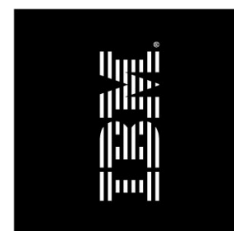**PLAN FOR A SMART, FLEXIBLE ENERGY SYSTEM:**

A Call for Evidence

(Issued November, 2016)

IBM Response to Ofgem and the Department for Business, Energy and Industrial Strategy

January 2017

Electricity Systems Team
Department for Business, Energy,
and Industrial Strategy

Energy System Integration Team
Office of Gas and Electricity Markets

12 January, 2017

Dear Sir,

Plan for a Smart, Flexible Energy System – A call for evidence

IBM is pleased to respond to the BEIS / Ofgem call for evidence. We have focused our comments on those areas where we have relevant experience and which we hope will assist in defining the approach and activities that will result in a Smart, Flexible Energy System.

I trust that you will find our response useful. If you would like to discuss any aspect of the response in more detail, please feel free to contact me.

Yours faithfully,

Graham Butler
Vice President Energy & Utilities, IBM United Kingdom Ltd.

graham.butler@uk.ibm.com

1   Introduction

Thank you for the opportunity to engage with Ofgem and BEIS through this consultation response. We have focused on responding to the questions to which we feel our viewpoints are most valuable, and have kept our responses brief and to the point. We have attached additional documents as part of this submission which provide a more detailed response to the wider vision of the evolving energy and utilities landscape.

This document provides general statements and a summary of our point of view regarding the move to a Smarter, Flexible Energy System. We also provided direct responses to a number of questions using the e-consultation.

We would welcome the opportunity to discuss responses further with Ofgem, BEIS and other stakeholders in the Energy and Utilities sector.

About IBM

In addition to being the world's largest IT and consulting services company, IBM is a global business and technology leader, innovating in research and development to shape the future of society at large. IBM's prized research, development and technical talent around the world partner with governments, corporations, thinkers and doers on ground breaking real world problems to help make the world work better and build a smarter planet.

About IBM Energy & Utilities

IBM works within a range of remits with clients across the Energy and Utilities Sector both in the UK and globally. IBM has published Point of View (POV) papers on the future of the Energy & Utilities industry, which we have included as part of this submission. IBM is a member of the USEF foundation[1] , which has demonstrated a common standard for a smart energy approach, ensuring interconnectivity in a future integrated energy market.

We have taken material from our POV papers in order to answer some of the questions you have asked in your consultation.

[1] *https://www.usef.energy/Organisation/USEF-Foundation.aspx*

2 Summary of IBM's Point Of View

The energy networks across the globe are changing at growing pace. Renewable energy, decentralised electricity generation, community energy, smart meters, smart grids, electrification of transport and heating, and battery storage are just some of the trends and technologies shaping the energy systems of the coming years. The GB electricity system is no exception. We believe that Ofgem's role in this transition is the vital one of promoting the speed of transition. The technologies are there and we must move the system forward to realise the full potential of their benefits.

The Energy Integrator

IBM has published its own Point of View on the vision of the future energy market landscape which describes the new role of the Energy Integrator. Whilst this Energy Integrator Model is a global viewpoint, we feel it has relevance in the GB market where new marketplaces will become established as we move away from a traditional energy market where large, centralised generators sell to energy retailers/suppliers and on to consumers using a unidirectional transmission and distribution networks. As part of our Energy Integrator Model, we have published white papers which we include with our submission; we invite stakeholders to read the paper and reach out to us for further discussion. We see the Energy Integrator Model as means of starting a conversation.

Figure 1 shows the context and potential roles of the Energy Integrator in an emerging Smart, Flexible Energy System.
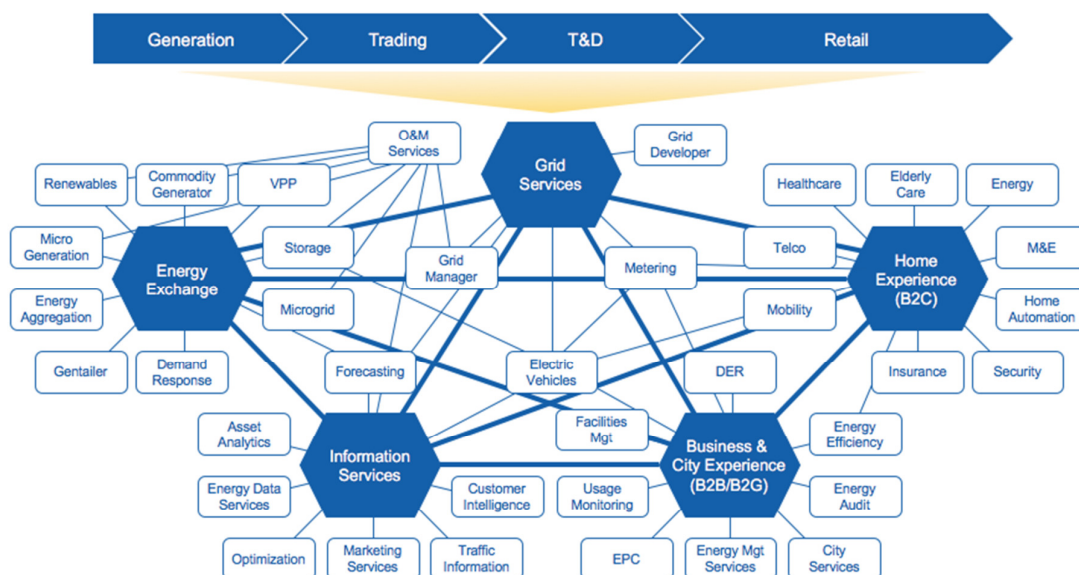
Figure 1: Smart, Flexible Energy System – capabilities and Energy Integrator roles

The speed at which we transition to a low carbon energy supply is defined by our national climate change policy and greenhouse gas emissions targets. It has been identified by the Future Energy Scenarios[2] that we will only succeed in meeting our targets if we proceed with a fully Gone Green scenario – involving a continued and concerted effort to transition to new technologies. The Energy Systems Catapult[3] has identified 135 new functionalities that will be required to meet the needs of the future energy system – and a number of associated risks and costs that go alongside the failure to deliver them in a timely fashion. The technologies we need are there and we now need to deliver a network and a market framework that allows them to operate.

Technologies referred to within our response

There are a number of technologies referred to with our response, a brief description of each is provided here to help the reader who may not be familiar with the technical terms.

Blockchain is a shared, distributed immutable ledger for recording the history of transactions. It fosters a new generation of transactional applications that establish trust, accountability and transparency. Blockchain became famous through its use in the Bitcoin crypto currency, in energy there are a number of uses we foresee for this technology, including energy trading (especially peer to peer) and supply chain tracking (e.g. ensure that firmware on smart meters and other sensors are not tampered with as the devices make their way through the supply chain).

For more detail see http://www.ibm.com/blockchain/what-is-blockchain.html and https://en.wikipedia.org/wiki/Blockchain_%28database%29

Internet of Things (IOT): The convergence of connecting people, things, data and processes is transforming our life, business and everything in between. The technical definition of The Internet of Things (IoT) is the network of physical objects accessed through the internet. Energy systems were of the earliest distributed systems that were instrumented with sensors, though these are usually connected over bespoke and dedicated networks. The rapid development of the IoT has however lowered the cost of sensors (whether they are connected to the internet or a private network) and has led to the development of powerful IOT data handling platforms which is benefitting the Energy industry.

For more detail see http://www.ibmbigdatahub.com/blog/how-internet-things-shaping-modern-business and https://en.wikipedia.org/wiki/Internet_of_things

Cognitive computing makes a new class of problems computable. It addresses complex situations that are characterised by ambiguity and uncertainty; in other words, it handles human kinds of problems. In these dynamic, information-rich, and shifting situations, data tends to change frequently, and it is often conflicting. The goals of users evolve as they learn more and redefine their objectives. To respond to the fluid nature of

---

[2] http://fes.nationalgrid.com/

[3] https://es.catapult.org.uk/

users' understanding of their problems, the cognitive computing system offers a synthesis not just of information sources but of influences, contexts, and insights. To do this, systems often need to weigh conflicting evidence and suggest an answer that is "best" rather than "right".

For more information see https://cognitivecomputingconsortium.com/definition-of-cognitive-computing/ and https://www.ibm.com/cognitive/

Technology Disruption in the Energy & Utilities Industry

Utilities are disrupted by four types of technology. Throughout the call for evidence, three types of these technologies are regularly discussed. Energy technologies, Consumer technologies and Operational technologies are well discussed within Ofgem's paper. It is time now to consider the IT solutions which will: complement, enable and be required for the development and implementation of the other three technology types. IT innovation including Internet of Things (IoT), cognitive computing, blockchain, big data, analytics and cloud computing are the underlying IT technologies behind a smarter more flexible energy system and it is vital that these transformative technologies are considered by Ofgem throughout their innovation strategies and funding initiatives.

Figure 2 puts the four disruptive technologies into context.
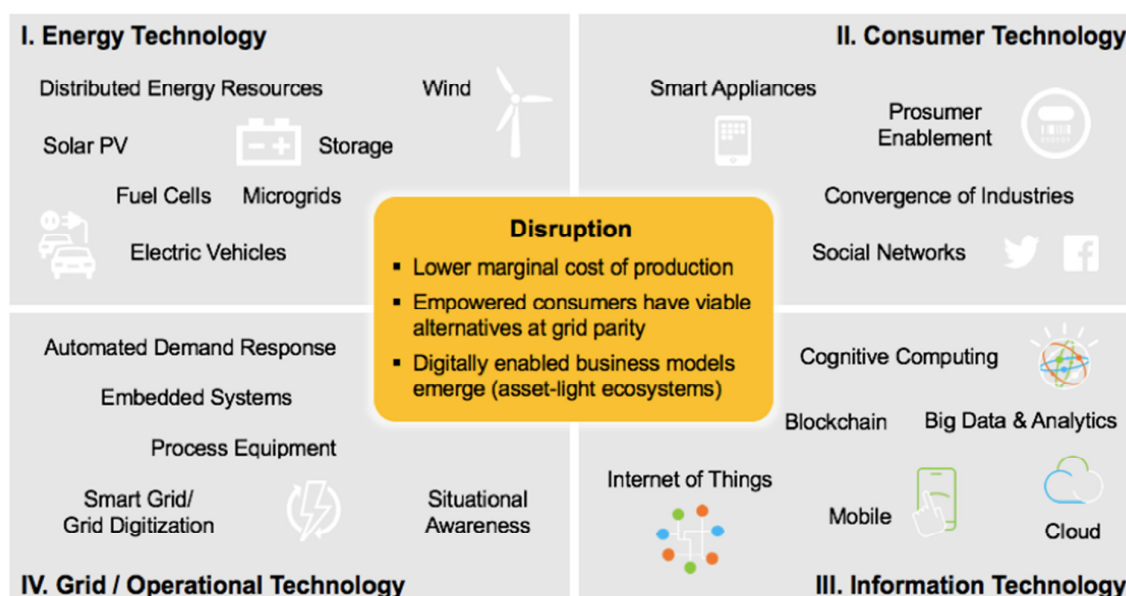
Figure 2: Four Technologies required for a Smart, Flexible Energy System

We believe that Ofgem and BEIS must widen their consultation network and engage with an audience of a greater range of stakeholders. The players in the electricity sector are no longer limited to the traditional group. It is time to embrace a wide range of technology and finance organisations as well as the increasing numbers of consumers and small scale organisations that are contributing to the development of Smart, Flexible Systems.

Innovation in energy is supported through the Network Innovation Allowance and Network Innovation Competition programmes, much of the focus of the projects under NIA and NIC is the trialling of emerging energy network technologies. We ask of Ofgem that they champion the support of innovation from a range of sectors to support the speed of transition that we must strive for in order to secure a Smart, Flexible Energy System, not just Networks.

At IBM we recognise the changing energy markets and networks as an opportunity to deliver smarter energy that is clean, affordable and flexible. The rate at which this change is occurring is increasing and the time for action is now. We welcome this chance to share our views with Ofgem and other stakeholders through this call for evidence, and we would welcome a continuing dialogue with Ofgem and other stakeholders on the design and delivery of a smarter, flexible energy network for Great Britain.

3   IBM response to specific questions

The Call for Evidence asks questions related to a wide range aspects of Energy Systems. We have focused on responding to the questions to which we feel our viewpoints are most valuable, and have kept our responses brief and to the point. We have attached additional documents as part of this response which provide a more detailed response to the wider vision of the evolving energy and utilities landscape.

IBM has provided responses to questions via the e-consultation: **11, 41, 42, 43, 45, 47 and 48**.

4 Contributors

This call to evidence response has been produced by members of IBM's Energy and Utilities industry team.

Graham Butler	Vice President Energy & Utilities	0771 3265496 graham.butler@uk.ibm.com
Jon Edmonds	Client Executive, National Grid	07887 708070 jon_edmonds@uk.ibm.com
Jeremy Willsmore	Energy & Utilities Industry	07860809397 willsmore@uk.ibm.com
Erwin Frank-Schultz	Energy & Utilities Industry Technical Leader	07714664741 Erwin.frank-schultz@uk.ibm.com
Phil Spring	Vice President, GBS E&U Industry Leader, Europe	07739 874577 phil.a.spring@uk.ibm.com
Laurence Carpanini	Director, Smarter Energy Solutions,	07710 397642 laurence.carpanini@uk.ibm.com
Adam Jones	Business Relationship Manager, National Grid	07721390093 Adam.Jones@uk.ibm.com
Pete Marsh	Client Technical Leader, National Grid	07500106761 Pete.marsh@uk.ibm.com
Cliff Wilson	Associate Partner, IBM Security	07967275392 Cliff.wilson@uk.ibm.com
Laura Daniels	Technical Consultant	07387049651 Laura.Daniels3@uk.ibm.com