



The voice of the
smart meter rollout



Making Business Sense

Powering Future Cities

July 2016



Foreword

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How much energy will we need to power our cities in the future? Where will that energy come from? How will it be distributed, stored and accessed?

We don't have all the answers to these big questions, yet. But this report highlights the importance of the digital energy upgrade that's already underway.

Two thirds of the world's population will be living in cities by 2045 and this may or may not be a future of mega-buildings and flying cars. But the expanding and ageing city population will load new demands onto some already creaking urban systems.

A radical rethink of the way cities are powered and managed is already beginning.

In the UK, our great cities – including Manchester, Liverpool, Newcastle, Nottingham, Cardiff, Sheffield, Bristol, Birmingham, Leeds, Glasgow and London – have made big strides.

Bristol is building a platform for smart city applications. Nottingham, Glasgow and Manchester have also set up initiatives to bring their smart city visions to life.

This report by Cebr outlines the likely paths of energy demand in 11 cities, and points to the challenges, but also the massive opportunities, ahead.

Currently – due to efficiency measures and greater interest in energy saving – electricity demand is falling. This is expected to continue, perhaps until 2025.

But between 2025 and 2035, the analysis shows a sustained

increase in electricity demand, due in large part to an expected surge in electric transport use.

Our current energy system must be ready for when millions of people plug-in electric vehicles at the same time at the end of the working day.

Increased use of renewable energy will also bring the challenge of intermittent energy supply. Electricity flows when the sun shines and the wind is blowing, but falls suddenly when they don't.

City planners and developers have already started thinking as much about energy storage and 'peak shifting' of energy demand across the day as about integrated transport and building regulations.

Smart meter technology has a big role to play in this. The meters are the essential devices that connect each and every household to the smart city energy grid.

The new meters are being installed in every home at no additional cost to consumers between now and 2020. This national digital upgrade is an essential part of making our cities ready for the future.

There is huge potential for cities and other local authorities to use these digital networks in innovative ways to manage energy flows and develop cleaner, greener neighbourhoods.

Cities are starting to seize some of the opportunities of smart technology. With devolution high on the policy agenda, I hope that this report provides further inspiration for mayors and city leaders to embrace a future of energy innovation.

1. Executive summary

The Centre for Economics and Business Research (Cebr) was asked by Smart Energy GB to assess trends in energy demand in major British cities, and to produce city-level forecasts of energy usage over a 20-year time horizon.

While there are detailed regular official forecasts of national energy usage, similar projections at a sub-national level do not exist in the public domain, and this is where we believe this report adds valuable insight on the geographical drivers of electricity and gas demand. The key findings of the research are:

- **although UK energy demand has decreased in recent years, it is expected to rise again.** The mid-2020s are set to be a turning point, and without further policy measures energy demand is set to increase as many of the 'easy' energy efficiency gains in the economy are exhausted. The latest DECC central forecasts show an 8 per cent rise in total energy demand between 2025 and 2035
- **this will be especially the case for UK electricity.** Demand is expected to rise by about a fifth (19 per cent) between 2015 and 2035. This is a result of economic growth, a rising population and technological changes, such as a shift away from petrol and diesel vehicles to electric vehicles
- **domestic electricity demand will grow particularly fast in urban parts of the country.** Bristol, Cardiff and London are all set to see domestic electricity demand rise by over 30 per cent between 2015 and 2035. Even Liverpool, with the slowest rate of domestic electricity demand growth of the 11 cities examined in the report, is set to see an increase of close to 20 per cent
- **the drivers behind this suggest that this is a positive development.** The increase in domestic electricity demand projected in our forecast reflects higher economic growth, in turn partly driven by higher population growth. Additionally, higher electricity demand is also expected to be driven by greater uptake of electric vehicles – something that is potentially great news for the UK's environmental sustainability
- **however, if not addressed properly this can also bring new challenges.** For example, increased usage of electric vehicles could lead to a sharp rise in electricity demand. We estimate that, if residential usage of petroleum were to be completely phased out by 2035, and there was an equivalent increase in electricity demand, domestic electricity usage would be around a quarter higher in each city than under our central scenario. This could raise the prospect of blackouts if an appropriate supply source is not present and demand is not effectively managed
- **in addition to electric vehicles, other technological advances could also increase electricity demand.** For example, a shift away from gas heating towards electrical heating and the increasing use of electronic devices in the home
- **cities are already starting to address these issues.** Businesses, local government, and third sector organisations have been working collaboratively to build more sustainable patterns of energy usage. For example, there have been efforts to insulate homes and install renewable power sources

- **looking ahead, it is crucial that this momentum is maintained.** This can prove difficult in a challenging fiscal environment, as many of these measures come with costs attached, such as the cost of subsidies for home insulation
- **smart solutions to change behaviour present a cost-effective response.** One way to help consumers adapt to new patterns in energy use would be the promotion of 'smart infrastructure'. Increasing individual awareness of the financial costs consumers face from energy inefficiency, through smart meters for example, could significantly change consumer behaviour

A range of policy interventions have successfully worked to increase energy efficiency and sustainability within the UK over the past decade. This includes both carrot and stick approaches, such as taxation to deter use of polluting sources of energy and subsidies to support innovation in renewable and efficient sources. Technological advances, such as the increasing fuel efficiency of transport, have also helped households and businesses become more energy efficient.

Nevertheless, momentum needs to be maintained if energy usage is to be contained going forward, especially in urban areas. Growth in domestic electricity usage will be more pronounced in several of Great Britain's cities, where population growth is often relatively high. Major cities such as Manchester and London are projected to see notably faster than average economic growth over the coming years, which will also translate into increased non-domestic demand for energy.

As this report notes, some technological advances such as electric vehicles could lead to a substantial increase in peak energy demand, raising the prospect of potential blackouts if supply does not increase sufficiently, or if load balancing is not increased. At the same time, other technological advancements can alleviate energy demand pressures – for example, past Cebr research has demonstrated how smart meters can lead to a decline in energy usage¹.

The structure of this report is as follows:

- section 2 examines recent trends in energy demand
- section 3 considers trends in energy demand across 11 major British cities
- section 4 presents Cebr's forecasts of city-level energy demand
- section 5 examines the major upside risks to these projections
- section 6 examines how organisations are attempting to increase energy efficiency in British cities
- section 7 draws conclusions from the preceding analysis

1. Cebr, British Gas Home Energy Report, 2015, https://www.britishgas.co.uk/media/r/1384/households_could_save__1_5bn_on_their_energy_bills

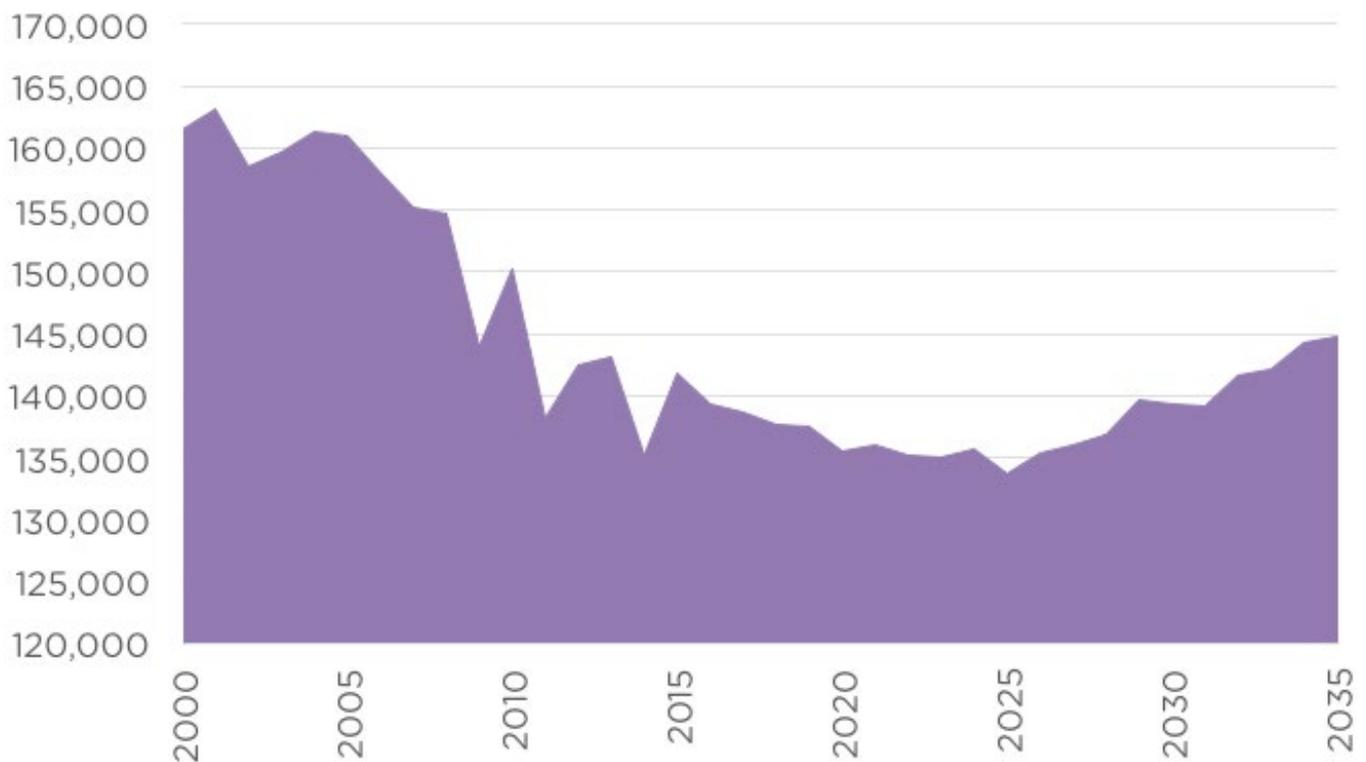
2. Trends in UK energy demand

The former Department for Energy and Climate Change (DECC) has produced regular energy and emissions projections. The latest forecasts produce insights into the likely path of energy demand over the years to 2035, based on a range of assumptions with respect to economic growth, demographic trends and government policy.

The DECC data shows that total final energy demand in the UK declined significantly between 2000 and 2015, by an estimated 12 per cent². Furthermore, under DECC's central estimates, demand will decline by a further 6 per cent by 2025, reflecting increased energy efficiency in the UK economy.

However, the mid 2020s are set to be a turning point, and without further policy measures energy demand is set to rise again after this point as many of the 'easy' energy efficiency gains in the economy are exhausted. The latest DECC central forecasts show an 8 per cent rise in total energy demand between 2025 and 2035, as shown in Figure 1.

Figure 1 UK final energy demand, KTOEs*



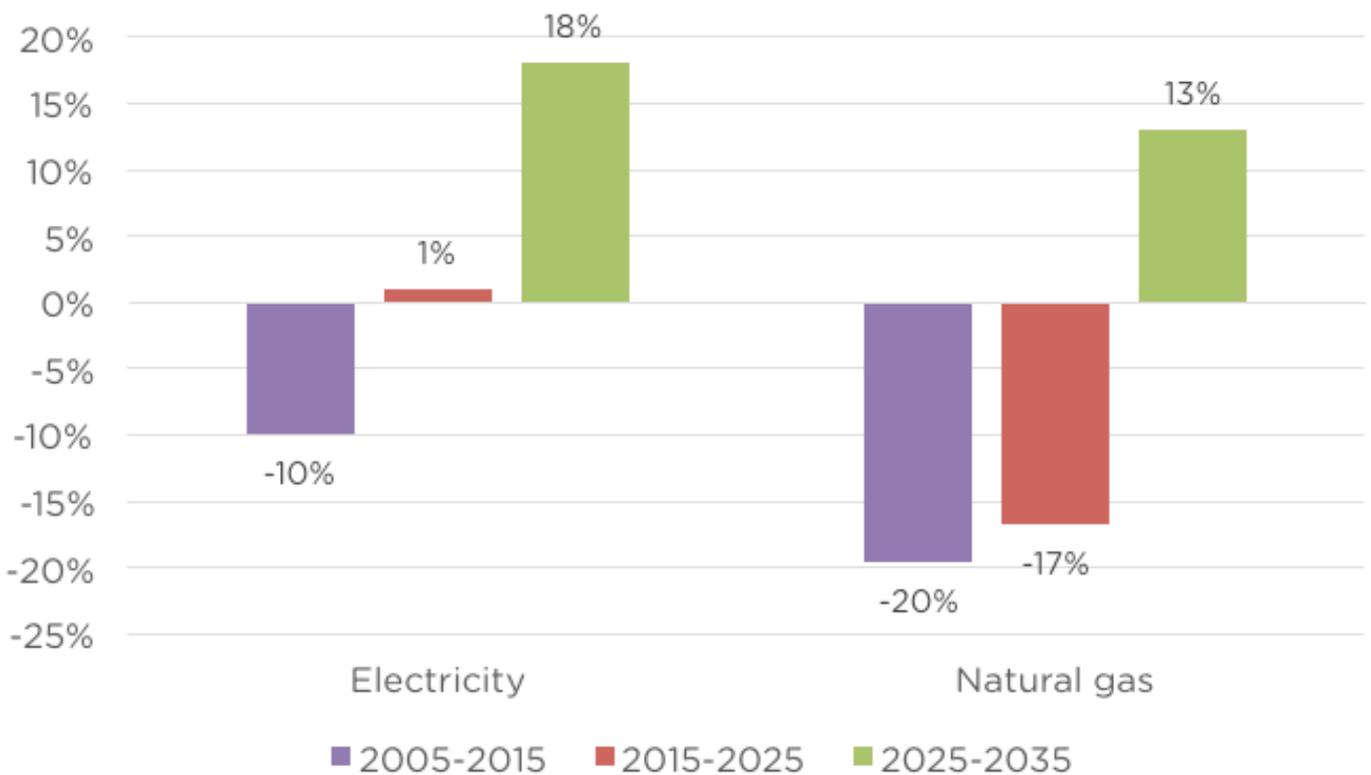
Source: DECC energy and emissions projections

2. Energy demand is measured in terms of KTOEs - kilotonnes of oil equivalent. A kilotonne of oil equivalent (toe) is a unit of energy defined as the amount of energy released by burning one kilotonne of crude oil.

There are likely to be significant changes in the drivers and sources of energy demand going forward, which means that, even if overall the UK consumes less energy than in the recent past, some parts of the energy system could potentially come under strain without a significant increase in capacity and new ways to manage the supply and demand relationship.

Breaking down final energy demand by source shows that electricity demand in particular is set to rise in the UK over the coming years, with demand expected to rise by about a fifth (19 per cent) between 2015 and 2035 under DECC's central forecasts. This is a result of economic growth, a rising population and technological changes such as a shift away from petrol and diesel vehicles to electric vehicles.

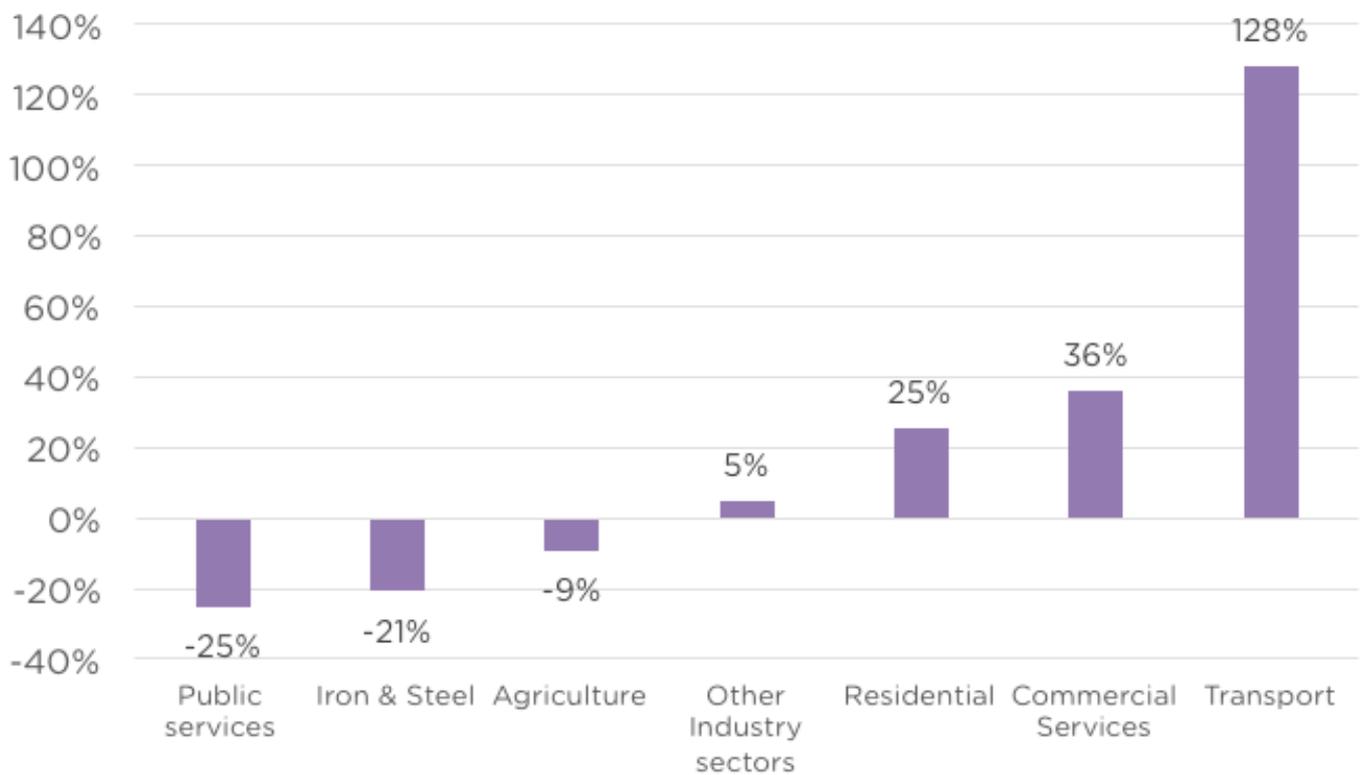
Figure 2 Growth in UK final electricity and natural gas demand



Source: DECC energy and emissions projections

The growth in final electricity demand forecast over the next 20 years will be driven by three sectors - residential, commercial services and transport, where demand is set to rise by 25 per cent, 36 per cent and 128 per cent respectively under DECC central forecasts.

Figure 3 Growth in UK final electricity demand, 2015-2035, by sector



Source: DECC energy and emissions projections

3. City-level energy demand

DECC produced estimates of domestic and non-domestic electricity and gas demand at a sub-national (local authority) level of detail. Cebr has drawn on this dataset to examine trends in energy usage across 11 major cities in Great Britain:

- Birmingham
- Bristol
- Cardiff
- Glasgow
- Leeds
- Liverpool
- London
- Manchester
- Newcastle
- Nottingham
- Sheffield

Cebr has then combined this data with DECC UK energy demand projections, ONS sub-national population projections and its own forecasts of employment and economic growth to produce forecasts of energy demand in these cities over a 20 year period.

Recent trends

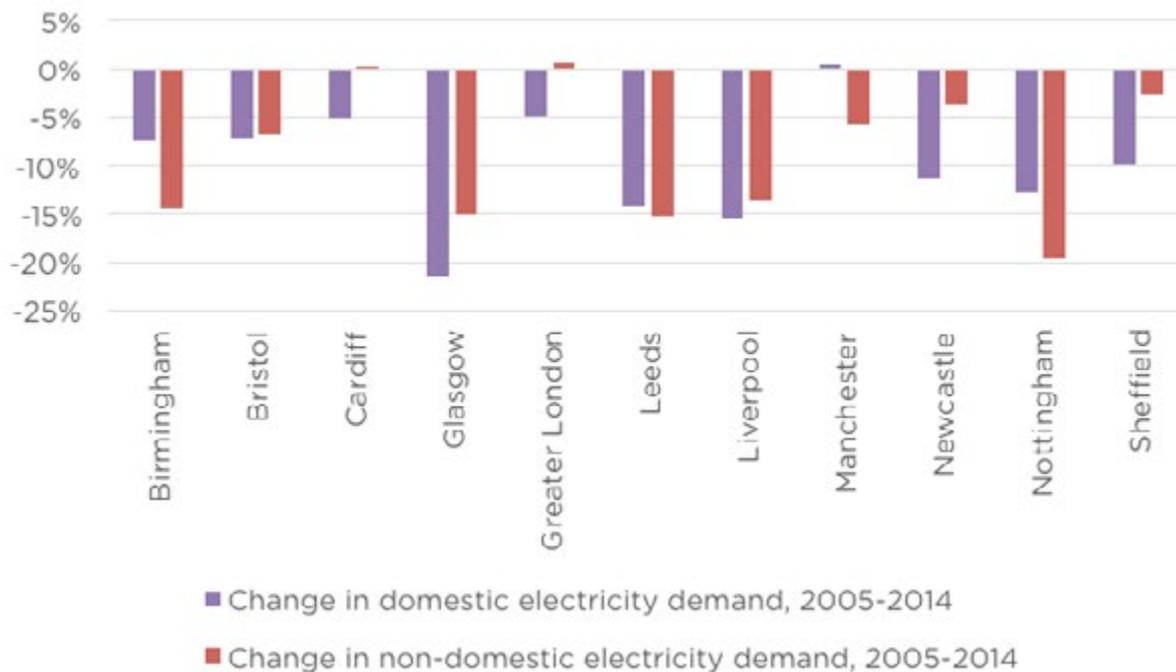
The DECC sub-national dataset contains estimates of final energy demand covering the years 2005 to 2014, which have been collated for the cities above.

The data shows that both electricity and gas demand have fallen across almost all of the 11 cities examined over this time period, though to varying degrees and with differences between domestic and non-domestic energy demand.

With respect to electricity demand, London was the only city studied in which non-domestic electricity usage did not decline between 2005 and 2014, probably reflecting the capital's strong economic growth over much of this time period, which led to a significant increase in the number of businesses operating in the capital. Manchester was the only city that did not see a decline in domestic electricity demand, which is likely to reflect the increase in the population of Manchester between 2005 and 2014.

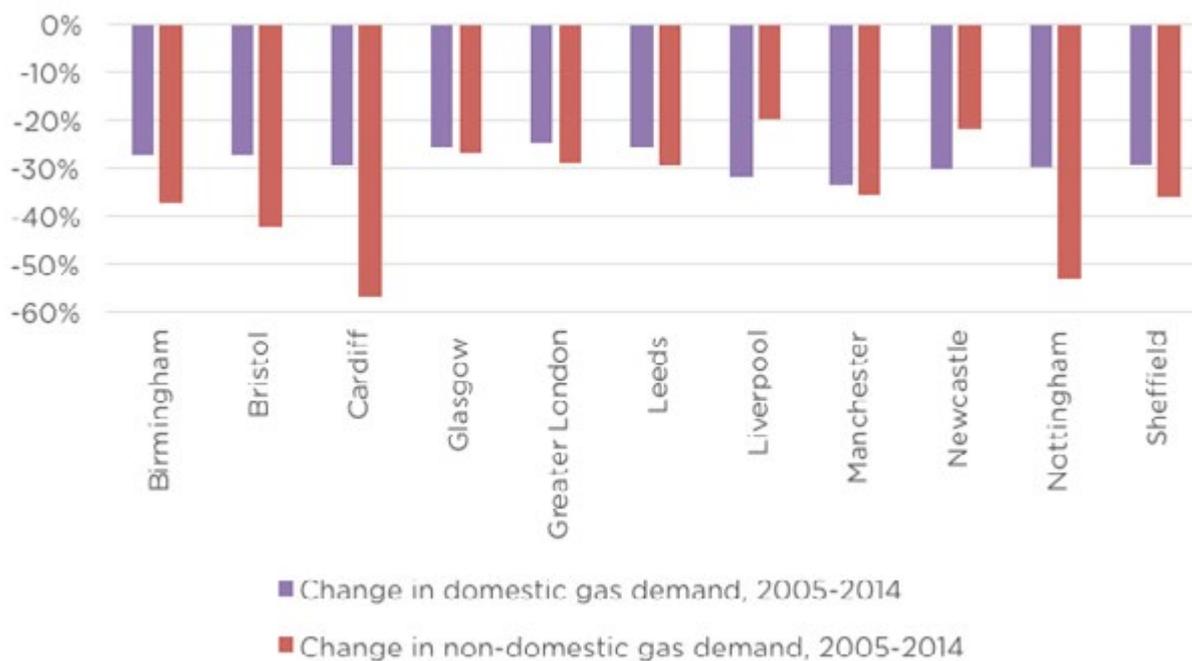
In each of the cities studied, domestic and non-domestic gas demand declined significantly more than electricity usage between 2005 and 2014, in line with trends seen in the nationwide DECC dataset. This is shown in Figure 5.

Figure 4 Change in final electricity demand, 2005-2014



Source: DECC sub-national energy statistics, Cebr analysis

Figure 5 Change in final gas demand, 2005-2014



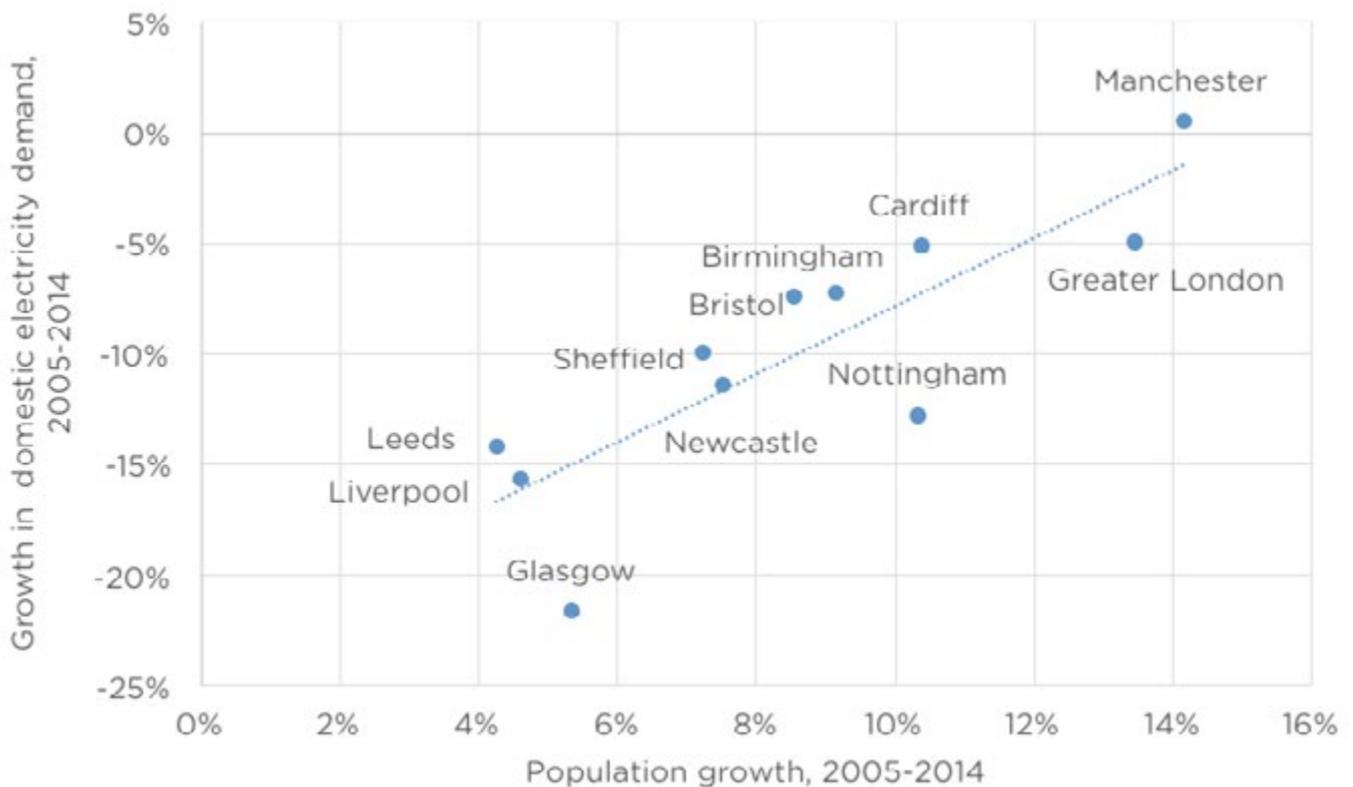
Source: DECC sub-national energy statistics, Cebr analysis

The drivers of energy demand at a sub-national level appear to have a significant correlation with economic and demographic variables. In particular, domestic electricity demand in the 11 cities studied is strongly correlated with population growth. For the 2005-2014 period, it is estimated that about 70 per cent of the variation in electricity demand between the cities can be explained by different rates of population growth.

There is also a link between economic growth and non-domestic (e.g. business) demand for electricity. Across all 11 cities, economic growth in each city explains over two fifths (44 per cent) of the change in non-domestic electricity demand over this time period.

Excluding Cardiff, which seems somewhat anomalous, economic growth in the 10 English and Scottish cities explained 78 per cent of the total variation of non-domestic electricity demand over this time period.

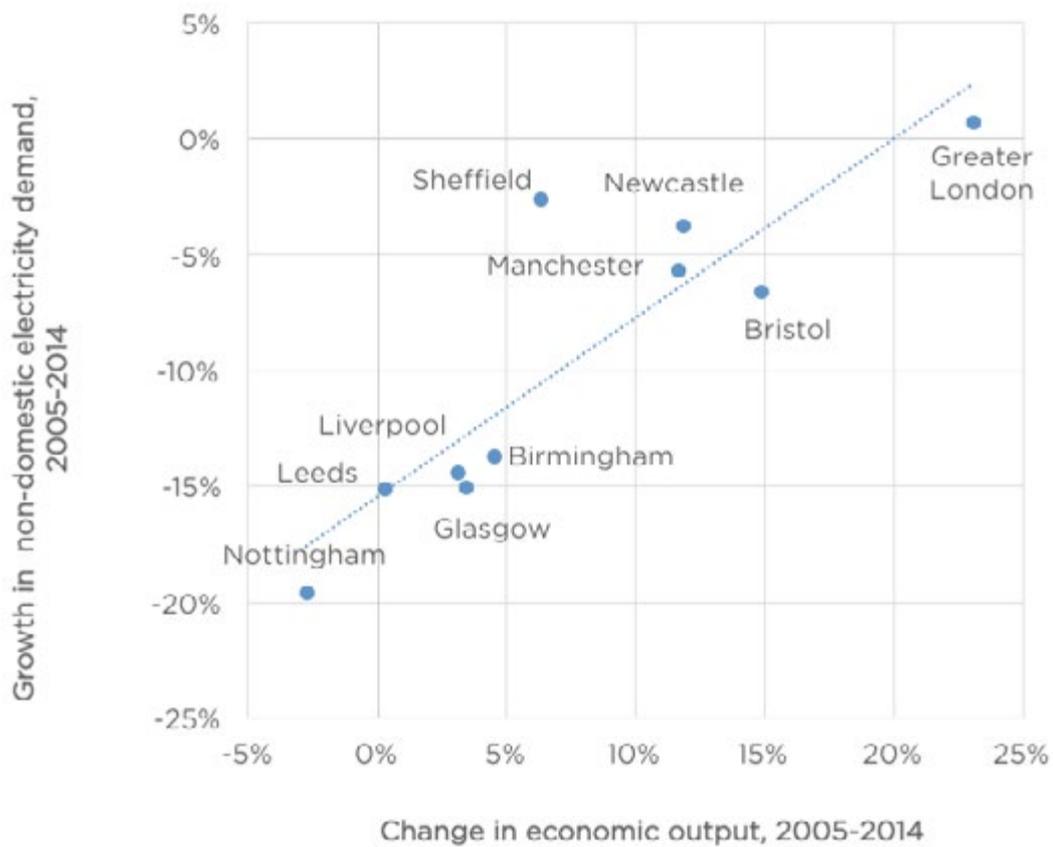
Figure 6 Correlation between final domestic electricity demand and population growth in each city



Source: DECC sub-national energy statistics, ONS, Cebr analysis

The correlation between gas demand and these economic and demographic variables is not as strong as those for electricity over this time period, probably reflecting a structural decline in the use of this source of final energy between 2005 and 2014.

Figure 7 Correlation between final non-domestic electricity demand and city economic expansion (as measured by growth in gross value added, GVA)



Source: DECC sub-national energy statistics, ONS, Cebr analysis

4. Looking ahead future trends in city energy demand

Based on the relationships that were identified in the previous section, ONS principal population projections and Cebr’s forecasts of economic growth at a city level have been used to produce forecasts for domestic and non-domestic energy demand in the 11 cities examined.

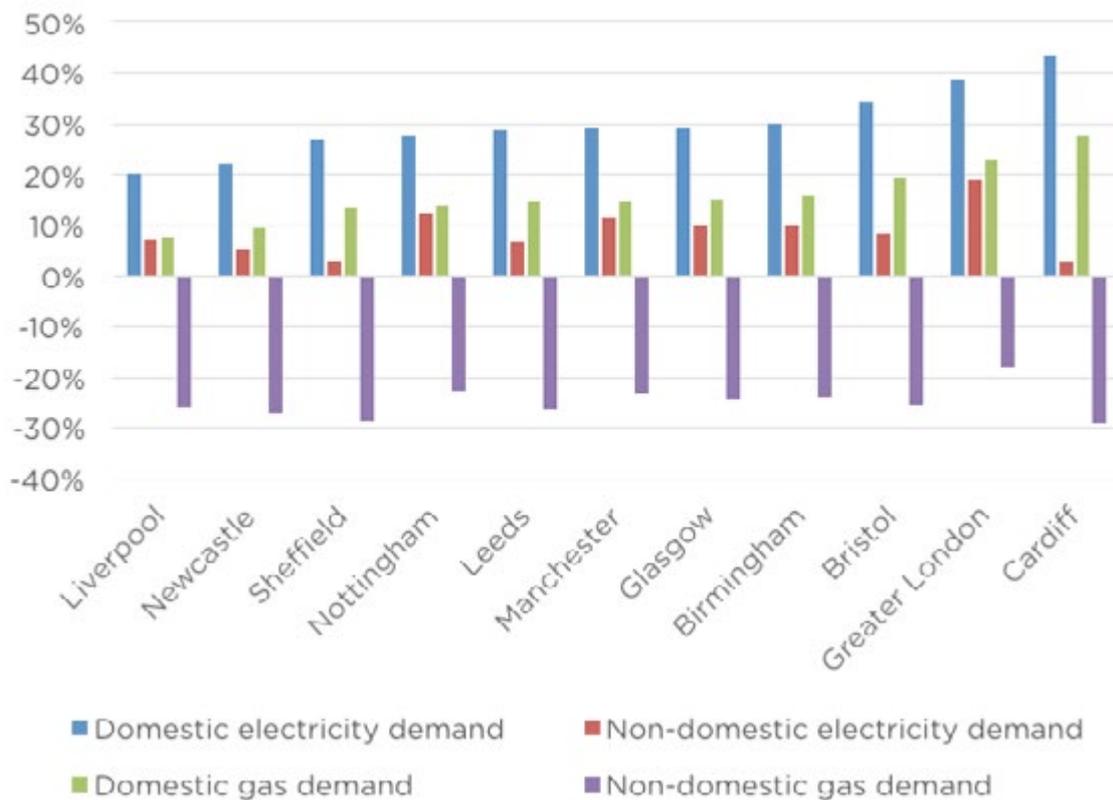
The forecasts show a significant increase in electricity demand, particularly domestic electricity demand, over the coming years. Bristol, Cardiff and London are all set to see domestic electricity

demand rise by over 30 per cent between 2015 and 2035. Even Liverpool, with the slowest rate of domestic electricity demand growth, is set to see an increase of close to 20 per cent.

Cebr expects slower, but still significant, rates of demand growth for non-domestic electricity as the economies of these cities expand. London, in particular, is expected to see non-domestic electricity demand increase by about a fifth (19 per cent) over the next 20 years.

While non-domestic gas usage is expected to decline going forward, in part reflecting a continued shift in the economy towards service industries, gas demand is expected to rise for households between 2015 and 2035, as the populations of these cities expand. The largest projected increases in domestic gas demand are Cardiff, London and Bristol, at 28 per cent, 23 per cent and 19 per cent respectively.

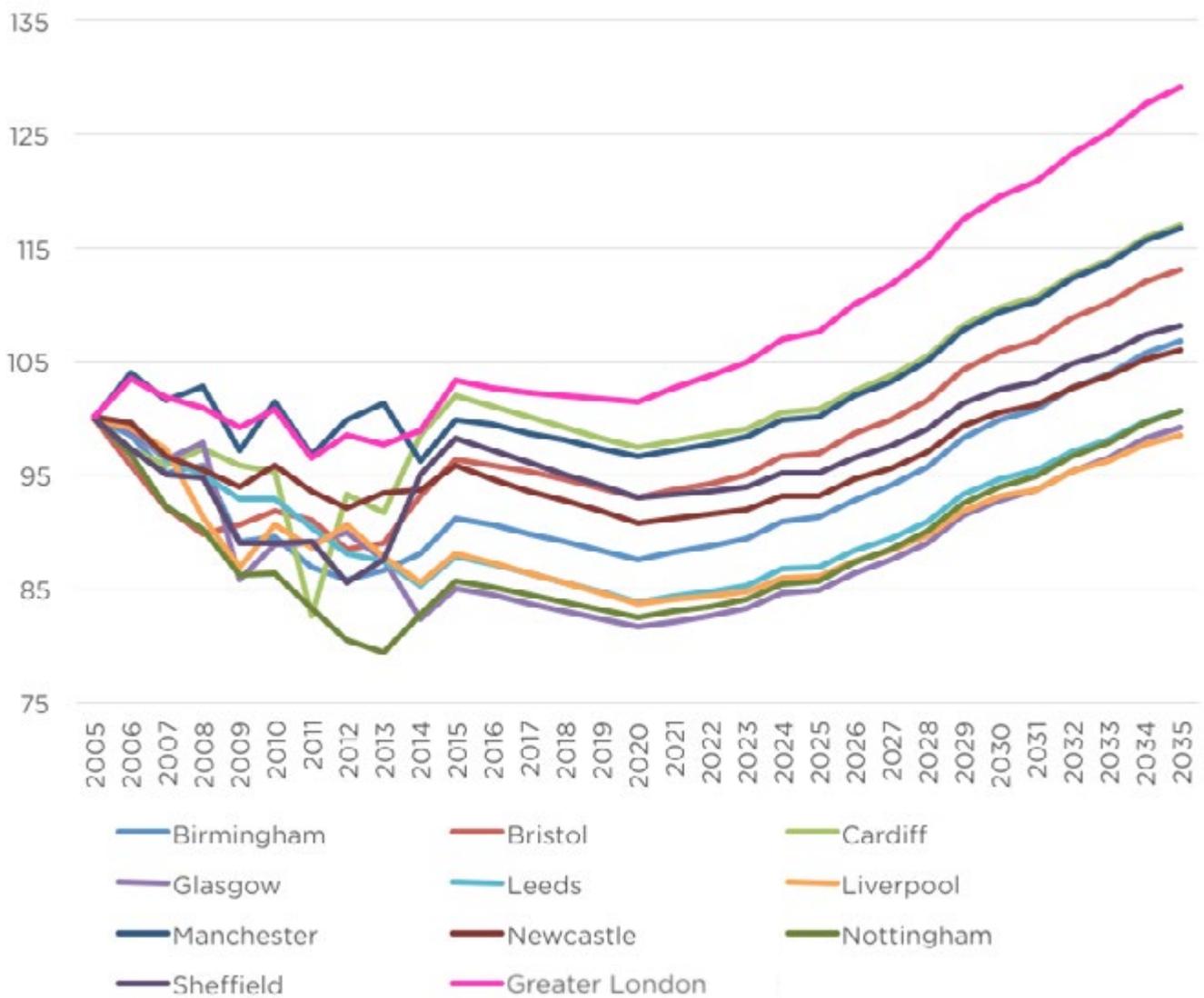
Figure 8 Per cent change in final energy demand, 2015-2035



Source: Cebr analysis

By 2035, electricity usage is expected to stand above 2005 levels in all but two cities – Liverpool and Glasgow. By 2035, electricity demand in London is set to stand 29 per cent above 2005 levels, while in Cardiff and Manchester electricity demand is expected to stand 17 per cent above 2005 levels. In Bristol, electricity demand is expected to stand 13 per cent higher, as shown in Figure 9.

Figure 9 Index of electricity demand (domestic and non-domestic), 2005 = 100



Source: Cebr analysis

5. Upside risks to the forecasts

There are a number of factors that could lead to higher levels of energy demand in the cities examined in this report, potentially creating a number of challenges.

Faster economic growth

The forecasts shown in the previous section of this report are constructed based on Cebr's central projections for economic growth, which assume that the pace of economic growth will enter a new normal, lower than the highs seen in the years leading up to the financial crash. This reflects a structurally lower rate of increase in productivity going forward and is now a widely held view. Indeed, the Office for Budget Responsibility (OBR) recently downgraded its medium term growth outlook due to it now expecting weak productivity growth to persist.

It is conceivable that economic growth could be stronger than Cebr expects in the long term, for example due to technological innovation, which could lead to a surge in productivity. In these instances, we would anticipate a greater level of energy demand.

The impact of faster economic growth on electricity demand could be significant. Cebr's central projections are for the UK economy to grow at an average rate of 1.5 per cent per annum between 2022 and 2035. If growth is 1 percentage point per annum higher than this in the UK (i.e. if growth returns to pre-financial crisis norms), and the city economies also grow 1 percentage point per annum faster, then electricity demand is predicted to be much higher. Cebr estimates an increase in demand of around 10 per cent in each city under this scenario.

Faster population growth

Another major determinant of the forecasts is the trajectory for population growth. Our city level energy projections are based on the principal population estimates produced by the Office for National Statistics. A more rapid rate of population growth would increase demand for energy.

Technological and policy changes

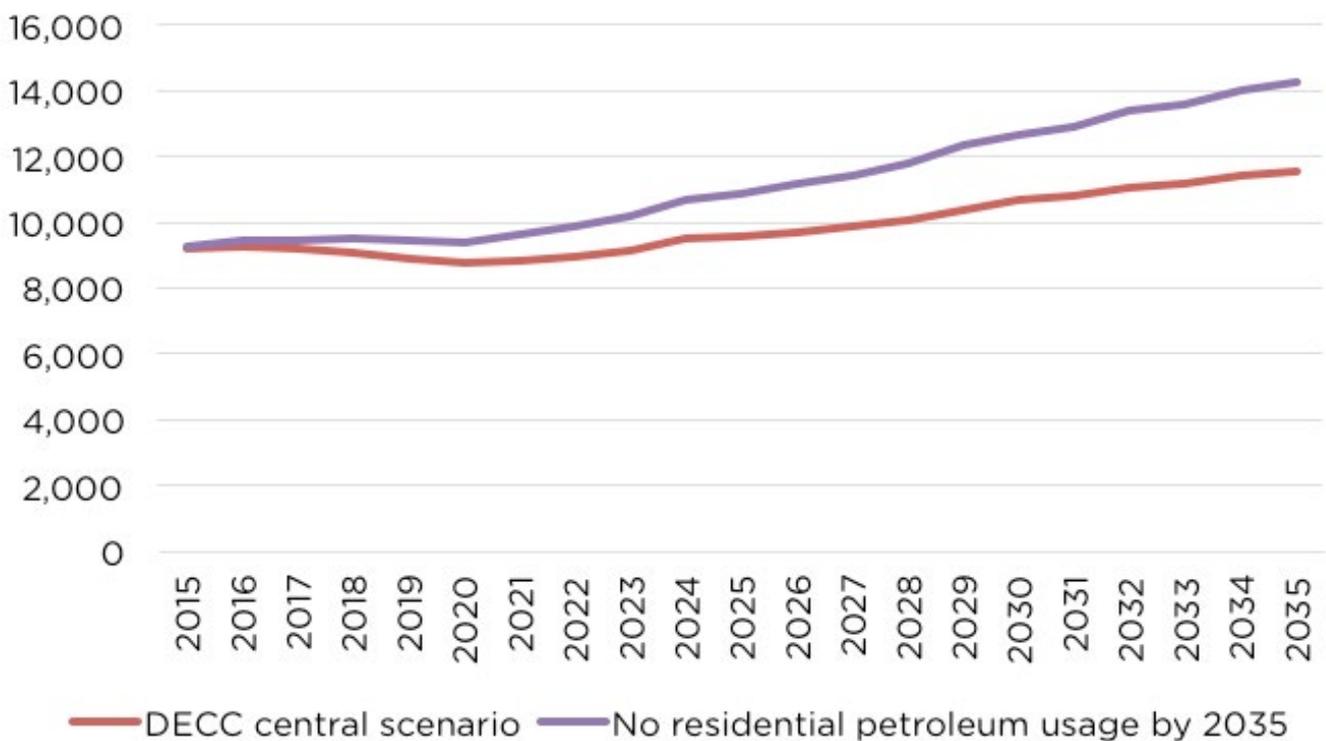
Although technology has the potential to increase energy efficiency within the economy, it also has the potential to increase energy demand. Further, it often leads to switches from one source of energy demand to another, so a policy to reduce use of one source of energy (e.g. petroleum) can increase demand for another source (e.g. electricity).

Developments in transport – in particular, increased usage of electric vehicles – have the potential to place significant pressure on the grid going forward. No one knows exactly how motorists will use electric vehicles in the future, but the implications for the UK's electricity infrastructure could be enormous. When electric vehicles plug in and charge, they add demand to both our facilities and our networks. Under National Grid demand modelling, there could be 3.2 million electric cars in the UK under the Gone Green scenario, and 0.9 million under the Slow Progression scenario by 2020³. The National Grid estimates that, on a cold winter day, the average electricity customer currently consumes 13 kWh. Its modelling assumes an average electric vehicle charge consumption of approximately 6.3kWh per day, which means an increase of almost 50 per cent in electricity demand for that home.

3. <http://www.nationalgridconnecting.com/journey-of-discovery/>

The DECC central projections that inform our city-level estimates assume some level of electrical vehicle uptake. If usage is higher than DECC anticipated, electricity demand across the UK, and within its cities, could be much higher. Cebr estimates that if residential usage of petroleum was phased out by 2035, and there was an equivalent increase in electricity demand, domestic electricity usage would be around a quarter higher in each city than under Cebr’s central scenario.

Figure 10 UK residential final electricity demand, KTOEs*, DECC central scenario and scenario with no residential petroleum usage by 2035



Source: DECC energy and emissions projections, Cebr analysis

6. Case studies

what is being done to create smarter cities?

As a result of the desire to become more energy efficient, environmentally friendly and prepared for the future, local authorities are partnering with an array of organisations to create smarter cities that use energy in a more sustainable way. An outline of some of these schemes is given below, providing an overview of the breadth of initiatives being undertaken and the potential lessons that different parts of the country could learn from each other.

Bristol Smart Energy City Collaboration

With support from the Sainsbury Family Charitable Trusts, the Centre for Sustainable Energy has brought together a cross-disciplinary group of 'Collaborators' in Bristol. The group includes Western Power Distribution (who run the local electricity distribution network); relevant City Council teams; the University of Bristol's Computer Science and Estates Management departments; and some of the sponsors of Bristol 2015 European Green Capital such as KPMG, Arup and DNV-GL. It draws on data, technical and smart meter expertise from Secure Group (which owns Bristol based Horstmann) and Demand Logic and community inclusion know-how from Knowle West Media Centre.

This collaborative approach, which brings together expertise from a wide range of disciplines and perspectives, is intended to enable Bristol to achieve significant energy efficiency and economic gains in the future. The Collaboration's aspiration is for Bristol to have, by 2020, a public-interest organisation coordinating the smart use, distribution and supply of heat and power across the city for the benefit of its people and businesses. That will require the city to develop the capabilities

and systems to access, manage and interpret local energy supply and demand data, enabling co-ordinated city and neighbourhood-scale interventions to:

- balance heat and power demand and supply across the city in real time
- curb energy waste and reduce peak demand
- stimulate better interventions to tackle cold homes and the associated health and social challenges
- enhance the financial value of renewable heat and power generated in the city, particularly from variable sources like wind, solar and tidal
- reduce network losses and manage system constraints
- provide commercial leverage in the energy market to capture for the city, its businesses and households, the economic benefits of an optimised local energy system

In its first year, the Collaboration has focused on how to bridge the gulf between its aspiration and current practice. Exploring commercial, technical, regulatory and socio-cultural aspects of the smart energy opportunity, the Collaboration has already mapped out the steps which need to be taken now and over the next few years. It is now working to ensure these steps are taken and that Bristol gets itself ready to make the most of smart energy data.

The Collaboration will work together to develop a collective understanding and to map out the steps which need to be taken over the next five years to establish the conditions and capabilities in Bristol to ensure sustainable energy usage going forward.

Nottingham Energy Partnership (NEP)

Established in 2001, NEP is a Queen's Award winning independent fuel poverty and climate change charity delivering energy efficiency projects to private households that cut energy bills, carbon emissions and increase quality of life.

NEP is the author of Nottingham City Council's 2020 Sustainable Energy Strategy and the organisation behind the East Midlands' first mixed tenure solid wall insulation programme, Aspley Super Warm Zone. Its two Warm Zones delivered 16,000 free and subsidised loft and cavity wall insulations to Nottinghamshire households. To date, it has project managed over 700 solid wall insulation installations.

This year, NEP secured funding from National Energy Action to deliver a groundbreaking solar battery storage project 'Sungain Battery Bank' which will allow 35 private households to utilise 30 per cent more of their generated energy. A range of systems are being used and NEP will monitor their effectiveness for 15 months.

Working closely with Mongoose Energy, NEP brought Nottinghamshire's first community owned solar farm to fruition, Nottinghamshire Community Energy. Over 25 years, this 5MW development will generate £1.8 million that will be reinvested into the local community. It will also supply 1,150 local homes with clean green energy. The charity invested £500k into this, along with 80 independent investors – most of them local households.

As a key partner in Nottingham's REMOURBAN project, a £5 million European smart cities initiative, NEP will deliver private sector solid wall insulation and LED lighting. NEP is also leading on the last mile delivery aspect with WEGO Zero Carbon Couriers to reduce the amount of delivery vans coming into the city.

Their longest standing Affordable Warmth project, the Healthy Housing Service, now in its 14th year, focuses on reducing the health impacts of living in a cold home and has trained 3,000 front line staff to help them spot the signs and refer clients to a tool kit of services that can really improve lives for vulnerable groups. It also delivers approximately 20 Energy Switching Workshops to local groups every year.

NEP is an ISO14001 and ISO9001 accredited organisation and has delivered over 3,000 Green Deal Assessments having qualified as a Green Deal Assessor and Installer organisation in 2014.

The London Energy Efficiency Fund (LEEF)

LEEF received £100m from private sector investors and the London Green Fund to be invested in public or private projects that promote energy efficiency across London⁴. LEEF works with building owners, public and voluntary sector bodies, developers, energy companies and other project promoters, to support a range of projects, including combined heat and power, district heating and renewable energy generation. To give an example, the fund is being used to support the installation of a heat network for over 15,000 homes on the Greenwich Peninsula.

After the initial fund was fully committed in August 2014 – 18 months ahead of schedule – an additional £11.5 million was provided by the mayor’s London Green Fund.

Each LEEF funded project accrues regenerated capital which is then recycled from initial investments back into the pot to ensure investment in energy efficiency continues. LEEF will continue to re-invest recycled capital generated from returns on initial seed investments maturing over the course of the next investment cycle to August 2018.

Since inception, LEEF has mobilised £350m of external capital alongside its own investments, saving 35,000 tonnes of carbon annual and 20,000 Mwh of energy.

Repowering London – delivering community energy in the capital

Repowering London is a community energy development body specialising in creating sustainable energy projects that deliver social, environmental and financial returns to the communities in which

they are based. The organisation supports local people to develop, own and manage renewable energy projects within socially deprived neighbourhoods and challenging urban environments. Repowering’s key aims are to:

- generate decentralised renewable/low carbon energy
- provide training and employment opportunities for local people
- promote local leadership through mentoring and community ownership
- provide opportunities for local and socially responsible investment
- help tackle fuel poverty by increasing energy efficiency awareness and encouraging behaviour change

Formed in 2012 by Agamemnon Otero and Afsheen Kabir Rashid (both of whom have recently received MBEs for their services to community energy), Repowering’s first projects were based in Brixton, London Borough of Lambeth. These projects were the first of their kind in the UK – delivering community-owned renewable energy in inner-city social housing. In 2015, Repowering completed its largest and most recent project; installing a 102kWp solar PV system on the Banister House Estate in Hackney. With a total generating capacity of 234kWp, Repowering’s projects result in almost 90 tonnes of avoided CO2 emissions each year. However, it is the social benefits of which the organisation is most proud. Since 2012, Repowering has mentored 40 adults to set up and run successful community energy projects in their

4. <http://www.leef.co.uk/>

local community, guided 24 young people through an innovative paid internship programme and run countless open meetings, energy advice sessions and workshops. In addition, Repowering's renewable energy installations are paid for using funds raised through a community share offer providing local ethical investment opportunities. The income received via the Government's feed-in tariff and the sale of energy on site is used to pay a reliable return to investors and create ongoing benefits for the local community.

Repowering has many more projects in development, including new schemes in Lambeth, Hackney and Kensington and Chelsea as well as their exciting Energy Garden project which combines community energy and community gardening on the London Overground rail network. Their next project on the Vauxhall Gardens Estate is already well underway and will be Repowering's largest project to-date with a 225kWp solar PV system scheduled for installation later this year.

Sustainable Glasgow

Sustainable Glasgow is the city's partnership for driving its ambition to be one of the most sustainable cities in Europe over the next 20 years. Chaired by the Leader of Glasgow City Council, Sustainable Glasgow brings together a range of partners from the principal sectors in Glasgow with the aim of achieving progress across environmental, social and economic aspects of the sustainability agenda. One of its principal objectives is to ensure that Glasgow achieves a 30% reduction target in CO2 emissions by 2020. Sustainable Glasgow published an Energy & Carbon Masterplan in 2015 as the guiding strategy for the city's transition to a low carbon future.

Since its inception, Sustainable Glasgow has seen the development of a number of projects that will make sizeable contributions to achieving its carbon reduction target. These include, but are not limited to:

- **the construction of the Cathkin Wind Turbine, a 3MW wind turbine** - this project was the result of an innovative partnership between the City Council and SSE. The turbine provides enough renewable energy to power 1,500 homes, whilst also providing a source of revenue for the city and the local community
- **the development of the state-of-the-art Glasgow Recycling and Renewable Energy Centre (GRREC)** - through the development of an innovative partnership with Viridor, the GRREC will transform how waste is processed in the city, diverting 90% of waste away from landfill and using it to generate enough renewable energy to power the equivalent of 22,000 homes. Sustainable Glasgow also aims to develop a district heating network emanating from GRREC, providing affordable warmth to local residents and businesses
- **the development of the 'Village' district heating network** - it provides low carbon heat to 700 homes, a 120-bed care home, the Emirates Arena and the Sir Chris Hoy Velodrome

Warm Up North

Warm Up North is an initiative for households, delivered by local councils in the North East of England in conjunction with British Gas. The aim of the initiative is to increase energy efficiency, help households reduce their energy usage, save money and stay warm.

Employing a local team of energy advisers, assessors and installers, it has helped deliver a range of energy efficiency measures into homes. Through the Energy Company Obligation (ECO), Warm Up North is helping individuals access available funding for eligible energy efficiency measures for their homes.

Warm Up North offers free Home Energy Surveys that assess the energy usage in peoples' homes. Warm Up North then recommends energy saving measures to help households reduce energy consumption and energy bills.

Sustainable Moseley (SusMo)

Moseley is an inner city ward of Birmingham. In July 2007, SusMo was formed with the dual aims of cutting carbon emissions within Moseley, and increasing residents' awareness that their lifestyles will have global repercussions through their environmental impact.

The group approached the Moseley Forum, the 'voice of the community' and established itself as a sub-committee negating the need for a separate constitution, and allowing them to focus on fund applications.

The group went on to contact local schools, the local business association, the local housing association and the local parish church. The parish church was motivated to invest in photovoltaic panels on its south facing roof, and thus go carbon neutral.

Another activity of the group has been to collect waste cooking oil from local restaurants and start to use it as source of energy. The group has also initiated a car-sharing club with a local business in an effort to reduce car usage in Moseley.

It has also encouraged residents to install smart meters as an energy saving item that makes it much easier for people to check their energy use.

The University of Liverpool Transport Plan

The University of Liverpool Transport Plan aims to create a more sustainable transport structure around the University, dealing with local transport issues, and encouraging sustainable travel behaviours.

To encourage public transport usage, the university is offering staff the opportunity to benefit from an interest free loan to purchase travel tickets. In addition, the university offers an exclusive Car Share Scheme, LivShare, and a Cycle Loan Scheme, all of which work to reduce private car usage to and from the university.

Energy Saving Trust Initiatives in Wales

The Welsh Government's Local Energy service, run by the Energy Saving Trust on behalf of the Welsh Government, provides financial and technical support to help social enterprises and SME's across Wales to develop their own renewable energy schemes.

The Energy Saving Trust also runs the Energise Wales service, funded by Welsh Government under the Resource Efficient Wales framework. This is a business network for Welsh companies working in the field of renewable energy, energy efficiency and those interested in diversifying into the sector. The service aims to facilitate networking amongst the energy community, offers free CPD workshops and training, networking events, support opportunities and insight into industry developments.

In addition, in Wales the Energy Saving Trust is a material subcontractor to British Gas which manages the Welsh Government Warm Homes Nest scheme. Nest aims to make homes warmer and reduce home energy costs. It provides free advice on saving energy and signposts individuals to a range of organisations for additional support including benefit entitlement. If someone owns or privately rents a home that is hard to heat, and the person or someone they live with receives a means-tested benefit, they may qualify for home improvements at no cost to them. These include central heating systems, insulation and renewable energy technologies.

7. Conclusion

This report shows that the UK should be prepared to re-enter a period of rising energy demand over the next 20 years, in the absence of additional measures to improve energy efficiency.

Electricity demand, in particular, is expected to grow particularly strongly over this time period, as the economy and size of the population expands. These economic and demographic pressures will be particularly strong in some of the Great Britain's largest cities. Increasing uptake of electric vehicles will also lead to an increase in electricity demand.

By 2035, electricity demand in London is set to stand 29 per cent above 2005 levels, while in Cardiff and Manchester electricity demand is expected to stand 17 per cent above 2005 levels. In Bristol, electricity demand is expected to stand 13 per cent higher.

These city-level numbers are based on Cebr's central economic projections – there are some significant upside risks to these figures. Even positive economic developments such as stronger population growth and faster economic expansion could have negative unintentional consequences if not properly managed.

For example, an increase in the demand for energy, if unmet by an appropriate source of supply, would raise the risk of blackouts in some of the UK's largest cities. The same goes for important measures to protect the environment, such as encouraging greater uptake of electric vehicles. If unaccompanied by measures to manage demand (such as through the use of smart meters and policies to encourage schemes such as car-sharing), this could increase household electricity demand by as much as 50 per cent, placing significant strain on the current electricity infrastructure.

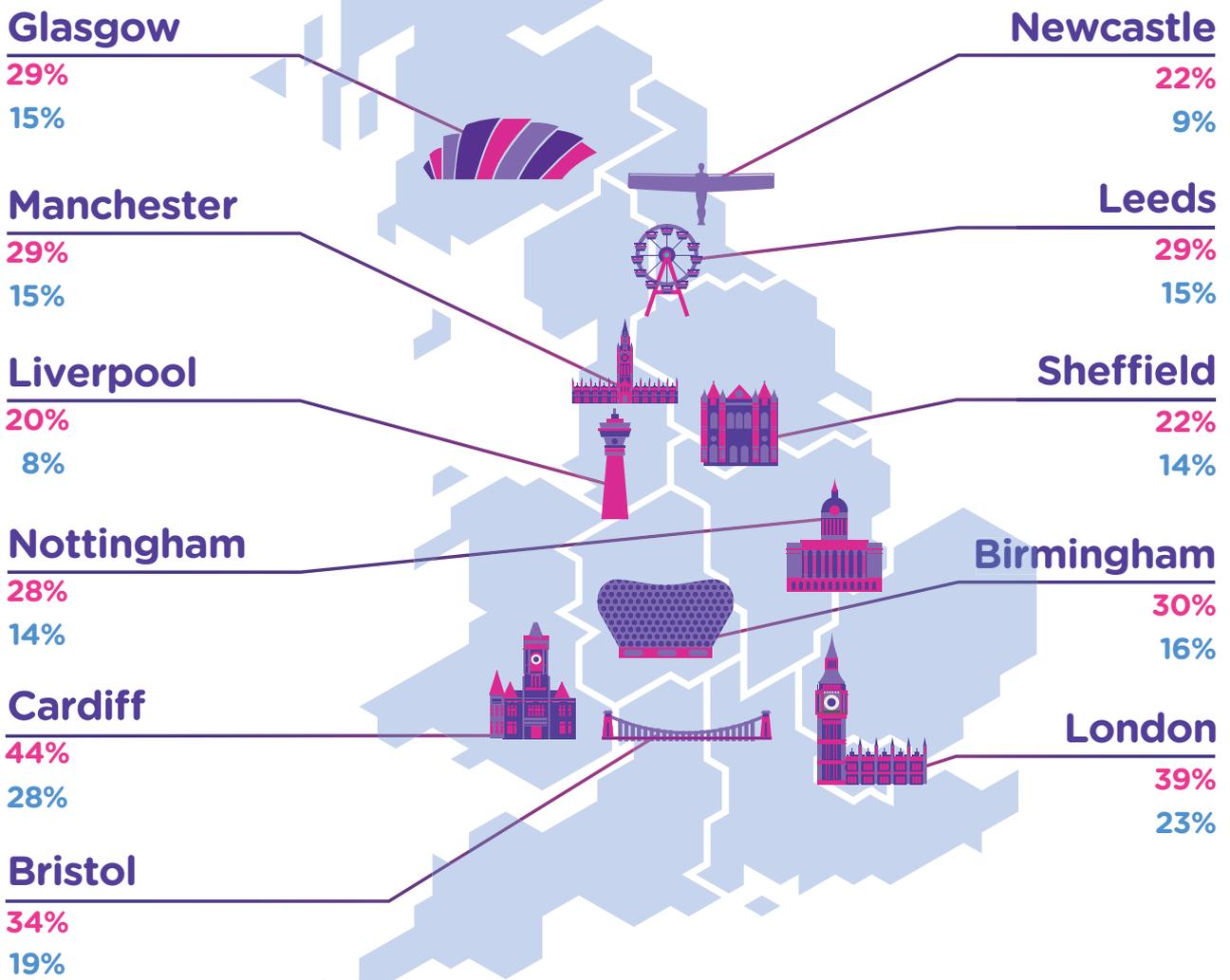
Ultimately, there's no single response that will guarantee energy sustainability in the future. A range of initiatives are being implemented and trialled in a bid to contain energy use going forward, as evidenced by some of the case studies in this report. Businesses, local government and third sector organisations have been working collaboratively to build more sustainable patterns of energy usage through, among other things:

- insulating homes
- installing renewable power sources such as solar panels
- implementing car clubs and public transport loans to discourage car usage
- digitising the grid underpinned by the smart meter network
- changing energy use patterns to reduce peak demand
- providing loans and finance to support local projects to reduce energy demand.

Some of these measures come with costs attached, such as subsidies for home insulation, but other measures such as encouraging greater use of car clubs and cycling, could potentially be delivered at relatively low cost. Another approach to help consumers adapt to new patterns in energy use is the promotion of 'smart infrastructure' and the smart energy grid allowing effective management of energy supply and demand. Increasing individual awareness of the financial costs consumers face from energy inefficiency, through smart meters for example, could significantly change consumers behaviour.

Predicted energy demand by 2035*

Domestic electricity increase
Domestic gas increase



Based on 2014 consumption levels from DECC

Domestic electricity increase
Domestic gas increase