the same message, responding as appropriate.

Government must set out a forward-looking timetable, ensuring appropriate timescales to any policy to allow the market to respond without adding burdensome costs.

Q32. Are there any other options that we should be considering with regards to mitigating potential risks, in particular with relation to vulnerable consumers?

techUK believes that it is absolutely vital to consider a range of safeguards to ensure that vulnerable consumers aren't negatively impacted, but able to take advantage of, a transition to a smart energy system.
To support vulnerable consumers, programmes which incentivise social landlords to install enabling technologies and potential incentives for smart appliances should be introduced.

Social landlords have historically been good at delivering improvements – this has come mostly in the form of energy efficiency insulation type retrofit but also providing solar PV, when Feed-in-Tariffs allowed. Although various government support programmes were focused on traditional energy saving measures it follows that the next step would be to look at smart energy/appliance based energy saving opportunities which can deliver value to residents, lower bills and help to tackle fuel poverty.

Current projects such as the GLA's RE:NEW programme have gone some way in providing project support and knowledge sharing, but industry insight from techUK member, the Housing Association Charitable Trust, has indicated that policy uncertainty has made social landlords more cautious about domestic energy and energy efficiency investments. Changes to available subsidies/grants, the changing funding environment resulting from universal credit and general uncertainty has meant attention has been refocused towards core business activities. More support is needed to inform social landlords of the opportunities of smart appliances and IoT enabled energy systems, particularly for heating.

Ultra-Low Emission Vehicles

Q.34 What barriers are there for vehicle and electricity system participants (e.g. vehicle manufacturers, aggregators, energy suppliers, network and system operators) to develop consumer propositions for the:

- **control or shift of electricity consumption during vehicle charging; or**
- **utilisation of an electric vehicle battery for putting electricity back into homes, businesses or the network?**

A significant number of trials have shown that controlled charging can alleviate network constraints, reduce consumers' costs and deliver the value of flexibility

The ability of smart meters to offer the capability to switch EV charging equipment[11] has not been widely used to date. But supported by ToU tariffs it offers the opportunity for a strong consumer proposition to be developed, providing real monetary value to consumers who allow the remote control of EV charge points.

However to realise the full benefits of this ToU tariffs should be supported by targeted DuoS charges. There is a concern that the additional consumer costs of adjusting network charging structures may be prohibitive, and may not represent value across the wider system.

In addition there is currently no accepted standardised approach for smart charging for vehicle-2-grid, or controlled charging services, making it difficult for companies to develop a commercial offering. Open standards are needed to provide system interoperability and enable smart charging as a flexibility mechanism, and not just as a consumer cost-incentive for EV adoption. To encourage wider customer acceptance there we need propriety communication and control protocols of DSR solutions to be opened up. An equipment agnostic set of standards and parameters needs to be developed.

Consumer Engagement with DSR

Large non-domestic consumers - Data Centre potential

Awareness of the opportunities of DSR within the tech industry is high, and a number of companies are already utilising building assets, such as air con and lighting, to offer flexibility. However, there are a number of barriers to the wider engagement of certain parts of the industry. In this section we will specially focus on the potential of the Data Centre industry to engage as a consumer of services.

The Data Centres sector offers considerable potential for DSR (~1GW) but current commercial and structural barriers limit engagement. Data centres depend on electricity but operators usually install standby generators to provide power supply in the event of mains power failure. These generators are rarely used and could provide significant grid balancing services if facilities opt to come offline and onto backup to increase available supply for short periods.

A small minority of data centre operators engage in DSR through schemes like STOR. Most consider it unattractive because there is a perception that it increases risk or is not economically compelling but the most concrete disincentive is regulatory.

[11] SMETs functions require smart meter functionality to include auxiliary load control switching. In addition CADs can act as a gateway enabling load switching.

Emergency backup generators for data centres are generally diesel fired combustion plant and therefore attract various forms of regulation. Some of these directly conflict with polices aimed at improving security of supply and prevent data centre engagement.[12]

Under the Medium Combustion Plant Directive (MCPD) provision is available for the exemption of emergency standby plant from some requirements. The Department for Environment, Food & Rural Affairs (DEFRA) is planning to apply these exemptions partially to MCPD but proposes additional regulatory requirements for diesel generators. This is in response to an exploited loop-hole in the Contracts for Difference policy.[13] Current proposals for these additional provisions include sensible exemptions for emergency standby and we would like to see these proposals implemented and applied more widely.[14] From an environmental perspective, policies should encourage organisations to leverage existing generating plant rather than establish new, purpose built, generator farms. This would minimise the additional embedded energy and carbon cost of manufacturing additional plant rather than making use of what is already available within the existing infrastructure.

Under the Industrial Emissions Directive, transposed in the UK as the Environmental Permitting Regulations, the Environment Agency's (EA) approach to permitting depends to some extent on whether generation is elective or emergency. In the specific case of data centres, operators will be reluctant to engage in DSR by taking facilities offline because the EA views this as 'elective' combustion and therefore takes the view that sites using emergency standby of this kind for DSR or Triad avoidance are likely to be ineligible for EPR permitting, or will be subject to much more onerous measures. The additional compliance costs this gives rise to make engagement with DSR services prohibitive for sites obliged under EPR. In view of the very high reliability of the UK electricity grid the likelihood of long outages is very low; therefore so is the attributable risk. Although evidence suggests that substituting test runs with DSR activity has only a very marginal impact on run hours, generators fired to take facilities offline for DSR purposes may run at times when they will add to other local pollution sources. These considerations would have to be carefully balanced, especially in AQMAs.

Rather than differentiating 'elective' from emergency generation, a distinction between supply that augments grid provision and supply that reduces demand on the grid could be made. Additionality could be a means of doing this.

Ofgem must work with DEFRA and the Environment Agency to deliver a solution that works for both the energy industry and data centre operators. Allowing the flexibility market to grow and take advantage of existing embedded generation delivering carbon savings and

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[12] See https://www.techuk.org/images/techUK_DCC_Com_1606_policy_conflicts.pdf

[13] Generator farms are now being established under the policy because the economics add up for investors to provide this kind of standby. These comprise multiple generators individually rated just below current thresholds for emissions compliance. The scale is such that it may affect air quality.

[14] Current proposals are to exempt emergency standby generators from the additional regulatory requirements provided that they are tested for less than 50 hours a year. There are no limits on emergency running and there is scope to test during triad periods / periods of peak demand, when the reduced load on the grid will actually have some wider benefit.

resilience at good value. Given the complexity of these issues we would welcome the opportunity to engage further with government and the regulator.

Domestic and small non-domestic consumers

We need engaged consumers who are aware of their own usage and the challenges facing the industry. Consumers should be empowered to make informed decisions about engaging in flexibility, however whilst current activities within Ofgem and BEIS are focused on breaking down barriers to the smart energy system and facilitating the building blocks that enable greater domestic participation. Little is being done to inform customers of what this means in real terms and how they can take advantage.

Now is the time to start engaging consumers (both domestic and commercial) or risk inertia and missing the opportunity offered by the current hype surrounding smart meters, smart appliances and smart energy technologies.

Consumers are already beginning to adopt distributed generation through solar panels and battery storage; solutions to engage EV's in balancing services are being explored; companies are committing to make all of their appliances IoT-enabled by 2020; energy companies are already offering connected home energy efficiency technologies to customers; and time-of-use tariffs are being rolled out to a wider number of customers starting with smaller businesses.

Coupled with increasing automation and an enhanced legal framework for data privacy and protection, that builds consumer trust, we are moving closer to the realisation of domestic flexibility.

One of the key challenges to greater deployment of connected home technologies, particularly those that offer energy savings, is cost.[15] Whilst affordability is a key benefit of the technology in terms of reducing energy bills, the demand for such technologies is still too low to bring down device costs, making systems unaffordable to most. In addition the cost savings from smart functionality may be outweighed by the cost of grid level enablers such as half-hourly settlement.
Greater awareness of the opportunities, the removal of key regulatory barriers around network charging, dynamic tariffs, and unequal access for DSR will encourage the market to grow, increasing supplier service offerings and bringing down device costs for customers. Increasing the number of devices installed will in turn allow industry to build new markets that deliver new services to National Grid, through the aggregation of households' ability to load shift, and delivering sufficient flexibility to act on request.

Consumer Protection and Cyber Security

Customer Protection

There is concern within the smart energy industry that a focus on only negative data stories could jeopardise the UK's ability to benefit from innovative new services enabled by Big Data.

[15] See Deloitte; "Switch on to the connected home"; The Deloitte Consumer Review 2016; July 2016

These stories create a fear over the security of data, uncertainty over data use and doubts over ownership and control of data. There is a need to rebalance the public debate on the role of data and refocus the discussion by drawing attention to the real examples of how these new services are making a positive difference to people's lives in the UK and contributing to the UK economy and environmental aims.

Whilst it is up to industry to earn the trust of consumers and businesses, Government can assist by helping to dispel myths and emphasise its commitment to data protection and security; by, for example, highlighting the harsh penalties companies can incur if a breach occurs.

In building a culture of data confidence there is a role for energy suppliers, service providers and intermediaries to remind customers of their rights under legislation, most notably the Data Protection Act 1998 and the new General Data Protection Regulation (GDPR), due to come into force in May 2018. Many of the companies working within this space already go above and beyond the legal framework, placing good data governance at the heart of their commercial offering and Government should continue to work with industry to understand how best to communicate these policies in an intelligible way to customers. Government should also continue to support industry as it develops principles which will guide industry best practice.[16]

Any interventions for privacy or security must be proportionate, ensuring that they do not act as a barrier to the full realisation of the benefits of a future smart energy system. In making any changes to the current regime a thorough cost/benefit analysis must be undertaken; fully accounting for any additional and unplanned costs changes will add to suppliers, or act as a barrier to market entry for new services, affecting competitiveness.

To realise the additional benefits of the smart meter rollout – namely the ability of smart meters to enable smart grid services such as domestic DSR and smart tariffs – Government should initiate a consumer education and awareness programme. Government should utilise the existing expertise of Smart Energy GB, particularly in relation to consumer behaviour change and explore the extent to which its focus should be broadened to cover promotion of additional smart energy products and services in the home. Further consumers should not only be informed but should also be able to manage the framework in which each data point can or cannot be shared.

Given that the smart energy market and related customer services are in the early stages of development it is important that government find a balance between regulatory oversight of activities to prevent abuse and the freedom of industry to innovate and address customer protection concerns holistically. SmarterUK welcome activities such as the ADE Aggregator Code of Conduct as an industry initiative to improve industry standards and expect that such activities should be extended to deal with domestic consumers as the domestic DSR market grows.

Cyber Security

[16] See techUK;"Trust Principles in an IoT World'; January 2017

Building the UK's smart energy future will require security by design, ensuring that added connectivity does not lead to reduced resilience. Development of a smart energy system will be incremental and it will be important that a whole systems approach looking, not just at security in infrastructure, but also the security of the technology in businesses and homes. It will be essential that as new devices and services are designed that they, as far as possible, do not open up a gateway into Critical National Infrastructure where previously it was securely guarded.

As with the design of the smart metering programme, all smart/IoT infrastructure programmes should engage with suitable agencies (such as GCHQ, MI5 and the NCA) and the newly created National Security Cyber Centre. Engaging in the early stages of systems design will ensure safe and smooth implementation of the programme.

Further to ensure that customers are engaged and play their role in security of the system industry must have simplicity and transparency as a core foundation factor for every new service enablement.

Digitising what were traditionally isolated energy network control systems and connecting operational networks (OT) and IT systems brings not only opportunities but also open up vulnerabilities for CNI that can lead to widespread and severe consequences throughout the economy. Cyber threats can now not only impact the virtual world but also the physical.[17] Traditional methods for protecting each are no longer enough. A lack of understanding on how protections and protocols should be aligned at the point of convergence between enterprise and systems-based equipment leads to a gap in process. Government needs to work with the energy and security industries to encourage a better understanding of the relationship between OT and IT, including their differences, implications each have on the other and solutions for secure integration. This is particularly challenging in sectors that have long supply chains and a long 'tail' of smaller players. Industry must be supported in developing appropriate policies, standards and skills that bridge the gap. SmarterUK welcomes the opportunity to work with Government on not only understanding but solving these challenges.

In addition government must have a view of the cascading impacts of an attack on the UK economy with industry encouraged to adopt appropriate measures for not just attack prevention but also attack response. In engaging with new services industry must build resilience into the network, ensuring appropriate protocols are in place to mitigate the impacts of an attack not just within its own direct supply chain but also across interdependent services and infrastructure. This will be particularly important as we lose diversity in our energy supply and increasingly integrate sectors using multiple cyber-physical systems.

As our system digitises and attacks become more sophisticated government must encourage greater cooperation and transparency across sectors, ensuring the true costs of an attack are recognised and resources are allocated accordingly to develop appropriate prevention and mitigation policies. Industry, with the support of Government and related agencies, must

[17] See Lloyd's and Cambridge Centre for Risk Studies; "Business Blackout: The Insurance Implications of a cyber attack on the US power grid." Emerging Risk Report 2015. May 2015.

address current issues with traditional investment models for cyber security across infrastructure and in particular how return on investment is calculated for investment in OT security. [18]

There is an opportunity to leverage British cyber defence expertise to develop British solutions to problems that will not only benefit the UK but can also be export to other countries, benefiting British business and making additional expenditure at the front end worthwhile. We are already seeing this with the smart meter programme and the Great Britain Companion Specification which Ireland are looking to adopt within their smart meter system.

Innovation

Q48. Do you think these are the right areas for innovation funding support? Please state reasons or, if possible, provide evidence to support your answer.

Yes. SmarterUK agrees with the identification of automated DSR, flexibility trading/optimisation platforms, storage, and vehicle-2-grid demonstrations as important areas for further innovation funding. Significant transformation has already taken place and these technologies/services will provide additional capability and support greater commercialisation particularly of opportunities in relation to domestic DSR and EV's.

To drive forward progress innovation funding should look to target trials at scale, aimed at accelerating the commercialisation of new business models and technologies.

With significant noise around smart energy and consumer engagement through smart meters and connected now is the time to continue testing the customer (and commercial) proposition for smart appliances and connected home energy management systems. With barriers removed and enhanced frameworks for data protection in place there is significant opportunity to test new business models including automation. Further significant activity around AI at both domestic and EU level means investigation into real world commercial applications is welcome. AI algorithms offer an opportunity to develop intuitive services that will not only provide added value to customers, conveniently managing service preferences, but also to service operators who will benefit from enhanced data processing and reasoning.

[18] See Kelly, S.; Leverett, E.; Oughton, E. J.; Copic, J.; Thacker, S.; Pant, R.; Pryor, L.; Kassara, G.; Evan, T.; Ruffle, S. J.; Tuveson, M.; Coburn, A. W.; Ralph, D. & Hall, J. W.; "Integrated Infrastructure: Cyber Resiliency in Society, Mapping the Consequences of an Interconnected Digital Economy"; Cambridge Risk Framework series; Centre for Risk Studies, University of Cambridge, 2016.
See Homeland Security's; "Recommended Practice: Improving Industrial Control System Cybersecurity with Defense-in-Depth Strategies"; Industrial Control Systems Cyber Emergency Response Team; September 2016.