

## **D3: Opportunities for integrating demand side energy policies**

**July 2014**

The report has been prepared by an independent expert selected jointly by DECC and the Alliance for Energy Management (AfEM) and funded by DECC. He has had access to, and worked with, staff across DECC and wider government in developing this report. The findings of the report are his own.

A 'Technical Analysis Study' to review existing key whole system energy models used by government, and in particular, to examine how D3 measures are taken into account in these models, has been published alongside this report.

Further background information is provided at Annex A.

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## Introduction

1. The energy sector is currently undergoing a dynamic period of transformation with the rapid growth in the demand side now beginning to take a more significant – and potentially transformational – role in the energy market.
2. Demand side activity is expanding in response to a number of factors including the introduction of a wide range of government programmes supporting energy efficiency and distributed energy solutions, along with a trajectory of increasing energy costs, greater consumer interest in taking control over energy use as the range of demand side solutions available grows, and, in certain instances, concerns over energy supply reliability,
3. This increase in demand side activity requires more detailed consideration by government at the national level, but also requires increasing stakeholder participation at the regional and local level.
4. The extent that this demand side activity might grow and impact on the energy sector is, as yet, not fully understood, and consequently creates potential risks for policy-makers, which include:
  - A lack of integration in the government’s approach to the demand side sector could cause policies to compete or undermine each other’s effectiveness.
  - The uncoordinated development of demand side activity could diminish the benefits that their increased use could deliver.
  - Insufficient understanding of demand side potential and a lack of coordination between national government and local actors may lead to the UK not choosing the most cost-effective pathway to a low-carbon and energy secure future.

## Purpose of this report

5. This report examines how demand side measures are considered in the policy development process across government with an aim to:
  - Examine the challenges to policy design that arise as a result of increasing demand side activity in an energy system which has historically been based around delivering supply side energy outcomes.
  - Identify where additional work may need to be undertaken by government and industry to better understand the impacts that arise as demand side activity increases.
  - Explore what steps may need to be taken to ensure that local considerations related to the implementation of the demand side are adequately accounted for in national policy.

## What do we mean by D3?

6. Demand side measures cross a broad – and increasing – range of energy reduction and small to medium scale generation technologies. These are brought together in this report under three categories: demand reduction, demand side response and distributed energy.
  - **Demand Reduction** – the long term reduction of demand through the use of effective energy efficiency solutions. This is typically achieved through measures such as improving building fabric with insulation, higher efficiency glazing, improving air tightness etc; the installation of modern efficient lighting systems; the adoption and use of building energy management systems (BEMS), the use of smart meters and smarter heating controls; new optimisation software; a switch to higher efficiency boilers, the use of more energy efficient motors and electrical products.
  - **Demand Side Response (DSR)** – supporting customers to undertake short term shifting or flexing of load by changing demand patterns, increasing export or taking excess energy from a network.
  - **Distributed Energy (DE)** – the use of renewable and low carbon heat and power generation systems, located onsite or within the local distribution network. Examples include photovoltaics (PV), heat pumps, solar thermal systems, biomass boilers, renewable and gas fired combined heat and power (CHP) systems; and the use of heat networks, which can deliver lower carbon heating to homes and businesses when connected to a variety of sources including CHP, energy from waste stations, anaerobic digestion plants, large scale heat pumps or even waste heat from industry.
7. The term ‘D3’ seeks to reinforce the idea that demand side measures, typically deliver maximum benefits to consumers when designed to operate in a complementary way. Customers – both domestic and business - are typically not wedded to any one energy solution, but want to take forward the most cost effective, integrated package of measures that best suited to their energy needs.
8. There is no single ‘D3 approach’; the range of energy technologies and services listed above simply provide an illustration of the growing number of demand side solutions that are new being taken up by consumers to help manage their energy requirements.
9. Demand side activity, both in terms of technologies and services, are predicted to grow over the coming decade as further government action is taken forward in a number of relevant areas, including:
  - Further action on improving energy efficiency in the domestic and non domestic sector through policies such as Energy Savings Opportunity

Scheme (ESOS), Electricity Demand Reduction (EDR) Pilot, and Private Rental Sector energy requirements.

- The roll out of the government's programme for the installation of 53 million smart gas and electricity meters by 2020 to households and small businesses
  - Non-domestic customers beginning to play a more active role in energy markets through DSR
  - The development of active distribution networks and smart grids, and steps to encourage greater distributed energy at community level
  - Emergence of energy storage solutions; and
  - Better customer insight on energy issues and how this can help support the development of energy behaviour change programmes.
10. This growth in demand side activity necessitates greater focus on not only how to integrate technologies, but also on how policies need to fit together to achieve the best outcomes. Adopting a D3 view of demand-side policies should help underpin the government's approach to its demand side policies such as energy efficiency, public awareness of energy usage and distributed energy.

### Background to the D3 Project

11. The D3 project has in part emerged as a result of discussions between government and demand side industry representatives during the design process of the Electricity Market Review (EMR),<sup>1</sup> and through forums such as the government's Distributed Energy Contact Group (DECG).<sup>2</sup>
12. Despite the Secretary of State's introduction to the Electricity White Paper stating that DECC had "*put demand reduction and energy efficiency at the heart of our policy programme,*"<sup>3</sup> the perception of many businesses working across the demand side sector was that, at a time when government was planning a fundamental restructure of the electricity sector, opportunities to use demand side solutions to help deliver the EMR's goals risked being overlooked: solutions favoured were tied to investment directed to larger scale, supply side infrastructure.
13. Industry concerns were perhaps best reflected in conclusions set out by the Energy and Climate Change Committee in their scrutiny of the Energy Bill introducing the EMR:

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<sup>1</sup> For further details see presentations at March 2011 D3 Stakeholder Workshop [http://www.chpa.co.uk/d3-stakeholder-workshop-content\\_295.html](http://www.chpa.co.uk/d3-stakeholder-workshop-content_295.html)

<sup>2</sup> <https://www.gov.uk/government/policy-advisory-groups/distributed-energy-ministerial-contact-group>

<sup>3</sup> Planning Our Electric Future, July 2011, DECC

*“The draft Bill and its associated documents are fundamentally flawed by the lack of consideration given to demand-side measures, which are potentially the cheapest methods of decarbonising our electricity system. Responsive demand features only to a limited extent in the proposed capacity market... Reducing overall demand, meanwhile, is entirely absent from the Bill. Indeed, the Secretary of State admitted to us that “there is a lot of work we should be doing and are doing on that”. ...This suggests that DECC is still failing to give enough priority to ensuring that demand-side measures contribute to our energy policy goals. We are concerned that adding last-minute measures to an already pre-determined structure of a Bill may severely limit what can be achieved on demand reduction and management through EMR.”<sup>4</sup>*

14. There are a number of possible reasons why demand side opportunities may have featured less prominently in the policy design process. It has been suggested that these may include access to data on demand side solutions, modelling tools capabilities the ability to link modelling tools within DECC to provide a more holistic view, and even confidence by policy makers in the demand side delivering – but the result is a perception that cost-effective demand side solutions have been, and continue to be, overlooked. This report is intended to consider why there is a perception that demand-side policies have been eclipsed by supply-side considerations, and what could be done to address this.

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<sup>4</sup> Energy and Climate Change Committee - First Report Draft Energy Bill: Pre-legislative Scrutiny, 17 July 2012

## How is D3 currently shaping the UK energy sector?

15. The UK electricity sector is going through a major period of transformation over the coming decade, with around a fifth of generating capacity, mostly large scale nuclear and coal power stations, set to close by 2020. It is estimated that the electricity sector will need up to £100 billion of capital investment to replace this capacity and upgrade the UK's electricity infrastructure between now and 2020.<sup>5</sup> The extensive package of measures developed over the past few years, through the Electricity Market Reform (EMR) programme, set out government's proposals on how to attract the investment needed.
16. At the same time as this new investment is being directed to supply side electricity sector infrastructure assets, there has also been increasing customer, regulatory, and political interest in demand side solutions. Recent government programmes supporting the demand side have converged with consumer-interest in reducing demand as a result of increased energy costs and predictions that these cost rises will continue to 2030.<sup>6</sup> The latest government statistics highlight how energy demand in the domestic sector has been steadily reducing, with a measured average reduction of 22.3% in England and Wales over the period 2005 to 2011.<sup>7</sup> Ofgem statistics report that for the decade to the end of 2013, household energy consumption fell by around 20% for gas and 10% for electricity.<sup>8</sup> Across the EU total energy consumption has reduced 8% from 2008 – 2012.<sup>9</sup> Similar reductions in energy use have been documented in the US, largely down to appliance and equipment efficiency standards, which have proved to be the most effective policy for saving energy.<sup>10</sup>
17. Demand side industry innovation has also brought forward a new generation of energy solutions, such as more advanced building controls and lighting technologies. In addition, the distributed energy sector has seen strong growth, especially in relation to photovoltaics (PV), where there has been a dramatic increase in capacity installed, spurred on by government support through FITs, major reductions in system costs and strong consumer interest.
18. Growth in localised, demand side heat solutions has also advanced over the past few years, especially in relation to the growth of interest in the use

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<sup>5</sup> DECC [Energy Investment Report](#), April 2014

<sup>6</sup> Infrastructure investment: the impact on consumer bills, National Audit Office (NAO), 13 November 2013

<sup>7</sup> Household energy consumption in England and Wales falls from 2005–11, Office National Statistics, 16 August 2013

<sup>8</sup> Ofgem Supply Market indicator update – 2 June 2014

<sup>9</sup> Energy consumption down by 8% between 2006 and 2012 in the EU28 – Eurostat News Release, 17 February 2014

<sup>10</sup> Appliance and Equipment Standards Fact Sheet – US Department of Energy, May 2014. Also, Research by the American Council for Energy Efficient Economy (ACEEE) has calculated that in the five-year period from 2008-2012, new efficiency improvements from US utility programs and appliance standards have avoided the need for more than 275 power plants. ACEEE Press Release 2 June 2014.

of district heating. A number of local authorities across the country and, in particular, Greater London Authority (GLA), have taken significant steps to support the development of new lower carbon heat networks. The use of district heating, particularly in combination with combined heat and power (CHP) plant, are particularly suitable in dense urban neighbourhoods. Major heat networks have operated for several decades now, such as those in Southampton, Sheffield, Woking and Nottingham, as well as several across London (including Citigen, the Pimlico District Heating Undertaking, and the Whitehall District Heating System). New heat networks have been installed over the past decade in Aberdeen, Birmingham, and Islington, and development is now going ahead on new projects in Gateshead and Bristol.<sup>11</sup>

19. This growth in demand side activity is already being seen in some countries as a major disruptive element to the way in which the energy sector has traditionally operated, with incumbent utilities beginning to change their patterns of business. Examples of this include a recent announcement by major EU energy company signalling a fundamental strategic change to its business model, moving away from supply side centralised generation assets, to the provision of integrated demand side energy solutions to its customers.<sup>12</sup> In the US the demand side is now being recognised by the electricity industry itself as a “potential “game changer””.<sup>13</sup> Modelling work undertaken by DECC, academic institutions and the energy industry amongst others all now predict a major uptake in demand side solutions across the energy system.<sup>14</sup>
20. Though large scale generation, connected at the national grid level, is likely to remain the backbone to the UK electricity system, it is also necessary for government to reflect on the policy implications of changes arising out of the growth of the demand side, as well as understanding the economic and technological changes these will lead to across the energy system as a whole.
21. A better understanding of such issues will allow government to effectively consider how to manage the risks outlined in the introduction to this report. It will also ensure that government is able to undertake a holistic and equal consideration of how to balance demand side and supply side measures in the policy process, allowing government to determine the most cost effective solution for consumers, the environment and the energy system.
22. The tension of balancing priorities between promoting supply or demand side measures, was highlighted by the Energy & Climate Change Select Committee in their review of the EMR’s Energy Bill, which stated:

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<sup>11</sup> The Mayor’s Climate Change Mitigation and Energy Annual Report, Greater London Authority, March 2014

<sup>12</sup> “The vision of Peter Terium, CEO of RWE: “We want to be the holistic energy manager of the future”” – Interview in Energy Post, 7 April 2014

<sup>13</sup> Disruptive Challenges: Financial Implications and Strategic Responses to a Changing Retail Electric Business – Edison Electric Institute, January 2013

<sup>14</sup> These include DECC’s Carbon Plan 2011, National Grid’s ‘Gone Green’ scenario, and Smart Grid Forum modelling work.

*“As with many aspects of energy policy, the Government has fallen into the trap of focusing far too closely on the supply side of the energy system, while neglecting to consider the contribution that demand-side activities could make to security and climate change objectives. Thinking about the demand-side needs to be given a much higher priority in the Bill, not least because it is likely to deliver much more cost effective solutions than building ever greater levels of generating capacity.”<sup>15</sup>*

23. Government will also need to explore how the various demand side policies in play could be better integrated to provide a more joined up and, critically, a more customer-focussed offer to consumers – both non domestic and domestic. Failure to do so risks leading to future regrets about technology decisions, and an increasingly fragmented energy system with a widening gap between local activity on D3 and national energy policy.

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<sup>15</sup> House of Commons Energy and Climate Change Committee Draft Energy Bill: Pre-legislative Scrutiny July 2012

## Mapping D3 Policies

24. The past decade has seen considerable activity by government developing policies to promote greater demand side action. These are spread across a wide suite of instruments from taxing energy use, energy reporting requirements and financial support mechanisms to drive the uptake of demand side technologies. The following section highlights the range of demand side policy instruments in use, sets out some of the challenges to policy makers in evaluating demand side policy, and considers areas of work that may need to be considered as demand side activity grows.

### Current Demand Side Policy Landscape

25. The government's work on demand side policies has been in response to increased political momentum to delivering solutions to tackle climate change, as well as responding to new opportunities through technology innovation, such as the micro-generation sector;<sup>16</sup> the development of a set of government policies on the generation of low carbon heat;<sup>17</sup> and also the need to drive building energy retrofit due to the recognition that the majority of buildings (pre Part L 2010 building regulation standards) in place today, will still be here in 2050.

26. Europe has also played a major role in promoting UK demand side action, particularly as a result of highlighting the importance of tackling energy use in non-domestic building sector. EU legislation which has shaped UK government demand side policies includes the 2003 Energy Performance in Buildings Directive, the 2004 Cogeneration Directive, the 2006 Energy End Use and Service Directive and most recently, the 2012 Energy Efficiency Directive. The 2009 EU Renewables Directive led government to adopting a 2020 15% renewable energy target, accelerating the development of UK renewable energy policy, and providing additional emphasis to look beyond larger scale renewable electricity generation, to supporting smaller scale renewables, through the introduction of Feed in Tariffs (FITs), and promoting action on renewable heat. As a result of the EU Energy Efficiency Directive, the UK has also adopted a binding energy efficiency target for 2020.

27. Recent government actions designed to promote demand reduction include the introduction of the Carbon Reduction Commitment (CRC), the Carbon Price Floor, the Green Deal and the Energy Company Obligation (ECO). Also, through the transposition of the Energy Efficiency Directive, the government has recently introduced the Energy Savings Opportunities

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<sup>16</sup> See Microgeneration strategy industry action plan: interim report, DECC, July 2012

<sup>17</sup> The future of heating: A strategic framework for low carbon heat, DECC, March 2012

Scheme (ESOS).<sup>18</sup> The government's full programme of activities on energy efficiency is set out in DECC's 2012 Energy Efficiency Strategy and 2013 update report.

28. Policies targeted at the domestic sector, through supplier obligated energy efficiency programmes, have been in place since the mid-90s<sup>19</sup> and have had considerable success in improving the energy efficiency of homes, as reported in the latest English Housing Survey report.<sup>20</sup>
29. The government's planned roll out of 53 million smart gas and electricity meters to homes and SMEs by 2020 represents a major transformation of the energy market. Smart Meters provide a key platform for smart grids and energy management systems, and have the potential to change the way consumers interact with the energy market, enabling opportunities such as new Time of Use (ToU) tariffs. Ofgem's Smarter Markets programme was created as a result of the Smart Meters roll-out to transition the UK energy market into a "consumer-focused and consumer-led" market.
30. The evidence base for energy efficiency improvement in the non-domestic sector is, however, less well defined and DECC is currently undertaking a major Building Energy Efficiency Survey (BEES) to improve and update the evidence of how energy is used here, including an assessment of the abatement opportunities for all non-domestic premises.<sup>21</sup> Other data sources for non-domestic buildings include the Display Energy Certificate (DECs) register for public sector buildings and the Energy Performance Certificate (EPCs) register for commercial buildings. Research undertaken by the Carbon Trust has found that a 35% reduction in CO<sub>2</sub> emissions by 2020 can be achieved in the non-domestic building sector using cost-effective energy efficiency measures. These would yield a net benefit to the UK of at least £4bn, while reductions of 70-75% by 2050 can be achieved at no net cost.<sup>22</sup>
31. Distributed energy technologies have been supported through the introduction of the Renewable Heat Incentive (RHI), Feed in Tariffs (FITs), and the recent appointment in DECC of a Heat Networks Development

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<sup>18</sup> ESOS will be introduced to meet the requirement, set out in Article 8 of the Energy Efficiency Directive, for large enterprises to undertake energy audits by 5 December 2015 and every 4 years thereafter.

<sup>19</sup> See Analysis of the history of environmental Supplier Obligations – A Report for Energy UK by Jan Rosenow November 2012

<sup>20</sup> In 2012, the average SAP rating of English dwellings was 59 points, up from 45 points in 1996. Further information English Housing Survey Headline Report 2012-13, DCLG February 2014

<sup>21</sup> DECC is working to improve the evidence available about energy use in non-domestic buildings. The last time a national survey was run was for the Non-Domestic Energy and Emissions Model (N-DEEM) in the mid-1990s. The data will be collected from surveys with 10,000 non-domestic building occupiers and a few site surveys will be used to model consumption and abatement potential.

<sup>22</sup> Technology Innovation Needs Assessment (TINA) Non-Domestic Buildings Summary Report 2013

Unit (HNDU). Ofgem maintain detailed statistical information on FIT generators, producing quarterly detailed tables, now reporting that over 500,000 installations,<sup>23</sup> mostly PV, have been installed since April 2010. DECC also produce monthly deployment rates of RHI take up. Combined Heat and Power (CHP) data is monitored through the CHP Quality Assurance (CHPQA)<sup>24</sup> programme and part of this data is made available through the government's CHP website.<sup>25</sup> Data on district heat schemes in the UK is currently being updated and will be published by DECC in 2015.<sup>26</sup>

32. Many of these demand side initiatives have been introduced by government in the past few years and are still evolving along with the market itself. Further policies announced but yet to be launched include: the £20m Electricity Demand Reduction Pilot, and the Capacity Market, a key output of the EMR proposals, where alongside CHP, Demand Side Response (DSR) and also energy storage will be eligible to participate.<sup>27</sup>
33. Table 1, overleaf, summarises major demand side policies in place, and their relationship to D3.

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<sup>23</sup> Ofgem Feed in Tariff installation reports

<sup>24</sup> [www.chpqa.com](http://www.chpqa.com)

<sup>25</sup> [chp.decc.gov.uk/cms/](http://chp.decc.gov.uk/cms/)

<sup>26</sup> As highlighted in 'Summary evidence on District Heating Networks in the UK' DECC, July 2013

<sup>27</sup> Capacity below a 2 megawatt (MW) de-minimis threshold will only be able to participate in the capacity mechanism when combined with other capacity through an aggregation service. Capacity receiving support through the Renewables Obligation (RO), Contracts for Difference (CfDs), or small scale Feed in Tariffs (FIT) will not be eligible to participate.

<b>Table 1: Government policies to support Demand Side Energy Measures</b>				
		<b>D1 Demand Reduction</b>	<b>D2 Demand Side Response</b>	<b>D3 Distributed Energy</b>
<b>Currently in Operation</b>				
<b>Sector</b>	<b>Policy</b>			
Domestic	Energy Company Obligation (ECO)	x		x
I&C	Enhanced Capital Allowances (ECAs)	x		x
ALL	Planning	x		x
I&C	Climate Change Levy/Climate Change Agreements (CCAs)	x		
I&C	Carbon Reduction Commitment (CRC)	x		
Domestic	Green Deal/Green Deal Communities	x		x
ALL	Products Policy	x	x	
I&C	Energy Performance Certificates (EPCs)	x		
I&C Public	Heat Networks			x
Public	Display Energy Certificates (DECs)	x		
I&C	Combined Heat & Power (CHP)		x	x
ALL	Feed in Tariffs (FITs)		x	x
	Renewable Heat Incentive (RHI)			x
I&C Public	Renewables Obligation			x
ALL	2014 Building Regulations	x		x
I&C	Defra Environmental Reporting Guidelines	x		x
<b>To be introduced</b>				
I&C Public	ESOS (Energy Saving Opportunity Scheme)	x		
Domestic	Private Rented Sector Energy Efficiency requirement	x		
I&C	Demand Side Response (DSR) (in Capacity Market)		x	x
I&C	Electricity Demand Reduction Pilot	x		
Domestic	Domestic RHI			x
Domestic	Smart Meters	x	x	x
ALL	Allowable Solutions	x		x
<b>Under Development</b>				
Domestic	2016 Zero Carbon Homes	x		x
I&C	2019 Zero Carbon Buildings	x		x
ALL	Smart Grid	x	x	x
ALL	Energy Storage		x	x

### D3 across government

34. DECC has recognised the need for stronger coordination around policy areas focused on consumers and to help facilitate this, the department has recently restructured to form a new Consumers and Households Group in January 2014.<sup>28</sup>

35. This new Group includes the majority of policy areas concerned with demand side measures including:

- **Energy Efficiency Deployment Office** – EEDO is a relatively new department in DECC, created in 2012. It has already set out the government’s Energy Efficiency Strategy,<sup>29</sup> and includes policy work in areas such as customer insight, non-domestic buildings and transposition of the EU Energy Efficiency Directive. EEDO has recently incorporated Products Policy within the team, which was previously led by Defra.
- **Heat & Industry** – Working on delivery of the government’s 2012 Heat Strategy.<sup>30</sup> Policy areas include the domestic and non-domestic RHI, heat networks (including the new Heat Networks Delivery Heat Unit (HNDU)), heat use in the industrial sector and also lead on CHP policy. H&I also contains the Industrial Energy Efficiency team which covers issues such as the CRC and Climate Change Agreements (CCAs).
- **Household Energy Efficiency** – Lead group on major domestic demand reduction policies such as government’s flagship Green Deal Energy Company Obligation (ECO) programmes.
- **Smart Meters Programmes** – Lead on government’s major programme to roll out 53 million gas and electricity smart meters to domestic and small business premises by 2020.

36. A separate DECC Group – ‘Markets and Infrastructure’ – covers a number of other important demand side policy areas:

- **Future Electricity Networks** – Lead on electricity distribution network activity within government, covering issues such as connection of distributed energy systems to the local electricity network and work

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<sup>28</sup> New Director General for Consumers and Households appointed, DECC 10 January 2014. See DECC Corporate organogram for full details - <https://www.gov.uk/government/publications/decc-corporate-organogram>

<sup>29</sup> Energy Efficiency Strategy: The Energy Efficiency Opportunity in the UK November DECC 2012 – recently updated in December 2013.

<sup>30</sup> The future of heating: A strategic framework for low carbon heat DECC March 2013

with Ofgem on the development of Smart Grids, as detailed earlier this year in the Smart Grid Forum's<sup>31</sup> Smart Grid Vision and Roadmap.<sup>32</sup>

- **Office for Renewable Energy Deployment (ORED)** – Lead on the development of the government's renewable energy policies and programmes, including the UK Renewable Energy Roadmap,<sup>33</sup> the FITs programme, and the recent two-part Solar Strategy.<sup>34</sup>
- **Electricity Market Reform (EMR)** – Group managing the government's major EMR programme, covering a wide range of policy areas, a small component of which related to demand side measures is DECC's forthcoming £20m Electricity Demand Reduction (EDR) pilot.<sup>35</sup>
- **Security of Electricity Supply** – Manages the design of the new EMR Capacity Market mechanism, which includes within its scope the provision for Demand Side Response (DSR), energy storage and distributed energy projects to bid in. Government will run the first Capacity Market auction in 2014 for delivery of capacity from the winter of 2018/19, subject to state aid clearance.

37. Whilst DECC is the lead department on demand side energy policy, a number of other departments also have their own initiatives in place supporting demand side measures and programmes. These include:

- **Department for Communities and Local Government (CLG)** – Lead government department on a number of major policy areas related to the demand side including: the 2016 zero carbon homes target and the 2019 zero carbon non-domestic building target;<sup>36</sup> Part L of the building regulations which concerns minimum energy requirements of new development; climate change mitigation policies as set out in the National Planning Policy Framework (NPPF)<sup>37</sup> and also setting the framework for Allowable Solutions.

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<sup>31</sup> The DECC/Ofgem Smart Grid Forum was created by the Department of Energy and Climate Change (DECC) and Ofgem to support the UK's transition to a secure, safe, low carbon, affordable energy system. The main issue discussed within the DECC/Ofgem Smart Grid Forum is how electricity network companies will address significant new challenges as they play their role in the decarbonisation of electricity supply. For more information - <https://www.ofgem.gov.uk/electricity/distribution-networks/forums-seminars-and-working-groups/decc-and-ofgem-smart-grid-forum>

<sup>32</sup> Smart Grid Vision and Routemap, DECC/Ofgem, February 2014

<sup>33</sup> UK renewable energy roadmap, DECC, July 2011 & Update November 2013

<sup>34</sup> UK Solar PV Strategy Part 1 and 2 DECC October 2013, April 2014

<sup>35</sup> As set out in Electricity Market Reform: Capacity Market – Detailed Design Proposals, DECC, June 2013

<sup>36</sup> See Ministerial commitment to zero carbon non domestic buildings target – Hansard, column 146WS 2010 December 2010

<sup>37</sup> Section 10 of the National Planning Policy Framework, DCLG, March 2012

- **Department for Transport (DfT)** – Through the Office for Low Emission Vehicles (OLEV)<sup>38</sup>, leads programmes supporting the uptake in the use of electric vehicles (EVs). Whilst the growth of EVs is predicted to increase total electricity generation requirement, using smart grid technology to phase operating times, EVs can be incorporated into the network in conjunction with distributed energy systems to balance supply and demand, reducing the need for costly network reinforcement.
- **Department for Health (DoH)** – Funding programmes to support energy efficiency improvements in hospitals, as well as short-term winter fuel poverty alleviation support, directed through local authorities, through the ‘Warm Homes Healthy Peoples Fund’.
- **Department for Education (DfE)** - Works with Salix to provide 100% interest free loans to schools to undertake energy efficiency improvements<sup>39</sup> as well as an ‘Academies Capital Maintenance Fund’ to help replace heating systems. In addition, the April 2014 Solar Strategy also announced that alongside the Department for Education’s work to improve energy efficiency across the 22,000 schools in England, DECC will provide guidance for schools on how to install solar PV.
- **Department for Environment (DEFRA)** – Sets requirements for companies to undertake action to reduce carbon through their greenhouse gas reporting requirements; also policy lead on anaerobic digestion and on energy from waste policy, which includes strong support for heat networks and CHP.<sup>40</sup> DEFRA also promotes energy efficiency on industrial sites as part of Environmental Permitting Regulations.<sup>41</sup>
- **HM Treasury (HMT)** – Introduced energy taxation instruments such as the Climate Change Levy and Carbon Price Floor to promote energy efficiency actions by business.
- **Cabinet Office (CO)** – Introduced the Energy for Growth Power Purchase Agreements in 2013 providing long term contracts to buy the output from renewable generators.<sup>42</sup>
- **Department of Business (BIS)** – Jointly works with industry on the Green Construction Board which has set out a Low Carbon Routemap for the UK Built Environment;<sup>43</sup> lead department on the Smart Cities agenda,<sup>44</sup> which includes a series of energy initiatives; also provided funding in January 2014 through the ESPRC to a programme studying

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<sup>38</sup> <https://www.gov.uk/government/organisations/office-for-low-emission-vehicles>

<sup>39</sup> Salix Schools Loan Fund <http://salixfinance.co.uk/loans/schools-loans>

<sup>40</sup> Energy from waste - A guide to the debate, Defra, February 2014

<sup>41</sup> See recent Consultation on the transposition in England and Wales of Articles 14(5)-(8) of the Energy Efficiency Directive, Defra February 2014

<sup>42</sup> <http://ccs.cabinetoffice.gov.uk/i-am-buyer/categories/energy/energy-for-growth>

<sup>43</sup> Low Carbon Routemap for the UK Built Environment, March 2013

<sup>44</sup> New initiative to support \$40 billion smart cities in the UK, BIS Press Release, November 2013

'localised energy systems',<sup>45</sup> and funds the Technology Strategy Board which has an energy programme of up to £35m per year.<sup>46</sup>

38. Ofgem's role is fundamental to the operation of the UK energy system, through their management of the gas and electricity networks. This includes oversight of connections and competition on these networks, network price controls applied to distribution network operators, and encouraging efficient network operation and network innovation, all of which directly impact on the prospects for the growth of distributed energy systems. Ofgem's 'Smarter Market's work also extends to supporting the transition to the use of smart meters, establishing the appropriate regulatory environment for Demand Side Response, and, with DECC, manages an active work programme through the Smart Grid Forum, which examines key issues affecting the electricity network as increasing levels of low carbon solutions – including D3 – are connected.
39. A number of organisations are also involved in supporting the delivery of government demand side policies include the Environment Agency (which manages the CRC programme), Ofgem (which – through E-serve – manages the CCL, FITs, RHI registration and administers the Low Carbon Network Fund and also monitors the delivery of the energy suppliers ECO targets), various advice programmes delivered on behalf of government by organisations such as the Energy Saving Trust and Carbon Trust<sup>47</sup>, Salix funding public sector building retrofits, and new initiatives are shortly to come forward such as the forthcoming Community Energy one-stop-shop.
40. In addition the Green Investment Bank (GIB) is fully owned by government, and works to fund major investments in major sustainability projects, including in relation to renewable generation and energy efficiency. It also works with three fund managers to finance smaller sized energy efficiency portfolios including CHP, building retrofit, street lighting and renewable heat.

## Analysis

41. The list above provides a 'snapshot' of demand side sector policies and programmes developed across government. There clearly has been considerable activity over the past decade to advance demand side reduction and more recently actions to help support the growth of low carbon distributed energy generation.
42. However, whilst there has been this proliferation of activity, there is a lack of evidence of coordination across the policy landscape, and to date government has not set out a holistic plan for demand side action across

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<sup>45</sup> [https://www.innovateuk.org/competition-display-page/-/asset\\_publisher/RqEt2AKmEBhi/content/localised-energy-systems-a-cross-sector-approach#](https://www.innovateuk.org/competition-display-page/-/asset_publisher/RqEt2AKmEBhi/content/localised-energy-systems-a-cross-sector-approach#)

<sup>46</sup> <https://www.innovateuk.org/energy>

<sup>47</sup> Though government stopped central funding to both the EST and Carbon Trust in 2011/12, both organisations still deliver a number of programmes for DECC.

UK homes, businesses, communities and local authorities. As a result, there now exists a fragmented landscape of, largely, demand side actions set out across the government's Energy Efficiency Strategy, Solar Energy Strategy, Community Energy Strategy, Heat Strategy and Smart Grid Vision and Roadmap – all of which are ultimately targeted at the same audience – final energy consumers.

43. The absence of a clearer understanding of the potential cost-effective contribution that the demand side sector could make creates the risk that the UK does not adopt the most cost-effective approach to meeting its energy needs.
44. Furthermore, the absence of an overarching demand side goal risks creating confusion around what individual policies are supposed to collectively achieve, this could potentially undermine investor and consumer confidence in the government's demand side policies, and creating the perception in industry of a complex policy landscape that lacks coherence.
45. There is also a risk that policies may overlap and, in some instances, potentially reduce each others potential effectiveness, rather than working together to ensure that an integrated demand side, D3, approach can deliver its full contribution to UK energy policy goals. An example of this is the introduction of Demand Side Response, which includes elements of Electricity Market Reform, Smart Meters, and products policy, and which as yet does not have any team in place taking a holistic view of whether the policy framework as a whole will deliver.
46. Although the demand side sector will continue to grow, without a clearer understanding of where it may develop, government will be unable to effectively plan for its impact on the future energy system. As such the key for successful future energy policy – as well as the immediate delivery of the many policies currently in place – is for government to review how they can be better integrated to present a coherent programme of measures that consumers recognise as actively supporting them reduce and manage their energy costs. Monitoring of outputs, enforcement of policies and the various programmes effectiveness in delivering carbon and energy savings also need to be made clearer to all stakeholders.

## Recommendations

**RECOMMENDATION 1: Government needs to set out a more coherent plan around the many demand reduction, demand side response and distributed energy initiatives it currently supports across a number of strategies, policies and programmes. At present, there is a risk that benefits and opportunities are missed for the UK as a whole without a greater focus on approaching demand side activity in a more integrated way.**

**RECOMMENDATION 2: DECC needs to give significantly more strategic consideration to D3 in order to determine the impact of current policies and the extent to which it is desirable for government to lead and coordinate demand-side activity and develop and resource a roadmap for action.**

### D3 as part of the future energy market

47. The wider use of an integrated demand side approach is already beginning to impact in areas where a more strategic approach to D3 has been established.

48. It's worth considering the impact of greater demand side activity in the US which can already be seen to be contributing to:

- Total electricity demand decoupling from the pace of overall economic activity. The US Department of Energy has predicted the electricity consumption will continue to fall as a result of improvements in the energy efficiency of household appliances.<sup>48</sup>
- Accelerated adoption rates of energy efficiency across all end-use sectors.
- Tighter environmental building codes leading to more energy efficient development across all sectors.
- Distributed energy beginning to increase its market share, with solar PV the lead technology; and
- Major improvements in battery-storage technology that could further boost the role of distributed energy.

49. One company's recent US market analysis stated:

*“Moving forward, the combination of changing customer preferences, growing energy efficiency, and advancements in DG and battery technology will likely continue to drive a wedge between growth in electricity sales and real GDP growth. Flat load growth, greater energy efficiency and advances in distributed generation technology are propelling the evolution of the traditional utility business model. Electric utilities will probably see more change over the next 10 years than they did over the previous 100 years. Over the next 3 to 5 years, electric utilities will have fewer captive customers, so their business models should evolve to become more customer-centric.”<sup>49</sup>*

50. Similarly, recent analysis by Barclays has concluded: “we believe that a confluence of declining cost trends in distributed solar photovoltaic (PV) power generation and residential-scale power storage is likely to disrupt the status quo”<sup>50</sup>. The impacts of such changes are, however, still highly uncertain in terms of the future of operation of incumbent utilities, however,

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<sup>48</sup> Electricity Use Drops In U.S. For 3rd Year In A Row, NPR, December 31 2013,

<sup>49</sup> U.S. Electricity Sales: In Need of a Jumpstart, CoBank, March 2014

<sup>50</sup> <http://www.energytrendsinsider.com/2014/05/28/barclays-just-threw-gasoline-on-the-fire-that-is-the-battle-between-utilities-and-the-solar-industry/#more-16697>

it is likely that energy suppliers will have to adapt business models with a greater emphasis on new services focused around demand side solutions.

51. Such changes can already be seen in the US where the growth in demand side activity is bringing forward new D3 approaches by utilities. California's energy system operator has recently set out a roadmap on how demand response services and energy efficiency can support existing policies supporting distributed energy.<sup>51</sup>
52. Such approaches are also now being examined more widely: the IEA has a work programme in place studying opportunities for 'Integrated Demand Side Management' looking at the "three pillars working together to achieve optimal use of energy produced"<sup>52</sup> – energy efficiency, demand side response and distributed energy.<sup>53</sup>

### Modelling the future energy system

53. It has been estimated that £110 billion of capital investment is required over the period from 2012 to 2020 for the construction of a new generation of power stations and to upgrade the UK's ageing energy infrastructure. Of this, government analysis indicates that around £75 billion is needed for new generating capacity. Ofgem's 'Project Discovery' estimates that around £35 billion is required to renew the UK's electricity transmission and distribution networks.<sup>54</sup> The government's latest figures indicate that around £14bn was invested against this target in 2013, meaning that the future estimated spend requirement now stands at up to £100bn from 2014 to 2020.<sup>55</sup>
54. The government's view on where this investment needs to be directed has been informed through detailed modelling work, first set out in the 2011 Carbon Plan, which has fed directly into the EMR policy.<sup>56</sup> In short, this suggests that electrification of sectors such as transport and heat could lead to average electricity demand rising such that the UK may need as much as double of today's electricity capacity to deal with peak demand.<sup>57</sup>
55. Although, particularly in recent years there have been a range of policies established to support D3 activities, including the planned roll out of smart meters, there is a perception that the focus of government and energy

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<sup>51</sup> Demand response and energy efficiency roadmap, California ISO, January 2014

<sup>52</sup> Chairman's Foreword, Implementing Agreement on Demand-Side Management Technologies and Programmes, Annual Report – 22 January 2014

<sup>53</sup> IEA Demand Side Management Programme, [www.ieadsm.org](http://www.ieadsm.org)

<sup>54</sup> Electricity Market Reform: Policy Overview, DECC November 2012

<sup>55</sup> DECC [Energy Investment Report](#), April 2014

<sup>56</sup> DECC EMR <https://www.gov.uk/government/policies/maintaining-uk-energy-security--2/supporting-pages/electricity-market-reform>

<sup>57</sup> page 70 onwards of The Carbon Plan - reducing greenhouse gas emissions, DECC, November 2011

sector funding has been around upgrading the system that has been in operation for fifty years or so, replacing existing assets with effectively 'more of the same' (i.e. more large-scale generation capacity). Hence investment is being directed to large-scale electricity generation capacity with plans that coal, gas plant and nuclear plant is largely replaced by offshore wind, gas, CCS and nuclear plant.

56. The outputs from government modelling work, and, importantly, how it feeds into policy decisions, has raised a key question by many demand side organisations about how these models take account of potentially more complex future energy scenarios, with far higher levels of disaggregated demand side energy solutions in place.

57. It is interesting to note that DECC's latest projections suggest that solar PV will be a key contributor to the growth of renewables in the UK, with a central modelling forecast for 2020 of 10GW of PV capacity in place, and with potentially up to 20GW being technically feasible.<sup>58</sup> In contrast, modelling underpinning Ofgem's major future energy scenarios work in Project Discovery,<sup>59</sup> undertaken only in 2009, makes no reference to solar PVs at all, and DECC's Carbon Plan makes only scant reference to the future role of solar PV. This highlights the rapid nature of which demand side measures can take hold if appropriately targeted to consumers.

58. As demand side activity grows, it is important that policy is best able to evaluate through its modelling work the extent that D3 can contribute to the achievement of UK energy priorities. At this time, opportunities such as DSR, deep level energy retrofits of non-domestic buildings, the role of heat networks, the growth of decentralised energy systems such as CHP and PV and the integration of D3 at the local/distributed network level have only limited integration in the DECC's energy models.

59. The need to evaluate the impact of demand side activity on local networks is now being recognised as being important to understanding how the UK's future energy system may operate. In the past few months alone, a number of new modelling projects have been announced looking at the future role of demand side in more detail. These include:

- Analysis using the Smart Grid Forum's TRANSFORM model to understand the distribution network reinforcement costs associated with increasing low carbon technologies connected to the electricity distribution network.

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<sup>58</sup> EMR modelling has suggested a level of solar PV between 1.8GW – 3.2GW coming forward under the RO and CfD to 2020. In addition to this, central assumptions for small-scale FITs indicate 7.5GW of solar during the same period, giving a modelled total of 9.3GW -10.7GW solar PV deployed out to 2020. See 'Solar PV Strategy Part 1: Roadmap to a Brighter Future' DECC, October 2013

<sup>59</sup> Project Discovery: Energy Market Scenarios Ofgem October 2009

- Work commissioned by the Energy Technology Institute (ETI) to develop a modelling framework to help local authorities evaluate the economic and social benefit of changes to the local energy system.<sup>60</sup>
- Also commissioned by the ETI, the development of new software modelling tool – EnergyPath – to be used in the planning of cost-effective local energy systems.<sup>61</sup> EnergyPath will complement the ETI’s ESME model.<sup>62</sup>
- DECC have also recently (February 2014) received a new, far more detailed National Household Model covering domestic energy policy over the whole of Great Britain which can model the impact of different scenarios on household energy demand.<sup>63</sup>
- A further initiative underway is the Technology Strategy Board’s £11m ‘Localised Energy Systems’ project that is taking a D3 approach, helping the development of products to improve the balance of demand and supply by supporting the integration of technologies into energy systems, including those of energy users and producers, at a scale from clusters of buildings up to whole districts.

60. These projects are closely linked to DECC’s work and it will be critical for these outputs to feed into future government modelling analysis.

61. The D3 project hence also includes a parallel study looking at the extent that demand side energy measures are taken into account in the energy models government use. This has been undertaken by the Centre for Sustainable Energy (CSE) and is published in parallel with this D3 policy landscape report.

### Moving to a D3 Future?

62. There is already broad agreement by all stakeholders that the future energy landscape will feature a far more complex mix of technologies generating, transmitting, distributing and storing energy.

63. The transformation is already underway and can be seen most markedly over the past few years in the take up of solar PV. Government’s initial assessment of the FIT scheme was that it was expected to support over 750,000 small scale low carbon electricity installations by 2020.<sup>64</sup>

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<sup>60</sup> See 19 February 2014 press release

[http://www.eti.co.uk/news/article/eti\\_appoints\\_europe\\_economics\\_to\\_develop\\_modelling\\_framework](http://www.eti.co.uk/news/article/eti_appoints_europe_economics_to_develop_modelling_framework)

<sup>61</sup> ‘ETI appoints Baringa Partners to help develop EnergyPath software tool to design cost-effective local energy systems for the UK’ ETI Press Release 27 January 2014

<sup>62</sup> The ESME model is considered in the parallel D3 Technical Analysis report

<sup>63</sup> Further information on this is at: <http://www.cse.org.uk/projects/view/1233>

<sup>64</sup> Impact Assessment of Feed-in Tariffs for Small-Scale, Low Carbon, Electricity Generation (URN10D/536) 1 February 2010

However, a total of 448,222 renewable installations have already been registered under the scheme from April 2010 to 31 December 2013.

64. Solar PV is now being added at a rate of over 20-25,000 a quarter and the Solar Trade Association believes that solar could be installed on one million roofs by the end of 2015.<sup>65</sup> National Grid now state that *“Embedded PV generation is experienced as a suppression of the National Demand. The effect is significant and as such National Grid now incorporates estimates of total PV generation in to its National Demand.”*<sup>66</sup>

65. It should be noted that progress in PV cost reductions (installed costs estimated to have fallen around 50% between 2010 and 2012) is being matched in other technology areas of the demand side sector. McKinsey has reported that LED costs have fallen by more than 85 per cent over the past five years, and the cost of electrical storage has halved over the period 2009 to 2012.<sup>67</sup>

66. Other indicators reflecting increased activity across the demand side sector include:

- A recent CBI survey reported that 80% of respondents cited energy efficiency as a priority for their company.<sup>68</sup>
- The uptake in the use of CHP and district heating in new development, especially in London where planning rules have encouraged the use of distributed energy systems in new development.<sup>69</sup>
- Significant interest across the UK in the use of district heating, recently supported through DECC’s new heat network funding programme.<sup>70</sup>

67. National Grid has stated that since *“2006 the demand on the transmission system has been dropping consistently. This is partly due to the connection of increasing amounts of distributed energy but also down to energy efficiency measures and behavioural change. The drop in demand level is sustained and likely to continue”*.<sup>71</sup>

68. Electricity distribution companies are already studying how this increase in the use of demand side measures will impact on the operation of their networks. The growth in D3 will lead to a major shift in network operation from the traditional passive role of transferring electricity from producer to

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<sup>65</sup> <http://www.solar-trade.org.uk/news.cfm?id=212>

<sup>66</sup> Summer Outlook 2014, National Grid, April 2014

<sup>67</sup> Myths and realities of clean technologies, McKinsey, April 2014

<sup>68</sup> ‘Shining a light Uncovering the business energy efficiency opportunity’, CBI, August 2013

<sup>69</sup> Detailed in following section

<sup>70</sup> Over 50 English local authorities have already successfully applied for DECC Heat Network funding since the programme became operational in September 2013 to study district heating opportunities in their area,

<sup>71</sup> Summer Outlook 2014, National Grid April 2014

consumer, to a much more complex 'active network', distributing electricity from potentially hundreds or thousands of generators at the local level, to the interaction of potentially millions of 'smart products', and storage devices to supporting local balancing and system optimisation.

69. Such opportunities are already being trialled through initiatives such as Ofgem's £500m Low Carbon Network Fund (LCNF) programme. A wide range of LCNF projects are now taking place across the UK, exploring how distribution networks can facilitate the take up of low carbon and energy saving initiatives such as electric vehicles, heat pumps, micro and local generation. Commercial demand side response programmes, community energy projects and projects studying consumer behaviour response – both in the domestic and non-domestic sectors are also underway.<sup>72</sup> The LCNF programme will finish in 2015, to be replaced by the introduction of the Network Innovation Allowance (NIA) and Network Innovation Competition (NIC). Ofgem will expect to see learning from the current LCNF embedded into future electricity distribution company business plans under the new regulatory regime, RIIO,<sup>73</sup> which will come into operation in 2015.

70. A major study into smart grids by the UKERC published earlier this year, following two years research, provides some useful insight to how consumers view a shift to greater user of demand side action and smart grids. The conclusions reported a real appetite for change from consumers and industry alike. Following a series of public workshops, the preferred scenario which showed greatest consumer interest was one predicting a future where a significant amount of energy is generated by households and through community led schemes with strong consumer interest in engaging with the energy system, partly due to increased national concern over the declining capacity margin, and also in response to the upward trend in energy prices.<sup>74</sup>

71. The government's recently published Smart Grid Vision and Routemap sets out the scale of change that the combination of smarter grids and greater D3 will bring:

*"The potential of smart grids are huge. They could revolutionise the way we generate and use energy, enabling new forms of generation to connect and bringing customers into the heart of the equation with their ability to shift demand and balance the system. To realise that potential, we need to rethink the roles and responsibilities of all the players in the electricity system; we need to continue to invest in smart technologies in the near*

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<sup>72</sup> The Energy Networks' Association (ENA) Smarter Networks Portal provides details on many of these LCNF projects <http://www.smarternetworks.org/Index.aspx?Site=ed>

<sup>73</sup> RIIO (Revenue=Incentives+Innovation+Outputs) is the new price control formula being brought in for electricity distribution companies, and will operate over an eight year period .

<sup>74</sup> Scenarios for the Development of Smart Grids in the UK, UKERC, February 2014

*term and integrate them into existing networks; and we need to maximise the economic and commercial benefits for the country as a whole.”<sup>75</sup>*

72. Such fundamental changes in the operation of the GB energy system will require a different focus by government to understand what benefits to consumers and to the efficient energy system management could be facilitated through the wider use of D3. Specific opportunities that may arise and require further consideration by policy makers could include:

- The extent that the novel solutions such as DSR or energy storage will be taken up, and the value this will bring to both consumers and network management.
- How consumers will respond to new opportunities for selling excess heat or power generated from their own onsite renewable or low carbon distributed energy systems.
- Whether a market for the ‘local sale of heat and power’ may emerge, and what the value of ‘local’ will be in a period of more active network management where such local supply of energy may be particularly valued for balancing purposes.<sup>76</sup>
- Whether D3 can enhance competition by bringing in new, non-traditional players in the energy supply market. These could include ESCOs, renewable suppliers, local authority or community led initiatives.
- The extent that these new energy sector players will want to invest in supporting their local networks by developing D3 solutions. This is particularly important, as the £100bn level of investment required between now and 2020 identified by government to upgrade the UK energy system is beyond the balance sheets of the traditional major energy suppliers.
- How government mechanisms targeted at the non domestic sector, such as the EUETS, the CCAs, CRC, CPF and ESOS, can best support the uptake of D3.
- How growth in D3 can help defer or avoid investment of centralised generation plant or transmission grid infrastructure.
- How local system balancing, through the use of DSR, CHP, heat networks and thermal storage, can help national level balancing of

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<sup>75</sup> Smart Grid Vision and Routemap, Smart Grid Forum DECC/Ofgem, February 2014

<sup>76</sup> These issues are looked at in detail by Sustainability First in their paper ‘The Electricity Demand-Side and Local Energy : how does the electricity system treat ‘local’ ?’, Sustainability First, January 2014

intermittent renewable electricity supply, and how these services can be rewarded.

- The extent that government policies will drive D3 as smart grids develops, or if the market will evolve via a slower ‘creeping’ process, simply as a result of ‘smart’ being integrated into the energy system over time through new products and services.
- How quickly the effects of the combination of Smart Grid and D3 will impact on the UK energy system. The Smart Grid Forum’s estimates that this impact will not fully be felt until the next RIIO<sup>77</sup> time frame (from 2023 onwards) however, it is also recognised that locational effects may drive activities forward at a faster pace – e.g. in cities, especially London, where future economic growth is already predicted to put significant challenges on the local electricity distribution grid. DNOs now believe that smart grids may need to respond to ‘hotspots’ where clustering of D3 is happening.
- How major government initiatives soon to be determined, such as DCLG’s 2016 zero carbon homes and 2019 zero carbon buildings policies, and the conclusion of its Allowable Solutions consultation, will support on the take up of onsite or local D3 solutions.
- The need for actions to encourage area specific D3 solutions as a result of regional differences ie urban vs rural; inner city vs suburban’ areas of higher PV incidence; areas of high district heating incidence; zero carbon building neighbourhoods vs conservation areas; areas with particular ‘peaky’ energy needs, such as business districts where DSR may be particularly attractive; areas with potential of high levels of energy storage; and so on.
- How consumers will behave once they have a greater ability to control their home or business energy systems through smart devices.

### Review of demand-side modelling within DECC

73. Alongside this policy report, DECC commissioned a review of its approach to modelling D3. As the report concludes, D3 is potentially a very difficult area to model due to the number and nature of interactions. The key conclusion of the review is that although each individual modelling effort is done carefully and to a good standard, more could be done to ensure effective integration of the results from multiple models and the influence of one model onto another.

### Analysis

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<sup>77</sup> RIIO ED1 operates from 2015-2022

74. The take up of demand side measures, mainly as a result of improved energy efficiency in the domestic sector, has clearly had an impact on helping reduce energy consumption over the past decade. When combined with other demand side solutions, notably through the installation of distributed energy systems, it can be seen that D3 can, and already is in some countries, leading to a fundamental change in how the energy sector operates.
75. Further consideration and analysis is required on the wider benefits that may arise out of the increased uptake of D3 and, importantly, how such benefits can be incorporated into DECC's modelling work. Critically, government also needs to clearly articulate how it intends to ensure that new policies come forward are solution neutral (i.e. not demand or supply side biased).
76. The UK is a world leader in smart grids activity and work undertaken by DNOs through Ofgem's LCNF programme is beginning to provide some highly useful information on the impact of increased levels of D3 onto the electricity distribution network. It will be increasingly important that outputs from these pilots are studied by policy makers and, where appropriate, feed into DECC's demand side policy work. Valuable insight into emerging areas of DECC work such as energy storage and DSR will be particularly important.
77. Areas that require greater analysis within government, and hence dialogue between government and industry, include the scope for D3 in the non-domestic building sector; greater opportunities for the use of CHP and district heating; and the potential for Demand Side Response.

## Recommendations

**RECOMMENDATION 3: As demand side opportunities grow, government needs to examine the extent that the demand side can contribute to helping achieve the UK's energy policy goals and give the appropriate support to help build expertise within relevant teams to ensure that this can be achieved.**

**RECOMMENDATION 4: DECC needs to undertake more detailed analysis to explore the potential impacts of D3 on the future energy landscape and identify the cost-effective contribution that these could make to UK energy policy.**

**RECOMMENDATION 5: As DECC looks forward to future carbon budgets, it should consider setting an energy demand management target for the UK, balanced against the estimated costs of future supply.**

## Government and Industry Engagement on D3

78. As detailed in the previous section, there has been considerable activity by government over the past few years in establishing a suite of new policies focused on supporting greater demand side action. The development and implementation of demand side policies can however present a very different set of challenges compared to those areas of work, predominantly supply side energy sector focused, that government has had long experience in delivering e.g. facilitating investment in oil and gas infrastructure, coal/gas/nuclear power station consent policy, electricity market restructuring etc.
79. This is not to say that DECC has not built up considerable expertise on demand side issues, however, it is clear that opportunities are developing quickly and testing existing energy market structures. Such changes require a more integrated approach across government, Ofgem, industry and other key actors to determine the extent that demand side activity is going to transform the UK's future energy market and where and how such growth is best supported. Such analysis needs to be focused more at the local distribution level, predominantly in our towns and cities, where greater volumes of demand side solutions will be introduced. Government is only now beginning to address this change in focus – for instance through the development of the Heat Networks Delivery Unit, the introduction of a new Community Energy Strategy, and a Core Cities programme, however it is clear that further work will need to be undertaken in this area.
80. Many of the challenges in evaluating demand side policies are already recognised by government, such as accessing data related to technologies (project capital costs and likely future cost reductions, carbon and energy savings achieved, existing market size, installer base etc), and predicting market and consumer response to new policy mechanisms. Some challenges are however perceived by many in the demand side industry as being more 'hard-wired' within government, such as has been highlighted by the Energy and Climate Change Committee, and need to be considered further as D3 begins to play a more significant role in the UK energy system.
81. Through discussions with demand side stakeholders, and officials within DECC, a number of issues have been raised in relation how government will need to rebalance policy considerations as D3 growth increases and, going forward, how policy design can create and evaluate genuine competition between supply and demand side solutions.
82. Points raised can be grouped around the following themes:

## ***I. A perception that government does not recognise the potential contribution that demand side measures could make to deliver UK energy policy goals***

- A common theme raised in many quarters is a view that UK energy policy is principally focused around supporting the development of large-scale infrastructure assets. There are good historical reasons for why this has been the case, but as a consequence, there is a perception that the development of supply side assets is where government's knowledge, expertise and most importantly, confidence in delivery against policy goals remains concentrated.<sup>78</sup>
- A perception that government has more confidence in the deliverability and measurement of policies that generate a unit of energy rather than save a unit of energy. The most recent example of this given is the consideration of demand reduction and demand side response opportunities in the EMR.
- A recent EU comment paper was highlighted during discussions, which pointed to the UK's support for new nuclear generation, and the issue of 'confidence' between supply and demand, and how the government "*considers that gains from demand-side response which go beyond those achieved through existing policies cannot be considered certain, in particular since the demand-side response market might take time before becoming effective.*"<sup>79</sup> However, the timetable and certainty around for new UK nuclear plant is itself as yet highly uncertain.
- An issue raised several times was that the EMR's future estimates of a requirement to double the present level of UK electricity generation capacity over the coming decades, as first set out in DECC's 2011 Carbon Plan, has set government focus on significantly increasing levels of large-scale supply side generation.
- A view that government has not as yet adequately considered the full extent that demand side solutions can make to achieve UK energy policy goals in the medium and longer term. For instance, some people feel that government is only now beginning to consider key demand side sectors such as improving energy performance in the non-domestic building sector, and also the role that distributed energy generation can play in the UK's towns and cities.

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<sup>78</sup> It should be noted that DECC only came into operation as a government department in 2008, merged from the former Department of Trade & Industry (DTI), which dealt with the majority of government energy policy, with a much smaller energy policy unit based in the Department for Environment, which in the main dealt with energy efficiency policy and on the development of the government's emissions trading programme.

<sup>79</sup> Para 254 of State aid SA. 34947 (2013/C) (ex 2013/N) – United Kingdom Investment Contract (early Contract for Difference) for the Hinkley Point C New Nuclear Power Station 18 December 2013. Para 398 of the paper goes further stating that: "*Aid to [new nuclear generators] also has the potential to decrease the incentives to invest in demand-side response measures, including storage, energy efficiency and energy saving measures.*"

***II. Many areas of the D3 market are developing quickly – the pace of change in industry and in policy-making is also rapid. This can cause uncertainty for business and policy makers.***

- A number of demand side policies currently in place have only recently been introduced, and have had as yet only a short time to operate. Policy design on some of these issues is also still developing (FITs, RHI, Green Deal, CHP, district heating etc). This makes it difficult for government to bring together a more 'customer focused' integrated package of demand side policy measures until there is greater understanding of how these policies work individually.
- A number of these policies have also been subject to significant amendments and delays. Examples include the restructuring of the FITs tariff regime (2011/12); HMT's changes to the recycling of funds under the CRC (2011); definitional changes and delays by DCLG in finalising policy around Zero Carbon Homes (2010-2014), as well as the recent announcement by the Prime Minister to review the scope of the ECO (2013). Such changes, often over very short timeframes have lead to business uncertainty across many parts of the demand side sector.
- Government has introduced a number of highly novel and ground-breaking new demand side policies. These include the Renewable Heat Incentive (RHI) domestic and non-domestic schemes, the 2016 Zero Carbon Homes programme and the Green Deal. Being the first to innovate comes with its own challenges, and the introduction of these particular initiatives has clearly been challenging. There may be benefits in understanding if there were specific reasons to why these demand side policies faced such difficulties as further innovative demand side policies develop. DECC's non-executive committee review of how the changes to the FITs regime were managed provides some useful recommendations in this area.<sup>80</sup>
- Government has also set out policies in response to anticipated progress of novel products, which have subsequently faced development difficulties. MicroCHP (<2kWe) and microwind (<3kWe) are two such examples of this, where industry's – and government's – initial expectations were not realised.
- DECC is undertaking work to develop its evidence base in a number of demand side sector areas. Examples include the Building Energy Efficiency Survey (BEES), which will collect data from 10,000 surveys of non-domestic building occupiers, which will be used to model

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<sup>80</sup> Feed in Tariffs Scheme: Lessons for the Future, DECC, March 2012

consumption and abatement potential.<sup>81</sup> The development of a non-domestic building National Energy Efficiency Data (NEED)<sup>82</sup> framework is also underway.

- The pace of development in some areas of D3 has opened up potential areas of ‘policy lag’– an example of this is the rapid growth in the distributed energy market, especially in relation to photovoltaics, since the introduction of FITs in 2010. Government’s initial expectations on the take up of PV have been far exceeded (detailed further on), as a result of significant cost reductions in PV technology and consumer appetite to install PV.
- In contrast to employees that work in the energy sector, many of which may stay working on energy issues across their career, government officials often move across different government departments and very different areas of policy after relatively short periods of time. Hence, there are challenges associated in maintaining a level of policy history and ‘corporate knowledge’ on technical regulatory issues within a team when there is such rapid staff change.
- It is widely anticipated that product innovation within the demand side sector will continue to improve products over the coming years.<sup>83</sup> Smart appliances, smart energy controls, energy optimisation software, DSR and the ability to exploit the full benefits of distributed energy output, could lead to dramatically different patterns of energy consumption across the local grid. Policy makers will therefore need to take into account the operation of a far more complex and active distribution network than that which currently operates.

### ***III. D3 industry needs a stronger and coherent voice***

- Industry representation across the demand side sector is made up of a large number of modestly sized trade organisations, often with limited capacity or resource to engage in detailed discussions with government across the breadth of policy areas that DECC, Ofgem, and the EU regularly consult upon. This poses challenges for both industry and government. From an industry perspective, consultation processes may seem remote and it can be challenging to understand how their views have been considered. From a government perspective, it can be difficult to determine a way forward when industry does not speak with ‘one voice’.

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<sup>81</sup> The last time a national survey was run was for the Non-Domestic Energy and Emissions Model (N-DEEM) in the mid-1990s. See ‘Non-domestic building energy use project phase I’, DECC, June 2013

<sup>82</sup> Data used in non-domestic NEED will be gathered from the Valuation Office Agency’s Non- Domestic Rating List (NDR), meter point electricity and gas consumption data, and business data from Experian and Display Energy Certificates (DEC).

<sup>83</sup> ‘Myths and realities of clean technologies’ McKinsey Insights, April 2014

- In contrast, the incumbent energy industry representation tends to be better resourced and able to engage with government on a more equal basis. Some demand side businesses are concerned that government will always listen more closely to established energy sector voices than the ‘businesses of tomorrow’. There have also been few instances of demand side industry secondees working within government – often because organisations are not always in the position to fund such activities, but also as a result of government not always considering such opportunities.
- The decision making process in government appears remote to many to the demand side industry, and there seems limited ability to influence work, especially in relation to the critical impact analysis phase of policy making where numbers presented are often outputs from government modelling, which little is known about outside of government departments.
- An issue raised, both by the demand side industry and within DECC itself, is that the government’s statutory targets on climate change and renewable energy can work against the delivery of the most cost-effective, low-carbon energy solution. This is because demand reduction/DSR measures are focused on contributing to the government’s carbon reduction goals (tonnes of CO<sub>2</sub> saved),<sup>84</sup> whereas the renewable energy target is however focused on the delivery of MWh of renewable energy to achieve the UK’s 2020 15 per cent target.
- Large-scale power plant investment is highly visible, typically undertaken by larger corporations and creates a concentration of jobs in local communities. The economic benefits of such projects are hence often easier to take into account. This contrasts with demand side policies, which support the installation of thousands of mostly ‘smaller’ demand measures, where the local benefits are more distributed and hence not so easily recognised, or at least not so well documented at present.
- Similarly, demand side measures are also less visible in terms of flagging up policy successes by government. Energy efficiency measures, CHP, district heating pipes, DSR opportunities etc. are ‘hidden away’. Over 2,500 MW of photovoltaics has been installed – predominantly on domestic roofs – over the past three years. Media – and often political - coverage however most often focuses on large amounts of investment in a major, single infrastructure project.

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<sup>84</sup> The Renewable Energy Roadmap recognises that energy efficiency is the most cost effective way of closing the gap between supply and demand, however, every unit of renewable energy generated is equivalent, in terms of the 15 per cent EU target, to 6.6 units of demand reduction.

- The demand side sector also brings forward ‘challenger companies’ with disruptive technologies that can present difficulties in terms of building policy. DECC’s Energy Entrepreneurs Fund<sup>85</sup> is hence a welcome initiative, providing support to these technologies, and helping establish an evidence base.
- Integrating D3 is a sophisticated process for the client and there are current few independent intermediaries operating between the policy and consumers. Whilst there are number of government funded bodies that have been created to help implement the management of government programmes (Green Deal Oversight and Registration Body, Ofgem, CHPQA, Microgeneration Certification Scheme etc), there is a perception in industry that there is a need for more independent, user friendly and accessible guidance for the end consumer, and that government may be best placed to deliver this.

## Analysis

83. The growth and opportunities presented by demand side solutions, and the need to craft policy instruments around these, has clearly presented challenges to government. There has been considerable churn across a number of key demand side policy instruments over the past few years, often over very short periods of time, which has created concern and uncertainty across all D3 sectors. Going forward, government must ensure that there is greater stability around policies introduced to develop the demand side supply chain.

84. To address this, it is critical that government builds expertise within its relevant demand side policy teams and ensures that key demand side policy areas develops sufficient resource, industry knowledge and data to help support policy design. The demand side industry has key role to play here and DECC – and industry – needs to examine how they can best engage to help build the department’s knowledge base, and also how industry can fully participate in the policy-making process.

85. The process to understand how a more coherent D3 approach across demand side policies can be introduced has yet to be examined in any significant way by government. Such an approach will require involving a broader range of stakeholders, including the participation of local authorities and cities, DNOs, consumer organisation and community energy groups as well the demand side industry.

86. The demand side industry represents a diverse range of technologies and organisations. Relevant trade bodies and professional organisations should consider how to better coordinate their activity and work together to

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<sup>85</sup> <https://www.gov.uk/government/publications/energy-entrepreneurs-fund-phase-3-documents>

better evidence the effectiveness of an integrated D3 approach and the contribution of D3 industry to the UK economy.

87. As the government's Energy Efficiency Strategy identifies there are a number of market failures which currently serve to limit uptake of demand reduction measures. The Strategy identifies four barriers: lack of access to trusted information, undervaluing energy efficiency, misaligned financial incentives, and an embryonic market. It seems likely that these barriers may also extend to other aspects of the D3 landscape. DECC should explore this issue further with industry.

### Recommendations

**RECOMMENDATION 6: As the energy market accommodates greater levels of demand side activity, government and industry need to work together to identify policy and market barriers, which may limit a more integrated D3 approach. This will not only need better coordination across government departments and policy areas, but will also require a more coherent industry representation on D3 to government.**

**RECOMMENDATION 7: Improving energy performance in the non-domestic buildings is a key area where significant work still needs to be undertaken by government – even if only to raise the profile of existing policies, awareness of which is not as high as it could be. This is also a priority for D3 activity and DECC and industry should work closely to set out coordinated plan of action for the non-domestic building sector.**

### **D3 & Location**

88. Through their powers and responsibilities (environmental, housing, health, planning, waste, local transport, building control, powers to promote well-being and so on), local authorities have significant influence over the scale and rapidity of deployment of demand side energy measures in their local areas.
89. Though government has been bringing forward a range of policies to stimulate demand side solutions, there remains limited opportunities for local government or cities, in either the policy design process, or in shaping strategies to deliver these actions.
90. In practice, there appear to be limited opportunities for local government to help define demand side policies at the early stages of conception, outside of the DECC-LGA memorandum of understanding (MoU) or via consultation responses.
91. An increasingly disaggregated energy sector will involve potentially many millions of new interactions with domestic and non-domestic consumers, from the roll out of smart meters, to deep building retrofits, the installation of PVs, heat pumps and district heating networks. This brings a much stronger spatial element into energy policy, where greater recognition of local potentials and constraints, knowledge of the built environment, renewable energy resource, skills, will need to be understood. This is likely to require a much closer relationship than that which exists at present between central government decision makers and those institutions closer to the side of delivery.
92. This includes not only local authorities, but also the devolved administrations, organisations such as the Core Cities group, specific strategic bodies such as the Greater London Authority (GLA) and AGMA (Association of Greater Manchester Authorities), and Local Enterprise Partnerships (LEPs), amongst others.
93. The government has recently undertaken a similar process, supporting the important contribution that can be made in the energy sector by community groups. The recent Community Energy Strategy sets out a useful series of actions to support demand side activity by these groups, and to unblock barriers to the wider take up of community-led projects. It may now be helpful for government to consider a similar process to help set out government's longer-term engagement on energy with local authorities and cities.

### **Background to government energy work with local authorities**

94. Government has undertaken several initiatives over the past few years which have looked to secure and support a greater level of involvement between local authorities and central government on energy. Some of these have included:

- DECC and DCLG commissioned work to help understand the different regional contributions that could be made to support the achievement of the 2020 renewable energy target. These were finalised in 2012,<sup>86</sup> and DECC's Renewable Energy Roadmap stated that local authorities and communities should be able to use the results of these assessments to inform development of their local and neighbourhood development plans.<sup>87</sup> It's not clear if this work has subsequently gone on to feed into local planning guidance documentation to support the delivery of the government's target, but DCLG's new technical planning practice guidance website does make reference to the methodology behind these studies.<sup>88</sup>
- Legislative changes were introduced by DECC in August 2010 allowing local authorities to sell renewable electricity for the first time.<sup>89</sup>
- DECC and the Local Government Association (LGA) funded a series of nine local authority pilots under Local Carbon Framework to explore how national carbon targets could be achieved at a local spatial level, and to share good practice on lessons learned.<sup>90</sup>
- DCLG undertook a review of government planning guidance, and set out a new set of energy criteria for planning authorities to consider in the National Planning Policy Framework (NPPF), which includes reference to supporting demand reduction and distributed energy.<sup>91</sup>
- In 2011 the then DECC Secretary of State signed a MoU with the LGA which had been *"created in acknowledgement of the pivotal role councils have in tackling climate change: by reducing carbon emissions from their own estate and operations; encouraging and enabling their residents, businesses and visitors to reduce their carbon emissions; and by achieving national priorities such as the Green Deal and renewable energy deployment in a locally appropriate way."*<sup>92</sup> The MoU set out a series of specific actions and a work plan bringing together

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<sup>86</sup> DECC publishes methodology for renewable and low-carbon capacity assessment, 12 October 2010

<sup>87</sup> Renewable Energy Roadmap, DECC, July 2011

<sup>88</sup> Launched 6 March 2014 - <https://www.gov.uk/government/publications/national-planning-policy-framework-technical-guidance>

<sup>89</sup> Huhne ends local authority power struggle DECC Press Release 9 August 2010

<sup>90</sup> Evaluation of the Local Carbon Framework Pilots, CAG Consultants, 2011

<sup>91</sup> sections 95-97, National Planning Policy Framework (NPPF), DCLG, March 2012

<sup>92</sup> Memorandum of Understanding - Between the LG Group and the Department of Energy and Climate Change, 9 March 2011

DECC and the local government group, with quarterly meetings to review progress. The MoU included, for the first time, some useful initiatives, which would help bring together the various strands of demand side policy activity initiated by government, working towards agreement of *“a collaborative approach to promoting locally appropriate and evidence-based renewable and low carbon energy deployment.”* The DECC-LGA MoU was significantly revised in July 2013 into a new, more strategic, two-page agreement.<sup>93</sup>

- Building on this MoU, government commissioned the Committee on Climate Change (CCC) to prepare guidance for local authorities on delivering CO<sub>2</sub> emissions reductions. This analysis was published in 2012<sup>94</sup>, with the CCC’s highlighting the important role played by local authorities in delivering national carbon targets, especially through actions such as improving energy efficiency in buildings. The CCC concluded that: *“All local authority areas should develop a low-carbon plan that includes a high level of ambition for emissions reductions and focuses on emissions drivers over which local authorities have influence in buildings, transport, waste, renewable power generation and their own estates.”*
- Following initial announcements that the 1995 Home Energy Conservation Act (HECA)<sup>95</sup> would be repealed, government later decided against such a move and instead issued new HECA guidance placing a basic requirement for all (English) local authorities to report on measures they propose to undertake in their local areas to improve the energy efficiency of all residential accommodation.<sup>96</sup> Research was undertaken on behalf of DECC, summarising the contents of each of the 313 HECA reports submitted.<sup>97</sup> A database of these summaries provides an outline of reported local authority demand side activities undertaken by each local authority, such as activities linked to the Green Deal, ECO, activity on FITs/RHI, and details on planned area-based approaches. Local authorities are then requested to update these reports every two years.
- DECC have also established a new Community Energy Unit within the department which will work with communities and local authorities to *“provide a step-change in the support offered to community energy projects”*.<sup>98</sup> This unit will work to address issues raised in the Community Energy Call for Evidence consultation, which reported that

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<sup>93</sup> Memorandum of Understanding between the Local Government Association and the Department of Energy and Climate Change, July 2013

<sup>94</sup> How local authorities can reduce emissions and manage climate risk Committee on Climate Change May 2012

<sup>95</sup> <http://www.parliament.uk/documents/impact-assessments/IA10-155AL.pdf>

<sup>96</sup> New guidance for local authorities to improve energy efficiency of homes, DECC press release 26 July 2012

<sup>97</sup> <https://www.gov.uk/government/publications/2013-home-energy-conservation-act-heca-reports>

<sup>98</sup> Para 8 Community Energy Strategy: Full Report, DECC, January 2014

there was “a large disparity in the level of support offered to community energy groups between different local authorities. In some places local authorities are perceived as having unintentionally undermined projects. The main barriers reported were a lack of capacity and understanding of the benefits of community energy; inconsistency compared with other local authorities in the application of planning rules and consents; and confusion over interpretation of government’s energy and climate change targets.”

- Recent funding programmes from government targeted at local authorities include the £46m Green Deal Pioneer Programme,<sup>99</sup> £88m Green Deal Communities Fund<sup>100</sup>, funding for Collective Purchasing initiative a new £90m tranche of funding announced in December 2013 to improve the energy efficiency of schools, hospitals and other public sector buildings over three years, building on the existing Salix scheme, and councils are also regularly bidding projects into the ECO brokerage.<sup>101</sup>
- In addition, DECC’s £7m Heat Network Funding Stream launched in 2013,<sup>102</sup> is already helping support 51 local authorities with their heat network plans from the initial two rounds of applications<sup>103</sup>.
- DCLG have put forward proposals in their Allowable Solutions consultation including questions about where funds should be allocated (local to the development, or elsewhere in England), and if measures supported should be in the traded or non-traded sectors.<sup>104</sup> The outcome of this consultation will have a significant impact of ambitions of local authorities to resource local demand action and invest in low carbon demand side measures.

95. Other areas of government energy and climate policy which link into the involvement of local include energy from waste, supporting consumer take up and use of smart meters,<sup>105</sup> low carbon transport, climate change adaptation and so on.

96. Recent research by the Green Alliance has however pointed to councils downgrading prioritisation on energy and climate change issue, with activities classed as ‘very weak’ or ‘absent’ in 65 per cent of local authorities.<sup>106</sup> Contributing to this:

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<sup>99</sup> £46 million boost for 132 local energy schemes, DECC Press Release, 24 January 2013

<sup>100</sup> Support for Local Authorities to keep homes warm and lower energy bills, 2 April 2014

<sup>101</sup> Government action to help hardworking people with energy bills, DECC Press Release 2 December 2013

<sup>102</sup> Funding boost for low carbon heating, DECC Press Release 26 March 2014

<sup>103</sup> HNDU Round 1 and Round 2 Successful Local Authorities, DECC March 2014

<sup>104</sup> Next steps to zero carbon homes - Allowable Solutions Consultation, DCLG, August 2013

<sup>105</sup> Smart Metering: A guide for local authorities and third sector organisations, DECC, January 2014

<sup>106</sup> Is localism delivering for climate change?, Green Alliance, November 2011

- Despite national statutory targets on climate change, renewable energy and fuel poverty, there are limited requirements on local authorities or cities to action work in these areas.
- Local authorities priorities on energy focus on areas such as social housing where the main priority is the provision of affordable heat. However government energy policy and action is focused on electricity. Heat, as many policy makers state, remains the 'hard bit to do'.
- It is difficult for local authorities to put longer-term demand side energy strategies in place when funding from government is piecemeal and often very time constrained in terms of delivery.
- A fragmented landscape of initiatives exist at present with little overall strategy setting out the full role local authorities and cities must play in helping achieve national goals.

97. Despite these challenges, there is some highly innovative work being taken forward by local authorities. Ambitions are clearly high as recent funding applications to government schemes have shown, but progress is typically limited and largely reactive to new funding that has come through from government or EU programmes.

### Background to government energy work with cities

98. Government activity with cities has been concentrated within the Deputy Prime Minister and Cabinet Office's City Deal programme, which DECC have also been closely involved with. The first wave of City Deals are with the 8 largest cities outside of London, known as the Core Cities.<sup>107</sup> A Wave 2 programme supports a further 20 cities, consisting of the next 14 largest cities and the 6 cities with the highest population growth during 2001 to 2010.<sup>108</sup>

99. The Low Carbon Pioneer Cities initiative which is part of DECC's contribution to the City Deals programme, has provided over £1m for initial scoping support for the development of heat networks involving five of the Core Cities - Greater Birmingham and Solihull, Leeds City Region, Greater Manchester, Newcastle and Nottingham.<sup>109</sup> Projects were initiated in Spring 2013 and DECC have commissioned a study to evaluate how the

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<sup>107</sup> Birmingham, Bristol, Leeds, Liverpool, Manchester, Newcastle, Nottingham and Sheffield,

<sup>108</sup> 'Deputy Prime Minister launches more 'City Deals' 19 February 2013. These include the Black Country, Bournemouth, Brighton and Hove, Greater Cambridge, Coventry and Warwickshire, Hull and Humber, Ipswich, Leicester and Leicestershire, Milton Keynes, Greater Norwich, Oxford and Central Oxfordshire, Reading, Plymouth, Preston and Lancashire, Southampton and Portsmouth, Southend, Stoke and Staffordshire, Sunderland and the North East, Swindon and Wiltshire, Tees Valley

<sup>109</sup> Projects for each city are outlined in 'Unlocking growth in cities: city deals – wave 1', DPMO July 2012

Low Carbon Pioneer Cities Heat Networks Projects progress and help support the deployment of heat networks.

100. One Wave 2 city – Stoke upon Trent – was recently awarded<sup>110</sup> £20m from the City Deals initiative to support the development of a new ‘Smart Energy Network’ based on the use of district heating across the town.

101. A range of other initiatives underway include involving cities include:

- Smart Community Demonstration Project in Manchester a £15-20 million pilot demonstration project, primarily funded by NEDO,<sup>111</sup> which will install 600 next generation air source heat pumps into council-owned homes in Greater Manchester and linking them via a ‘smart network IT platform’.<sup>112</sup> It is also useful to note that a new Low Carbon Investment Director of the Greater Manchester Combined Authority, which represents the 10 local authorities of Greater Manchester, was appointed in April 2014.
- The Core Cities group are currently reviewing a series of energy initiatives with a principal aim of establishing city-based energy companies providing local energy services to their community.<sup>113</sup> Their recent paper, Power Up the Cities,<sup>114</sup> states that group is seeking to “*establish a coordinated framework of Energy Service Companies (ESCOs) across their eight urban areas that will seek to obtain one or more supply and independent distribution licences.*”
- The Greater London Authority (GLA) has wide programme of initiatives in place attempting to address the capital’s energy needs and to reduce CO<sub>2</sub>. These range from a domestic energy efficiency retrofit programme (RE:NEW), a support programme and procurement framework to help public sector bodies access energy services (RE:FIT), and a major distributed energy programme centred around the deployment of CHP and district heating projects across the capital. The GLA is also undertaking actions to support the economic viability of smaller low carbon generators, by taking on a ‘junior’ – or Licence Lite – electricity supplier status<sup>115</sup> Much of the distributed energy activity is supported by positive planning policies, as set out in

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<sup>110</sup> ‘City Deal to bring UK’s first ever large-scale, low-carbon heat network system to Stoke-on-Trent’ DPMO Press Release, 13 March 2014

<sup>111</sup> Japan’s New Energy Development Organisation

<sup>112</sup> Launch of Smart Community Demonstration Project in multi-million pound deal to bring down fuel bills for GM residents, AGMA Press Release, 12 March 2014

<sup>113</sup> Consisting of Birmingham, Bristol, Leeds, Liverpool, Manchester, Newcastle, Nottingham, Sheffield

<sup>114</sup> Core Cities Growth Prospectus Policies Step 6: Power Up the Cities, Core Cities, November 2013

<sup>115</sup> Full update on programmes are set out in The Mayor’s Climate Change Mitigation and Energy Annual Report, GLA, March 2014. GLA recently announced that they are tendering ofr a third party agreement with a fully licensed supplier, which should allow the GLA to take on a junior ‘license lite’ status. ‘Mayor to become London’s smallest electricity supplier’ GLA Press Release 25 April 2014

London's spatial strategy, the London Plan,<sup>116</sup> which effectively to supports an integrated D3 approach through a requirement on developers to follow an 'energy hierarchy' based around energy efficiency and distributed energy. The latest amendments to the London Plan in fact also propose that new development should also incorporate greater opportunities for demand side management in enable to support opportunities such as DSR.<sup>117</sup> Mayoral support to local authorities has also supported the development of a decentralised energy maps for each of capital's 33 boroughs<sup>118</sup> as well as energy master plans for key regeneration Opportunity Areas in London.<sup>119</sup> Building on this, the GLA has recently announced that it will prepare an Energy Spatial Master plan for London.<sup>120</sup> The GLA's decentralised energy programme is supporting a total of 26 heat network projects in London with a combined value of £260 million. Preparing such an evidence base has led to major activity in the capital in advancing distributed energy solutions, particularly in the new build sector,<sup>121</sup> where CO<sub>2</sub> savings are anticipated to exceed 2010 national building regulation targets by 36%. As a result of such planning, London boroughs and GLA have been well prepared to apply for to DECC demand reduction and distributed energy funds as they become available.

- APSE (the Association for Public Service Excellence) are currently consulting with local authorities on recently proposed Local Authority Energy Collaboration.<sup>122</sup> This sets out a plan bring together a large number of local authorities to enable and facilitate the local municipalisation of energy services focussed around the ownership of local energy generation, distribution networks and delivery of energy efficiency works.
- Ofgem's Low Carbon Networks Fund (LCNF) (to be replaced shortly by the Network Innovation Allowance (NIA) and Network Innovation Competition), has been supporting Distribution Network Operator (DNO) trials of demand side technologies in a number of regions including projects such as Low Carbon London (which has programmes in place on network management of electric vehicle charging, and a DSR trial involving domestic customers with smart meters) and SOLA Bristol (matching PV output with onsite energy storage) amongst others.

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<sup>116</sup> The London Plan, Greater London Authority, July 2011

<sup>117</sup> Para 5.22a of Further Alterations to the London Plan (FALP) consultation, GLA, January 2014

<sup>118</sup> Published on the London Heat Map website – [www.londonheatmap.org](http://www.londonheatmap.org)

<sup>119</sup> For further information see: <https://www.london.gov.uk/priorities/planning/opportunity-areas/location-londons-opportunity-and-intensification-areas-0>

<sup>120</sup> GLA Investment and Performance Board paper 20 February 2014

<sup>121</sup> 'Energy Planning: Monitoring the implementation of London Plan energy policies in 2012' GLA, July 2013

<sup>122</sup> Energy Prospectus – A Powerful Prospect, APSE, February 2014

## Analysis

102. The growth in demand side will necessitate local government to become a more active participant and decision-maker in the deployment of energy technologies introduced in their area. This can already been seen through action being taken by a number of local authorities and cities across the country. Demand side initiatives are already beginning to feature in a greater number of local authority plans – especially in relation to technologies such as CHP and district heating – as recent DECC Heat Networks Funding programme have evidenced.
103. However, without a coherent plan by government on how to fully engage local authorities both in the design and implementation of policies that encourage the growth of demand side action, many good opportunities will remain untapped. This could risk the growth of the demand side to progress in a piecemeal and uncoordinated way, with consumers potentially losing out on the full benefits that an integrated D3 approach could deliver.
104. Furthermore, in the absence of effective engagement between national and local government, there is the potential for national policy and local priorities to conflict: for instance, a lack of coordination between implementation of the RHI and local district heat networks could lead to consumers spending money on technology which rapidly becomes redundant; unplanned distributed energy growth could lead to more costly network operation and so on.
105. To mitigate this risk, government should ensure that local government play a far more central role in any plans government has on demand side activities. Government needs to identify how to deliver energy priorities effectively through local authorities, recognising constraints and limitations to this approach and what resources are required.

## Recommendations

**RECOMMENDATION 8: DECC needs to review its policy engagement process with local authorities and cities, bringing in their knowledge and expertise to how a more coordinated approach at the local level could be built into existing and future demand side policy initiatives, to best deliver policy goals.**

**RECOMMENDATION 9: With reference to the GLA’s work with local authorities, developing local area decentralised energy plans, and in line with the Committee on Climate Change’s recommendations from their 2012 local authority study, DECC should explore opportunities to support the development of local area energy master plans.**

**RECOMMENDATION 10: Building on DECC’s decision in April 2014 to create a Community Energy Unit, Government should consider expanding the role of the heat networks delivery unit to provide broader demand management delivery support to local authorities.**

## Conclusions

106. The energy landscape in the UK has evolved considerably in recent years and will continue to do so. There is now considerable appetite at a consumer and local level – both domestic and non-domestic – to take greater control of energy supply and energy management, and D3 solutions allow for this to happen. Government has taken a great deal of action to promote uptake of demand side measures in recent years, however the pace of change has led to poorly coordinated policy development.
  
107. It is now time for government to take a step back and develop a clearer understanding of how the demand side can contribute to UK energy policy and how policies interact at a national and local level. Government needs to determine the extent to which it wishes to actively directly shape and influence the evolution of the demand side, as it does with supply side generation, in order to transition to a low-carbon energy future in the most cost-effective manner.
  
108. As this report has identified, failure to do so creates a risk that government and consumers incur significant unnecessary costs, energy security ambitions are compromised, and individual government energy policies do not meet their potential.

## **ANNEX A: Summary of Recommendations**

**RECOMMENDATION 1:** Government needs to set out a more coherent plan around the many demand reduction, demand side response and distributed energy initiatives it currently supports across a number of strategies, policies and programmes. At present, there is a risk that benefits and opportunities are missed for the UK as a whole without a greater focus on approaching demand side activity in a more integrated way.

**RECOMMENDATION 2:** DECC needs to give significantly more strategic consideration to D3 in order to determine the impact of current policies and the extent to which it is desirable for government to lead and coordinate demand-side activity and develop and resource a roadmap for action.

**RECOMMENDATION 3:** As demand side opportunities grow, government needs to examine the extent that the demand side can contribute to helping achieve the UK's energy policy goals and give the appropriate support to help build expertise within relevant teams to ensure that this can be achieved.

**RECOMMENDATION 4:** DECC needs to undertake more detailed analysis to explore the potential impacts of D3 on the future energy landscape and identify the cost-effective contribution that these could make to UK energy policy.

**RECOMMENDATION 5:** As DECC looks forward to future carbon budgets, it should consider setting an energy demand management target for the UK, balanced against the estimated costs of future supply.

**RECOMMENDATION 6:** As the energy market accommodates greater levels of demand side activity, government and industry need to work together to identify policy and market barriers, which may limit a more integrated D3 approach. This will not only need better coordination across government departments and policy areas, but will also require a more coherent industry representation on D3 to government.

**RECOMMENDATION 7:** Improving energy performance in the non-domestic buildings is a key area where significant work still needs to be undertaken by government – even if only to raise the profile of existing policies, awareness of which is not as high as it could be. This is also a priority for D3 activity and DECC and industry should work closely to set out coordinated plan of action for the non-domestic building sector.

**RECOMMENDATION 8:** DECC needs to review its policy engagement process with local authorities and cities, bringing in their knowledge and expertise to how a more coordinated approach at the local level could be built into existing and future demand side policy initiatives, to best deliver policy goals.

**RECOMMENDATION 9:** With reference to the GLA's work with local authorities, developing local area decentralised energy plans, and in line with the Committee on Climate Change's recommendations from their 2012 local authority study, DECC should explore opportunities to support the development of local area energy master plans.

**RECOMMENDATION 10:** Building on DECC's decision in April 2014 to create a Community Energy Unit, Government should consider expanding the role of the heat networks delivery unit to provide broader demand management delivery support to local authorities.

## ANNEX B: Background to D3 Project

This project is the result of a collaboration between the Department of Energy & Climate Change (DECC), working in collaboration with the Alliance for Energy Management (AfEM)<sup>123</sup>, agreed in 2013 to commission a project examining how demand side measures are considered in the policy development process across government, including in DECC's whole system energy models, which are regularly used to help guide and evaluate policy proposals.

Particular attention is given to the following demand side actions: **d**emand reduction, **d**emand response and **d**istributed energy – or as this report collectively calls them – D3. The D3 label simply serves to reinforce this idea that most consumers – domestic and non domestic alike – are better able to take control over their energy use through an integrated mix of demand side solutions.

This research has been prepared by an independent expert selected jointly by DECC and AfEM and funded by DECC. He has had access to, and worked with, staff across DECC and wider government in developing this report. The findings of the report are his own.

Funding for the D3 project has been also secured through the Cabinet Office's Contestable Policy Fund, matched by DECC, to commission a parallel 'Technical Analysis Study' to review existing key whole system energy models used by government, and in particular, to examine how D3 measures are taken into account in these models. This project was issued for tender by the department in January 2014 and was awarded to the Centre for Sustainable Energy (CSE).

The findings of this analysis have been published alongside this report, and are intended to contribute to understanding how existing models may need to evolve to reflect this a shift to an energy system with a much higher penetration of D3.

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<sup>123</sup> Consisting of the Combined Heat and Power Association (CHPA), the Association for the Conservation of Energy (ACE) and the Energy Services Trade Association (ESTA)