ELECTRICITY MARKET REFORM CONSULTATION RESPONSE

FROM D3 GROUP
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EXECUTIVE SUMMARY

We define D3 as the spectrum of activities that encompass the demand side of energy use, namely:

- Demand Management (DM) – long-term reduction of demand - also known as energy efficiency or energy productivity
- Demand Response (DR) – short-term shifting or flexing of load
- Distributed Generation (DG) – generation of all types embedded in the distribution system.

We believe that the D3 label is useful for capturing all types of demand side activities which are often discussed separately but should be viewed as a whole.

The evidence from many studies and practical examples from around the world demonstrate conclusively that **D3 represents a very large, reliable and cost-effective resource for the electricity system** that to date has not been widely used. Expanding the utilisation of the D3 resource should be a central part of the electricity market for many reasons including:

- increasing the proportion of intermittent renewable generation capacity will require greater short-term response capacity
- the expansion of D3 will:
  - be more cost-effective than expanding supply capacity
  - contribute significantly to the policy aims of increased energy security, energy affordability and decarbonisation
  - bring other benefits including greater competition, business model innovation, new employment opportunities and inward investment
  - reduce the policy risk of dependence on rapid deployment of off-shore wind and new nuclear capacity.

We see EMR as a unique opportunity to put in place market mechanisms that drive the expansion of D3 and believe that this can be done through simple, clear and focused policy statements that are written into industry governance and regulatory frameworks. We recognise that the urgency of bringing on-stream new generation capacity means that EMR cannot be delayed and so **we strongly recommend that the Government implements a "no regrets" policy** that is consistent with its objectives for delivering effective market reform at least cost to the economy. If this is not done we may find that D3 options are effectively locked out of the market in a period in which we are likely to need all resources, both supply side and demand side, to be available for use.

We are not prescriptive in the design of market mechanisms to promote D3, and nor could we be within the time and resource constraints of our group. Different D3 resources are likely to need different mechanisms and as EMR is implemented resources need to be made available to design specific mechanisms within an over-arching policy direction and industry governance and regulatory frameworks.

Our guiding principles are that **markets are preferable to prescription** and that there should be **comparable value for comparable service**. The latter is particularly critical in the design of any capacity mechanism.

Key considerations that need to be included in EMR include:

Demand side resources need to be treated on an equivalent basis to supply side resources.

EMR must include incentives that help to create predictable, long-term revenue streams for D3 resources as well as supply resources and that these incentives should be accessible to market players throughout the value chain i.e. networks, aggregators, energy service companies and consumers – as well as the system operator, generators and suppliers.

Aggregators are an essential enabler for D3 and the EMR arrangements must support the establishment of D3 aggregators through means such as proportionate and lower cost regulatory systems.

Market stability is paramount. Investors in D3 need to be confident that policy as well as the regulatory and market framework can deliver contracts of sufficient duration.

The opportunity to develop D3 resources should be developed in advance of need. The requirement for demand response (DR) and flexible distributed generation (DG) will emerge rapidly and it is essential that market mechanisms to incentivise this "smart response" are established and functioning ahead of the real need.

Moving from today's electricity market to one that is fit for the future requires that the full D3 resource is made available to the market and this will become increasingly evident as new renewable capacity is brought on-stream and longer-term structural changes such as decarbonising the heating and transport sectors begin.

The reform process must be properly co-ordinated with respect to D3 resources. The immediate policy priority must be consideration of how demand management (DM) and distributed generation (DG) can participate in the CfD or Premium FiT arrangements.

To summarise:

- D3 represents a large, reliable and cost-effective resource that needs to be made accessible through EMR
- D3 can contribute significantly to energy policy objectives as well as bring other advantages in line with Government objectives
- Government needs to implement a "no regrets" policy that recognises the equivalency of the demand and supply resources
- The specific details of how the different D3 resources can be brought into the market can follow as long as the policy direction is clear and appropriate industry governance and regulatory frameworks are in place.

Contents

INTRODUCTION

We welcome the Government's moves to reform the electricity market and the opportunity to comment on the consultation document. This response to the electricity market reform consultation document and has been prepared by a diverse expert group of individuals from both commercial and non-commercial organizations, with long experience in both demand side measures and the electricity market. The views expressed in the document do not necessarily represent the views of the individuals' organisations, some of which have prepared separate submissions to the EMR consultation.

The contributors to this report believe that the demand side of the energy supply demand equation has never been fully recognised in energy policy and that electricity market reform (EMR) represents a once in a generation opportunity to put in place measures that will increase the uptake of the economic potential for demand side measures. The group shares a vision that putting in place measures within EMR to support the demand side of the energy market would contribute significantly to the three aims of energy policy, increasing energy security, improving energy affordability and reducing carbon emissions by bringing an additional, reliable and cheaper resource into the electricity system. In addition, policies to promote the demand side would increase competition by attracting new entrants, foster business model and technical innovation, and create new employment opportunities within a more innovative and dynamic electricity market.

We recognize the urgent need for EMR as well as the need for speed in implementing EMR in order to secure the necessary investment in new generating capacity. However, we also believe that there is also an urgent and important need to incorporate measures, or at least flexibility to introduce measures, into EMR that encourage the growth of demand side activities i.e. demand management, demand response and distributed generation. It is vital to implement a "no regrets" policy with respect to EMR and ensure that EMR has flexibility built into it in order that future options to encourage the demand side through market mechanisms can be introduced. We recommend that the concept that demand is equivalent to supply should be incorporated into the regulatory and governance framework of EMR and that the immediate priority must be a consideration of how demand management and distributed generation can participate in the CfD or Premium FIT arrangements. The opportunity to develop wider D3 resources should be developed in advance of need which will intensify rapidly as an increasing proportion of renewable generation is brought on-line and existing plant is retired.

WHAT IS D3?

There are sometimes problems of terminology when considering the various aspects of energy demand side measures, which encompass a diverse range of technologies and management techniques including energy efficiency techniques, demand response and distributed generation technologies, both renewable and non-renewable such as Combined Heat and Power (CHP). We believe that bringing them together under the D3 banner is helpful.

We define D3 as including three types of activity:

Demand management (DM) – the reduction of energy use on a long-term basis i.e. demand destruction. Demand management can be enabled by a wide range of diverse and site specific technologies e.g. low energy lighting of various types such as LEDs, lighting controls, insulation, more efficient industrial processes, and by management techniques such as monitoring and targeting. Demand management is also referred to as "energy efficiency", or "energy productivity". We prefer the latter term as it indicates the true nature of improving energy efficiency i.e. getting the same, or greater, output from reduced input of energy.

Demand response (DR) – the dynamic management of energy load on a short-term basis in response to short-term balancing requirements, possibly indicated by price signals. DR can be achieved through a range of technologies including the use of stand-by generators, switching off load, frequency response and energy storage. It is important to note that DR includes load shifting and demand shifting and could in future include increasing load in response to periods where there is excess supply, or negative energy prices, caused by the intermittent nature of renewables.

Distributed generation (DG) – (also known as decentralised or embedded generation), the generation of electricity from a diversity of sources, connected to the distribution system rather than the transmission system. DG can use a range of technologies including renewables (e.g. solar, wind, biomass) and low carbon (e.g. gas fired Combined Heat and Power - CHP).

Note that demand management and demand response, as well as distributed generation, can occur in both end users' premises as well as the electricity network itself.

THE D3 VISION

Encouraging the growth of D3 through market mechanisms to promote the use of D3 resources has the potential to transform the electricity market. At present the market is dominated by the "big six" vertically integrated suppliers who operate major power generation plant, operating in a costly and complex regulatory environment, providing an undifferentiated product to passive consumers. A fully functioning D3 industry, encouraged and supported by market mechanisms, would promote movement towards an electricity market in which there are multiple competing suppliers, offering differentiated services, increased use of decentralised smaller scale generation plants, active management of the network, a smarter grid, and full demand side participation. In this vision there would be greater competition, easier

market entry and a diversity of supply and carbon abatement options delivering greater resilience and reliability. Our vision is summarised in Figure 1 and 2.

Figure 1: Electricity Market Reform – the existing market

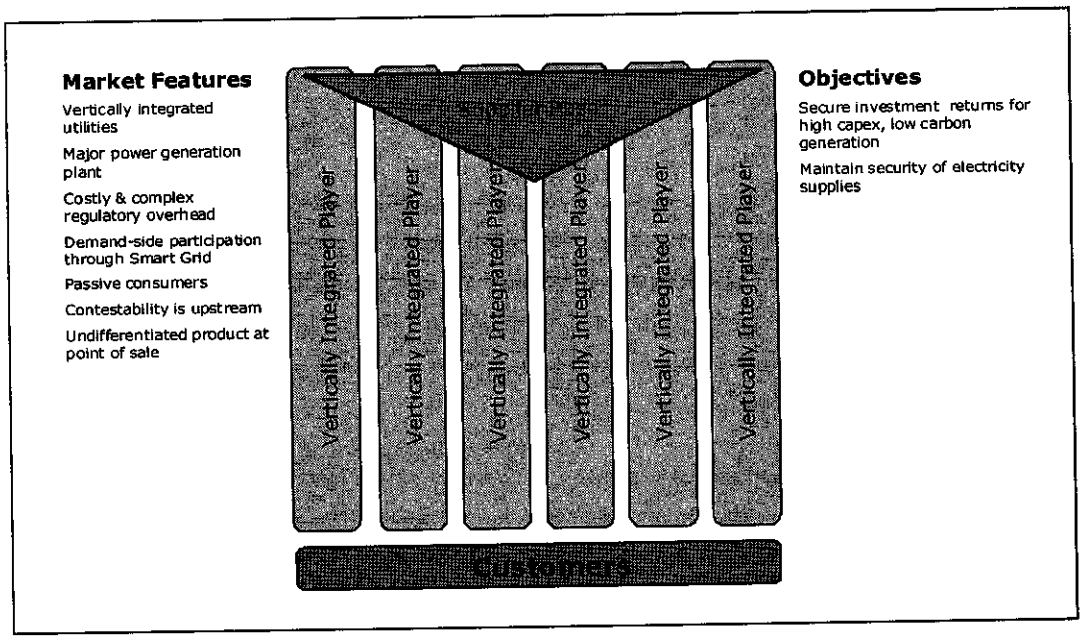
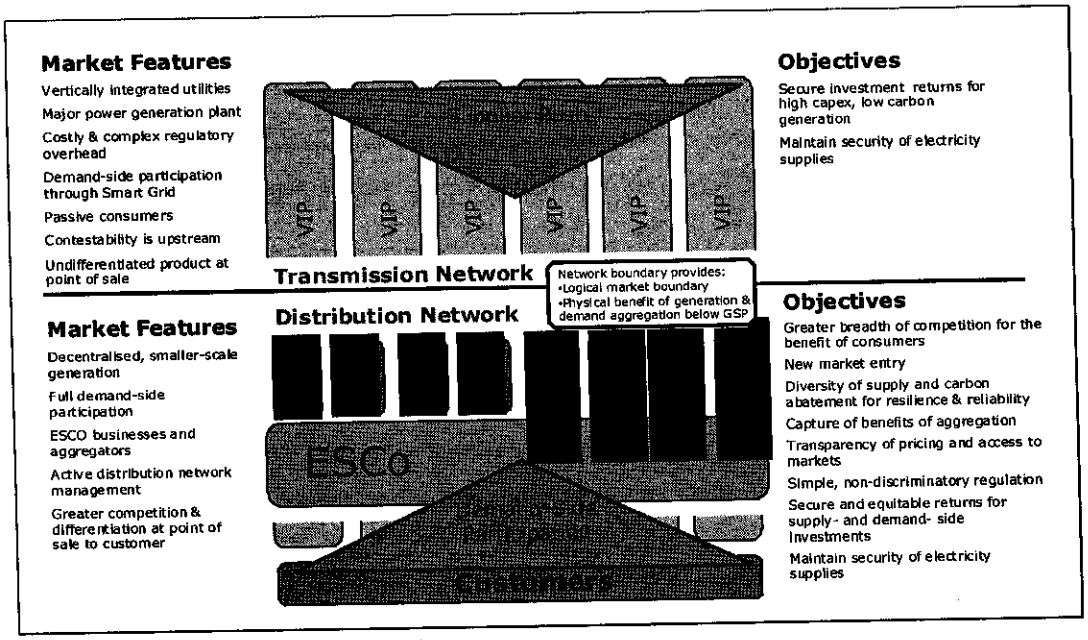


Figure 2: Enhanced Electricity Market Reform – with D3 Participation



Our vision is one in which the traditional means of encouraging demand side measures - exhortation and regulation, are replaced by properly functioning market mechanisms within the electricity market itself, both within energy markets and capacity markets. Different markets such as the short-term balancing market and the longer-term capacity market will need to be designed to provide parity between supply and demand options. D3 needs to move any from being thought of as a policy issue to being viewed as a reliable and cost-effective resource within the electricity system.

THE SIZE OF THE PRIZE

The prize that is on offer from enhanced D3 activities falls into three categories; demand management (energy efficiency or energy productivity), demand response (load management) and distributed generation.

Demand management

Many studies, over many years, have identified that there is an untapped and significantly sized resource on the demand side of the market that can help deliver policy goals more cost effectively than supply side alternatives. Leach et.al.[1] in a bottom-up study set out a low energy future "in which the UK could have 50 years of prosperous material growth and yet use less primary energy" than it did in 1979. Other studies at the level of individual firms, including Fawkes[2] (1985) estimated the economic potential for energy saving in the food and drink sector at c.30%. In 2010 the Food & Drink Federation agreed a target of 35% (increased from a previous target of 30%) reduction in carbon dioxide emissions by 2020 relative to 1990 levels[3], suggesting that despite much improvement over the last two decades the energy productivity resource is still very large. Around the world a few leading companies have demonstrated the potential for improving energy efficiency and reducing greenhouse gas emissions. 3M's 3E[4] and subsequent 3P programmes have yielded impressive results, reducing pollution and energy use as well as being profitable. Between 1990 and 2009 the company reports that it reduced its total greenhouse gas emissions globally by 77% (in absolute terms). From 1973 3M has reduced energy consumption indexed to net sales in its U.S. operations by 80% and between 2000 and 2005 it reduced energy use indexed to net sales by 27%.

The 2007 Mckinsey[5] study on global energy productivity identified energy productivity as a "compelling resource" and "a vast, low cost energy resource". In their global study McKinsey estimated that additional investments of $700bn a year in energy efficiency would cut global energy demand growth to 2020 by half while generating average internal

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1 Leach G. et.al. 1979 *A Low Energy Future for the UK*, IIED

2 Fawkes S.D. 1985 *The Potential for Energy Conserving Capital Equipment in UK Industries,* PhD thesis University of Stirling

3 Food and Drink Federation 2010 *Five fold environmental ambition. Progess report 2010. Building on Success.* http://www.fdf.org.uk/publicgeneral/FDF_Environmental_report_2010.pdf

4 3M website *Climate Change* http://solutions.3m.com/wps/portal/3M/en_US/3M-Sustainability/Global/Environment/ClimateChange/#Increasing Energy Efficiency

5 McKinsey Global Institute *Curbing Global Energy growth: The Energy Productivity Opportunity* http://www.mckinsey.com/mgi/reports/pdfs/Curbing_Global_Energy/Curbing_Global_Energy_executive_summary.pdf

rates of return of 17%. In addition, such investments (equivalent to 1.6% of global fixed capital investment) would achieve significant cuts in greenhouse gas emissions.

One study by the Electricity Power Research Institute (EPRI)[6] in the USA estimated that energy efficiency programmes alone have the potential to realistically reduce the growth rate in electricity demand from 1.07% to 0.83% per year from 2008 to 2030. Under ideally conducive conditions the study concluded that the growth rate could be further reduced to 0.68% per year. In 2030 this would represent a realistically achievable potential of 5% to a maximum achievable potential of 8% compared to the US Energy Information Administration (EIA) 2008 Annual Energy Outlook Reference Case forecast.

The UK Government in the 2002 Energy Review[7] identified the cost effective potential for energy efficiency at around 30% with potential financial benefits of £12 billion. This level of efficiency potential was noted as[8] "consistent with estimates from other countries summarised by the Intergovernmental Panel on Climate Change".

Researchers at the Rocky Mountain Institute, reflecting on 20 years of energy efficiency gains in the USA from the oil shocks of 1976 to 1996 noted[9]: "the scope for efficiency has, if anything, increased. In 1976 the argument was whether 10 or 30% could be cost-effectively saved. Now, after saving $180 billion a year it's 50 versus 90%".

The company and industry examples referred to above, coupled with many national and international studies, are compelling evidence that the energy productivity resource is both very large and cost-effective. Companies like 3M, however, are at the leading edge of good practice and many barriers to exploiting the full potential for improving energy productivity exist. We believe that it is possible to include measures in EMR that help to reduce many of the barriers to improving the uptake of financially viable demand side measures, thus improving the use of this large and economic resource, as well as increasing the size of the resource. To date the primary method of encouraging energy productivity has been exhortation and regulation, rather than through the market. We will describe how simple, clear and focused policies can deliver the benefits described above.

Demand response

A number of studies have identified the potential for demand response services over and above those already in place through National Grid's STOR system. A study for the DTI[10] identified that in the water industry there was the potential for 238MW of demand side flexibility, of which approximately 136MW could operate on timescales suitable on

[6] EPRI 2009 *Assessment of Achievable Potential from Energy Efficiency and Demand Response Programs in the US (2010 – 2030)* http://www.edisonfoundation.net/iee/reports/EPRI_SummaryAssessmentAchievableEEPotential0109.pdf

[7] Performance and Innovation Unit 2002 *The Energy Review*, UK Cabinet Office, http://www.cabinet-office.gov.uk/innovation/2002/energy/report/, Page 190

[8] Performance and Innovation Unit, 2001 *Energy Efficiency Strategy*, UK Cabinet Office, Consultation Draft September 2001, http://www.cabinet-office.gov.uk/innovation/2002/energy/report/working%20papers/PIUc.pdf, pages 8-9.

[9] *Rocky Mountains Institute Newsletter* Fall/Winter 1996 Volume XII Number 3, Snowmass, Colorado USA, http://www.rmi.org/images/other/NLRMIfallwin96.pdf

[10] DTI 2006 *Reducing the cost of system intermittency using demand side control measures* http://www.flexitricity.com/file/56721004-01%20DTI%20Demand%20Side%20Flexibility%20DTI%20format.pdf

timescales suitable for frequency response. The same study also identified 50.9MW of demand side flexibility in a large supermarket chain, at least 90% of which was low risk and could operate on timescales suitable for frequency response. This would equate to approximately 305MW in the large supermarket sector and approximately 411MW across the entire supermarket sector (including small and medium stores). Additional potential exists in the chemicals, paper, food and drink and manufacturing sectors, particularly in cooling systems, pumping, product movement and motive power. A further conclusion of the study was that smaller units of demand flexibility tend to offer faster response times than larger units. The overall size of the resource is certainly in the gigawatt scale with the potential for diesel generation estimated at up to 16GW.

As an increasing proportion of renewables are brought onto the grid the level of uncertainty ahead of real time will increase. It is widely recognised that this will result in an increase in system reserve requirements and an increasingly important need for demand response. The precise details of the changes that additional renewables will bring are yet to emerge but it is clear that D3 could provide a significant, low cost and reliable resource. Spinning reserve required for balancing purposes is both a major cost and source of carbon emissions and D3 could reduce the amount of spinning reserve required.

Dynamic demand applied to refrigeration, as being developed by companies such as RLTec, could replace significant quantities of spinning reserve. RLTec estimate that the three million domestic refrigerators sold each year in the UK represent more than 35MW of response while the installed base of thirty million refrigerators would represent some 350MW of response.

The potential for enhanced demand response has been studied in other countries. The EPRI study referred to above estimated that energy efficiency and demand response has the potential to reduce the non-coincident summer peak demand in the USA by 157 GW to 218 GW, representing a range of achievable potential in summer peak load in 2030 of 14% to 20%.

Distributed generation

Distributed generation currently accounts for approximately 10% of UK generating capacity (c.8 GW). Numerous studies have been conducted to assess the potential for DG, covering both specific technologies and across all technologies. For Combined Heat and Power alone, DECC[11] estimated a potential for 12.7 GW_e of installed electrical capacity by 2020, approximately double the current installed level. Analysis conducted by Pöyry and AECOM for DECC[12] also indicates the potential for substantial development of district heating networks: with a de-risked investment attracting capital at the 'societal' discount rate of 3.5% and with a full shadow price of carbon applied to the combustion of fossil fuels, it is estimated that heat networks could meet the heat demand of 3 to 8 million households and 15 to 26 million m^2 of non-domestic floor space, together accounting for 6 to 14% of the nation's building heat

[11] DECC 2010 *Updated Energy and Emissions Projections* http://www.decc.gov.uk/en/content/cms/statistics/projections/projections.aspx

[12] Pöyry and AECOM 2009 *The Potential and Costs of District Heating Networks* http://www.ukgbc.org/site/resources/show-resource-details?id=546

demand. These networks could provide the platform for valuable demand response resources capable of smoothing both peaks and troughs in power prices.

The benefits of DG include:

- Reduced energy use and reduced carbon emissions which come about through use of CHP or renewable generation technologies as well as by reduced losses through embedding generation within the distribution system.
- Increased resilience in the system i.e. reduced vulnerability. WADE[13] identified two types of vulnerability in the electricity system, supply vulnerability and critical infrastructure vulnerability. The former includes; supply vulnerability, labour disagreements, political and economic motivated supply interruptions, malicious interruptions and increasing competition in international geopolitics. Critical infrastructure vulnerability includes natural threats, military threats, and sabotage. Numerous industry and academic studies around the world support the view that distributed generation reduces both types of vulnerability.
- The possibility of increased local involvement with energy production, contributing to the localisation agenda.

WADE research also showed that the UK could save about £1.4 billion of avoided capital costs (c.27% lower than the centralised alternative), have lower energy costs and reduce carbon emissions by c.17%, by using DG to meet demand rather than central plant – mainly as a result of reduced need for expensive high voltage transmission[14]. A synthesis of similar WADE research from around the world suggests that a shift of investment in centralised power generation to decentralised generation typically saves anywhere between 15% and 40% of total delivered energy costs by displacing the need for generation capacity to meet peak electricity demand as well as grid capacity to transport the displaced power.[15] Independent research by the IEA and others reinforces these findings. The IEA estimate savings in excess of $125 billion as a result of increased global DG investment up to 2030.[16]

HOW D3 CAN CONTRIBUTE TO POLICY AIMS

D3 can directly, and materially, contribute to the three main energy policy drivers, enhancing security of supply, reducing energy costs and reducing carbon emissions.

D3 and energy security

Security of supply has several aspects to it; long-term security of supply, short-term security of supply and increased resilience - increased D3 activity can contribute to improving all of these. It is increasingly recognised that there are

[13] WADE 2007 *Security through decentralised energy*
http://www.localpower.org/documents/report_security.pdf

[14] WADE 2006 *Decentralising UK Energy: Cleaner, Cheaper, More Secure Energy for the 21st Century*
http://www.greenpeace.org.uk/MultimediaFiles/Live/FullReport/7441.pdf

[15] WADE 2006 *The WADE economic model, previous results and future application*
http://utahcleanenergy.org/files/u1/report_model_past.pdf

[16] IEA *Investment Outlook 2003*
http://www.iea.org/textbase/nppdf/free/2003/weio.pdf

likely to be short-term security of supply problems caused by increasing the proportion of intermittent, renewable energy sources (largely wind power) and that this will require an increase in the amount of Short Term Operating Reserve. The National Grid[17] in 2009 estimated that increasing wind power capacity to 30GW by 2020 would require an increase in STOR capacity by 6.5 GW (compared to the 2009 level of 4 GW). An increased level of D3 activity, particularly demand response, would improve short-term energy security by providing more, and cheaper, options for reducing demand quickly.

By improving energy efficiency the overall energy demand for any given level of economic activity is reduced, hence reducing the need for additional capacity and imported fuel, contributing to improving long-term security of supply.

The third aspect of energy security, increased resilience, would be enhanced by greater use of distributed generation providing greater resistance to technical faults or deliberate attack.

D3 and affordability

An increased level of D3 activity would contribute to improving energy affordability on several levels. Firstly by reducing overall energy volume for a given activity, demand management can reduce the overall cost to the energy consumer at any given energy price.

Consumers may also benefit financially if D3 measures are supported and incentivized. There is potential for increased use of new business models in which end users (industrial, commercial and residential) are rewarded for demand side services. These services are beginning to appear, with companies such as Flexitricity[18] providing aggregation of demand response through the use of standby generators and RLTec[19] developing frequency response technology for commercial and residential appliances. Other possible business models could evolve, such as "virtual utilities" which could feature use of building automation technologies (both commercial and residential) to aggregate demand management and responses for which consumers receive payments. As well as smaller early stage companies we are aware of a number of large established businesses (including well known consumer brands in other industries) with an interest in entering the D3 market with new business models. In addition, of course, incumbent electricity suppliers are in some cases looking to develop new business models around D3 services and would respond to any market incentives.

At the entire system level total infrastructure costs will be reduced as overall demand will be lower as the installed cost per MW and MWh of demand side measures is less than those for supply options. Reducing demand will also reduce

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17 *Operating the Electricity Transmission Networks in 2020*
http://www.nationalgrid.com/uk/Electricity/Operating+in+2020/2020+Consultation.htm

18 Flexitricity company website
http://www.flexitricity.com/

19 RLTec company website
http://www.rltec.com/

the costs of meeting the 2020 renewable targets. Demand side measures taken at the end user point have a knock-on effect through the system, reducing energy use and capital requirements at each stage upstream.

D3 and decarbonisation

An enhanced level of D3 activities contributes directly to decarbonisation in several ways. Firstly a "negawatt hour" i.e. an unused megawatt hour, is entirely carbon free (ignoring the carbon content embedded in any equipment necessary to install the measure). Secondly, by increasing the use of the potential demand response resource there will be a reduced need to keep fossil-fuelled "reserve" generation stations partly loaded on "stand-by". Shifting load as part of demand response could also reduce the need for fossil fuelled reserve. The enhanced use of distributed generation will reduce the overall requirement for fuel through the use of renewable or conventional combined heat and power (CHP) technologies which are more carbon or energy efficient than conventional power stations. In addition there will be savings due to reduced transmission and distribution losses, as electricity is generated or saved locally.

Additional benefits of D3

As well as the benefits outlined above an increased level of D3 activities will bring additional benefits. We believe these additional benefits include:

Future proofing the electricity system to ensure more flexibility into the 2020s. It is considered likely that existing market arrangements will be adequate through 2020 but after that an increasing amount of D3 will be needed to maintain system integrity. If flexibility is not built into EMR from the beginning it may be too late to bring in an increased level of D3 resource when it is needed.

Creating new services and green jobs. Research[20] indicates that for every £1m invested in energy efficiency 8–14 person years of direct employment are created. Indirect employment effects contribute a further 9-40 person years because lowered fuel bills mean money can be spent on other goods and services that are more labour intensive than energy supply.

- **The emergence of new business models.** If the conditions to encourage the growth of D3 can be put in place we believe we will see new business models emerging such as the virtual utility model, bringing technical and business model innovation. Since privatization the electricity market has seen little in the way of real innovation, either in technology or business model. Encouraging D3 could bring the level of innovation seen in other industries, notably telecoms. We are aware of a number of companies who are evaluating entering the energy market with new services and business models. Another possible business model, one that would fit with the localization agenda, is community aggregation of electricity purchasing whereby local authorities and other local organizations aggregate their purchase of electricity and associated services. This model has been proven in several states in the USA since the late 1990s. In Ohio and Massachusetts over 2.2 million

20 Impetus Consulting and Greenpeace 30 Mar 2009 *The Case for Including Energy Efficiency Investment in the Fiscal Stimulus Package.* http://www.greenpeace.org.uk/files/EE_fiscal_stimulus_Impetus_Report.pdf

customers purchase electricity through the Community Choice Aggregation (CCA) model[21] and four other States have passed CCA enabling legislation over the last 10 years.

- **Increased competition.** By encouraging D3 companies currently considering the energy market, and others, could be drawn into the energy supply market, creating the prospect of increased competition.

- **Inward investment.** The encouragement of D3 could bring with it increased inward investment. We are already seeing significant interest from large multi-nationals in investing in the UK residential smart meter roll-out for example[22].

- **Policy risk reduction.** The enhanced growth of D3 will improve system or technical resilience but we believe that it could also significantly reduce the overall risks associated with current energy policy which is dependent on the two pillars of greatly increasing offshore wind power and new nuclear capacity. The major aim of EMR is of course to unlock the investment in new generation capacity needed to ensure continuity of electricity supply in the face of planned retirement of both large coal fired plant and an ageing nuclear fleet. We see significant risks in both pillars of current energy supply policy, specifically the deployment of both large scale offshore wind and new nuclear capacity, even assuming EMR can put in place conducive conditions for investment decisions to proceed. The deployment of both forms of generation on the scale required may be delayed due to technical, economic and financial factors even assuming policy uncertainty issues can be resolved. Ensuring that EMR includes measures to encourage the growth of D3 activity would reduce the risks inherent in the current policy direction.

EVIDENCE OF DELIVERABILITY

Although the economic potential of increased demand side activities is generally recognised there are concerns voiced about D3, particularly from supply side participants, about its deliverability. The barriers to increased demand side activity are well known and include factors such as: the small, diverse investments involved which are much harder to embrace than a small number of large investments such as power stations, verification of energy savings, and maintenance of savings amongst others. We believe, however, that a sufficient body of evidence now exists that demonstrates that these issues can be overcome and that the economic potential of D3 can be delivered. In this section of the document we set out some of the available evidence from around the world.

The market mechanisms described are not necessarily the solutions that are appropriate for the UK but we believe that they conclusively demonstrate that appropriate market mechanisms *can* increase the use of the D3 resource and make it an integral part of an electricity system which is both reliable and cost-effective.

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[21] Marshall, S.E. December 2010 *Forming a National Community Choice Aggregation Network: Feasibility, Findings and Recommendations* http://www.galvinpower.org/sites/default/files/Community_Choice_Aggregation_Report_Final_1-4-11.pdf

[22] See for example Blobal plc's announcement that it has signed an MOU with Samsung to provide a fully funded solution for residential smart meters http://www.bglobalmetering.com/downloads/9e32b778-f906-47ad-9e8d-17fbb7987df9.pdf

ISO New England

ISO New England, which oversees New England's bulk electricity system and wholesale electricity markets[23], established a Forward Capacity Market (FCM) in 2006/7 that pays suppliers to ensure sufficient capacity is available to meet future peak loads. ISO New England projects power needs three years in advance and then holds annual auctions to purchase the resources necessary to satisfy the future regional requirements. This market allows energy efficiency and other demand resources to compete directly with generators. In the first auction, held in February 2008 (and subsequent auctions) demand side resources contributed substantially to eliminating the need for new generating capacity and to providing low cost resources to the regions consumers.

The ISO New England serves a population of 14 million people, covers 350 generators, 8,000 miles of high-voltage transmission lines with 13 interconnections to the electrical systems of New York State and Canada. The region has over 32GW of total supply, including 1,500 MW of demand response capacity, and an all time peak demand of 28,130 MW. In comparison, the UK has about four times the population and 2.5 times more supply capacity (80GW).

In the ISO New England forward capacity market demand resources covering all three components of D3, energy efficiency (demand management), demand response and distributed generation, are treated as fully equivalent to traditional power supply resources. It recognizes that demand response and distributed generation reduce the peak capacity required needed by reducing power requirements during identified peak hours. In addition energy efficiency and distributed generation have the potential to lower the entire load duration curve during peak and non-peak hours.

The FCM auction allows new capacity to set the market clearing price, accounts for location specific capacity requirements, and provides a multi-year (up to five years) commitment to new resources to encourage investment. Resources must clear the auction and demonstrate measured and verified performance during specified peak hours to receive capacity payments. The FCM auctions are live, Internet based auctions conducted over several days. The bidding begins with all qualified resources at the starting price and proceeds in a "descending clock" auction, with resources withdrawing at prices below what they deem to be acceptable. The auction ends when wither there is no longer excess capacity or the price reaches the auction floor price (which is set at 60% of the Cost of New Entry).

Energy efficiency and other demand side measures can have a significant impact if they are allowed to. In ISO New England's first Forward Capacity Market auction held in February 2008, 12,000 MW of new demand and supply resources submitted applications and of these 6,102 MW survived the qualification process to participate in the auction. Of the 6,102 MW, 41% - 2,483 MW – were demand resources with energy efficiency projects making up over 590 MW (9.7% of the auction) of the total. After eight rounds of bidding the auction ended at the floor price of $4.50 per kW per month and demand resources made up 2,554 MW of the cleared capacity (1,694 MW were existing demand resources and 860 MW were new projects). Of the 860MW of new demand resources were brought on line. These included 579 MW of real-time demand response and load management and 267 MW of energy efficiency. The

[23] Jenkins, C., Neme, C. and Enterline, S. *Energy efficiency as a resource in the ISO New England forward capacity market* http://www.veic.org/Libraries/Resource_Library_Documents/ISO_NewENgland_ECEEE_Jenkins.sflb.ashx

participation of the demand side measures reduced the cost of new capacity to consumers so it remained at the auction's floor price of $4.50 per kW per month.

The FCM payments allowed rebates to be paid to common energy efficiency measures through the reduction they made to peak loud. The modelled revenues based on the net present value of the FCM payments for appliances are: efficient refrigerator $8, efficient room air-conditioning $47, commercial lighting $3, residential compact fluorescent lamps (CFLs) $1.

But in order to participate only sophisticated organizations (such as Efficiency Vermont – see below) had the wherewithal to collect the verifiable data in a form suitable for the scheme. It is therefore essential that the auction [any similar market mechanism] makes clear that demand side projects are eligible, and that the auction mechanics are simple enough for likely sponsors (such as energy service companies, commercial buildings or local government) to come forward.

Efficiency Vermont

Efficiency Vermont is the branding of the Vermont Energy Investment Corporation (VEIC) which delivers energy efficiency services to businesses and citizens of Vermont, a total of over 330,000 electricity accounts. Efficiency Vermont is effectively an energy efficiency utility (the first in the USA) and was created by the Vermont Legislature and the Vermont Public Service Board in 2000. Its mandate is to promote cost-effective acquisition of energy and demand resources through energy efficiency and an energy efficiency surcharge on each consumers electricity bill funds the energy efficiency resource acquisition activities of Efficiency Vermont.

Efficiency Vermont is an ISO New England market participant and as such takes part in the FCM described above.

Efficiency Vermont, in its 2010 annual report[24] reported a cost-benefit ratio of 2.75 to 1 with net benefits, after costs of $48.1m, of $83.8m in 2009. The energy savings were 96,000 MWh with a reduction in carbon dioxide emissions (across the lifetime of the measures) of 614,000 tons (557,000 metric tonnes). Measures implemented also reduced peak demand, by 13.5MW in summer and 15.2MW in winter.

The Efficiency Vermont capacity commitment, at 62 MW, represents the second largest commitment in the State (after the Vermont Yankee nuclear plant at 620 MW). All other demand resources in the state together will provide a total of 41 MW of capacity reduction, making them in aggregate the fourth largest resource.

PJM

PJM Interconnection, LLC (PJM) is the regional electricity transmission organization (RTO) that coordinates the movement of electricity and administers wholesale electricity markets in an area that extends, following recent expansions, from New Jersey and Pennsylvania in the northeast, south to parts of North Carolina and Kentucky, and

[24] *Efficiency Vermont 2009 Annual Report* November 2010
http://www.efficiencyvermont.com/stella/filelib/FINAL2009AnnualReport.pdf

west to parts of Illinois (the PJM Region). It covers a population of 54 million, has a peak load of 144.6 GW, 164.9 GW of capacity, 1,310 generators and delivered 745,000 GWh of energy.

Since 1999 PJM has had a requirement that demand side resources be treated as capacity. In 2007 PJM implemented a Reliability Pricing Model (RPM) system in which Base Residential Auctions (BRAs) are conducted to procure capacity for successive 12 month periods for future periods, up to three years ahead. The BRAs have seen a steady increase in demand response clearing the auction. In 2009 there was an increase of 5,682 MW in demand[25]. As a percent of peak load, DR has increased from 1.2 percent in 2006/2007 to 6.3 percent in 2010/2011, approaching the 7.5 percent limit set under PJM's market rules. As a result, PJM recently undertook a study of DR saturation and recommended increasing the limit to 8.5 percent for the RTO, finding that this level would produce a low probability (10 percent) of a resource being interrupted more than 10 times. Greater limits were proposed by PJM for the specific areas within the ISO.

The operation of the PJM RTO is not without controversy with prices being significantly higher than those projected in simulations before the event.[26] In addition the design of the auction has resulted in existing generation capacity taking most of the available payments under the scheme.

Building Owners and Management Association (BOMA) of Chicago

The BOMA of Chicago, a trade association for the commercial real estate industry in the city, working with Metropolitan Energy Services (an energy service company) has devised a virtual utility model that aims to sell capacity into the PJM capacity markets. The scheme involves many of the iconic large skyscrapers in the downtown "loop" area of the city and it is estimated that savings of peak load of up to 200MW[27] (20% of the aggregated peak demand of BOMA members) could be achieved once the scheme is in operation. By bringing together BOMA members a larger capacity can be offered into the PJM market and BOMA members can achieve a better deal than by contracting independently with DR providers. Having failed to receive US Department of Energy stimulus funds the pilot plant is receiving $20-$30m investment from Korean companies. It is expected that the pilot programme will come on-line in the summer of 2011.

The BOMA of Chicago project illustrates several things; the size of the D3 resource, the emergence of new business models involving multi-party collaboration, increased competition and the attraction of inward investment.

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25 Boston, T. 20 January 2011 *2010 ISO/RTO Metrics Report PJM Highlights*
http://www.isorto.org/atf/cf/%7B5B4E85C6-7EAC-40A0-8DC3-003829518EBD%7D/2010%20ISO-RTO%20Metrics%20Report.pdf

26 Wilson, J.F. *Raising the Stakes on Capacity Incentives: PJM's Reliability Pricing Mechanism (RPM)* 14 March 2008
http://www.publicpower.org/files/PDFs/RPMreport2008.pdf

27 Chicago buildings use DR to sell virtual power in PJM
http://www.competecoalition.com/newsroom/chicago-buildings-use-dr-sell-virtual-power-pjm

Connecticut Renewable Portfolio Standards

The State of Connecticut has implemented Renewable Portfolio Standards (RPS) that include renewable power, power from CHP, energy efficiency and demand response. The mandatory percentage from CHP, energy efficiency and load management (defined as Class III resources) increases from 1% in 2007 to 4% by 2020[28].

ConEd New York

ConEd NY identified a need to reduce local peak capacity by 192 MW by 2012. Energy service companies were invited to bid in demand side measures. An extensive system of Measurement and Verification (M&V) was required to prove the benefits. All the successful bids were based on improving energy efficiency and the total costs of $144m were out weighed by $450m of benefits. As a result of this programme ConEd NY reviewed planned capacity upgrades in the area and concluded that some planned upgrades would never be needed[29].

Australia and New Zealand

Between 1993 and 2004 New Zealand instigated reforms in its electricity market, some of which have helped to encourage the growth of D3 services. Orion, a combined retailer/distributer 88% owned by Christchurch City Council was confronted with growing demand peaks and in 1990 instituted demand-management schemes for its customers that included, among other things, direct shifting of water heating off-peak (in the period when it could trade electricity), facilitating insulation of houses and peak-load pricing. The effect of these programmes has been to decouple peak demand, and hence network capacity growth, from the growth in energy demand. Orion estimates that the effect of the measures has been to delay, perhaps for a very long period, the need for additional generation and the accompanying network enhancements, suggesting a saving of $180m[30]. Although the prime effect has been on network capacity it is also likely to have moderated the growth in electricity demand. Orion presents evidence that shows that electrical usage has not grown as fast as the local economy which is in contrast to the New Zealand economy as a whole.

Meridien Energy introduced the country's first power exchange in August 2001, allowing nine larger customers to resell contracted energy supplies, with 90% of the resold energy arising from voluntary demand reductions e.g. from changing production schedules. Such exchanges help non-wholesale customers to assess the relative merits of using contracted energy supplies for their own use or selling it to customers who ascribe it a higher value, thereby facilitating an increase in the price elasticity of overall electricity demand. In October 2003 the largest New Zealand network infrastructure company launched the country's first nationwide demand-side power exchange, focusing on medium to large users.

Energy Response Pty is an open access aggregator of demand side response for participants in the New Zealand and Australian electricity markets. In November 2005 NEMMCO (the Australian system operator prior to 2009) tendered for

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[28] Department of Public Utility Control Connecticut Renewable Portfolio Standards Overview. http://www.ct.gov/dpuc/cwp/view.asp?a=3354&q=415186

[29] Neme, C, Peterson, P. *Competitive Procurement of D3 Resources*, Regulatory Assistance Project, D3 Expert Stakeholder Workshop 3 March 2011

[30] Evans, L., Meade, R. *Alternating Currents or Counter-Revolution?* http://www.iscr.org.nz/f310,14100/14100_Chapter_7_Demand-Side_Participation.pdf

500MW of reserve capacity for the period 16 January to 10 March 2006. On 13 January 2006 NEMMCO announced Energy Response Pty Ltd was awarded a contract to supply 125MW of firm reserve through aggregated demand side response for 15 hours a day. This equated to about 25% of the total Victoria – South Australia shortfall of electricity reserve required during peak times[31].

Denmark

Wind presently accounts for approximately 20% of Danish power generation and the country has an ambition to raise this contribution to 50% by 2025. CHP accounts for the majority of electricity production, providing 52% of generation in 2000[32]. Much of this CHP plant is used to provide heat to local or city-wide district heating networks incorporating significant thermal storage capacity.

Until the end of 2004, CHP plant connected to district heating plant was subject to a fixed, 3-tier, time-of-day tariff regime. In January 2005 this system was revised, with generating plant of greater than $5MW_e$ dispatched in response to prices in the spot market. This arrangement has ensured that this capacity is increasingly responsive to market conditions, including price signals created by variations in wind output. In some networks, the addition of electric boilers has further enhanced the flexibility of these systems, affording operators the opportunity to take advantage of low spot prices in the power market to recharge thermal stores for subsequent heat supply. Figure 3 3 below illustrates the operating regime of one heat network in response to episodes of peaks and troughs in the power market. CHP operation is restricted to peak price periods, whilst during a collapse in power prices on the Sunday an electric boiler is dispatched to restore thermal reserves.

Analysis under the Ecogrid study[33] has determined that the goal of 50% of electricity from wind is feasible, but only with fundamental changes to the power system operation and architecture. In addition to the interconnection to Nordic and northern German networks, this is likely to require a wide range of distributed resources in both the demand- and supply- side. Thermal storage is one such resource, with an estimated capacity of between 20 and 30 GWh. In a system operating with around 5 GW of wind capacity, this storage facility is considered likely to provide a valuable sink for peaks of wind energy generation, allowing continuous wind farm operation to meet instantaneous electricity demand and charging of thermal storage to meet future heat demand[34].

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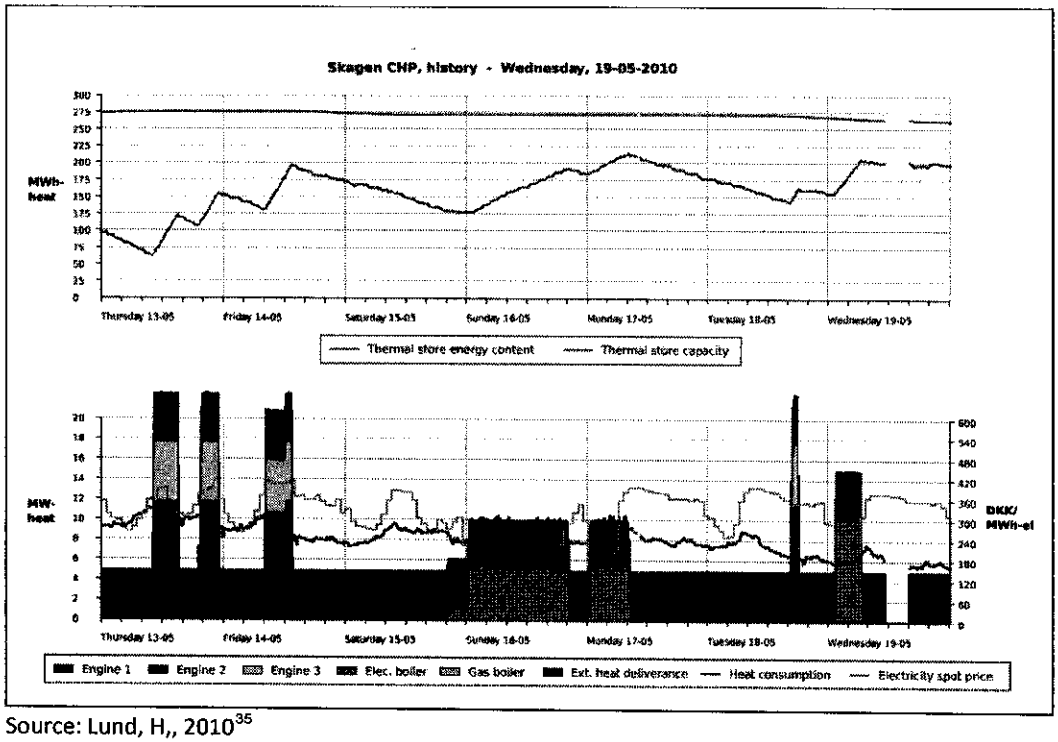
31 Energy Response Pty website http://www.energyresponse.com/?pageid=3&cid=3

32 Odgaard, O., & Jørgensen, M. H. 2005 *Heat Supply in Denmark: Who What Where and Why.* Energy Copenhagen: The Danish Energy Authority

33 Trong, M. D., Nørregaard, K., Østergaard, J., Bach, P., Lind, M., Sørensen, P., et al. 2009. *EcoGrid.dk Phase I Summary Report: Steps towards a Danish Power System with 50 % Wind* Energy. *Wind Energy.* Århus, Denmark.

34 Smith, A., 2010, *Quantifying Exports and Minimising Curtailment: From 20% to 50% Wind Penetration in Denmark*, London Analytics/BIEE

Figure 3: Experience of Integrated CHP and Thermal Storage Operation



Source: Lund, H,, 2010[35]

Conclusion

We believe that these examples from around the world demonstrate conclusively that putting in place market mechanisms that recognize the equivalency of supply and demand options brings forward a large, reliable and cost-effective resource for use in the electricity system. Here we are not arguing in favour of any specific market mechanism, only that the principle of demand and supply equivalency should be built into EMR along with flexibility that will allow the introduction of market mechanisms designed to increase the utilisation of the D3 resource.

UK

We are aware of many D3 initiatives in the UK including:

- A growing number of Energy Service Companies offering services to the industrial and commercial sectors
- Nascent Energy Services Companies developing business plans for the residential sector
- Localised generation schemes – driven by both private and public sector agencies – using Combined Heat and Power and renewable generation sources

[35] Lund, H. 2010, *The Danish Experience in successfully managing the integration of renewables and CHP in a smarter grid structure*, Aalborg University, Denmark

- A growing interest from large companies in aggregating large scale demand management measures
- Demand Side Management, Active Distribution Networks and Distributed Generation are all key features of the Electricity Networks Strategy Group (ENSG) Smart Grid Vision and Roadmap[36].
- ENSG is jointly chaired by the DECC and Ofgem. The ENSG smart grid working group was been tasked by DECC and Ofgem to produce these reports. They were published on 2 December 2009[37].
- The smart grid area is strongly related to D3 and there is considerable parallel and important work going on in smart grid. Ofgem subsequently announced the selection of four innovative projects that will speed up the crucial development of smart grids. They share £62 million of funding from the £500 million Low Carbon Networks Fund.

Action by local authorities to install D3 measures

Birmingham regards EMR as an opportunity to promote more efficient city energy planning through the encouragement of new "city energy cooperation platforms". It is undertaking a 25 year street maintenance programme and in the first five years will result in 50% of the street lighting being replaced with almost wholly LED lighting. On air conditioning units Birmingham has utilised chilled beams in the refurbishment of one of our major offices.

Birmingham and London boroughs Camden and Haringey are lead partners in two electric vehicle charging infrastructure project's which has the potential to provide local electrical storage.

Smart Grid Development

Ofgem subsequently announced the selection of four innovative projects that will speed up the crucial development of smart grids. They share £62 million of funding from the £500 million Low Carbon Networks Fund.

CE Electric: Customer-led network revolution (£26.8m)

A project in the north east exploring how a combination of smart technologies and changes in customer behaviour can reduce the costs associated with low carbon technologies. The project uses British Gas' early roll out of smart meters and low carbon products such as solar panels and heat pumps. It also sees CE Electric working with a variety of partners, including Durham University to evaluate the GB potential for smart demand response.

UK Power Networks: Low carbon London – a learning journey (£24.3m)

A "smart city" initiative for London that will explore how to best use new technologies and active network management. The project will also seek to understand when, how and why consumers use energy and how this can be influenced. This will work on the back of several existing low carbon projects, such as the Plugged in Places Scheme that encourages use of electric cars. The project will be carried out in partnership with a number of organisations throughout London, including EDF Energy, Imperial College, Logica and Transport for London.

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[36] http://webarchive.nationalarchives.gov.uk/20100919181607/http:/www.ensg.gov.uk/assets/ensg_routemap_final.pdf

[37] http://webarchive.nationalarchives.gov.uk/20100919181607/http:/www.ensg.gov.uk/assets/ensg_smart_grid_wg_smart_grid_vision_final_issue_1.pdf

Central Networks: Low carbon hub (£2.8m)

This project in East Lincolnshire will investigate ways of increasing the amount of electricity generation - mainly wind - that can connect directly to the local electricity network. The project will monitor wind speed, generator output and network conditions and the knowledge will benefit small, renewable generators who want to connect directly to the distribution network. This will help deliver potential savings to customers by allowing more generation to connect at lower cost.

Western Power Distribution: Low voltage Network Templates for a low-carbon future (£7.8 million)

This project in South Wales will examine the effect that low carbon technologies have on the network. The trial will help other companies become more efficient by allowing them to anticipate network behaviour and know which solutions have already been proven to work well. It will work with existing Welsh Assembly Government and npower initiatives[38].

Although we see increased interest and activity in demand side measures there remain many barriers to the growth of the D3 sector. For example several local authorities are developing CHP led DG projects that could result in significant local low carbon electricity generation. Market conditions, however, do not provide the means by which investors can recover sufficient value from their investment. These authorities favour an approach that allows direct sales to consumers, currently only allowable in smaller projects in which third party access is allowed. We believe that incorporating appropriate market mechanisms, and other regulatory changes, into EMR will foster the growth of innovative D3 services.

[38] Ofgem press release. *Ofgem Awards £62 million across four projects in first Low Carbon Networks Fund competition* http://www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=343&refer=Media/PressRel

UNLOCKING THE POTENTIAL OF D3 THROUGH THE EMR

The previous section underlined the value of D3 resources in achieving the transition to a secure, competitive and affordable energy system. This section sets out recommendations for the key elements of the Government's approach.

These recommendations draw extensively upon the findings of the D3 Expert Stakeholder Workshop held on 3 March 2011. A report of the proceedings can be found in 'Appendix four: D3 stakeholder workshop report, 3rd March 2011'.

The considerable benefits that D3 resources can deliver are apparent in the evidence of international experience. The case for incentivising these resources is amplified by the pathway to decarbonisation that the Government has adopted. Although the UK market is already demonstrating limited progress in mobilising some D3 resources, most notably demand response, the contribution of D3 falls far short of that which will be required in a largely decarbonised electricity system. It is, therefore, critical that the Government pursues a comprehensive and progressive programme of reforms at this time, which will:

- provide the certainty of a long-term framework that all elements of the industry require; and
- avoid the risks and costs that are inherent in a more restricted programme of reform that offers the ephemeral attractions of bureaucratic simplicity and short-term deliverability.

Fundamentals

- **The first step in the process of electricity market reform is the establishment of robust arrangements for industry governance and regulations.** This overarching framework must provide for a clear allocation of responsibilities and liabilities between institutions that are consistent with the objectives of the reform process. It should not aim to prescribe the specific mechanisms or processes that should be adopted, nor the specific techniques or technologies that should be supported. This requirement is not unique to the D3, but applies in respect of all elements of the electricity system. The case for this approach is set out in the paper presented in Appendix three: Paper on governance and institutions by Simon Skilling.

A Core Approach to Mobilise D3

- **D3 resources present to Government a 'no-regrets' approach** that is consistent with its objectives for delivering effective market reform at least cost to the economy. This is because the potential upsides of D3 can be obtained through establishing a clear governance and regulatory framework and, thereby, without the need to for significant additional effort in developing new detailed policies. International experience demonstrates the capability of D3 resources to provide a diversity of reliable and cost-effective services that reduce CO_2 emissions, enhance system resilience and reliability and mitigate investment and operating costs across the energy system. For a Government that has consistently emphasised its commitment to energy efficiency and a reduction in energy costs, the mobilisation of D3 resources should be a priority.

- **Evaluation of policy mechanisms.** Following the development of the institutional framework, the Government should progress the development of the discrete elements of its EMR proposals. Each of the relevant proposals that are adopted – specifically the Feed-In Tariff and Capacity Mechanism as presently envisaged – should be designed and implemented to enable and incentivise the participation of D3 resources.

Guiding Principles

- Comparable value for comparable service. The principle that all providers capable of providing a comparable resource to the system receive a comparable reward for that service must be applied across the reformed electricity market. This is critical in the design of any capacity mechanism and in the process to allocate FITs.
- Markets should be employed in preference to prescription. EMR should be based on the principle that markets offer the greatest opportunity to incentivise a competitive, efficient and cost-effective service that meets the long-term interests of consumers. The diverse, dynamic and innovative nature of developing D3 resources is fundamentally inconsistent with that a prescriptive or administered approach.

Key Considerations

- **In common with the supply-side, D3 resources are dependent upon the availability of predictable and sufficiently valuable revenue streams in order to incentivise the delivery of services to the system**. It is vital that the reforms that are adopted align with the necessary incentives for demand-side actors and so enable them to capture the economic value from their demand-side investments or actions. Value and benefits need to be accessible to market players' right through the value chain, in return for the service provided: not only the system operator, generators, and suppliers but also networks, aggregators, ESCOs and consumers.
- **Aggregators are an essential enabler for D3**. The EMR arrangements must support the establishment of market aggregators to mitigate costs of market entry and provide the necessary coordination of differentiated and distributed D3 resources. This means designing a much more proportionate and low cost regulatory system for businesses, especially those that are simply reducing demand (for instance financing schemes to upgrade lighting) rather than actively participating in the market place in a responsive fashion.
- **Market stability is paramount.** As for supply-side approaches, investors in D3 resources need to be confident in a future market opportunity in order to develop the capability and see a clear route to delivering a revenue stream. This involves a clearly stated Government policy, underpinned by an appropriate regulatory and market framework capable of delivering contracts of sufficient duration.
- **The reform process must be properly coordinated with respect to D3 resources.** The immediate policy priority must be a consideration of how demand management/reduction and distributed generation can participate in the CfD or Premium FIT arrangements, recognising the importance of reducing load and managing down new investment costs.
- **The opportunity to develop wider D3 resources should be developed in advance of need.** The subsequent requirement for demand response and flexible distributed generation resources will emerge rapidly

as an increasing amount of existing generating capacity is decommissioned. It is essential that the market frameworks that will incentivise this 'smart response' are established and functioning in advance of need, in order to bring forward the optimal resources when they are required. The period from today to the latter half of the decade is the opportunity to establish, trial and improve these arrangements, building experience in utilising demand response to meet system operation requirements.

Moving from Today's Electricity Market to One Fit for Tomorrow

- **The creation of the New Electricity Trading Arrangements (NETA), which replaced the mandatory Pool, was expected to allow demand and generation to compete with each other** in the market and became one of the judged criteria to support the move to the new arrangements. Although designed into the system, demand participation has not occurred in practice. This is because the adopted market structure, which encourages illiquidity, thwarts players in discovering equivalent supply market prices over a sufficient period for investment.

  We remain concerned that without addressing this issue new entry and active participation in these areas will not occur.

- **EMR places early emphasis on the need for an enhanced demand side response in order to facilitate balancing of supply and demand**, but fails to set out the value of this or how it will be achieved. Suppression or 'destruction' of demand, contributes to the security of supply as less low carbon generation capacity will need to be built or funded.

  This is not presently recognised as an element of competitive contribution. This clearly needs redressing in any design of market arrangements.

- **Longer term structural changes such as Smart Grids will play an increasing and essential role in the UK energy scene**, as the transport and heating sectors are decarbonised. Reference to these elements, new players to deliver them, and their potential contribution in improving system security appear to have been ignored.

  A failure to take proper account of these changes at this radical juncture in the design of the electricity market will be a serious omission

CONSULTATION QUESTIONS

Current Market Arrangements

1. Do you agree with the Government's assessment of the ability of the current market to support the investment in low-carbon generation needed to meet environmental targets?

The current market structure has not been conducive to investment or promotion of distributed generation (DG), demand-side reduction (DSR). It is also not fit for purpose in its ability to accommodate Smart Grid (SG) development. All these features (collectively labelled D3) will be critical in meeting the renewable and low carbon target and realising a manageable and affordable energy market that is capable of reliably accommodating significant tranches of intermittent or inflexible low carbon generation. Critically, development of D3 will also provide a competitive brake on other more expensive elements which will be needed in their absence, and in the longer term will be essential if we are to accommodate this type of generation alongside decarbonisation of transport and heat.

We agree that the current market arrangements are unsuitable for investment in these high capital low carbon technologies, however we question whether the full retention of the current wholesale trading arrangements, without significant modification, is possible alongside the changes that Government propose.

The creation of the New Electricity Trading Arrangements (NETA), which replaced the mandatory Pool, was expected to allow demand and generation to compete with each other in the market and this became one of the judged criteria to support the move to the new arrangements. Although designed into the system, demand participation has not occurred. Separately specific concerns were strongly expressed at the time over the likely impact of NETA on independent market entry, smaller players and DG, and although a high-level industry-working group was formed to study and report on these areas, its recommendations were not acted on. These market concerns have been realised in practice, and in spite of subsequent Government and Regulator enquires, little positive change has been made. As a consequence these potentially dynamic elements to the electricity market have effectively been suppressed.

A key problem with the existing market conditions remains the inability of new entrants to access and visualise market prices. Government recognise that there is concern around the liquidity of the electricity market and points to the current study which is being undertaken by Ofgem into this area. Unfortunately as the results of this work are not available it is difficult to form an opinion as to whether any reforms in this area will be fundamentally effective and more importantly, fit for future purpose. We remain concerned that, without addressing this issue at a very high level, a number of the aspirations for Government in encouraging new entry and participation in these new areas will be thwarted or stillborn.

2. Do you agree with the Government's assessment of the future risks to the UK's security of electricity supplies?

The consultation document places much emphasis on the need for an enhanced demand side response in order to facilitate balancing of supply and demand. The Government envisages an important role for DSR in this regard. The costs of supply disruption are referenced as up to £30,000/MWh. Clearly in a modern functioning state a highly reliable electricity supply is exceptionally important. The Government is therefore correct to place a high value in maintaining this. Properly envisaged, DSR can clearly play a significant role in contributing to such security. It does however need to have proper access to the prices which encourage appropriate behaviour to allow the necessary investment in managing and controlling demand.

Equally the longer term saving, suppression or 'destruction' of demand, contributes to the security of supply as less low carbon generation capacity will need to be built or funded. The consultation document does not appear to properly recognise this element of competitive contribution. This clearly needs redressing in any design of market arrangements.

There is also little reference given within this chapter on the longer term structural changes which will be needed or that are desirable in the new low carbon world. It is separately envisaged by Government that Smart Grids will play an increasing role in the UK energy scene, and that is being explored and developed by a number of projects under the Low Carbon Network Fund. The development of Smart Grids with associated smart metering will require new actors and new commercial agreements between parties. It is envisaged that new entrants will include aggregators and energy service companies that will operate on a local and regional basis managing demand and generation and offering products and services to distribution and transmission system operators. Reference to these elements and their potential contribution in improving system security are absent from this consultation. A failure to take proper account of these changes at this radical juncture in the design of the electricity market will be a serious omission.

Options for Decarbonisation: Feed-in Tariffs

3. Do you agree with the Government's assessment of the pros and cons of each of the models of feed-in tariff (FIT)?

In promoting D3, we are concerned to ensure that demand side resources have the equivalent access to FITs as is afforded to the supply side of the market. It is, as yet, unclear which design of FITs most appropriately balances risks between investors and consumers for the different technologies. Therefore, it is inappropriate at this stage in the process to prescribe a particular preferred FIT model and, in any case, it is extremely unlikely that one design will be optimal across the technology mix.

4. Do you agree with the Government's preferred policy of introducing a contract for difference based feed-in tariff (FIT with CfD)?

As a general comment we believe it is unlikely that there is one particular, favoured solution that is appropriate for all the low carbon technologies that the Government seeks to encourage or promote. On the supply, or generation, side there is a fundamental difference between those technologies that have low variable costs and those with high, fuel-related costs such as biomass or CCS. Similar discrepancies exist on the demand-side. Whilst the Government may be pursuing the laudable aim of simplification there is little merit in this approach if it fails to deliver effective incentives across the sector.

The consultation leans towards the FIT with CfD as a preferable alternative to the premium or fixed FIT. With regards to D3 this approach would appear to have the advantage of providing a stable price for Demand Management (Energy Efficiency) actions and in design should sharpen commercial signals to Demand Response. Whether it does so in practice depends on a number of factors such as the bidding strategy of various parties and the ability of other players to discover a 'market' price. It therefore remains to be seen whether the out-turn effect will be as envisaged. We consider that it should be the role of an appropriately constituted institution to undertake further analysis to rigorously test the assumption that the FIT with CfD will maintain the integrity of a functioning wholesale market.

Separately we are not convinced that the Government rejection of further consideration of any Regulated Asset Base (RAB) model is any worse for UK plc than the FIT options, due to the amount of 'banded' technology discrimination and subsequent tuning that will be necessary through adoption of such major interventions in the electricity market.

5. What do you see as the advantages and disadvantages of transferring different risks from the generator or the supplier to the Government? In particular, what are the implications of removing the (long-term) electricity price risk from generators under the CfD model?

As has already been observed it is unclear where the long-term electricity price will be 'discovered'. It is difficult to envisage how the existing 'illiquid' electricity trading arrangements will accommodate generators that are recipients of major external environmental subsidies or taxes because their bidding behaviour will clearly not be properly reflective of their longer term costs or investments. (This is compounded by the likely continued dominance of vertically integrated utilities).

In these circumstances, the 'electricity price risk' may be a secondary consideration. Equally important will be the ability of new entrants to access or contract against this price, however unrepresentative it may be. As has been observed elsewhere in the consultation document in order for this model to work, the electricity trading arrangements may need to revert to a mandatory trading platform so that this visibility and price is clear. This option however appears to be absent from consideration.

6. What are the efficient operational decisions that the price signal incentivises? How important are these for the market to function properly? How would they be affected by the proposed policy?

Clearly any CfD which is required to finance investment in low carbon generation should be sculpted to encourage operation at peak electricity periods or to carry out scheduled maintenance when electricity demand is expected to be low.

The ability of such plant to operate in this way, given other constraints, will be highly technology specific. Similarly the ability to hold back generation in order to respond to high electricity price or balancing signals will be valuable in the market, although whether such behaviour is merited given the likely predominance of the external preferential tariff, remains to be seen. It would be inappropriate to construct market rules which somehow prevented full exposure of the actions or lack of actions of low carbon generation from the market as this will dampen any D3 response.

7. Do you agree with the Government's assessment of the impact of the different models of FITs on the cost of capital for low-carbon generators?

The Government places significant emphasis on their Consultants' analysis of the cost of capital and separately the required relative hurdle rates for different players. It is not clear whether these assumptions are borne out in practice. For example the reduction in hurdle rate for a typical utility under fixed or CfD low carbon support is quoted as 0.3%, whereas for an independent developer it is 1.4 to 1.1%. Further evidence to support these assumptions would be welcome.

8. What impact do you think the different models of FITs will have on the availability of finance for low-carbon electricity generation investments from both new investors and existing investor base?

On balance we would like to see low-carbon electricity generation that also provides D3 services rewarded equitably for these services, but without distorting the market opportunities for a 'pure' D3 offering, which will also need funding on a long-term basis.

9. What impact do you think the different models of FITs will have on different types of generators (e.g. vertically integrated utilities, existing independent gas, wind or biomass generators and new entrant generators)? How would the different models impact on contract negotiations/ relationships with electricity suppliers?

Unchallenged, vertically-integrated utilities will probably continue to favour and internalise these costs and carry them through to their retail customers. Unless challenged, the barriers to entry for new supply businesses will still remain and therefore the ability of independent low carbon generators to compete will still depend on the desire of large suppliers to contract for their output on a long-term basis. A key consideration in this regard remains whether there is an obligation on such suppliers to take low carbon energy sources from outside their own stable. This is a key decision for Government if it is serious about establishing large-scale entry from independent sources, whether from generation or demand.

10. How important do you think greater liquidity in the wholesale market is to the effective operation of the FIT with CfD model? What reference price or index should be used?

Greater liquidity and associated 'ease of discovery' in the wholesale electricity market is absolutely essential if there is to be any new independent entry. The reference price or index should be as close to the full costs of generation as possible in order to stimulate the right commercial response from other players. It is important that there is a complete mirror image for generation and demand, so that competitive forces can be brought to bear.

11. Should the FIT be paid on availability or output?

A properly designed to feed in tariff should be sculpted to reflect both availability and output.

Emissions Performance Standards

12. Do you agree with the Government's assessment of the impact of an emission performance standard on the decarbonisation of the electricity sector and on security of supply risk?

It is assumed that the policy objective in creating EPS is to remove polluting power stations from the generation fleet of plant, since to permit such plant to be built or to continue to operate would undermine the policy of environmental objectives being proposed elsewhere under these reforms.

It is recognised however that certain fossil fuelled plant provides important services in balancing the system and contributing to the security of supply which may become more in doubt as intermittent or inflexible low carbon generation is encouraged onto the system.

Whilst historically such plant has fulfilled this role, increasingly in the future other sources should be considered. These include of course, D3 measures, but may also cover the use of electricity and heat storage. Many of these alternatives will not have the same fossil fuel resource issues as existing plant. Any policy measure in this area needs to take account of these issues to avoid creating, or locking in, any unnecessary or perverse incentives.

13. Which option do you consider most appropriate for the level of the EPS? What considerations should the Government take into account in designing derogations for projects forming part of the UK or EU demonstration programme?

As observed, creation of a policy which allows unconstrained operation of fossil fuel plant at times of stress in the market will blunt any longer term commercial signal to encourage other sources of generation or demand which may be cleaner.

14. Do you agree that the EPS should be aimed at new plant, and 'grandfathered' at the point of consent? How should the Government determine the economic life of a power station for the purposes of grandfathering?

Grandfathering of existing plant so that it can continue to provide services to contribute to securing supply, whilst attractive on a short-term basis, does not give a clear signal to the market about necessary change in this area. It should only be used as a last-resort.

15. Do you agree that the EPS should be extended to cover existing plant in the event they undergo significant life extensions or upgrades? How could the Government implement such an approach in practice?

See answer to Question 14

16. Do you agree with the proposed review of the EPS, incorporated into the progress reports required under the Energy Act 2010?

No comment.

17. How should biomass be treated for the purposes of meeting the EPS? What additional considerations should the Government take into account?

Biomass is at least a cleaner fuel than unabated coal, and when taking into account any emission standard, its contribution should be favoured even if co-firing in not permitted. Equally any plant which has a more efficient energy process such as CHP, should be treated preferentially, and not be penalised for producing heat and electricity instead of just electricity.

18. Do you agree the principle of exceptions to the EPS in the event of long-term or short-term energy shortfalls?

As already observed, any generation plant needs to have its full costs revealed in the marketplace so that competitive alternatives are exposed and accessible.

Options for Market Efficiency and Security of Supply

19. Do you agree with our assessment of the pros and cons of introducing a capacity mechanism?

It is widely observed that the current electricity market rules do not provide any appropriate signal for capacity. The Government has indicated that the work of Ofgem and National Grid to improve arrangements for the balancing of the system and increase liquidity in the wholesale market are 'vital'.

It remains to be seen whether this work achieves the wider benefits expected by the Government. It appears that there is a desire to introduce a capacity market because there is a concern that unless there is an explicit reward for capacity, security of supply will be threatened as we move through the transition to a low carbon generation. We

welcome the Government statement that this capacity mechanism, if needed, would be also designed to reward demand-side response and to encourage the development of energy efficiency and other smart technologies. We are dismayed to see the lack of reference with the consultation as to how this may be set on the same platform as supply measures.

20. Do you agree with the Government's preferred policy of introducing a capacity mechanism in addition to the improvements to the current market?

We note the review of the current work being carried out to improve the electricity market operation. The reference to demand-side response (DSR) in this regard is brief and understates its potential. It seems to refer purely to time shifting of demand rather than investment in technology which would provide and add to demand-side services. The consultation document also refers to the value that DSR may bring to network operators in smoothing peaks in demand. It fails to recognise that this type of service may be at odds with a DSR response which contributes to security of supply. Much more work is needed in this area if D3 is to properly contribute on an equitable basis with other capacity sources in this area and to establish a hierarchy of requirements from system operators.

21. What do you think the impacts of introducing a targeted capacity mechanism will be on prices in the wholesale electricity market?

Any capacity mechanism which has been introduced runs the risk of 'polluting' price signals in the energy market. Rewarding capacity through an availability payment in this way means that some proportion of costs are covered, allowing that capacity to bid into an energy market in an increasingly unconstrained manner. It is also the case, however, that:

- existing, written-down assets; and
- assets that have been incentivised under the FIT (or other arrangements targeting energy);

The case for a capacity mechanism is built upon the premise that 'unpolluted' price signals alone will not provide the orderly market response to maintain the necessary standards of system security. We support this view and support the concept of a capacity mechanism. However, the impacts on bidding behaviour and pricing outlined above have important implications for the design of this and other proposed mechanisms:

Targeting the capacity mechanism has the advantage that payment is only made to that capacity that requires the additional incentive to secure its availability, thus avoiding the risk of over-rewarding capacity and placing unnecessary costs upon consumers.

22. Do you agree with Government's preference for the design of a capacity mechanism:

- **a central body holding the responsibility;**
- **volume based, not price based; and**
- **a targeted mechanism, rather than market-wide.**

As a general comment, we have major concerns over the superficial treatment of D3 in this consultation, even though its headline role is stated as being one of the new features of a low carbon future. It is admitted in the consultation that there has been no DSR economic modelling, and this needs urgently addressing.

Until this work is undertaken, published and consulted on, we suggest that DG, DSR and energy efficiency must be assumed to offer a competitive resource that is integral to the operation of the electricity system. The design of the proposed capacity mechanism should reflect this 'no regrets' approach and ensure that D3 resources are afforded the full opportunity to compete on a level playing field.

With regard to the specific questions raised:

We agree that the responsibility for the operation of the capacity mechanism should rest with a central body. In particular, it is important to recognise the increasing role of the System Operator in purchasing reserve contracts (STOR) which, by definition, also involve the purchase of capacity. It is necessary for the System Operator to undertake a transparent exercise which demonstrates what services are required to maintain security of supply in a world of increasing intermittent generation. These services must then be purchased in a clear and transparent manner which is open to all potential providers of the service including the demand side of the market. Indeed, there is an argument that the System Operator should be mandated to demonstrate that it has purchased all cost effective response from the demand side of the market.

23. What do you think the impact of introducing a capacity mechanism would be on incentives to invest in demand-side response, storage, interconnection and energy efficiency? Will the preferred package of options allow these technologies to play more of a role?

A targeted capacity mechanism clearly has the ability to incentivise demand-side response and other measures. However in view of the other concerns already mentioned in this consultation, and in particular the concerns over the pollution of price signals raised in response to Question 21, care will be needed to craft these elements to ensure that over the long-term D3 resources are incentivised to enter the market and are afforded the opportunity to compete.

Specifically we are concerned that:

- The lack of an obvious role for D3 resources under the Government's FIT proposals, as laid out in the consultation, could afford a competitive bias towards supply-side options in any capacity mechanism.
- An indiscriminate approach to a capacity mechanism would confer a competitive advantage upon existing assets thus crowding out new D3 entrants and restricting the opportunity for them to compete in the future. This has been

the experience in US markets which have experimented with Forward Capacity Markets, and from which the recommendation is to pursue a targeted approach.

We also recommend that the Government moves quickly to develop the capacity mechanism once a decision has been reached over both the over-arching institutional arrangements and its preferred approach to the low-carbon energy incentive or FIT. There is a window of opportunity to trial and develop an efficiently-functioning capacity mechanism, that offers comprehensive incentives to both the supply- and demand- side, in advance of the critical requirement in the latter half of this decade and the beginning of the next.

24. Which of the two models of targeted capacity mechanism would you prefer to see implemented:
• Last-resort dispatch; or
• Economic dispatch.

It is impossible to answer this question at this stage without full knowledge of the other measures which might apply and any interaction with the wholesale electricity market.

25. Do you think there should be a locational element to capacity pricing?

If D3 measures are to be considered in any capacity pricing market (even if targeted) then clearly there must be a locational element. D3 measures may well be required for other reasons such as local network support. A hierarchy of contract and pricing therefore needs to be developed so that appropriate network signals are properly given and made, and that perverse decisions to require capacity actions for security of supply purposes do not cause local constraints to be resolved elsewhere.

Analysis of Packages

26. Do you agree with the Government's preferred package of options (carbon price support, feed-in tariff (CfD or premium), emission performance standard, peak capacity tender)? Why?

The Government's preferred package of options needs to be analysed carefully to establish that there are not leakages between the elements of the package causing inappropriate behaviour or pricing. The interaction between these options and the wholesale electricity market also needs careful study, and is heavily dependent on the results of other work on market reform and liquidity. Whilst some of these options may work in theory or in a perfect market, the reality will be significantly different.

27. What are your views on the alternative package that Government has described?

No further comment beyond those raised in respect of Question 26.

28. Will the proposed package of options have wider impacts on the electricity system that have not been identified in this document, for example on electricity networks?

Ofgem are currently involved in a fundamental review of the transmission charging regime. Until this concludes it is difficult to map the Government's proposed package of options. On a longer term basis, development of smart grids is envisaged. Little reference is made to this in the electricity market reform consultation although the timescale for their development are similar. It would be disturbing if changes were locked in now which prevented a change of this nature in the future.

29. How do you see the different elements of the preferred package interacting? Are these interactions different for other packages?

No comment.

Implementation Issues

30. What do you think are the main implementation risks for the Government's preferred package? Are these risks different for the other packages being considered?

The lead times to construct nuclear power stations, or develop a sizeable offshore wind resource are significant, but the market rules need to be in place soon in order that there is investor confidence. In making decisions to permit and encourage low carbon generation of this nature, it is important not to overlook the potential for large-scale but implementable energy efficiency or 'negawatts' or short lead time D3 measures.

Similarly problems associated with security of supply, may not appear until there is a much larger percentage of inflexible or intermittent generation on the system than at present. If the mechanisms to encourage D3 response are not put in place soon, then this avenue may be shut off prematurely.

31. Do you have views on the role that auctions or tenders can play in the setting the price for a feed-in tariff, compared to administratively determined support levels?

No comment.

32. What changes do you think would be necessary to the institutional arrangements in the electricity sector to support these market reforms?

It is almost certain that significant Institutional reform will be required as a key component of electricity market reform, irrespective of the specific form of the final market arrangements. This reform should be instigated at an early stage of the process, once the substantive decisions over the direction of reform have been determined, and in advance of the detailed design of mechanisms.

It is imperative that the relevant institution or institutions assigned with responsibility for award of contracts and operational decision-making within the low-carbon incentive (FIT) and capacity mechanisms are mandated, or otherwise strongly incentivised, to ensure equitable treatment of D3 resources.

Questions 32 to 36.

No comment.

37. Some technologies are not currently grandfathered under the RO. If the Government chooses not to grandfather some or all of these technologies, should we:

• Carry out scheduled banding reviews (either separately or as part of the tariff setting for the new scheme)? How frequently should these be carried out?

• Carry out an "early review" if evidence is provided of significant change in costs or other criteria as in legislation?

• Should we move them out of the "vintaged" RO and into the new scheme, removing the potential need for scheduled banding reviews under the RO?

We have no specific response to this question although we note that the RO will continue until 2017. Clearly plant which continues to be operational but is outside an expired payment mechanism may be a useful D3 contributor.

38. Which option for calculating the Obligation post 2017 do you favour?

• Continue using both target and headroom

• Use Calculation B (Headroom) only from 2017

• Fix the price of a ROC for existing and new generation

No Comment

APPENDICES

Appendix one: Glossary of terms

BOMA Chicago	Building Owners and Managers Association Chicago
BRA	Base Residential Auctions – capacity auctions operated by PJM
CFL	Compact Fluorescent Lamp
CHP	Combined Heat and Power
D3	The totality of demand side measures including demand management (DM), demand response (DR) and distributed generation (DG)
DG	Distributed Generation – generation capacity connected to the distribution system
DM	Demand Management – also known as energy efficiency, energy productivity – long term reduction in energy use for given economic output
EPRI	Electric Power Research Institute - USA
ESCO	Energy Service Company
FCM	Forward Capacity Market
IEA	International Energy Agency
ISO New England	Independent System Operator in New England
NEMMCO	Australian system operator prior to 2009
PJM	Regional Transmission Organization covering large parts of the NE USA
RPM	Reliability Pricing Model – model operated by PJM
STOR	Short Term Operating Reserve
VEIC	Vermont Energy Investment Corporation
WADE	World Alliance for Decentralised Energy

Appendix two: Membership of D3 expert group

[redacted] – Environmental scientist and policy specialist

[redacted] – CHP and district heating advocate

[redacted] Energy data and process management expert

[redacted] Energy infrastructure expert

[redacted] – Energy policy advocate

[redacted] – Consumer rights advocate and environmentalist economist, Consumer Focus

[redacted] – Local and regional authority expert

[redacted] – Sustainable development advocate

[redacted] – Energy expert

[redacted] – Energy efficiency expert and investment banker

Appendix three: Paper on governance and institutions by Simon Skilling

Policy, Governance and Institutions: The key issues now facing EMR

Simon Skillings 17th February 2011

Context

Proposals to reform the electricity market (EMR) are currently under consultation. There appears to be broad support for the idea that the Government should sign long term contracts with low carbon generators as a means of encouraging sufficient investment into the sector to meet decarbonisation goals[39]. However, in order to move this concept forward to a point at which implementation issues can be considered, it is necessary to address two fundamental questions:

- Who decides which contracts to sign?
- How do they decide which contracts to sign?

This note sets out the key considerations necessary to answer these questions and, as a result, identifies some important questions about the details of the EMR proposals. In particular, the extent to which flexibility in contract design is allowed appears a critical decision and one which is particularly important if the opportunities presented by investments in the demand side of the market are to be realised.

High level policy

The underpinning assumption behind the electricity market reform proposals is that the extent of the required transition is such that the capital markets are not prepared to devote the necessary levels of investment given the extent of the risks involved. It is therefore necessary for Government to intervene and directly transfer some of this risk to electricity consumers through signing long term contracts. However, the precise nature of the required transition has yet to be established and this is obviously an important requirement before it can be decided which contracts to sign.

The dilemma facing policy makers is:

- On the one hand, to establish clearly defined and long term market opportunities for low carbon resources such that investors throughout the supply chain have the confidence to provide the necessary delivery capacity, whilst,

[39] This paper only considers long term contracts for the provision of low carbon resources. However, many of the issues discussed are also directly applicable to the capacity markets proposed to maintain security of supply.

- On the other hand, ensuring that any long term commitments are credible, particularly from an affordability perspective, given the highly uncertain nature of future technology and commodity costs and the broader political environment.

In other words, investors need to be persuaded of the integrity of long term future markets that are created by policy makers and, by definition, could also be destroyed by policy makers.

There appears to be two potential components to the policy framework:

- Firstly, the overall emissions envelop for the UK power sector. The Committee for Climate Change has recently recommended that emissions should be reduced to 50gCO_2/KWh by 2030.

- Secondly, a technology innovation policy that ensures key technologies receive sufficient support for early stage demonstration and the necessary rates of deployment to drive costs down to competitive levels.

Given the requirement to balance market certainty with affordability, it seems likely that a policy framework will involve establishing long term volume targets which are robust to key uncertainties along with a process for increasing these targets through time as more information becomes available. However, the elements covered by such a policy framework are particularly important for the EMR debate and there is a spectrum of possibilities. It is possible that the initial policy will be restricted to discrete volumes of specific technologies (e.g. first of a kind nuclear and the CCS demonstration programme). At the other end of the spectrum, the policy might define overall volumes of required low carbon generation out to 2030 with certain minimum levels for individual technologies.

This is a broad spectrum and the implications for the EMR proposals are very different. However, it does appear difficult to reconcile a narrow policy definition with the extent of the challenge which triggered the EMR process.

Who decides?

The key institutional question is: 'Who decides which contracts to sign?' and the right answer depends critically on the nature of the high level policy. If the policy framework is restricted to a small number of discrete technology investments, it is possible for the Government to manage the one-off processes involved. Moreover, the nature of the contract instruments, and the method by which they are allocated (auction or negotiation), can be defined in advance and form part of the market reform 'decision'. However, if the policy framework is broader, and involves a trade-off between multiple technology choices, the job of allocating contracts becomes much more substantial. In this situation, it seems more appropriate to establish an agency to manage the contracting process. It is also likely that this solution requires a very different market reform 'decision' which is focussed on the governance of the agency going forward. It particular, the requirement for the agency to deliver policy objectives at least cost are likely to be paramount and this, in turn, will require decisions to be made about how much of the agencies actions should be prescribed in advance and how much flexibility should be allowed and monitored by review after the event.

An alternative approach would be to place an obligation on market participants (say, suppliers) to sign contracts with low carbon resources in line with policy requirements and this would avoid the need to prescribe in advance a new set of regulatory arrangements relating to contract allocation. However, this approach can only provide the same level of investment certainty if the market participants are guaranteed to be able to pass potentially stranded costs through to end customers and this is clearly incompatible with a competitive retail market. Moreover, the introduction of obligations on market players increases the complexity of the businesses and introduces new risks to manage. This, in turn, establishes strong drivers for consolidation to manage these risks cost effectively. Therefore, in reality, a supplier obligation approach effectively switches the focus from ex-ante regulation of contractual allocation to ex-post regulation of market conduct. Presumably, it is for these reasons that the supplier obligation model was rejected in the EMR consultation document.

Governance of a contract purchasing agency

The terms within which a contract purchasing agency operates must be clearly defined in advance. Primarily, this will involve a clear delineation between those issues that rightfully remain the province of Government and those in which the actions of an empowered agency could be expected to deliver benefits to electricity consumers. For example, it seems inappropriate for an agency to decide which technologies are worthy of subsidy and the maximum level of subsidy each technology should receive. These should be among those issues that set the constraints within which the agency can operate. However, it is possible to imagine that a suitable level of freedom of approach would enable the agency to not only attract new potential providers of low carbon resources but to identify innovative new contractual arrangements that lead to a more effective sharing of risk between investors and customers[40].

It would be necessary for the agency to demonstrate through ex-post audit that it had adopted a contractual approach that delivers the greatest customer benefits. This would include evidence as to the circumstances in which competitive auctions have been deemed appropriate and those in which bi-lateral negotiation have been adopted.

Another important consideration in defining the governance arrangements is to clarify the interaction between the contract purchasing agency and the broader market. This is a particular area where a clearly prescribed set of rules is important since it will provide the certainty that is required by market participants. For example, it may prove most cost effective to purchase the output from intermittent renewables through a fixed feed-in-tariff arrangement. However, it may be necessary to prescribe that such arrangements can only be used if accompanied by incentive mechanisms to ensure efficient despatch of these assets. Another example relates to the role of the agency in promoting market liquidity. The portfolio of long term contracts will leave the agency (and, therefore, customers) exposed to variations in short term wholesale price. It may be beneficial to encourage the agency to trade this exposure in the market under prescribed rules to reduce risks for both customers and other market participants.

[40] Indeed, this is exactly the role that Ofgem takes in regulating investment in network infrastructure

The demand side opportunity

Perhaps, the largest opportunity afforded by a central purchasing agency is associated with stimulating the demand side of the market. It is widely recognised that there is an untapped and potentially significant resource on the demand side of the market that can help deliver policy goals more cost effectively than supply side alternatives. However, the diffuse nature of this market has made it extremely difficult for policy makers to effectively engage with this opportunity. Unlike the supply side of the market, where there are a small number of technology options and market participants, the demand side is awash with small companies each with their own ideas on the propositions that can deliver significant customer benefits. It is, therefore, impossible to identify a single policy instrument that will effectively stimulate the broad range of potential demand side investments. Flushing out these opportunities is therefore much more suited to the on-going operation of an expert agency than a one-off policy process.

One simple way to open up the demand side opportunities would be to oblige the contract purchasing agency to identify and procure all available demand side resources that are cheaper than any supply side contracts that it acquires. Compliance with this obligation could be monitored by ex-post audits of the agency along with checks on the verification processes associated with the demand side contracts.

Conclusions

The Government will need to establish a policy framework to underpin the process for signing long term contracts. It is likely that this policy framework will need to evolve over time and involve the choice between several competing technologies. This will be delivered most effectively by establishing a central agency to manage the contracting process at arm's length from Government.

The governance framework for the contracting agency is critical and must clearly establish those issues which should be determined by Government and those where the agency has flexibility to identify the cheapest way to deliver policy objectives. It does not appear sensible to unnecessarily constrain the freedom of the agency in contract form given the variety of costs and risk profiles of the candidate technologies.

There is a particular opportunity to use the governance of the agency to maximise the potential of demand side resources to meet policy objectives at least cost. This can be achieved by obliging the agency to identify and procure all available demand side resources that are cheaper than the supply side contracts that it acquires.

Appendix four: D3 stakeholder workshop report, 3rd March 2011

Demand-Side, Distributed Generation & the Smarter System: Security, affordability and choice in electricity market reform

3rd March 2011, Charles Darwin House, 12 Roger Street, London, WC1N 2JU

This document provides a succinct summary of each session at the D3 Stakeholder conference and concludes with a more detailed overview of the over-arching take outs from the workshop's presentations and discussions.

Contents

Summary of the Workshop Sessions

Ministerial address

Greg Barker, Minister of State for Energy and Climate Change set out ambitious objectives for reform:

- The need to 're-imagineer' the sector, introducing a new and radical market framework
- Ensuring that new market participants and new business models come forward
- Securing the best deal for British consumers
- Increasingly valuing the 'negawatt' and moving towards the position where energy efficiency can become a traded commodity

Introduction to D3

Graham Meeks, Director CHPA

- Definition of D3:
  - Demand management – or energy efficiency
  - Demand response
  - Distributed generation

D3 in context: The value of D3 in meeting the objectives for market reform

Charlie Lewis, DECC

- Provided an overview of the consultation content and process
- Reiterated the consultation is about a targeted capacity mechanism
- Highlighted that the consultation recognises that there are advantages in ensuring that the Demand Side can play a full part in the electricity market

Catherine Mitchell, Exeter University

- Efficient use of energy is complementary to security, social and environmental goals of energy policy
- All areas of energy policy should be focussed on enabling the efficient use of energy
  - Reducing it where possible i.e. buildings, transport etc
  - Encouraging the use of more resource efficient products
  - Encouraging the most efficient operation, integration and design of the energy system, including infrastructure
- Electricity Market Reform should be enable shift from the current 'supply led' energy system to one which focuses on reducing and managing energy demand
- Proposed moving from linear and supply model to a dynamic interlinked demand side focus with smart grids and smart super-grids. Asked the question, who would be the system agency?

David Smith, National Grid

Outlined his vision for the role for demand side:

- The day to day variability in future generation sources will increase operational challenge
- Smart grids and meters needed to make this work
- Energy efficiency is essential
- Electrification of transport and heat
- The gas National Transmission System will require more flexibility

Unlocking the value - What role can markets play in creating price and volume certainty for D3 resources?:
Chris Neme, Energy Futures Group US and Paul Peterson, Synapse Energy Economics

- D3 benefits - system peak capacity, transmission capacity, distribution system capacity, energy
- D3 in electricity market reform - bring D3 innovations to market, diversifies funding options for D3, can by-pass "artificial" Government caps, strengthens cap-and-trade and carbon pricing
- But also highlighted - D3 choices today affect future, profit-maximising leads to cream-skimming, market can be adjusted to better address long term, but may still need/want "performance-based obligations"

Workshop 1: Creating the conditions for new market entry
Chair: Steve Fawkes Matrix, Speakers: Mark Coyle Utilisoft, Colin Prestwich Smartest Energy and Garry Felgate Orion Innovations

- Barriers to entry include regulatory complexity and associated high costs
- Need for aggregators to facilitate participation of smaller players
- Lack of consumer trust in energy companies is a barrier

Workshop 2: Designing capacity markets for demand-side participation
Chair: Simon Skillings E3G, Speakers: Chris Neme Energy Futures Group US,
Paul Peterson Synapse Energy Economics, Stephen Woodhouse Pöyry Management Consulting

- Need to recognise the range of services demand-side provides
- Long term contracts need certainty of value/revenue stream
- Contracts should be available for non-traditional utility players
- Need to demonstrate the value of price fluctuations to the consumer

Workshop 3: Technical and operational challenges
Chair: Stephen Andrews Lower Watts Consulting, Speakers: Nigel Fox National Grid, Duncan Botting IET, Gary Keane Pöyry Management Consulting

- Technical challenges are so great that we probably can't do without D3
- Current infrastructure investment decisions, may not be optimal for the smart –grid vision required to facilitate full D3 participation
- Future DSO-TSO relationships key to ensure consumer value
- Disconnect between the technical and commercial reality
- Ensure EU IT (and Protocols), for systems and communications, with counterparties are harmonious
- Legislative issues e.g. frequency sensitive equipment

Concluding session
Meg Gottstein, The Regulatory Assistance Project

- Advocates of D3 need to highlight that D3 is an integral part of the electricity system, not peripheral
- Carbon tax revenues could be used to fund D3 activities egg contract payments for demand destruction
- Grid development - RIIO / LCNF Low carbon network fund provide financing for innovative solutions to network problems valuable for D3

Judith Ward, Sustainability First

- Need clarity on demand-side definitions and demand-side focus and priorities – a demand-side 'lexicon'
- Need to develop consensus on long-term vision and principles for enabling demand-side participation in the GB wholesale electricity market
- White Paper is imminent – so immediate EWP aim must be a 'No regrets' policy for demand-side
- Demand-side incentives need good alignment through the value-chain to realise revenue
- Get visibility for demand-side within GB policy goals of affordability, security and carbon

Workshop conclusions

All aspects of D3 must be correctly viewed as a key resource for the electricity and wider energy system. There is a fundamental requirement to limit load growth in order to minimise supply-side resource requirements. The electricity system is itself moving from a system where the development of power generation has closely followed the requirements of customers' demand, to one where demand will increasingly be required to respond to the pattern of generation. Whilst a significant 'overhang' in generation capacity has insulated the UK from these effects in the recent past, in future the contribution of D3 resources will increasingly be prised.

The customer is central to the D3 resource. The linear model of electricity supply is increasingly compromised in the future energy system. Addressing consumer behaviours and incentivising consumers to provide services will become increasingly core to the development of energy systems.

D3 resources are dependent upon the availability of predictable and sufficiently valuable revenue streams in order to incentivise the delivery of services to the system. It is vital that we develop demand-side incentives which align well – so that different market actors can capture the available economic value from their demand-side investments. Value and benefits need to be accessible to market players right through the value chain, not only to the system operator, generators, and suppliers but also to networks, aggregators, ESCOs etc.. It is also vital that customers must see some financial benefit – or reward – in return for the demand-side 'service' they provide / offer into the market. These resources must also be able to access *all* the markets where they provide a valuable service in order to fully compensate for the costs of service provision.

There is presently insufficient coordination in the value chain of the electricity system. The system faces considerable complexity with respect to legislation, regulation, technical operation, infrastructure, environmental conditions and cultural or behavioural constraints. The value chain for the future energy system is now being constructed in a piecemeal fashion – the narrow focus of the EMR upon the wholesale market is an illustration of that. For D3 resources there is a question of hierarchy in determining where the value of these resources is best applied. These conditions create an urgent requirement for a higher degree of coordination that embraces:

- Mobilisation of demand- and supply- side resources
- Infrastructure
- Markets
- Regulations

Markets can deliver a substantive, robust and cost-effective D3 response. Demand-response resources have a proven capability to deliver an effective and reliable service in reserve and response markets, in the UK and internationally:

- US experience has demonstrated the capability of D3 to deliver robust response and to deliver major cost reductions in forward capacity markets.
- Clear evidence is available of the cost savings throughout the system provided through D3 resources: in the ISO-NE capacity market D3 contributed 10% of new capacity and reduced the cost of capacity payments by 15%; in New York City D3 action provided quantified benefits of $221M in deferred distribution at a cost of $122M.
- Credible and proven M&V arrangements have underpinned significant D3 resource development to support US ISOs.
- D3 is providing a growing contribution in UK STOR markets, individually and through a growing number of aggregators. Demand response is active in Fast Response markets.
- In response to present UK market arrangements, a number of new entrants are at or near the point of market entry. A number of these are drawing upon US or EU market experience.

D3 resources are distinct. D3 resources share many common attributes, including their fundamental relationship with the consumer. However it is also vital to recognise that they offer distinct services to the system and must be clearly differentiated in this regard. This diversity underlines the importance of market-based approaches to the incentivisation of these resources.

The demand-side continues to suffer from a lack of visibility. The multi-faceted nature of the energy demand-side means that policymakers may continue to err towards supply-side measures and investments, precisely because these appear more concrete and guaranteed. At the same time there persists an innate scepticism that the demand-side will never fulfil its potential. There is a growing need to work towards making the demand-side more concrete – and less

elusive – by being properly valued, quantified and ultimately 'monetised'. Acting in a more consolidated manner could help to secure these goals.

Workshop recommendations

For EMR:

Frameworks and Institutions. It is essential that we determine a clear regulatory and institutional framework that is consistent with the objectives for EMR in advance of designing the detail of the mechanisms. This framework must provide clear allocation of responsibilities between institutions and parties.

'No Regrets' approach for DM & DG. Demand Management and Distributed Generation must be afforded the opportunity to participate in the principal wholesale market mechanism offered to supply-side options under the EMR (i.e. CfD or PFIT).

Comparable value for comparable service. The principle that all providers capable of providing a comparable resource to the system receive a comparable reward for that service must be applied across the reformed electricity market. It is critical in the design of any capacity mechanism.

Fair reward for multiple benefits delivered. Many D3 resources provide multiple benefits, in the same way that some supply-side resources may provide a combination of energy, carbon and system services. D3 resources should have equitable opportunity to monetise the value that they deliver in all the markets that they serve within the energy system and carbon abatement framework.

Markets should be preferred to prescription. EMR should be based on the principle that markets offer the greatest opportunity to incentivise a competitive, efficient and cost-effective service that meets the long-term interests of consumers. The diverse, dynamic and innovative nature of developing D3 resources is fundamentally inconsistent with that a prescriptive or administered approach.

Aggregators are an essential enabler for D3. The EMR arrangements must support the establishment of market aggregators to mitigate costs of market entry and provide the necessary coordination of differentiated and distributed D3 resources. This means designing a much more proportionate and low cost regulatory system for businesses, especially those that are simply reducing demand (for instance financing schemes to upgrade lighting) rather than actively participating in the market place in a responsive fashion.

Market stability is paramount. As for supply-side approaches, investors in D3 resources need to be confident in a future market opportunity in order to develop the capability and see a clear route to delivering a revenue stream. This involves a clearly stated Government policy, underpinned by an appropriate regulatory and market framework capable of delivering contracts of sufficient duration.

The reform process must be properly coordinated. The immediate *policy* priority must be a consideration of how demand management/reduction can participate in the CfD or PFIT arrangements, recognising the importance of reducing load and managing down new investment costs. However, the opportunity to build experience in utilising demand response to meet system operation requirements must be exploited in the time available *before* this becomes a pressing need.

Check for consistency. In developing its reform proposals, the Government must show in the EWP how it will take forward demand-side participation in the relevant aspects of the new market arrangements –including in the discussion of institutions.

For wider energy policy:

Policymakers must view D3 as an energy system resource. Recognition of D3 as a resource – rather than an adjunct to energy policy – is a transformational step in the mobilisation of market participants to provide cost-effective services to the system. The prospect of widespread electrification of heat is one development that underlines the scope for D3 resources to contribute services, and the growing value that it brings.

A Demand-Side Strategy should be developed. DECC and the CCC to identify the practical steps which they might take to develop a broad-based and coherent GB Demand-Side Strategy and Road-Map to 2030 – designed to integrate with the many supply side measures currently being put in place. This will in any case become a priority under the re-cast *Energy Savings Directive*.

For D3 actors:

The demand-side needs to behave in a more coherent and coordinated way. A coordinated approach that underlines the integrity of D3 and recognises the aggregate contribution it can make to the energy system will increase its significance to the process of market reform.

The demand-side needs to make itself more visible. Along with greater coordination in their practical contribution to the energy system, D3 actors should work to enhance their visibility and to become a tangible entity within the energy policy framework.

For Further Information

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Or visit: www.emrd3.org.uk where copies of all presentations are available.