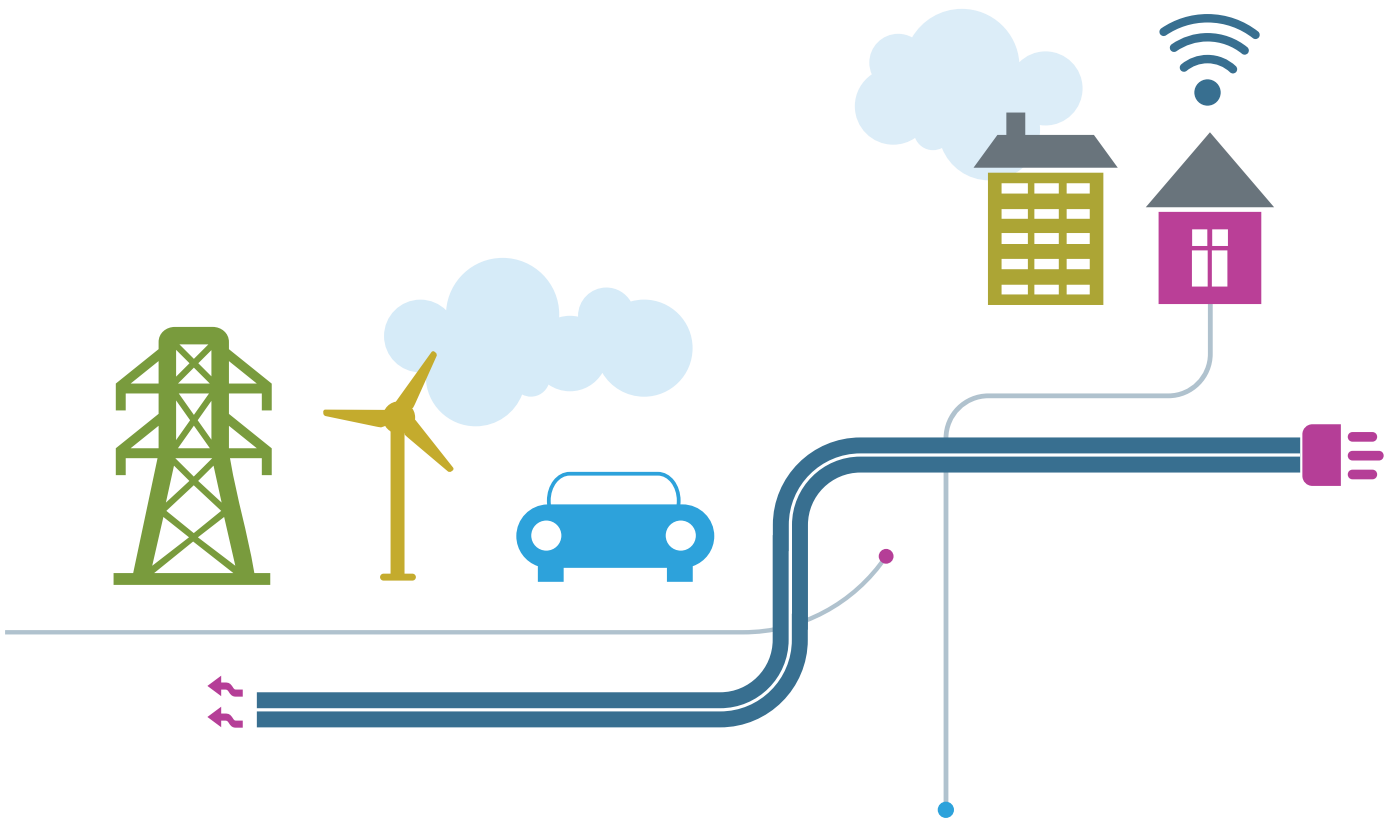


DEVELOPING A MARKET FOR SMART GRID

A White Paper for Policy Makers
and Regulators



COMPANIES INVOLVED IN THE PREPARATION OF THIS PAPER



Pegler Yorkshire



ABOUT BEAMA

BEAMA is the trade association for the UK electrotechnical industry, representing over 200 companies in the power, electrical and building services sectors. Our members, who range from multinationals to SMEs, manufacture the wide range of equipment required for end-to-end electrical systems.

The companies involved in the preparation of this paper are BEAMA Emerging Market members and have considerable expertise in the connected homes and smart grid sector.

Under BEAMA Emerging Markets we provide focused activity for existing and new product sectors and services that have significant potential to build UK supply chains and develop export opportunities. This encompasses Smart Grids, Electric Vehicle Infrastructure and Connected Homes. The focus of these cross sector groups is on connectivity of devices and systems and providing support for UK companies in representing them in the global market.

BEAMAs established product groups provide strong representation for companies already selling products into the UK supply chain, from transmission and distribution equipment, down to devices and systems for the built environment.

For more information about joining BEAMA please email smartgrid@beama.org.uk

Details about all BEAMA activity can be found on the BEAMA website www.beama.org.uk

INTRODUCTION

Consumers need to be put at the heart of EU and UK market reform. Fundamental to this is empowering them to control their energy use, incentivised by price and efficiency. The benefit of building flexibility into our energy system to manage demand and generation is two fold:

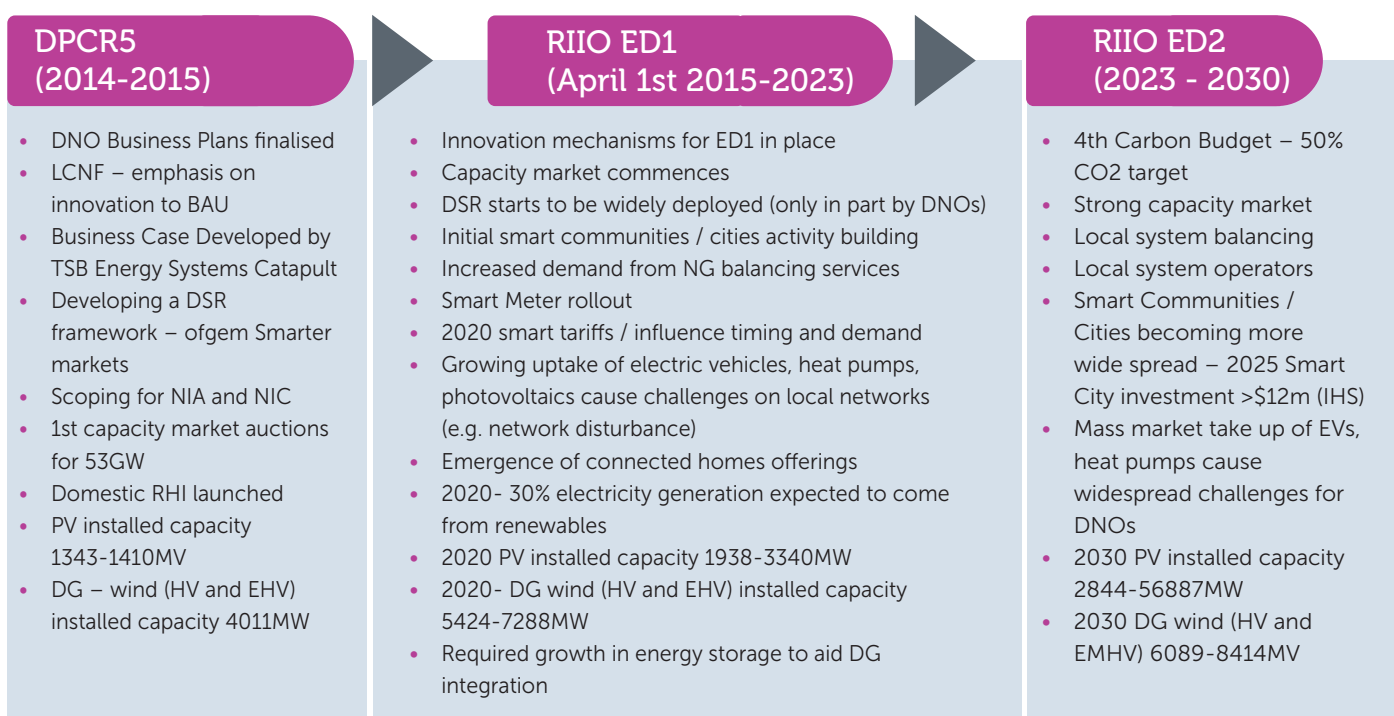
- Energy saving and maintained comfort for the consumer
- Minimised pass through costs of network reinforcement

BEAMA members manufacture infrastructure that makes up the end-to-end smart grid, from transmission and distribution equipment right down to the interfaces available for consumer control of their energy system, including smart meters, heating and lighting

controls. As the primary representative for the supply chain in this sector, BEAMA is fully aware that international and European standards are being developed today, that will become codified in EU regulation and market reform. Therefore the UK must provide a clear signal to the global supply chain and the European Commission that we are supporting this market and leading the development of products and system interfaces that will incentivise the empowerment of consumers in managing their own energy use.

It is clear that ED1 will mark a period of significant change in how we need to manage and operate the end-to-end electricity system. Therefore we need to consider carefully how we plan to manage this and maximise economic

and social opportunities from the changing needs of generators, network operators and the consumer. UK industry needs to accelerate investment in intelligent energy system design. It is evident that ED2 will mark a period of significant uptake in low carbon technologies and distributed generation, at volume, and to adequately prepare for this we need to invest sooner in designing an energy system that is efficient and can deal with fundamental engineering problems that are already evident today. BEAMA's concern is that not enough savings are being brought forward into ED1 through investment in smart grids, and the market trajectory for the supply chain is unambitious up to 2023.



TODAY'S MARKET TRAJECTORY

DEMAND SIDE RESPONSE AND NETWORK BENEFITS

The role of Demand Side Response (DSR) is changing. As a concept it has been established previously as a (reasonably) predictable means of delivering balancing services and avoiding network constraints either on a time or location basis. In other words, if peak loadings are predicted due to established load profiles or due to localised constraints, then DSR services can be called upon to ameliorate these events in line with pre-agreed contractual arrangements. Whilst an effective balancing mechanism, this approach relies on the old paradigm of centralised generation, single direction flow and no consideration of the changes brought about by the steady shift towards dynamic smart grid systems. DSR provides the DNOs with new, cost effective tools to address network and supply constraints.

**THE NEED TO MEET
THE CHALLENGE OF
INCREASING PV
GENERATION SHOULD
DRIVE A REVIEW OF THE
WHOLE DSR SERVICE
REQUIREMENT MODEL.**

Distributed Generation (Embedded Generation) is already bringing major changes to the electricity flows at the distribution level and this ripples up into the transmission system as unpredictable changes to demand requirements. The expected growth in the electrification of heat and transport will bring additional changes to energy flow and demand, creating challenges on local networks. These changes will not be easily predictable, particularly at the distribution level, and may not provide the luxury of hours or even minutes of warning to permit current 'Dispatch Notice' practice to be applied.

In terms of renewable embedded generation (wind power and solar PV generation), there are two distinctly different profiles:

- **Wind power** fluctuating with lower rates of change in outputs over a 24 hour period – and meteorological data is being developed that is capable of reasonably predicting these changes in output
- **Solar PV** which has a defined curve between dawn and dusk, but suffers from rapid changes in output due to cloud cover

DSR measures can potentially be used to accommodate these profiles, but different approaches are needed. In fact, wind generation could probably be managed using the 'DSR service requirement' of DNO (pre-fault dynamic) with dispatch notice times of between 0.5 and 4 hours and a 2 to 4 hour duration. However, the need to meet the challenge of increasing PV generation should drive a review of the

whole DSR service requirement model and hence during this process a better service could be developed for both wind and PV embedded generation matching.

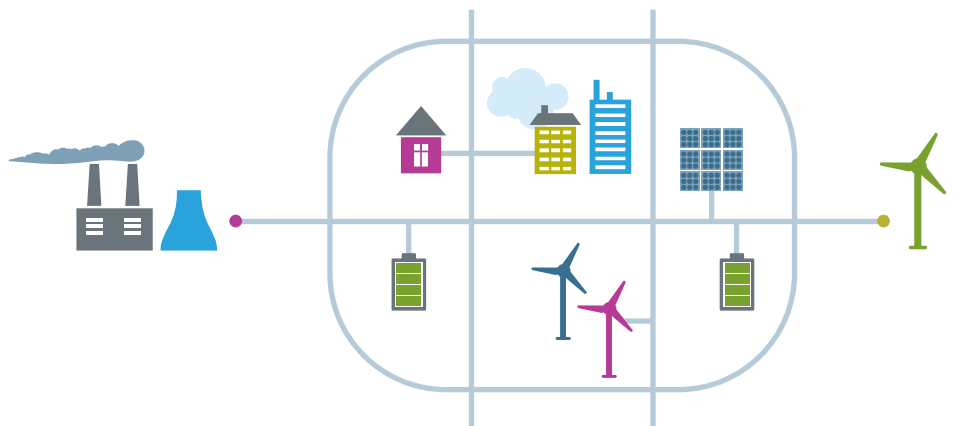
Projects are ongoing to establish the value of previously underutilised resources such as buildings in the role of DSR. For example the shared value of commercial buildings in a dense urban environment. Therefore the industry is understanding the role different building types may have in their ability to deliver DSR services that, when aggregated, could deliver benefits to all parties. Some of these projects could deliver learning that can inform the development of a shared service framework.

One further point to consider is that current DSR models tend to consider load reduction and/or standby generator operation to meet contractual requirements. While not explicitly stated, it seems to be generally accepted that standby generation will be delivered from diesel generators or similar. In future the ability to both sink and source power through load and generation management will increase and in these terms an electrical energy storage system could play a valuable part in meeting the more dynamic fluctuations that may occur on the distribution network. The potential value of storage applications in the UK is not accessible in today's market, and BEAMA supports work that may help facilitate the right market mechanisms enabling DNOs, and other potential owners of storage to extract its true value, and the corresponding value of DSR.

USERS OF ENERGY

Consumers will benefit not only from innovation and investment in smart grids, but they will also have the opportunity to reduce their energy consumption by engaging directly with the energy system. We must not underestimate the value that technologies such as thermal storage can also offer to the electricity system, especially in managing winter peak load.

These benefits put considerable emphasis on the application of smart metering data as rollout in the UK commences. How consumers visualise and use their energy data will considerably influence the development of the smart grid and the value we can extract from investments in smart metering as well as monitoring and automation equipment further up the system.



THE CONSUMER IS THE MOST EFFECTIVE SOURCE OF SYSTEM FLEXIBILITY TO MANAGE THE CHANGE IN GENERATION PATTERNS AND REDUCE CARBON EMISSIONS.

Technology suppliers can demonstrate the technical feasibility of system flexibility and options for consumers, whether through smart controls, building management systems or smart meter interfaces and consumer access devices. However, the commercial offerings for consumers are still unclear, placing increasing emphasis on the role of Electricity Market Reform and the regulatory changes necessary to realise the true value of demand side options. BEAMA are therefore very supportive of the work in the DECC Ofgem Smart Grid Forum.

A lot of potential options for demand side flexibility are being trialled in the UK through LCNF and other innovation funds. BEAMA's key focus is on how to develop a market for these options beyond trials and R&D, extracting the real market value of these offerings to consumers.

EMPOWERING DOMESTIC CONSUMERS – THE FUTURE CONNECTED HOME

The design of domestic energy systems is changing and with the introduction of FIT and RHI a growing number of domestic consumers now operate low carbon electricity, heat and hot water systems. In turn, the market for smarter controls is growing rapidly. These will enable integration of demand side flexibility to help alleviate stresses and constraints on the energy system and reduce consumer energy bills.

The UK Smart Metering rollout places a strong emphasis on consumer benefits and the pace of market demand for consumer engagement solutions in the UK is greater than anywhere else in the

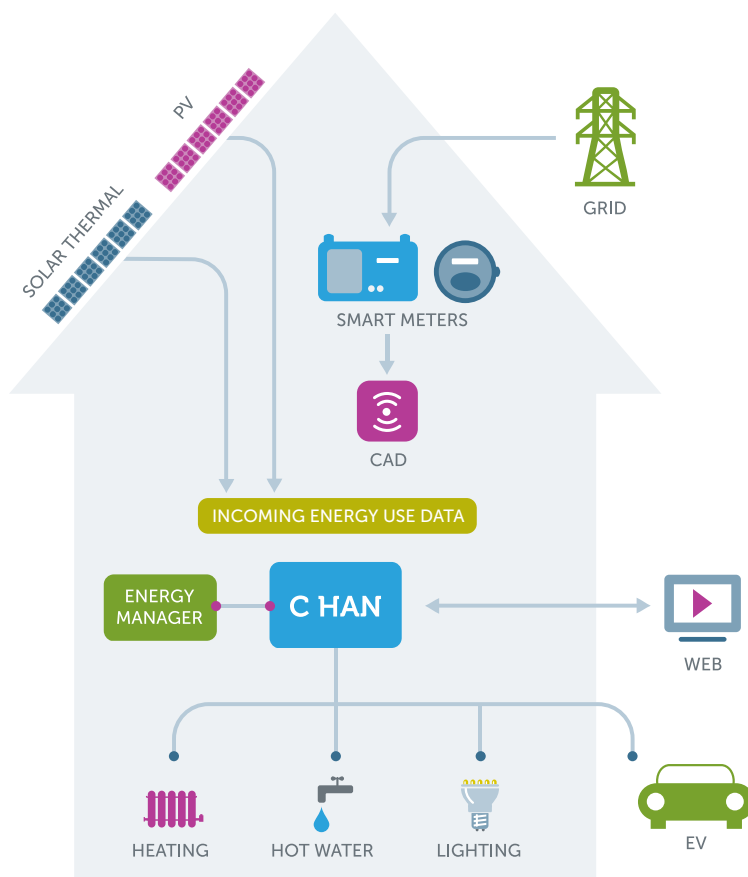
world. BEAMA therefore expects to see significant innovations in consumer energy management systems.

Within the mandated smart meter offering there is regulatory provision for a Consumer Access Device (CAD) to connect to the meter as a trusted device. The CAD will provide consumers access to their data. The meter data will be available to the consumer to use as required and a major potential use will be by the Consumer Home Area Network (CHAN) in the connected home. The connected home can use real time consumption and price data in conjunction with other incoming data

sources, e.g. local onsite generation weather, and make informed and automated decisions on the most efficient use of energy.

We can therefore envisage how the future smart home would respond to Time Of Use tariffs (TOU), dynamic and static. With the development of the appropriate tariff structures and the market standards to enable system integration, there are big opportunities for the UK market. The UK is well placed to take a leading role in Europe and internationally in defining the blueprint for this system architecture and design.

BEAMA'S FAST GROWING CONNECTED HOMES GROUP WILL BE CONTINUING TO WORK ON SYSTEM INTEGRATION AND RELATED STANDARDS FOR CONNECTED HOMES, AND ESPECIALLY HELP TO DEVELOP CONFIDENCE IN THIS MARKET SECTOR ON THE AVAILABLE SOLUTIONS FOR CONSUMERS.



THE CONNECTED HOMES

RECOMMENDATIONS IMMEDIATE MARKET CRITICAL ACTIONS

WE NEED A STABLE MARKET FOR RENEWABLES AND THEREFORE MUST BE CAREFUL IN MAKING CHANGES TO SUBSIDIES AND TARIFFS

- Regulatory arrangements need to be made to incentivise the ownership and operation of storage by the network operators and 3rd parties. The full value of storage for more flexible management of electricity is not fully utilised due to the lack of commercial incentive. The UK is missing a huge opportunity to develop a market for these technologies and drive innovation in this sector if we do not resolve this. Crucially we will limit the potential integration of renewables and DG on the system if we fail to deploy large quantities of storage in the UK, therefore endangering our efforts to meet CO₂ targets
- LCNF has facilitated a good level of collaboration across the sector and the learning from tier 1 and tier 2 projects is evident in the business plans in ED1. The emphasis on efficiency and competition in LCNF has meant that the tendering of projects is often treated as business as usual and therefore the UK is at risk of missing the original objectives in the drive for value for money. The emphasis during ED1 and the innovation allowance and competition should be on tackling system wide challenges across both the distribution and transmission system
- BEAMA notes Ofgem's recent announcement that it expects to see £400m savings in ED1 as a result of smart grid implementation by the DNOs. Achieving these savings will be very demanding and it will be necessary to accelerate the savings made possible through smart grid investment and intelligent system design. Such actions may also position the UK at the forefront of European developments
- We need investor confidence for a stable renewables market, and therefore must have consistency and continuity in policy support
- Market dynamics need to be better linked to tariffs. The recent move to simplify tariffs available could endanger the development of dynamic TOU and the formation of a valued DSR market
- Commercial and regulatory frameworks must be developed to enable dynamic TOU tariffs for domestic consumers, and encourage flexible services to enter the energy market on a level playing field with traditional energy sources. We therefore need to accept that DSR is a resource in a full range of markets, not just for large commercial consumers, and maintain an open market. BEAMA is therefore supportive of work being carried out by Ofgem to develop a DSR framework
- To commercially articulate the business case for automated demand side services we need to better understand future wholesale prices and the impact renewables may have on these. We are well aware that the automated control of some low carbon technologies will be costs sensitive, and therefore to determine the true value and optimal benefit they can have to the consumer and network we need to understand this fully
- System integration – the market for ICT and applications for consumer energy data is growing fast and this poses a significant opportunity for the UK. The industry will need to drive the development of standard gateway interfaces for smart energy platforms. This requires market wide involvement in relevant standards committees at UK, EU and international level. With the progression of the UK smart meter rollout we should be market leaders in this sector

GLOSSARY

RIIO	Revenue = Incentives + innovations + outputs The RIIO regulatory model sets the outputs that the Network Operators need to deliver for their consumers and the associated revenues they are allowed to collect for the eight-year period
ED1	Electricity Distribution 1 – the RIIO price control period between 1st April 2015 to 31st March 2023
ED2	Electricity Distribution 2 – the RIIO price control period between 1st April 2023 to 31st March 2030
DNO	Distribution Network Operator
DSR	Demand Side Response
PV	Photovoltaic
DR	Demand Response
EVs	Electric Vehicles
DG	Distributed Generation
NIA	Network Innovation Allowance
NIC	Network Innovation Competition
DECC	Department of Energy and Climate Change
HAN	Home Area Network
C HAN	Consumer Home Area Network
SM HAN	Smart Meter Home Area Network
RHI	Renewable Heat Incentive
FIT	Feed In Tariff
CAD	Consumer Access Device
LCNF	Low Carbon Network Fund
ICT	Information and Communications Technology
TOU	Time of Use
DPCR 5	Distribution Price Control Review 5



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