

Distributed Energy

Powering Britain's Economic Future

November 2017

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Foreword

This report has a bold aim:
to change the way that you think about energy.

“

...I believe we should see energy as a power for good which can unlock new revenue streams, become a source of competitive advantage and drive growth.”

Our subjects in this study - public bodies, businesses and heavy industry - have tended to see energy as a high fixed cost, a commodity that is delivered to them, something over which they have little control.

But I believe we should see energy as a power for good which can unlock new revenue streams, become a source of competitive advantage and drive growth.

The means of achieving this lies in distributed energy solutions, a technical term for a suite of real products and services that are reshaping the way people engage and use energy.

This approach is not just about more efficient ways of using energy; it is also about producing more electricity closer to the point of use through technologies such as gas-fired back-up generators, solar and combined heat and power; and it is about harnessing the full power of data and the digital world to alter behaviours and take control.

In this report, we show how key sectors of the economy could save hundreds of millions of pounds a year by adopting the full range of distributed energy solutions. But more significantly, we also show how this could help to create hundreds of thousands of new jobs, boost overall economic growth and even cure the persistent challenge of low productivity.

In the process, I believe we can create a new sector in the economy – one encompassing energy, technology, innovation and services – and establish the UK as a world leader in developing and managing the energy systems of the future.

At Centrica, we are committing hundreds of millions of pounds in new investment over the next few years to make this a reality. After reading this report, I hope that you too will share our vision.

Jorge Pikunic, Managing Director,
Centrica Distributed Energy and Power

November 2017

Executive Summary

Energy is vital to the operation of millions of businesses in the UK. Ensuring it is reliably available, used efficiently and priced competitively is essential for a successful economy. In this report, we argue that we no longer need to see energy as an immovable cost.

Energy already plays a vital role in the UK economy. Energy UK estimated that in 2016 the energy supply and generation sector supported 637,000 jobs and £18bn of investment¹. In the same year, Oil and Gas UK estimated that the exploration and production industry supported 330,000 jobs and £8bn of capital investment².

However, we believe many businesses and organisations are not using energy effectively. In 2013, the Confederation of British Industry (CBI) estimated that businesses may be able to reduce their energy costs by 15 per cent and in his 2016 report on the NHS, Lord Carter of Coles highlighted “a significant opportunity for hospitals to achieve cost efficiencies [is] by reducing their energy consumption.”

As the UK Government proposes a new Industrial Strategy to upgrade the economy as we leave the EU, we argue that energy can play a central role in unshackling businesses and tackling persistent challenges, such as productivity. The UK is the world’s fifth biggest global economy and has world-leading sectors and record employment levels, but productivity was 17 per cent below the G7 countries in 2015 and lags behind France by 30 per cent.

In this report we show that the UK economy could be significantly boosted if new, commercially viable energy solutions (called distributed energy solutions in this report) were adopted to help larger energy users to use less energy, improve their performance, increase their operational resilience and even access new revenue streams. These energy solutions consist of a range of technologies, services and products – including battery storage, onsite power generation

“

a significant opportunity for hospitals to achieve cost efficiencies [is] by reducing their energy consumption.”

technologies, state of the art energy saving devices and new energy trading technologies – which allow organisations to sell their excess energy. We outline these technologies in more detail in Chapter 2. Each energy user will require a different set of solutions, but the evidence of their effectiveness is undeniable.

Despite many years of discussion around the potential of energy efficiency and smart energy, no-one has yet made a clear case for these solutions. In this report we address this gap. We produce two key assessments: 1) The energy cost savings that could be realised if three UK sectors – industrial, healthcare and hospitality & leisure³ (which together account for 27 per cent of UK Gross Value Added, GVA, and 31 per cent of employment⁴) – adopted these solutions, and; 2) The subsequent potential benefit to the UK economy of additional investment in this equipment, reducing energy costs for large energy users and freeing up money to be invested back in the UK.

This report sets out what distributed energy solutions are, how they can benefit businesses and what the wider potential benefits for the UK economy could be. But, more importantly, it shines a light on the potential for these technologies to reduce public sector costs, unshackle UK businesses and create new opportunities for growth in the UK.

¹ Energy UK, 2016

² Oil & Gas UK, Business Outlook 2017

³ This is the leisure, hotel and hospitality sectors combined

⁴ 2014, ONS Statistics (last full data set available)

⁵ Total jobs: direct, indirect and induced

Our Findings

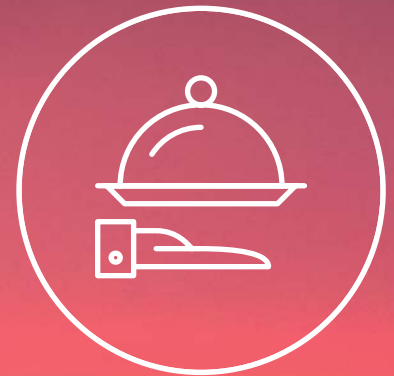
Potential Annual Energy Savings



Industrial
£540m



Health
£130m



Hospitality/Leisure
£310m

Associated UK Economic Benefits



GVA to UK
£18.5bn



Jobs supported
260,000⁵



Economic Output
1.5% increase

The UK is opening a new chapter in the way it uses energy. But unlike previous eras, the twenty-first century will be defined not by a single energy source, but by three distinct yet related trends: decentralisation, digitisation and customer control.



Introduction

The modern history of the UK economy has been marked by shifts in how we source and use our energy.

The nineteenth century industrial revolution was powered by steam engines and the coalfields of the UK. The twentieth century revolution in mass mobility, home heating and materials innovation was fuelled by oil and gas from around the world and Britain's own North Sea.

As the first mass-market electric vehicles roll off the production line, it is becoming increasingly clear that the UK's twenty-first century energy story will be the spread of electrification into ever more parts of the economy, such as transport and heat.

Centrica has been there at every step of this energy transformation. As a company we trace our history back to the Gas Light and Coke Company, which helped kick off the energy revolution in 1812 by supplying London with coal gas to light its streets and homes. Over 200 years later we are utilising data science and smart technology to help customers better control their energy.

The UK is opening a new chapter in the way it uses energy. But unlike previous eras, the twenty-first century will be defined not by a single energy source, but by three distinct yet related trends: decentralisation, digitisation and customer control.

In decentralisation we are seeing increasing amounts of localised, lower carbon energy sources supporting the UK grid – solar, battery storage and Combined Heat and Power (CHP) units; in digitisation new technology and data analytics are developing to help domestic and business customers to manage their energy, such as Centrica's Hive⁶ products for homeowners and Centrica Business Solutions for larger energy users. Taken together this has fundamentally increased our customers' ability to control their energy use.

Centrica is once again at the forefront of these changes. Through our Centrica Business Solutions offering we are providing businesses with a suite of tools that allow them to use energy more efficiently and cost-effectively, increase resilience and create new sources of value. We believe that this has the potential to make a vital contribution to the future of the UK energy system, and the UK economy, which is why we will be investing £700 million in this business by 2020.

In this paper we do three things:

1. **Show how distributed energy solutions are changing the way businesses understand and use their energy.**
2. **Produce one of the first quantitative projections of the benefits that new distributed energy solutions could bring to key sectors.**
3. **Show the national economic benefit that could be realised from the investment and cost savings that distributed energy solutions could bring.**

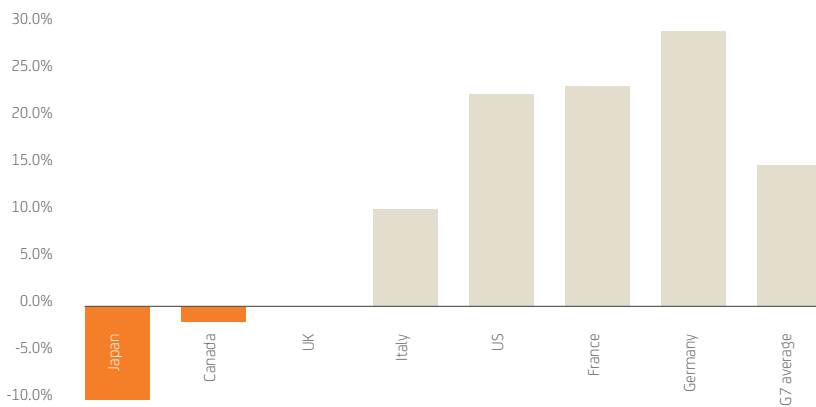
⁶ Hive, from Centrica Connected Home, is the UK's leading smart home provider. Products include a smart thermostat; connected plugs, lights and sensors; and a camera to help people stay connected to home wherever they are.

Chapter 1: Energy and the Industrial Strategy

The UK industrial landscape

At the start of 2017, the UK Government published its Industrial Strategy green paper with the aim of identifying the measures that government and industry can take to improve productivity, grow the economy and lift living standards across the UK.

G7 productivity 2015 (GDP output per hour worked relative to UK)



One of the persistent economic challenges identified is “low productivity”⁷.

The productivity puzzle has many facets, with low productivity manifesting itself in areas such as skills training, infrastructure investment and utilising new technology and innovation. But one area that Centrica is focused on is effective energy use. What is clear from the experience of the last 50 years is that energy, and how we use it, has been a key driver of UK productivity. In the period since 1970, the UK has tripled the economic activity it produces with the energy equivalent of a single barrel of oil⁸.

To drive the future growth of the UK economy and increase productivity, energy costs need to reduce further. Businesses have indicated that improving the efficiency of their operations is a priority and although energy costs on average account for three per cent of UK business expenditure, there are 15 sectors in the economy – including steel, chemicals, glassmaking and ceramics – where energy costs represent more than 10 per cent of total business expenditure⁹.

The changing energy landscape

There are three current trends in the energy sector that can contribute to reductions in energy costs to help boost the UK economy:

1. Energy production is becoming decentralised, creating opportunities for greater self-sufficiency. There are now a range of commercially viable, small-scale power generation technologies that are transforming the power sector. New generation is increasingly being installed at the local level so it is being fed into the distributed network, rather than the national transmission system. In fact, distributed generation has more than quadrupled in the UK in recent years, from 7.1GW in 2010 to 28.8GW in 2016¹⁰.
2. Data and insight is allowing forensic analysis of energy usage. The energy system is becoming more measurable, interconnected and intelligent. New data insights and analytics technology are now available for larger energy users, allowing them to easily monitor their usage across multiple devices and sites. This equipment can be installed in a matter of hours and allows a large industrial user to see whether a single process, such as a conveyor belt, is running efficiently.
3. The ability to have greater control over their energy means that customers can now drive value for their businesses rather than it being a pure cost. Revenue streams are available for businesses and organisations that effectively manage their energy. There are a range of revenue streams available for different activities, from reducing the amount of energy you use in a period of high demand, to generating excess energy and selling it back to the grid or being ready to support the system at short notice. These revenues mean distributed energy solutions can provide a return on investment quickly and help to offset an organisation’s energy bill.

A new economic sector

Beyond the ability for businesses to reduce energy costs and become more productive, distributed energy solutions also present a prime opportunity for the UK to lead the world in supporting a new sector, which encompasses energy, technology, innovation and services. The global market for connected devices is estimated to grow from an installed base of 15.4 billion devices in 2015 to 30.7 billion in 2020, and 75.4 billion in 2025¹¹. There are an increasing number of companies selling and installing energy solutions and providing advice and consultancy on energy management, creating new jobs and investment. For example, Centrica will be investing £700m globally in this business to 2020, employing over 1500 people and with our headquarters in the UK.

Furthermore this sector provides global opportunities. As both energy efficiency and renewable energy play an ever greater role in energy systems around the world, the demand for distributed energy solutions will grow. With one of the most advanced energy systems in the world, the UK has an opportunity to become a global leader and reap first-mover advantage by ensuring British businesses provide the solutions to new markets overseas.

As we demonstrate in this paper, the benefits for the UK from distributed energy are potentially large and wide-ranging. They go beyond straight cost savings, to the ability to create new value from energy and the development of a whole new sector for the UK. But in order to capture those benefits, there is a lot of work to be done to increase understanding of the solutions on offer, and the way in which they can contribute to the UK economy. We begin that work in this paper.

⁷ Industrial Strategy Green Paper, Foreword

⁸ BEIS, Energy Consumption in the UK, 2017, Table 1.05

⁹ BEIS analysis, ONS Supply Use Table, 2014

¹⁰ BEIS, Digest of UK Energy Statistics, 2017, Table 5.12

¹¹ IHS Markit report, 2016



Chapter 2: What is distributed energy?

The first step in understanding the potential of distributed energy solutions is understanding what the term means. The World Alliance for Decentralised Energy defines this as “electricity production at or near the point of use, irrespective of size, technology or fuel used – both off-grid and on-grid.” We believe that this is a good start, but is too narrowly defined.

Distributed energy should also cover a much broader range of solutions, including energy efficiency, monitoring and on-site generation, that can help larger energy users - public organisations, commerce and industry - to take control of their energy and turn it into an opportunity. We also believe an important principle for distributed energy is that not every energy user will need the same solution. The benefit of this is the ability to utilise a range of solutions to best fit the energy user.

Distributed Energy Solutions

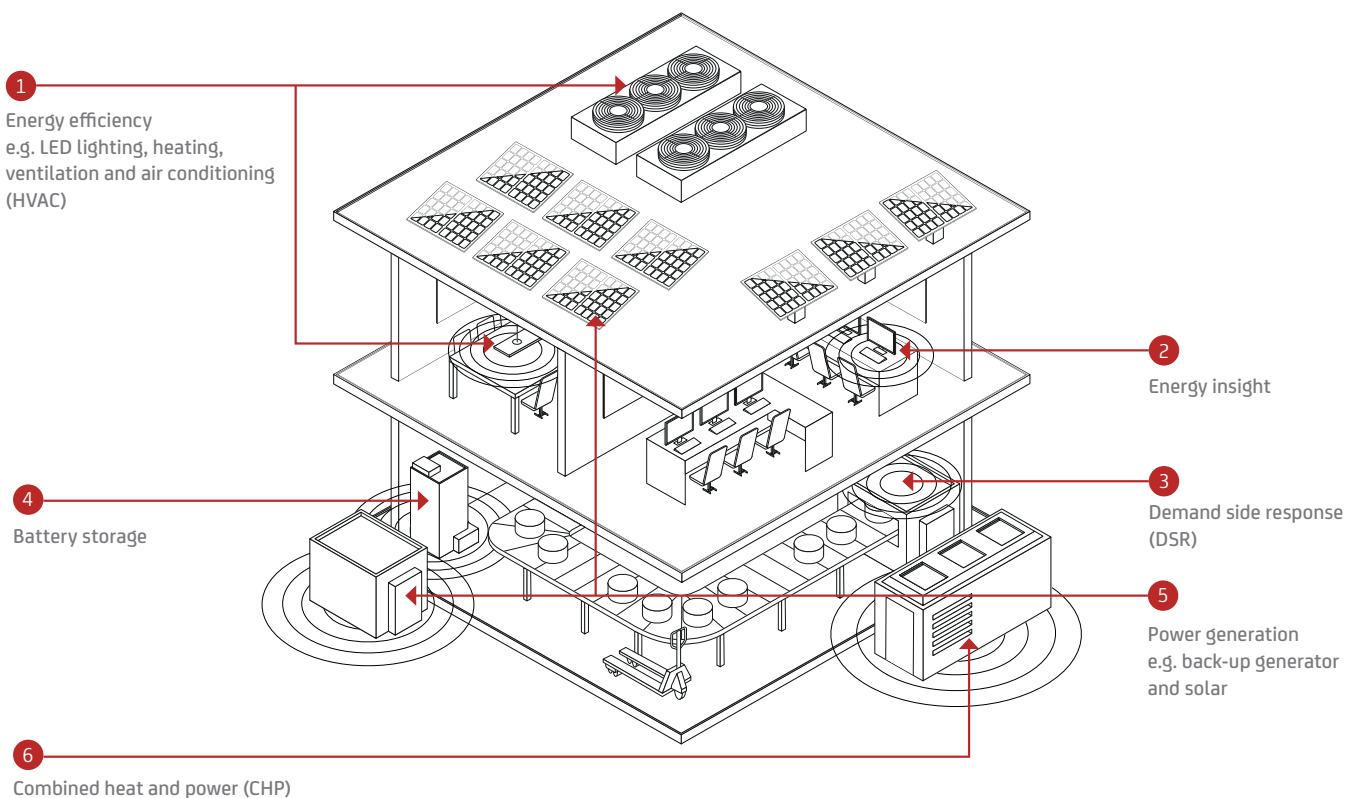
This diagram shows the different technologies that could benefit a larger energy user.

1. Energy Efficiency

The ability to reduce costs by upgrading or improving a range of energy-consuming processes, including lighting, building management systems, insulation, and heating and cooling systems.

2. Energy Insight

New technology is available that allows larger energy users to accurately monitor their energy use across all equipment and devices. For example, Centrica’s own Panoramic Power technology uses self-powered, wireless sensors that transmit real-time data from equipment to an analytics programme, allowing businesses to respond to issues, undertake predictive maintenance and identify opportunities for cost reductions.



3. Demand side response (DSR)

Revenue streams are available for energy users, if they are able to reduce, or even increase, their energy consumption at times when the grid demands it. New technology allows energy users to respond to these changes in demand quickly and easily and without putting security of supply at risk.

4. Battery Storage

Lithium-ion battery storage systems are becoming increasingly viable as a standalone asset or as an addition to on-site generation. They can be charged at cheaper times and then used when prices increase to better manage energy costs. They can also work alongside renewable technologies, which on their own are intermittent, and can be used to support the grid, which will create new revenue.

5. Power Generation

A range of small-scale power generating technologies exist, including solar and gas generators, to provide on-site generation, a source of back-up power for sites as well as the ability to sell excess energy back to the grid at peak times.

6. Combined Heat and Power (CHP)

CHP plants work by converting gas into both electricity and heat in a single process. It's one of the most efficient sources of energy and allows organisations to produce a significant amount of their energy needs on-site, improving the resilience of its supply, reducing costs and helping to reduce carbon emissions.

What revenue streams are available from energy technology?

In this report we talk about the ability to access new revenue streams from energy assets, but what do we actually mean?

There are a series of ways in which energy assets – such as an on-site power generator – can access new revenues: the energy market – buying and selling electricity live; the capacity market – contracts awarded to generators who provide power at peak times

in winter; various National Grid markets that reward services provided to the network, such as Short Term Operating Reserve – being ready to provide power at short notice; and Demand Side Response – large energy users taking less electricity from the National Transmission System at times of high demand. These schemes help balance the overall electricity network and organisations involved are therefore paid for these services.

How expensive are these technologies to install and run?

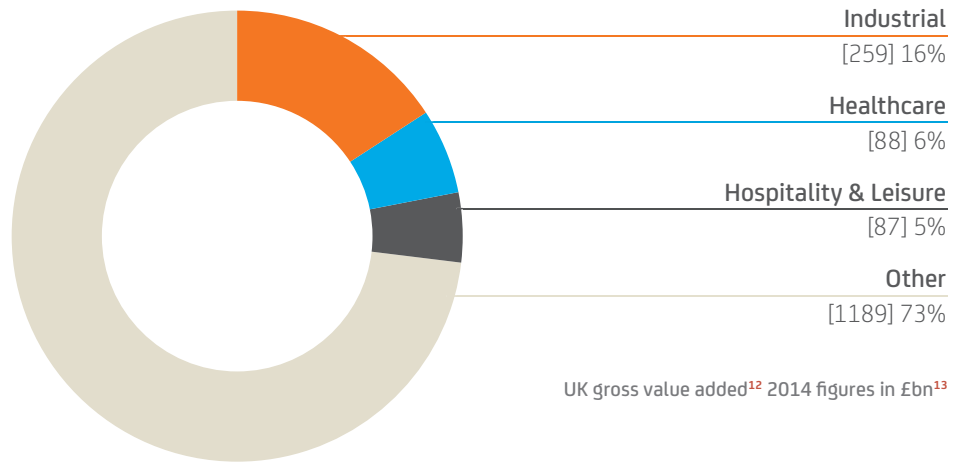
The costs of energy technologies are falling rapidly. Lithium-ion battery costs have fallen from over £2,000/kWh in 1990 to around £100/kWh today, so many of these technologies are now commercially viable. With costs falling, revenue streams available to offset costs and different financing solutions available (no upfront capital costs for example), these solutions are now more accessible than ever. We have worked with

organisations that range from UK hospitals to industrial companies to leading retailers and all have seen tangible cost-reduction benefits that justify investments made.

Chapter 3: The distributed energy opportunity

We will use this chapter to provide some real life case studies as well as economic modelling to show the potential benefits of distributed energy solutions for the UK.

We have focused this information around three sectors, which we believe show the largest potential to benefit from distributed energy solutions: industry, healthcare, and hospitality & leisure. Together, they account for a little over a quarter of the economy; including 27 per cent of UK gross value added, and 31 per cent of all UK employment.



Case Studies

In each of the three sectors we profile a case study highlighting the experience of a typical Centrica Business Solutions customer to bring the opportunities to life.

- Industry Case Study: The Global Cement Manufacturer;
- Healthcare Case Study: University Hospitals of North Midlands NHS Trust;
- Hospitality, Hotel and Leisure Case Study: Places for People Leisure.

Economic analysis: The methodology in summary

These case studies show the individual benefits of distributed energy solutions, but there has never been an analysis of how the UK could benefit more broadly from adoption of this technology. We have worked with economic experts from FTI Consulting to assess two things:

1. The annual energy cost savings each sector could realise: this has been calculated based on the energy cost savings of typical users in each sector.

2. The potential economic benefits to the UK: these have been calculated based on the typical users' investment costs and energy cost savings, and increases in spending that these would create in the economy.

As the first economic benefits analysis of its kind in this sector, there are some caveats and assumptions:

- We have used best available Centrica data to inform the economic calculations.
- The economic benefits are calculated by scaling up the data from typical users. The methodology is described in detail in Appendix 2, and is consistent with the general framework used by bodies such as the International Energy Agency¹⁴ in determining economic benefits.
- To illustrate the potential for this new technology, we focus on the gross economic benefits it could provide. We do not consider any consequent economic costs or displacement of resources.

- The investment spending benefits presented are based on a 50% take-up scenario – i.e. 50% of users in each sector take up these technologies.
- The economic benefits presented are a one-off benefit that would be felt if these solutions were taken up. The cost savings are annual, and so would lead to economic benefits every year.

Lastly, it is important to note, that due to a lack of data at this point, the calculations do not include the potential productivity benefits from the distributed energy technologies. While these potential benefits have been omitted here to ensure that the figures are robust, it is anecdotally clear that these technologies are bringing productivity benefits to companies as outlined in the Global Cement Manufacturer case study and indicated in Chapter 2 of this report.

¹² Gross value added is the total value of all goods and services produced in an economy (i.e. output), less the goods and services used up or transformed in that production process,

¹³ 2014, ONS Statistics (last full data set available)

¹⁴ International Energy Agency, on Capturing the Multiple Benefits of Energy Efficiency (chapter 2)

UK Economic Benefit Analysis: Three Key Sectors



Industry



Healthcare



Hospitality
and Leisure

UK Economic Benefit Analysis: Industry

Context

As the Industrial Strategy green paper points out, “there are 15 sectors in the economy – including steel, chemicals, glassmaking and ceramics – where energy costs represent more than 10 per cent of total business expenditure”¹⁵. These are sectors where the UK is fighting for competitiveness in the global economy; with the total industrial sector using 92 million MWh in 2015 (one quarter of UK total electricity supply), small changes to energy costs can have big impacts.

The UK currently has the second highest industrial electricity prices among the G7¹⁶. Helping UK businesses use energy more effectively will be critical in ensuring that the UK can improve its productivity, boost competitiveness and seize the opportunities afforded by the UK’s post-Brexit trade policy.



Reduction in annual energy costs

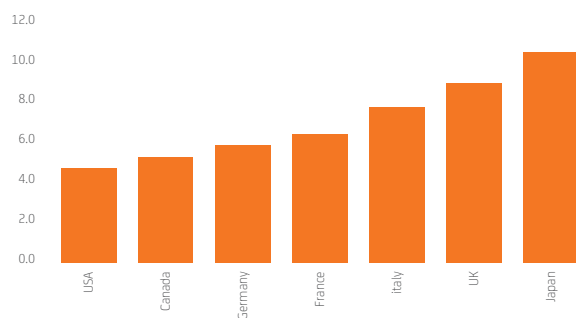
Below we outline the benefits to the UK if certain proportions (25 per cent increments up to 100 per cent) of each key sector took up these new solutions. The benefits we looked at were: gross value added (GVA) and employment benefits. We have represented these in graphs that show the value each sector could gain if different proportions of the sector adopted the solutions. We have based our central estimates on the 50 per cent scenario.

UK Economic Benefits

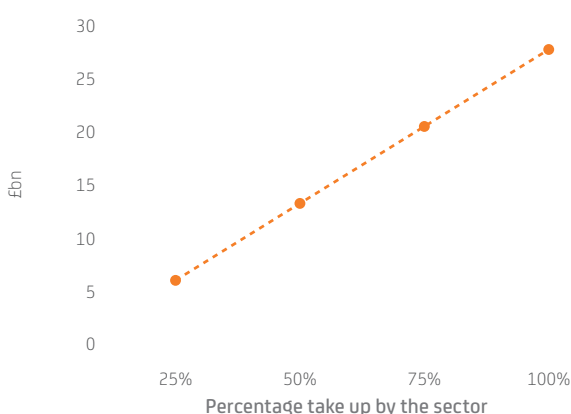
Our analysis suggests that, if just 50 per cent of businesses in the industrial sector utilised these solutions it could:

- Reduce energy costs by £540m per annum;
- Create £13.9bn for UK GVA;
- Support around 195,000 jobs¹⁷.

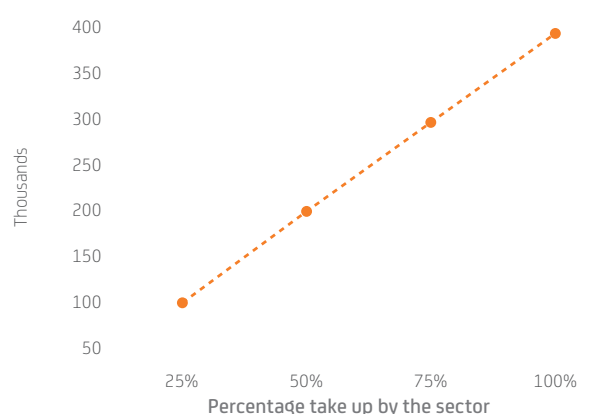
G7 industrial electricity costs 2016 (p/kWh)



Industrial GVA



Industrial employment



¹⁵ Industrial Strategy Green Paper, p91

¹⁶ BEIS, Industrial electricity price in the IEA, September 2017

¹⁷ See Appendix 2 for inputs and assumptions



Case Study: Global cement manufacturer

- Centrica worked with a large cement company, which has operations across 50 countries, to find a solution that would allow their plant managers to have full visibility of the performance of their critical machines.
- We outlined the solutions available and recommended the installation of equipment that would provide greater insight into the company's operations. We installed our Panoramic Power wireless sensor technology to measure energy use and pinpoint consumption across different equipment, buildings and plants.
- This analysis identified a conveyor motor was not working correctly, which in turn was creating a bottle neck in the process. Fixing this saved the client over £200,000 annually at just one location.
- Our data also showed that energy was being consumed unnecessarily across several buildings and plants outside of working hours. By highlighting this, we achieved the client an additional saving of almost £8,000 a year.

Over
£200,000
annual savings

UK Economic Benefit Analysis: Healthcare

Context

As set out in the UK Government’s 2015 financial settlement for the NHS to 2020/21, the NHS needs to achieve almost £22 billion of savings by 2020, requiring 2-3 per cent savings every year, with the majority (£14.9 billion) of that to be delivered locally¹⁸. With the NHS spending over £6.5 billion annually maintaining and running its estate and facilities, energy cost-reductions can make an important contribution¹⁹.

This has already been recognised by the Government. In his 2016 report into operational efficiency in English NHS acute hospitals, Lord Carter of Coles highlighted “a significant opportunity for [NHS] trusts to achieve cost efficiencies by reducing their energy consumption...if trusts were able to invest in energy savings schemes such as LED lighting, combined heat and power units, and smart energy management systems”²⁰. He further pointed out the demand for such investment, with the 2013/14 energy efficiency fund being oversubscribed four-fold, due, in part, to pay-back periods of under four years.

Lord Carter estimated potential savings for local NHS trusts of around £36 million per annum, if all trusts could meet the median benchmark for energy costs. Installing the measures quoted above, that figure rose to £125 million per annum. It was because of these potential savings that he recommended establishing an ‘invest to save energy efficiency fund’ by April 2017.



Reduction in annual energy costs

UK Economic Benefits

Our estimates suggest that if just 50 per cent of NHS England utilised these solutions it could:

- Reduce energy costs by £130m per annum;
- Create £0.9bn for UK GVA;
- Support around 15,000 jobs²¹.

It is important to note that the figures quoted here are for the public sector only, due to a lack of data available for private sector healthcare provision. As such the additional benefit would be even higher if the private sector - which accounts for 17 per cent of healthcare expenditure²² - also took up the opportunities of distributed energy solutions.

¹⁸ NHS, NHS Five Year Forward View, Chart 4.2, May 2016

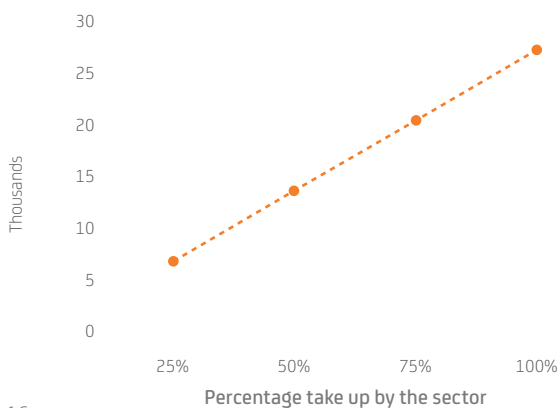
¹⁹ NHS England

²⁰ Lord Carter of Coles, ‘Operational productivity and performance in English NHS acute hospitals: Unwarranted variations’, an independent report for the NHS, February 2016

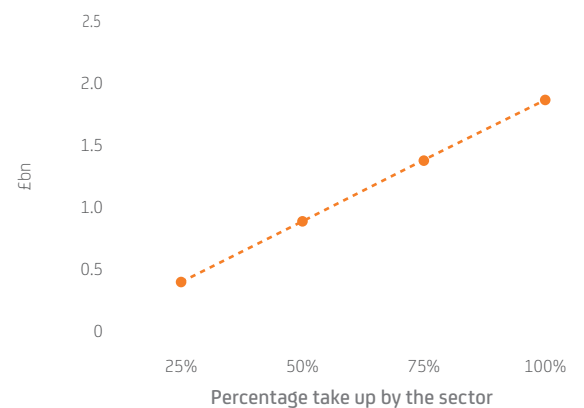
²¹ See Appendix 2 for inputs and assumptions


²² ONS, Healthcare Expenditure in the UK, March 2015

Healthcare employment



Healthcare GVA





Centrica is helping an increasing number of hospitals to overhaul their approach to energy through new energy centres that include combined heat and power (CHP); boilers; efficient lighting; heating and ventilation systems; renewable technology; and building management systems.

Case Study: University Hospitals of North Midlands NHS Trust

- Providing services for approximately 900,000 people locally and three million regionally at Royal Stoke Hospital and County Hospital in Stafford, energy consumption is consistently high for the University Hospitals of North Midlands NHS Trust.
- To better manage this, the Trust needed a cost effective energy saving solution that would improve environmental performance and reduce the expense associated with energy generation.
- We replaced their old system with a new combined heat and power (CHP) plant on the Royal Stoke University Hospital site. The unit is helping to reduce the hospital's carbon emissions by almost 2,800 tonnes a year and is delivering annual savings of around £500,000, equivalent to approximately 20 full time nurses.

£500,000
annual savings

2,800
tonnes of carbon
saved

UK Economic Benefit Analysis: Hospitality & Leisure

Context

The UK's hospitality & leisure sector is facing a number of headwinds in 2017, including growth in the supply of rooms, security concerns and UK economic uncertainty²³.

In particular, Brexit has raised questions over the future of the estimated 442,000 migrants from the EU who work in retail and hospitality, with some studies suggesting up to 94 per cent would fail the current UK visa test for non-EU migrants²⁴. The potential for a resultant rise in wages will pose a challenge for a sector in which labour costs comprise a significant proportion of the cost base. As a result, hotels, leisure centres and coffee shops will increasingly be looking for other ways of cutting costs.



Reduction in annual energy costs

UK Economic Benefits

Our analysis suggests that, if just 50 per cent of the hospitality and leisure sector utilised distributed energy solutions it could:

- Reduce energy costs by £310m per annum;
- Create nearly £3.7bn for UK GVA;
- Support 50,000 jobs²⁵.

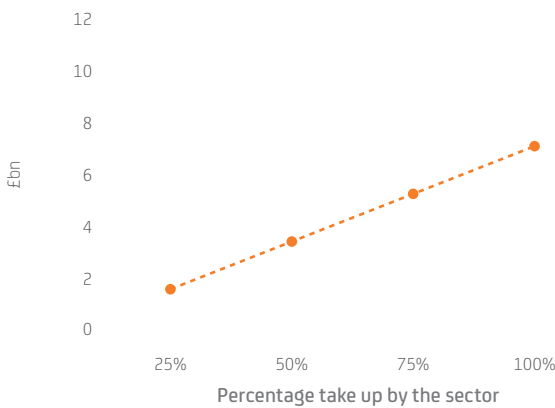
²³ PWC, Facing the future: UK hotels forecast 2017

²⁴ Oxford University Migration Observatory, for the Financial Times, 16 June 2016

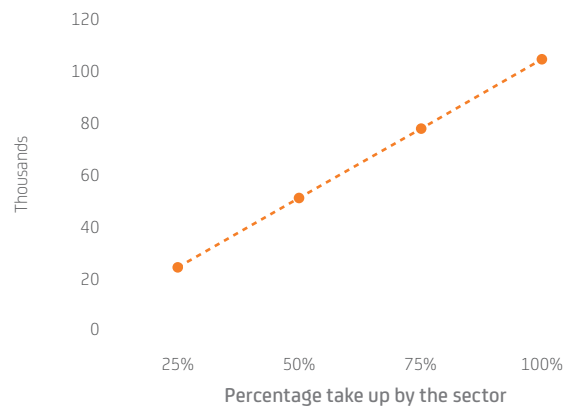
²⁵ See Appendix 3 for full inputs and assumptions.

“
...hotels, leisure centres and coffee shops will increasingly be looking for other ways of cutting costs.”

Hospitality GVA



Hospitality employment





Case Study: Places for People Leisure

The balance of thermal demand and electricity for a typical swimming pool, means that combined heat and power (CHP) is an extremely effective and efficient option for the leisure industry.

We currently operate and maintain 14 CHP units for Places for People, eight of which were installed with our Discount Energy Purchase scheme that means the business benefits from both lower bills and a reduced carbon footprint without the requirement to capitalise.

The fleet of CHPs is delivering annual savings of around £250,000 alongside a reduction in carbon emissions of over 2,600 tonnes a year.

£250,000
annual savings

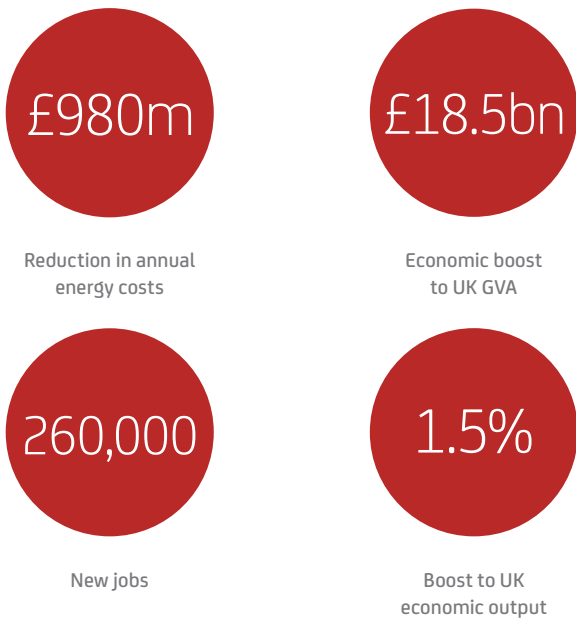
2,600
tonnes of carbon
saved

The National Picture

Taking these figures together we can provide a picture of the scale of the potential economic benefit for the UK economy if the opportunities from distributed energy solutions are taken up in these three key sectors.

Between industry, healthcare and hospitality & leisure, this represents a section of the economy which accounts for just over a quarter of the UK's gross value added, and almost a third of UK employment²⁶. As such, if other sectors also invest in these solutions, the benefits to the UK in economic output, gross value added and employment could be even higher.

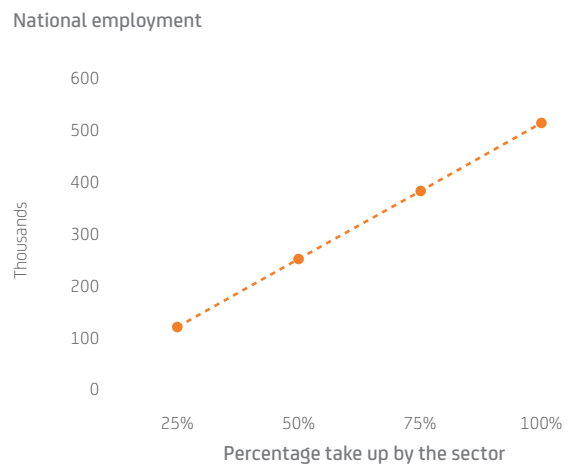
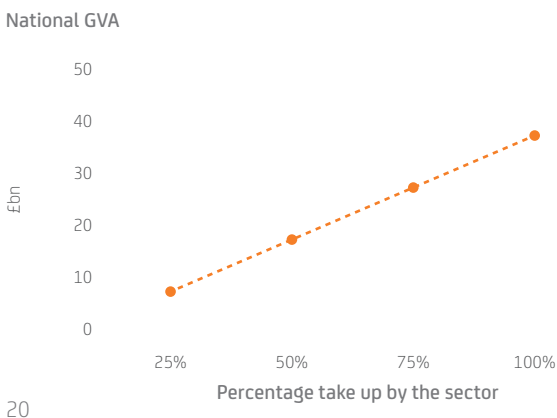
Our analysis shows that if just 50 per cent of the three sectors utilised these solutions it could deliver:



The Global Opportunity

The UK is not alone in undergoing the distributed energy revolution. Although Britain has the strengths to become a leader in this area, other international markets are rapidly developing. In the context of the Industrial Strategy's goal of "Encouraging growth and inward investment" this both presents an opportunity for UK export businesses and serves notice that the UK needs to act quickly if it wishes to take a global lead.

²⁶ 2014, ONS Statistics (last full data set available)





Chapter 4: Recommendations

Distributed energy is a new market, one which is growing rapidly as businesses such as Centrica develop their products, services and offers.

We believe that more could be done to unlock the potential of these solutions and make the following key recommendations.

1. The Department for Business, Energy & Industrial Strategy (BEIS) to commit to assessing the role distributed energy solutions could play in delivering long-term energy cost reductions for the UK and promoting these solutions across Government and public bodies.

As part of the Clean Growth Strategy, the Government has set UK business a challenge: to improve energy productivity by 20 per cent compared to 2030. This is an important goal, and one which highlights the importance of distributed energy solutions to the UK's wider industrial future by helping UK businesses to raise their energy productivity and competitiveness.

Similarly, as the UK public sector continues to look to do more with less, distributed energy can help improve the efficiency of public service provision. Reducing the energy bill across all public sector buildings should therefore be a central challenge as part of the Clean Growth Strategy.

Meeting these challenges in both the private and public sectors will require businesses to be made aware of the technologies and services which are available to them. Companies like Centrica will play their part, but Government too should raise its game; BEIS needs to improve its understanding of the technological advances driving distributed energy.

We believe that BEIS should build on the initial analysis of this report to produce an authoritative assessment of the cost reduction opportunities and economic benefits of distributed energy to the UK. This would include reporting on the impact that distributed energy solutions could play in delivering long-term energy cost reductions for the UK as part of the "Delivering affordable energy and clean growth" industrial strategy pillar. This would have a number of benefits. It would provide a powerful tool to promote improved business decision-making. It would stimulate innovation and growth in distributed energy technologies by highlighting the market's potential, and it would provide an important signal to public services providers about the potential of these technologies.

2. The Committee on Climate Change (CCC) to consider if the utilisation of new energy solutions for larger energy users could represent a lower cost route to decarbonisation.

As part of the Clean Growth Strategy's commitment to meeting the UK's Fourth and Fifth Carbon Budgets, the Government has agreed to set tighter targets for emissions reductions in central government, and a voluntary public sector target of a 30 per cent reduction in emissions by 2020-2021.

This report has highlighted the potential for distributed energy solutions to deliver emissions savings for individual businesses and large public sector energy users; e.g. a typical hospital can achieve a saving of around 2000 tonnes of carbon each year.

The development of distributed energy solutions are changing the way that we use energy across the economy. Like the rapidly falling cost of renewable energy, or rapidly rising potential of electric vehicles, this is changing the terms of our decarbonisation challenge. It is also important to note that distributed energy approaches such as demand side response can lower the cost of balancing the grid and enable the further development of renewables. While there is a greater understanding of the impact of both cheaper renewables and electric vehicles on the UK's decarbonisation pathways, the potential impact of distributed energy is yet to be fully incorporated into policymaking.

We believe it is incumbent upon the Committee of Climate Change to now take the lead in producing a definitive assessment of the cross economy potential for distributed energy to cut carbon emissions. This should also include the scope for distributed energy in delivering future carbon budgets, assessing the impact of emission reduction plans across both the power and industrial sectors.

3. UK Government to review the incentivisation of businesses to utilise distributed energy solutions and the markets and schemes available to reward flexibility.

In addition to the benefits to the individual company from installing distributed energy solutions, there is a benefit to the whole energy system from the greater flexibility which distributed energy can provide. This is increasingly important as intermittent renewable technologies make up a growing share of UK power generation.

The Government should therefore ensure that it minimises barriers to the uptake of distributed energy solutions. We supported Policy Exchange's Smart Power 2.0 report last year, which provided sensible recommendations about simplifying and making more transparent the flexibility and ancillary services markets. There is also good work already ongoing through National Grid's Power Responsive and the proposals outlined in the Clean Growth Strategy, but the Government should assess if more action is needed, whilst ensuring there is not an increase in regulation for the businesses taking up these solutions.

Additionally the UK should assess how to incentivise distributed energy solutions to contribute to delivering the plans outlined in its Clean Growth Strategy. The proposed Industrial Energy Efficiency scheme is promising, but needs further details about how the scheme can ensure UK industries are making the most of distributed energy solutions which are available to them. We would therefore recommend that the Government set up a working group with industry to assess how the industrial energy efficiency scheme can be best implemented and reflects technologies available today.

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Appendix 1: About Centrica

The world of energy is changing and, with our chosen businesses, distinctive positions and current capabilities, Centrica is well placed to deliver for its customers and for society.

We will satisfy our customers, deliver cash flow growth and returns for our shareholders and be efficient and excellent in our operations.

We are shifting investment towards our customer-facing businesses – organised around two global customer facing divisions: Centrica Consumer and Centrica Business focused on the residential consumer and the business customer respectively.

Our areas of focus are Energy Supply & Services, Connected Home, Distributed Energy & Power, Energy Marketing & Trading.

We supply energy and services to over 27 million customer accounts mainly in the UK, Ireland and North America through strong brands such as British Gas, Direct Energy and Bord Gáis supported by around 12,000 engineers and technicians.

We are focused on delivering high levels of customer service, improving customer engagement and loyalty. We aim to be a good corporate citizen, employer of choice and to provide leadership in a dynamic and changing world.

We are developing innovative products, offers and solutions, underpinned by investment in technology. In February we announced the creation of a new venture 'Centrica Innovations' that will identify, incubate and accelerate new technologies and innovations. We will look to invest up to £100 million over the next five years in start-ups, giving us access to technology and entrepreneurial capability and resources.

About Centrica Business Solutions

Centrica Business Solutions has been established to develop new thinking, new technologies and new ways of working to help our customers take control of their energy and improve their performance, resilience and growth.

Our energy intelligence, products and solutions are already powering the ambitions of 1,500 energy users around the world. From retail and manufacturing to health and education, we help our customers improve their operational efficiency, increase their resilience, and unlock new sources of value and revenue. Centrica will be investing over £700m in this area by 2020.

For more information:
www.centricabusinesssolutions.com

Appendix 2: Modelling, inputs and assumptions explained

Overview

- Centrica commissioned FTI Consulting to help develop the quantitative analysis for this report.
- FTI Consulting is an independent global business advisory firm, with deep expertise and significant experience in energy markets, and in performing economic analysis across a range of sectors.

Methodology

Stage 1- Identifying typical users

- Centrica supplied a profile of a typical distributed energy customer in three sectors that play a key role in the UK economy: (1) industrial, (2) health care, and (3) leisure/ hotel / hospitality. Centrica also supplied information around the typical bundle of Centrica Business Solutions technologies invested in by these users, and the energy cost savings that these technologies would deliver.

Stage 2 – Determining direct benefits

- FTI Consulting calculated the direct economic benefits arising from:

Investment spending

- The businesses that supply Centrica Business Solutions with goods and services (including Centrica) will earn revenue (i.e. there will be economic output), that will be greater than the value of the inputs they use in production (i.e. there will be gross value added), and that will require employees to deliver (i.e. there will be jobs created in the Centrica Business Solutions supplying industries).
- These benefits are one-off – they occur in the year in which the investment is made.

Net energy cost savings

- The Centrica Business Solutions goods and services will allow users to save on their energy bills by using less energy, shifting use to times when energy is cheaper, and exporting unused electricity to the grid. FTI Consulting assumes that users in the industrial sectors

and leisure / hotel / hospitality sectors will deploy these savings by reinvesting in their businesses – generating output, value added and employment in those industries in which they invest. FTI Consulting further assumes that the health care sector deploys these savings by delivering more health care – generating output, value added and employment in the health care sector itself.

- These benefits are perpetual – they are enjoyed in every year that the users' energy bills are lower (than they would have been without the Centrica Business Solutions goods and services).

Stage 3 – Determining indirect and induced benefits using economic multipliers

- The direct benefits in Step 2 multiply, as the benefits ripple throughout the economy. These ripple effects are known as indirect effects (increased economic activity in the supply chain) and induced effects (increased economic activity due to successively higher income and employment).
- Output multipliers and employment effects vary between different economic activities (identified using the Standard Industrial Classification, or SIC codes).
- FTI Consulting have analysed UK national accounts to calculate the multipliers for each SIC code. Depending on exactly how Centrica Business Solutions users redeploy their cost savings, a range of multipliers may apply. For example, the induced output multipliers:
 - range from 1.3 to 2.8 in the industrial sector;
 - range from 1.4 to 2.6 in the commercial sector;
 - are 1.5 in the healthcare sector; and
 - range from 2.0 to 2.5 in the SIC codes that relate most closely to the supply of Centrica Business Solutions technologies.

Stage 4 – Creating total figures

- FTI Consulting added the direct, indirect and induced benefits from Stages 2 and 3 to calculate total economic benefits, and presented a range of estimates based on the range of multipliers. Centrica took the middle of the range of estimates for its primary results.

Inputs and Assumptions

Inputs

- Inputs are data points that are known. FTI Consulting used inputs from:
 - Centrica (to identify typical users in each sector and the global Centrica Business Solutions market size);
 - UK Office of National Statistics (for economic output, GVA, employment, CPI inflation and multipliers);
 - Scottish Government Input-Output Analysis (to estimate UK induced employment effects, not provided by the ONS);
 - UK Government Department for Business, Energy & Industrial Strategy (for energy market data); and
 - NHS (for hospital beds and energy use).
- FTI Consulting used data for 2014, as this is the most recent year for which all of the above data is available (unless stated otherwise).
- FTI Consulting used economic multipliers from 2013, as this was the most recent year for which the most granular data was available.

Assumptions

- Assumptions made were either conceptual, or made where specific data points were not known. This report uses two types of assumptions:
 - General conceptual assumptions; and
 - Specific technical assumptions and modelling choices (not discussed below).
- Key general conceptual assumptions include:
 - **Typical users Centrica identified are ‘representative’**
FTI Consulting assume that the typical users identified by Centrica (and the input data provided for each user) are representative of the potential users of Centrica Business Solutions technology in the sectors to which they relate.
 - **Investment in Centrica Business Solutions technology is ‘new’ spending**
Since the scope of their work was restricted to estimating the gross economic benefits, FTI Consulting were required to assume that the users’ investment in the Centrica Business Solutions technology is ‘new’ spending (i.e. there is no reduction in spending elsewhere in the economy). Equally, if the user did not invest in such technologies (supplied by Centrica Business Solutions or its competitors), it is assumed that they would not have invested elsewhere. Overall in the analysis, the focus is on benefits, not the costs (including opportunity costs).

- **FTI Consulting did not take into account that energy suppliers lose revenue from energy efficiency**

Since the focus of their work is on estimating the gross economic benefits, FTI Consulting did not account for the fact that every £1 of energy cost saving experienced by a Centrica Business Solutions technology user would lead to £1 less revenue for energy suppliers.

- **The economic benefits presented in the report relate to the first year in which all potential users install the Centrica Business Solutions technology**

The benefits from the investment spending in Centrica Business Solutions technologies are a 'one off' benefit. Those from productivity improvements and cost savings are perpetual. As only one year of the perpetual benefits are included within the report results above, it can therefore be assumed that the actual benefits are in fact higher than those reported.

- **FTI Consulting did not model the economic benefits from improvements in users' resilience to disruptions from the grid**

- **Linear scaling**

FTI Consulting assumed that the benefits to typical users scale linearly (i.e. on a straight line basis) to the rest of the sector.

- **Centrica Business Solutions technologies do not provide the typical user with a significant improvement in productivity**

At this stage it is not possible to provide data to provide a clear example of productivity benefits, such as, predictive maintenance or avoided brownouts. This is undoubtedly a benefit of these technologies, but at this stage data is not sufficient to enable further benefits calculations.

Disclaimer

The analysis as described in Appendix 2 has been prepared by FTI Consulting LLP ("FTI") for Centrica plc in connection with the 'Quantitative analysis to support delivery of a research paper on distributed energy' project commissioned in June 2017. This analysis has been prepared solely for the benefit of Centrica plc in connection with this project and no other party is entitled to rely on it for any purpose whatsoever. FTI accepts no liability or duty of care to any person for the content of this analysis. Accordingly, FTI disclaims all responsibility for the consequences of any person acting or refraining to act in reliance on the analysis or for any decisions made or not made which are based upon such analysis. The analysis contains information obtained or derived from a variety of sources. FTI does not accept any responsibility for verifying or establishing the reliability of those sources or verifying the information so provided. Nothing in this analysis constitutes investment, legal, accounting or tax advice, or a representation that any investment or strategy is suitable or appropriate to the recipient's individual circumstances, or otherwise constitutes a personal recommendation. No representation or warranty of any kind (whether express or implied) is given by FTI to any person as to the accuracy or completeness of the analysis. The analysis is based on information available to FTI at the time of preparing the analysis in August 2017 and does not take into account any new information which becomes known to us after this date. We accept no responsibility for updating the analysis or informing any recipient of the analysis of any such new information. All copyright and other proprietary rights in the analysis in Appendix 2 remain the property of FTI and all rights are reserved. UK Copyright Notice © 2017 FTI Consulting LLP.

