The Association for Decentralised Energy

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Bringing Energy Together

Invisible Energy

Hidden Benefits of the Demand Side

Introduction

Invisible Energy: Hidden benefits of the demand side[1] explores what the unseen world of local, demand side energy has delivered over the last 30 years, and what more it could deliver by 2020.

While UK GDP has more than doubled since 1980, primary energy demand in the industrial, commercial and public sectors has stayed flat or fallen. Put simply, we are doing a lot more with a lot less.

Invisible Energy illustrates how much more energy we would be using if our energy intensity stayed the same as it was in 1980.

This narrative is meant to be read alongside the *Invisible Energy* pyramid report, exploring the document's content in more detail. This document goes through each of the three sections – cost, security of supply and carbon emissions – explaining the data and graphics in each one.

The role of the demand side in meeting the trilemma

Investment in decentralised generation, demand reduction and demand response has led to major progress in addressing the three key challenges to energy policy: Affordability, security of supply (both gas and power), and emission reductions.

Invisible Energy looks at each of these three areas and asks:

- What has the demand side contributed to date;
- What more could be achieved by 2020; and,
- What policy changes could deliver even more?

Report methodology[2]

Invisible Energy compares how much energy the industrial and service sectors used per unit of GDP in 1980, and applies that same energy intensity to UK GDP in 2012.[3]

Looking out to 2020, *Invisible Energy* uses DECC's estimate that 108 TWh of additional energy efficiency opportunity is achievable in the industrial, commercial, and public sectors.[4]

Household primary energy use is not included in the *Invisible Energy* analysis.

Industrial energy and the UK economy[5]

The energy intensity of industry has almost halved in the past 30 years, meaning **the industrial sector is now able to produce twice as much, with the same amount of energy, than in 1980**.[6] This statistic reflects consistent and ongoing investments by industry into their energy productivity, working to deliver year-on-year savings to ensure competitiveness.

Invisible Energy's findings, therefore, serve to celebrate the enormous gains achieved in the industrial sector, alongside the commercial and public sectors, exploiting demand side investments to de-link GDP from energy consumption. Policy intervention is now needed to make further achievements.

Jobs, growth and cost

Making a business more efficient can have a big impact on its profitability by reducing the cost of production. Cutting energy cost can be done either through onsite generation (like combined heat and power) or in end use (more efficient drives on factory lines). More energy efficient businesses improve competitiveness and drive down the cost of goods and services for householders.

Our analysis shows that if we used as much energy in the industrial and services sector per unit of GDP in 2012 as we did in 1980, **business and public sector consumers would be spending an additional £37.2bn on their energy every year.**[7]

In addition, the professional energy management service and building technology industries **employ more than 136,000 people**.[8]

The 2020 opportunity

Based on DECC's estimate of the amount of cost-effective energy efficiency potential in its Energy Efficiency Strategy, **an extra £5.6bn in fuel and power costs could be saved by 2020**[9], as well as **generating an additional £25 billion in sales**.[10]

Recommendation to achieve that opportunity

To achieve these cost savings for consumers by 2020, it's important that Government addresses the mixed signals currently being sent to users. Policies need to be designed around the energy user, working seamlessly together from the user's perspective. **Clear, simple and integrated policies will help users to make the right decisions** to cut waste while also improving competitiveness.

Energy security

Every unit of energy wasted is an energy security opportunity lost. The more we get from each unit of energy, the more secure the UK's energy supplies are.

By calculating the amount of gas per unit of GDP the industry and service sectors used in 1980 and comparing it with 2012, we found **UK gas imports would be twice as high** without the local, demand side actions by industry, commerce and the public sector since 1980. This reduction is **equivalent to 771 LNG tankers every year**.[11]

By performing the same calculation for electricity, our analysis shows that **we need 14 less power stations[12], which is over half of our current generating capacity**. That means that we have avoided the capital and operating costs, and the policy support costs, that those 14 power plants would have needed.

The 2020 opportunity

Actions on the demand side have helped keep Britain's lights on, making the UK a better place to do business by keeping energy supplies consistent and reliable. Much more can be done with a strong demand side policy.

Adopting the right policy could mean that **by 2020 we could save enough power to run the London Underground for 30 years, equivalent to 45 TWh**.[13] Further reduction in energy demand will make the UK more secure and enable greater energy independence.

Recommendation to achieve that opportunity

Current policy on energy security focuses only on the tiny amount of energy (16%) that we use at final energy demand.[14] There is little or no focus on the 84% of energy we lose before it reaches the user.

The term used to address all energy entering the system (rather than just the small amount of final energy demand at the end) is 'primary energy'. Reductions in primary energy demand are called 'primary energy savings'.

Using primary energy savings does not risk losing any recognition of final demand saving. But in contrast, by focussing on final energy savings we risk missing primary energy saving opportunities.

Considering the potential primary energy saving is the only way to ensure that all the system-wide savings are valued and that every energy efficiency option is fully and fairly comparable. Primary energy savings needs to be the benchmark for all efficiency policy.

Carbon emissions

Too often doing the 'right thing' costs more. Green energy is usually more costly than higher emission fossil fuel energy for instance. However, higher costs are usually not the case with demand side investment. In fact, actions over the last 30 years have not only saved tens of billions of pounds, but they have also saved hundreds of millions of tonnes of carbon.

The emissions savings are huge. Without demand side investments over the past 30 years, **we would be emitting an additional 462 million tonnes of CO_2 every year**.[15] That is the same amount of carbon reduction **achieved by one-third of the Amazon rainforest**.[16] And it's not just CO_2; reducing energy demand also reduces other pollutants like particulates and oxides of nitrogen and sulphur.

The 2020 opportunity

Action by 2020 could lead to carbon savings equivalent to taking one in four cars off the road[1718] - think of how much positive impact that could have on our climate targets, and on the air we breathe.

Recommendation to achieve that opportunity

Our energy system is based on a centralised model and new policy often repeats the same patterns, following what has come before. Often when tackling carbon emissions, policymakers see the task of coordinating and evaluating smaller actions taken in local areas across the breadth of the country as more difficult than undertaking one large action.

A recent DECC analysis[19] found that these smaller opportunities are often missed in policy development. Currently there is no test to see if demand-side action can offer the same carbon

benefits as supply side action for less money, meaning that more cost-effective opportunities are missed.

A new approach is needed, policy that enables demand-side options to compete with supply-side ones. To make sure that taxpayers receive best value, **Government assessments of policies to reduce emissions should test decentralised and demand side options against traditional centralised solutions.**

Conclusion

This report highlights the invisible primary energy savings that keeps our lights on, our businesses competitive and our emissions falling. Without the demand side the UK energy system, and economy as a whole, would be costing, and emitting, far more.

By highlighting the value, we hope this report will transform the debate – moving the demand side from the margins to centre stage, making it the primary focus of future policy so that the cost of our energy can be managed and kept secure as we move to a low carbon economy.

References

[1] This document has been developed through collaboration between the Association for Decentralised Energy (ADE), the Energy Services and Technology Association (ESTA) and the Association for the Conservation of Energy (ACE). We would like to especially thank Sonal Nandanwar for her significant contributions in developing the analysis underlying the report.
[2] More details on the calculation methodology used are available on request.
[3] DECC, 2014. *Energy Consumption in the UK, Table 1.02.*
[4] DECC, 2013. *The Energy Efficiency Strategy: The Energy Efficiency Opportunity in the UK, Strategy and Annexes.*
[5] There is a relevant issue of the UK economy's ongoing shift away from industrial sectors and towards service sectors that will not be captured within this analysis. Over the past 30 years, growth in energy intensive industry and manufacturing has been outpaced by the services sector, and there has been significant demand destruction (reduced energy use due to industrial closure). It is important to recognise the impact of industrial capacity going offshore. Offshoring represents a failure in emissions policy, as the energy and emissions are re-imported to the UK embedded the manufactured product. However, this period has also seen an enormous increase in industrial energy efficiency, with the industrial sector producing twice as much, with the same amount of energy, than in 1980.
[66] DECC, 2014. *Energy Consumption in the UK, Table 1.15.*
[7] Estimated 2012 retail energy prices from DECC 2013 *Updated Energy and Emissions Projections*.
[8] DECC, 2013. *Low Carbon Environmental Goods and Services*: *Report for 2011/12.*
[9] Estimated 2020 retail energy prices from DECC 2013 *Updated Energy and Emissions Projections*.
[10] DECC, 2013. *Low Carbon Environmental Goods and Services*: *Report for 2011/12.*
[11] Assumes LNG has density 1/600th of gas (http://www.chevron.com/deliveringenergy/naturalgas/liquefiednaturalgas/) and tanker has 140,000 m^3 capacity (http://www.southhookgas.com/lng-tankers)
[12] Assumes each power station has 2 GW of generating capacity.
[13] Assumes electricity demand of 1,500 GWh per year at London Underground and across Transport for London services. Transport for London, 2009. *Environment Report: Data Tables.*
[14] Cullen, J and Hall, C, 2009. *Engineering Fundamentals of Energy Efficiency.* PhD thesis, Cambridge University.
[15] Uses carbon intensity assumptions found in Defra 2013 *Government GHG Conversion Factors for Company Reporting: Methodology Paper for Emission Factors*.
[16] Assumes Amazon Rainforest absorbs up to 1.5bn tonnes of CO2 per year. Met Office, 2013. "Understanding climate change impacts on the Amazon rainforest".
[17] Assumes each car travels 8,200 miles per year. Department for Transport, 2012. *National Travel Survey: Statistical Release.*
[18] Assumes vehicle emission factor of 0.312019615 kg CO_2e per mile. Defra, 2014. *UK Government conversion factors for Company Reporting.*
[19] DECC, 2014. *D3 Opportunities for Integrating Demand Side Policies*

For further information please contact Claire.Wych@theade.co.uk