

# BEAMA's Vision for a Smart, Flexible Energy System

BEAMA response - BEIS Ofgem Smart, Flexible Energy System  
- A Call For Evidence



## Foreword

### BEAMA CEO, Dr Howard Porter



BEAMA fully support the need for a full review of market frameworks and associated policy for a smart flexible energy system and this consultation is a good step in the right direction to establishing a value proposition for all parties involved in a market for flexibility, including the end consumer.

Greg Clark's foreword stated the need to maximise the ability of consumers to play an active role in managing their energy needs, and this we fully support. BEAMA members are already delivering solutions into the market that will empower consumers to manage their energy better and more efficiently but which will also establish them as an integral part of the overall energy system and the maintenance of grid stability.

The innovation I have witnessed in our sector over the past few years has been unprecedented and I have no doubt that we are entering into a period of significant change for the whole energy market. The innovation spend over the past 5 years has ensured momentum in the UK market for smart devices and technologies, and arguably positioned the UK as leading the European and international agenda. However, we need to foster this in robust export support and policy, as well as collaboration and support for standardisation work. This will lead to the development of an integrated energy system, and establish the unique UK IP formed off the back of innovation trials into international standards, thus expanding export potential for UK companies. This is a huge growth area and the BEAMA board fully endorse the support from BEIS and Ofgem to get to grips with this agenda and involve industry in developing a market led approach.

BEAMA is able to provide considerably more detail and contribute further to this work. Due to the time constraints of this consultation we have done our best to submit the full breadth of views our members take but strongly believe there is a need for further follow up. I would therefore like to invite BEIS and Ofgem to contact BEAMA in follow up to this consultation and provide opportunity for further evidence to be submitted. This will allow us to further refine our thinking around the policy and regulatory options we have which are necessary for this market to develop.

Kind regards



Dr Howard porter

## BEAMA's Vision for a Smart, Flexible Energy System

### Introductions

Domestic consumption makes up a third of overall UK consumption<sup>1</sup>, but is responsible for 50% of peak demand, whilst SME peak consumptions contributes 30% making a total of 80%<sup>2</sup>. The Digest of UK Energy Statistics (DUKES) also shows that the combination of energy industry usage and conversion, transmission and distribution costs accounts for 62% of fuel inputs. Issues with both peak demand and minimising losses during conversion transmission and distribution of electricity need to be addressed. This consultation goes some way to open up this discussion but we must maintain the focus on systems and the domestic consumer and SME sectors.

The structure of this consultation doesn't convince industry that the discussion will continue at a system level so from the outset we call for a team to be set up to review the end to end challenges associated with this call for evidence.

The solution lies with the consumer, and understanding the role of the consumer in the context of this debate is key. However, it is not clear that Greg Clark's Foreword statement 'we must maximise the ability of consumers to play an active role in managing their energy needs', has been fully carried through in this consultation.

We need to be working from a vision of how we want consumers to be engaging with the energy system in 2030 and work back from there to develop a plan/ strategy going forward. We outline in this consultation response some of this vision (new build policy and regulation, tariffing etc) and some immediate actions that can be taken but follow up on this point is essential.

To frame our response to this call for evidence BEAMA has outlined here the outputs we hope will develop from this work and our vision for the future smart, flexible energy system. These are based on some core principles on which we have based our response, further outlined herein.

### Key outputs

- **A known market framework for domestic Demand Side Response by 2020**  
– allowing the network operators to adequately plan for the next RIIO price control period starting 2023. We view this as a realistic timescale in line with plans for half hourly settlement and the implementation of smart tariffs for domestic consumers.
- **A clearly quantified value proposition for the flexibility market, from generator to customer-** To establish the market for flexibility services, especially in the domestic sector we need to clearly understand the value

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<sup>1</sup> Digest of United Kingdom Energy Statistics, July 2016 para 5.2

<sup>2</sup> GB Electricity Demand – Context and 2010 Baseline Data table 7 and Ofgem Demand Side Response. July 2010. Appendix 2 P. 50

proposition for all parties. This will ensure consumers are sold suitable products and services and the benefits are fully understood.

- **The market must remain open to new entrants to offer a range of service propositions to consumers** – in developing the market design and suitable regulation for aggregators and flexibility providers we should not provide new barriers to future market opportunities.
- **Develop targeted regulation** – here we call for government to review existing regulation before introducing new frameworks into the market. Where appropriate by reframing existing regulation we could make significant progress in developing a market for domestic DSR. A good example would be the Building Regulations and Part L. This is not targeted or integrated with government policy effectively, but if reviewed effectively could help mould homes for the future energy customer. Today Part L is driven by energy efficiency and therefore buildings are evaluated by blunt mechanisms to determine energy conservation. The amount of energy that could be conserved and the carbon intensity of energy potentially avoided by DSR is not evaluated or re-warded. Regulation driven by energy efficiency alone could stifle the DSR market and limit the retention and/or the future deployment of DSR type beneficial technologies. One example that could be introduced through Building Regulations is a minimum thermal storage provision capable of delivering a defined amount of hot water, in all new heat generator installations in single unit residential homes.
- **Develop a whole buildings approach to evaluating flexibility** - this could be through a range of mechanism and ties in with the current direction of EU policy.
- **The UK shouldn't be doing anything in isolation, especially because of emerging new EU relationships.** Creating unique policy and regulatory frameworks for products in the market would be damaging to the UK supply chain and our continued competitiveness and exports in this sector. This is specifically relevant to product regulation and building regulation and assessment procedures. Whatever we develop in the UK should be done so with a view to exports and promote engagement with overseas markets.
- **There is benefit in mapping the timeline for delivery of specific solutions and broader industry transitions i.e. the move to DSO.** This could involve the allocation of deliverables and delivery dates, responsibility, key stakeholders and participants and the points at which their involvement is required. This will better demonstrate the requirements and responsibilities and remove any barriers to participation.
- **Focus needs to be on developing regional market mechanisms** – for pricing to be reflective of network constraints that DSR is best suited to solving, and for market deployment of technologies at scale.

## Our Principles

- As a general principle we believe the market for storage and other flexibility services should be assessed not through asset type, but by the effect this has

on the system, and the services they provide. This will ensure technologies and services are rewarded appropriately.

- We support the principle that consumers will become active participants in the energy market. Their contribution will be key and any policy or regulatory decisions made on energy market reform should consider the consumer value and proposition.
- In all discussions associated with developing markets for flexibility a systems approach must always be adopted and considered, therefore testing the implications of decisions on multi-vector applications for the energy sector.

### Developing an energy system for the consumer

Following on from one of BEAMA's core principles, we have expanded further on how we can give the consumer an active role and the use cases associated with this.

Over the last few years BEAMA, with our members, have developed a number of smart grid and connected homes demonstrations<sup>3</sup>. These demonstrations have all sought to deliver clear examples of how different use cases for connected homes could operate in the short to near term, based on products already available in today's market.

All of the use cases BEAMA have demonstrated are achievable technically in today's market. However, we have always stated the fundamental barrier to this market is a clear market design for flexibility services, which can enable a consumer to be an active participant in the energy system. What is needed therefore is a clear value proposition. The changes needed to achieve this are fundamental. We feel this call for evidence is tackling some of these fundamental changes, but perhaps this is still being dealt with in silos. The review of this call for evidence and corresponding answers needs to be horizontal and look at the whole market design framework for the UK. This is also in line with the recent announcements in the Winter Package.

A distributed energy system should mean the ability to develop and deploy virtual power plants, micro-grids and private networks. There are a broad range of potential business models suited to specific local needs and customer ownership/engagement models. Ultimately the full range of business models and approaches should be allowed provided they are justified to deliver benefits to the consumer and whole energy system. Any changes made to market frameworks shouldn't block future market options like this, but should enable this type of innovation. We could also see therefore electricity systems in the same vein as district heating systems which have been heavily promoted in recent years.

### Demonstrating connected homes- recent case studies

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<sup>3</sup> <http://www.beama.org.uk/resourceLibrary/demonstrating-a-smart-grid.html> BEAMA, July 2015, Demonstrating a smart grid report - following the demonstration at Aberdeen LCNF conference  
<http://www.beama.org.uk/resourceLibrary/the-beama-connected-homes-demonstration---beyond-smart-metering.html> BEAMA, 2015, The BEAMA connected homes demonstration - Beyond Smart Metering  
BEAMA, November 2016, Demonstrating flexible Hybrid Homes and Demonstrating Connected Homes with Smart Metering - two demonstrations exhibited in 1 Victoria Street.

More recently we have produced two demonstrations which are currently being exhibited at 1 Victoria Street. These provide an insight into the capabilities of an ecosystem of smart energy products in the home and the applications of the data available from smart metering. This has helped moved industries thinking forward and can help government in understanding the needs of the future home and how this could be designed from a flexibility perspective.

### Connected Homes with Smart Metering

GB energy suppliers are now rolling out smart metering systems for gas and electricity to all 26 million households. By 2020 all domestic customers will have access to their own energy data and therefore can engage directly in improving their energy efficiency and can access energy management solutions and services. Our demonstration unit shows the integration of the Smart Metering Home Area Network (including all mandated equipment under the GB smart meter program) to the Consumer Home Area Network via the Consumer Access Device (CAD). In this demonstration we have applied a 3 tiered tariff structure similar to that trialled in the Low Carbon Network fund projects, as a means to show the applications that customers can access for domestic energy systems. The tariffs applied aim to demonstrate how consumers can reduce peak demand and improve the overall efficiency of primary services (heat, hot water, lighting etc). More detail on how this demo runs is provided in a recently published leaflet<sup>4</sup>. Overall this demonstration gives just a handful of examples of where value can be extracted from smart meter data, putting the consumer in control and at the heart of their own energy management.

### Flexible hybrid homes

The second demonstration which has been displayed at 1 Victoria Street provides an insight into the capabilities of an ecosystem of smart energy products in the home, and of vital importance, the value of stored energy (electrical and thermal) to consumers and the energy system overall. This demonstration visually shows two forms of network generation, renewable and conventional fossil fuel power plant. The scenarios demonstrated are based on the ability to manage domestic energy use according to national supply and domestic onsite generation. In doing so we can help balance supply and demand on the system, and utilise as much as possible low carbon energy from national and local generation.

More detail on how this demonstration runs is provided in a recently published leaflet<sup>5</sup>. We have provided some information below on the two scenarios developed for this demonstration, specifically on demand 'Turn Up' and 'Turn Down'. It is felt these have not be adequately understood in this call for evidence (para 51b, 68, 69). We hope the explanation below, relating to our demonstration on flexible hybrid homes can provide some clarification related to the Aggregators section of the call for evidence.

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<sup>4</sup> BEAMA, November 2016, Demonstrating Connected Homes with Smart Metering

<sup>5</sup> BEAMA, November 2016, Demonstrating flexible Hybrid Homes



- Turn up

When wind farms are generating intelligence in the home, via an integrated home management system, can turn up demand in the house – powering equipment from the grid. Should wind speed increase unexpectedly, under the terms of today's market the grid would curtail the wind farm (turning off some of the turbines). Under the scenario for a flexible hybrid home, this increase in wind generation can be identified as a rise in frequency on the system. This can be the role of an aggregator whereby the integrated home management system can then receive a signal (via the aggregator) informing the home to increase demand. The home therefore starts to draw more load from the grid, using it to heat the water tank, re-charge the battery store and EV. All other equipment keeps running, as does the wind farm. This is a good example of where multiple storage devices as part of a system within a home can provide flexibility services without affecting the customer or requiring the customer to be involved in any actions. We should therefore always be considering the value of combined energy systems in a building not the value of individual appliances in isolation.

- Turn down

Similar to the above an aggregator can monitor wind energy production and, on identifying a decrease in wind speeds through a decrease in frequency, a signal can then be passed to the integrated energy management system informing the home to reduce load. The home can therefore start to draw more load from local batteries and stored energy resources. This avoids using carbon intensive forms of energy, as under today's operational market constraints fossil fuel power plants would be asked to increase production and the house would continue to draw from the grid.

## Executive Summary

Here we provide a summary of our answers to each section of the call for evidence.

### Enabling Storage

- As a general principle we believe that the market for storage and other flexibility services should be assessed not through asset type, but by the effect this has on the system, and the services they provide.
- BEAMA believe that if we resolve connection and charging methodologies we will alleviate barriers to the market for storage. We need to allow for multiple options for ownership and allow storage operators to bid into the full range of services in order to make the market viable and ensure value can be passed to the customer.
- This section doesn't adequately address the overlap between storage and DSR. There is a real danger in defining things too rigorously around fixed categories in a time of rapid technological change - it risks making it difficult to implement valuable cross-cutting technological services.
- Nothing should be written into network regulation or primary legislation that will prohibit future business cases, technology applications and the full range of scaled storage applications including LV and building energy storage.
- A definition of storage needs to account for vector substitution.

### Aggregators

- Opening access to the Balancing Mechanism for DSR would be welcomed. However, supply licences are expensive and hence a significant barrier to entry for small, new aggregators.
- Aggregation is inherently different to supply and should not be forced to fit itself into the supply bucket in order to access flexibility markets.
- The current settlement system was designed for the capabilities of large, monolithic facilities that were prevalent at the time, not for new, agile equipment which could be installed at grid edge (e.g. in domestic properties)
- The capabilities of modern equipment cannot be fully exploited because the system, although clearly in need of greater flexibility, is not currently set up to exploit that flexibility.
- We need to develop new processes that can sit alongside and augment the main settlement processes, but which operate in nearer to real time for aggregators to be able to deliver energy flexibility.
- Aggregator actions could be steered to help suppliers improve their imbalance positions at the same time as they effect system actions. The possibility of positive impacts by aggregators seems to be overlooked in the Call for Evidence



## System Value Pricing

- We expect half-hourly settlement to endure, along with the market structure to support it. We do not anticipate a nationwide change to this structure, whether driven by regulation or markets or both.
- In order to achieve greater energy flexibility, all stakeholders need to determine together what additional processes can sit alongside 30 minutes settlements in the wholesale market to support energy flexibility.
- A clear definition and standardising of flexibility services would permit those providing and using such services to better quantify and compare the merits of competing services and technologies
- To make flexibility of the electricity system easy to access and use, data needs to be available in near-real time. Tariffs and the system that takes advantage of them can be thought of as a multi-level control hierarchy consisting of (in diminishing size) the central monitoring and service despatch; a community energy system and microgrid; a home energy management system; and a smart appliance.
- The Smart Meter communications architecture was not designed for mass real time communications, and is therefore limited to what it can deliver in the context of supporting energy flexibility. Services that respond in near-real time to changing network demand need a supporting real time communications channel.

## Smart Tariffs

- Smart tariffs incentivise consumers to use, store and export electricity at times that are most beneficial or least costly to the system. ToU tariffs are the most important and most visible expression of smart energy network management. However, the questions expressed here needs to be considered in the light of Half-Hourly Settlement, and the Government's view that this is an essential foundational and enabling step for smart energy management.

## Providing price signals for flexibility

- The existing charging structure does not provide the signals needed to support full DSR, especially in the residential sector.
- The introduction of a capacity charge would be a short term step to encourage DSR.
- In the medium to longer term, a full revision of the charging mechanism is needed to support a fully functional DSR and DG market.
- Work is needed to understand true network costs so that assets can be charged according to their costs and benefits without one-off settlements for each.
- Government policy should as far as possible be technology neutral. A well designed flexibility market should allow all technologies to compete in a transparent fashion.
- The design of such a charging mechanism for the distribution system is not yet understood and urgently needs analysis and trialling. Technical feasibility, commercial viability, consumer acceptance and protection must all be balanced.

## Smart Appliances

- The industry needs an agreed definition of all elements of 'smart' that contribute to flexibility. Recognising not all appliances can provide all functions of flexibility. We need to define the smart elements of flexibility in order to classify appliances. This would be the basis of any market led label for smart appliances - as defined by their ability to deliver flexibility.
- We need to get the market design right first before we can regulate an offering for consumers through the appliance market. The development of smart appliances should be driven through developing the appropriate value proposition through market design, not by enforcing functionality on consumers before they can extract that value.
- To fully answer the questions being asked in this section considerable work is required to define the market and technical requirements for smart appliances. We have only touched the surface on this topic in our answer and invite Government to work with BEAMA to develop this further.
- Interoperability should not be forced through regulation but driven by the market and standardisation work.
- When this work is complete and the value for consumers understood and defined BEAMA would support the development of labelling for smart appliances ensuring consumers can appropriately engage with the flexibility market.

## Ultra-Low Emission Vehicles in a Smart Energy System

- Home EV charging is highly suitable for DSM interventions when coupled with consumer controlled parameters, equipment is commercially available today to perform these functions.
- The difficult part is creating the right market conditions to encourage consumers to install and use smart functionality. Two elements are vital in achieving this in the long term:
  - Ensuring that the systems themselves are part of a unified smart technology sphere developed in conjunction with other products by industry standards bodies for interoperability (i.e. government might set goals but not the specific standards of how to achieve them).
  - EV smart charging must be an integrated part of the domestic DSR market mechanism and not dealt with separately –this would be bad for EVs and harm progress in the rest of the market.
- V2H and V2G are again technically feasible and available today and may in the future serve a useful purpose but may be overtaken by other solutions such as static battery storage. Timely development of such systems would be enhanced by clearer understanding across different industries of the detailed nature of the need and the rewards for meeting it.

## A System for the Consumer

- The move to DSO presents several valuable opportunities for DNOs and the effective coordination of key resources, ownership and enabling policy frameworks are an essential aspect of this.
- Generally trigger points for further engagement should be in advance of the points at which the flexibility services and customer participation at domestic level (where appropriate) become necessary from a system perspective. We therefore need to start working on developing the market design and mechanisms to support a market for domestic energy flexibility today.
- There is a continued role for suppliers, aggregators, providers and installers in encouraging customer uptake of innovative solutions and new technologies and in clearly demonstrating the inherent value propositions.

### Cyber Protection and Cyber Security

- The market demand for products at a system and consumer level is already driving increased security standards for the market. Standards for communication protocols are already being upgraded for improved security and protection.
- Any DSR system needs to be designed with the above threats in mind. We already have a lot of this protection enshrined in current policy and regulation, including the Data Protection Act. Furthermore, we should be following the precedent set by smart metering for the ownership and storage of customer data.
- BEAMA members are engaging with the standardisation work around this topic at a European and International level and will continue to supply products into the market that meet the existing standards for Cyber protection and security.

### The role of different parties in system and Network Operators

- This section identifies some of the perceived barriers of DSO as well as examples of known work in the area. These new ways of operation present considerable benefits but there is also a need to consider the risks and cost implications, particularly the variations arising from the different market models and optionality therein, as well as the participation of the key stakeholders involved in scoping, delivering and harnessing benefits from the proposed changes. The move to DSO presents a number of key benefits to network operators and customers and this section aims to capture some of the most valuable benefits as well as suggesting industry ownership and examples of work undertaken to date or in progress as appropriate. Lastly this section identifies the key initial risks, benefit and cost implications of the presented high level market models and highlights the key requirement for broad stakeholder involvement in shaping and delivering these new approaches.

## Innovation

- Sufficient funding should be available for significant demonstration projects in these areas which have high TRL levels (above 5). Furthermore there should be funding available for the capital cost of these demonstrations and not only for research. For priority number 1 (Commercial and Residential automated DSR) there should also be a strong emphasis on research, and funding available for consumer side / consumer behaviour evaluation. Innovation spend should now be targeting trials at scale, aimed at moving into the commercialisation of new business models and technologies.
- Focus now needs to be on driving innovation through to Business As Usual and innovation should be established as a core part a Network operator's business.
- BEAMA members have reported on the limitations the NIC and NIA governance processes may place on innovation and the ability for truly innovative projects to come to the fore.
- Overall collaboration for LCNF, NIA and NIC projects with partners has been positive. BEAMA have reported to Ofgem in the past concerns over the level of risk companies are often forced to take on in delivering a project. This risk in most cases is also not proportionate to the size of the company that could be involved, and therefore favours the involvement of larger companies to partner on projects, likely to also already be active suppliers into the DNOs BAU procurement. This risk is reputational, as well as financial. Alleviating the risk SMEs would have to take on as part of a project would encourage more of the SME community to take leading roles in project delivery under NIA and NIC, benefiting the UK market overall.
- Issues around the treatment of background and foreground IP must be addressed. This is something BEAMA have been reporting on for 3 years and it is a significant barrier for many companies engaging with innovation projects.

