

Response to the Industrial Strategy Green Paper Consultation from the Centre on Innovation and Energy Demand

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1. Introduction

Researchers at the [Centre on Innovation and Energy Demand](#) (CIED) are driven by an interest in accelerating prospects for a more sustainable energy future. Our primary focus is on the processes of innovation – both technological and social – that will contribute to this objective, using a range of multi-disciplinary social science approaches.

We welcome the opportunity to contribute to the Government’s Industrial Strategy Green Paper consultation. We hope that the following insights from recent CIED research will provide a useful input to the process.

We would be delighted to contribute further to the Government’s ongoing engagement work in developing its Industrial Strategy.

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Our response sets out some general views on the extent to which the strategy is consistent with the transition to a low-carbon economy, the need for a greater emphasis on energy demand reduction and how the latest thinking in innovation studies could benefit the strategy before addressing the specific questions set out in the consultation document.

2. Industrial strategy, innovation and transitions

We welcome the creation of a new Industrial Strategy and were pleased to read that the Government aims not to repeat the mistakes of the past and to learn “the lessons of our own successes and those of our overseas competitors”.¹ The Green Paper does demonstrate an improvement on previous UK industrial strategies: we particularly agree with the intention that “industrial strategy must be about creating the right conditions for new and growing enterprise to thrive, not protecting the position of incumbents.”² We also support the view that successful “innovation” does not consist solely of R&D but also incorporates commercialisation and development processes. The inclusion of these points demonstrates an improvement in the Government’s approach towards supporting innovation that has been missing in previous industrial strategies.

While credit should be given for these improvements, we feel that the strategy nevertheless demonstrates a significant lack of understanding of how the innovation process and transitions

¹ HM Government (2017) ‘Building our Industrial Strategy Green Paper’ P.9

² HM Government (2017) ‘Building our Industrial Strategy Green Paper’ P.6

actually happen on the ground. We argue that there are four aspects that would help to improve strategy:

1. acknowledging the role for government and policy in driving innovation;
2. giving greater consideration to the role that incumbents play;
3. taking a mission-oriented approach to innovation; and
4. paying more attention to the deployment of proven innovations in new contexts.

We explore each of these elements below.

2.1 The role for government and policy in driving innovation

The strategy states:

“While there is a clear role for the Government in energy policy, markets also are crucial in inventing and spreading new techniques for saving energy, new and more efficient means of energy generation and storage, and new ways to finance clean technologies. It is the private sector that will ultimately be the driving force behind our low carbon economy.”³

We agree that both markets and policy play a key role for innovation. However, we want to stress that there is clear evidence for the fundamental role of policy in driving low-carbon innovation and transformation, so the government is well-advised not to downplay its own role. Multiple studies have shown that governments and policy are a key part of the innovation process, both in setting long-term targets and also in making these appear credible by enacting instruments which enable the achievement of these targets.⁴ Offshore wind is a key example in this regard.⁵

Globally, the trend is to rely on policy driven rather than market driven change, as evidenced by the fact that no less than 15 countries around the world have implemented some type of carbon tax, some going back more than two decades.⁶ Mandatory regulations or policies such as renewable portfolio standards or feed-in tariffs have been adopted by 102 countries or provinces, a jump from only 45 in 2005. In 2008, Spain became the first county to mandate solar water heating nation-wide.

We note also that in historical cases where government intervention has aided in big technological transitions, there is often much more direct government involvement in the form of regulations, subsidies, and infrastructural funding. There are several powerful historical examples showing the

³ HM Government (2017) ‘Building our Industrial Strategy Green Paper’ P.89

⁴ Rogge, K.S. & Reichardt, K., (2016), ‘[Policy mixes for sustainability transitions: An extended concept and framework for analysis](#)’, *Research Policy*, 45(8), 1620–1635

⁵ Kern, Florian, Smith, Adrian, Shaw, Chris, Raven, Rob and Verhees, Bram (2014) [From laggard to leader: explaining offshore wind developments in the UK](#). *Energy Policy*, 69. pp. 635-646. ISSN 0301-4215

Kern, Florian, Verhees, Bram, Raven, Rob and Smith, Adrian (2015) [Empowering sustainable niches: comparing UK and Dutch offshore wind developments](#). *Technological Forecasting and Social Change*, 100. pp. 344-355. ISSN 0040-1625

⁶ Finland and the Netherlands have had one since 1990, Sweden and Norway since 1991, Denmark since 1992, the United Kingdom since 1993, Costa Rica since 1997, Switzerland and Taiwan since 2008, India and Ireland since 2010, Australia and Japan since 2012 (though Australia’s was repealed in 2014), France since 2013, and Chile since 2014. Moreover, as of late 2014, Canada, China, New Zealand, South Africa, and the United States all had proposals for a carbon tax pending debate in their respective parliaments or congresses.

effect that this can have. The development of district heating networks in Denmark, and the development of natural gas infrastructure in The Netherlands, are two good examples. In both of these cases, government planning and regulation played a key role.

The industrial strategy, however, currently relies too heavily on market-led approaches and does not acknowledge the crucial role for government in providing a stable frame for these investments, through coherent energy policy, visioning, regulation, and implementation of policy packages. An exclusively market-led approach is likely to fail.

To accelerate the development of a low-carbon economy, the British government should therefore look at ways to require businesses to use renewable resources, to work with local governments and invest state funds to develop networks of green infrastructure, and to set standards for new housing and vehicles that continuously encourage the use of state-of-the-art green technology.

For example, in the automotive sector, roles for the government in counteracting barriers to the diffusion of automated technologies might include:

- Coordinating and funding trials and demonstrations;
- Setting policy, regulation and legislation supportive to automated technologies;
- Building a robust evidence base, and fund social research that includes public and industry perceptions of technology;
- Raising public awareness and facilitating debate;
- Ensuring skills and know-how are developed domestically;
- Considering automation as one of a suite of options, and not overlook multi-modal opportunities including rail;
- Aiding the development of a business case, and the scale-up of start-ups and domestic innovation.

Bringing together the diverse set of stakeholders (e.g. vehicle manufacturers, telecoms companies, freight quality partnerships, councils, owner/operators, freight businesses, residents near freight routes, traffic managers, lobby groups etc.) into a conversation on the roles of automation as a solution for contemporary issues, may be a useful starting point.

In the specific domain of heat, one particularly powerful mechanism that was used in Denmark was requiring municipalities to develop local heating plans, which were approved by the Danish Energy Agency. This was a powerful way of using the expertise of local government to advance national energy goals on a wide scale. The UK Government could do something similar, requiring local councils to develop and implement low-carbon transition plans, possibly requiring them to meet a benchmark of carbon emissions reduction.

2.2 Incumbents and the need for phase-out policies

The strategy understandably focuses on the ways in which new, innovative, technologies and practices might be supported. While this is undoubtedly an important and necessary part of the innovation process, it neglects the impact that incumbent players can have on the process, often acting as a barrier to new entrants. In addition, there is a risk that if industry is not given adequate notice about the direction of travel (for example the scale of transition necessary to meet our long-

term carbon targets), incumbent industries will not adapt and could be left with stranded assets. Employees may not have the right skills to find employment in the new low-carbon economy.

Our analysis of UK policies in the building sector identified 68 policies that support the creation of low carbon innovations, but only 19 policies aimed at phasing out or disincentivising high-carbon technologies or practices.³ The industrial strategy needs to consider not just what it will support (in terms of innovation and industries) but also whether existing arrangements and policies might act as a barrier to potential areas of growth. It should plan for how high carbon technologies and practices might be phased out in an ambitious but predictable and planned way.

The Government's plans to phase out coal are an example of good practice, but this approach must be applied across other sectors of the economy – such as heating and transport – if we are to deliver on our low-carbon commitments (see below).

In this context, we would argue that sunset industrial policies are important to address the influence of locked-in industries that could block the transition to a low carbon economy. These would be focussed on alleviating the social and economic damage that could occur, for example in regions with concentrations of high carbon industries. A clear and consistent strategy, and appropriate oversight to ensure discipline, needs to be put in place to prevent vested interests from influencing public policy in the interests of their own profits (rent-seeking) and at the expense of environmental and social welfare⁷. Where high-carbon industries are in receipt of implicit or explicit subsidies, multiple policy options for reform exist: best practices in measurement, subsidy repeal, impact studies, and adjustment packages.⁸

2.3 A mission-oriented approach to innovation

We note the conclusion of the recent BEIS Select Committee inquiry on Industrial Strategy that applying a “mission-based” approach as opposed to the current sector-based approach would provide a positive vision for the economy while avoid the problem of “picking winners”. At the same time, this approach understands that state intervention is not just about fixing markets, but also about creating and shaping markets.⁹ We endorse the recommendation that:

“Specific support for industry be guided by a targeted ‘mission-based’ approach, channelling the Government’s support towards addressing the big challenges of the future.”¹⁰

We suggest that given the UK’s commitments to reduce its carbon emissions, a national mission oriented around decarbonising the economy would be appropriate and should generate significant job and export opportunities as other countries also implement their commitments under the Paris Agreement. We explore this further below.

⁷ Busch, J, Foxon, T J and Taylor, P (2017), ‘Designing industrial strategy for a low carbon transition’, CCCEP Working Paper

⁸ Sovacool, BK. “[Reviewing, Reforming, and Rethinking Global Energy Subsidies: Towards a Political Economy Research Agenda](#)”, *Ecological Economics* 135 (May, 2017), pp. 150-163

⁹ Tim paper/BEIS evidence.

¹⁰ House of Commons Business, Energy and Industrial Strategy Committee (2017) *Industrial Strategy: First Review* Second Report of Session 2016-17, p. 25, paragraph 64.

2.4 Deployment of proven innovations in new contexts

Within pillar 1 of the strategy (‘investing in science, research and innovation’) the identification of a commercialisation gap (“we have not been as successful at commercialisation and development as we have been at basic research”) and a clear ambition (“to identify future opportunities and keep the UK at the cutting edge of new technologies”), whilst laudable and important, gives too much emphasis to high-tech and high-visibility technological paths. This runs the risk of underestimating the potential contribution and investment needs of the less conspicuous but equally crucial deployment of existing and proven innovations in new contexts.

This is one of the endemic problems of innovation in the UK, which can only be prevented if innovation paths are not treated as passing fads. In the area of low-carbon energy, for instance, there are significant missed opportunities from developing a more coherent strategy to support the continuous deployment of heat pumps, district heating, solar heat and power technologies, and so on – all relatively mature innovations but for which the UK is still a long way from having developed the required supply-chains, installation and maintenance networks, and user exposure that can guarantee their successful uptake.

To follow Scandinavian, German, Swiss, and Austrian leadership on consolidating respective innovation systems would require significant and continuous investments in supply chains consolidation, installation and maintenance skills (e.g. technicians), new contractual forms (to support private residential investments, as well as the involvement of local authorities and actors for district heating), and so on. We believe that the Industrial Strategy provides exactly the kind of framework where these integration issues can be dealt with. A long-term vision for the industrial future of the UK could more firmly address current societal demands and global challenges and engage with a transition to a low-carbon economy.

There is also opportunity in framing energy efficiency measures as infrastructure investments, as these have the potential to reduce energy costs to households and businesses and bring local economic benefits, through job creation. This would recognise energy efficiency investments as comparable in benefits to supply-side investment, and open up new forms of financing by aggregating from individual households to larger numbers, such as revolving funds that recycle savings to enable further investments¹¹. This would link to an ‘Efficiency First’ strategy (see below).

3. The transition to a low-carbon economy

The global economy is at the brink of a paradigm shift towards low-carbon solutions, as evidenced by the Paris Agreement which the UK ratified last year. Major efforts are underway in all parts of the world to accelerate green innovation and transformation processes, thereby creating new business opportunities and expanding growth markets for low-carbon technologies. Countries and regions such as China, California, Japan or Germany have long acknowledged that it will not be possible to achieve these commitments through incremental changes to existing systems. Rather, a fundamental transformation in the energy system and the economy will be required, and sectors will

¹¹ Bergman, N and Foxon, T J (2017), ‘Reorienting finance towards energy efficiency in the UK’, Paper for ECEEE Summer Study, France, May 2017.

be undergoing disruptive changes due to technological, economic and social developments – as the examples of e-mobility and smart homes illustrate.

With its legally-binding target to reduce its carbon emissions by 80% by 2050 the UK is well aligned with this shift to a green economy as the new normal. However, only if these global market developments towards a green economy constitute a fundamental element of the UK's industrial strategy will the UK be able to fully harness the economic benefits of the ongoing technological and structural changes in the global economy. We therefore argue that the transition to a low-carbon economy should be a principle that underpins the entire Industrial Strategy. With this in mind, it is unfortunate that the Industrial Strategy has not been more closely linked to the forthcoming Emissions Reduction Plan, which will set out the pathway to delivering on the 5th carbon budget.. While we welcome the fact that Pillar 7 of the strategy recognises the potential for economic benefits of the transition to a low-carbon economy, it is our view that not only are considerations about how the low-carbon transition might transform our economy not given sufficient weight, but there are some aspects of the strategy that may be inconsistent with achieving the UK's carbon reduction goals.

3.1 Sending the right signals

In a decarbonising world, successful industrial policy must be strongly aligned with climate policy. The Green Paper rightly acknowledges the Government's commitment to meeting legally-binding targets under the Climate Change Act and the fact that we have to date had an "exemplary record of meeting our obligations"¹². However, the Green Paper neglects to mention the fact that the UK is currently not on track to meet its future commitments under the 4th and 5th carbon budgets. We therefore question the decision to prioritise affordability of energy and securing industrial opportunities over the need to reduce carbon emissions.¹³ This also neglects the potential economic benefits to the UK economy of taking a leading role in the low carbon transition. The Committee on Climate Change estimates that the UK low-carbon economy is growing faster than the rest of the economy, already employs hundreds of thousands of people, and contributes around 2-3% of GDP, which is a comparable size to energy-intensive manufacturing¹⁴.

While the strategy states the Government's desire to 'secure the economic benefits of the transition to a low-carbon economy', we believe that the de-prioritisation of action to tackle climate change will undermine business confidence and could ultimately stifle innovation in low-carbon technologies.¹⁵ This would be detrimental for the UK's competitiveness in the emerging green growth markets of the future. As a result, the economic benefits of the low-carbon transition are likely to flow to other countries which follow a clear green industrial strategy. We therefore recommend that the Strategy must give a much clearer commitment to meeting climate targets. This could be achieved either through sectoral policies, or a mission-oriented approach (as described above).

More generally in the area of low-carbon innovation, comparative research identifies a major problem in many European countries, and notably in the UK, with 'start-stop' policies that over

¹² HM Government (2017) 'Building our Industrial Strategy Green Paper' P. 89

¹³ HM Government (2017) 'Building our Industrial Strategy Green Paper' P. 89

¹⁴ Committee on Climate Change (2017) '[Energy Prices and Bills – impacts of meeting carbon budgets](#)' March 2017, p. 57

¹⁵ HM Government (2017) 'Building our Industrial Strategy Green Paper' P.11

time tend to undermine the confidence of investors to ‘go green’ (whether these are businesses, private individuals, or local authorities). This tendency, evidenced by fluctuating support for low-carbon energy investments and frequent rule changes over the last decade, prevents the development of a healthy demand for such innovation, with immediate repercussions on delivering the industrial ecosystems that can secure “the industrial opportunities for the UK economy of energy innovation”.¹⁶ Conversely, coherent policy direction and related signals can be a low effort and low cost way to deliver “manufacturing and services around clean energy”¹⁷ – as the Green Paper’s example of offshore wind and Siemens investments illustrates. We believe that such a model of certainty and coherence should be followed and generalised beyond large projects, to include the opportunities from small and local-scale low-carbon innovation.

3.2 Consistency with carbon reduction commitments

We are also concerned that some aspects of the Strategy may not be consistent with action to reduce carbon emissions. For example, the discussion of hydrogen fuel cells without consideration of whether hydrogen will be produced in a low-carbon manner and the lack of any mention of Carbon Capture and Storage (CCS), which may be key in decarbonising both hydrogen production and energy intensive industries.

4. The role of energy demand

We welcome the fact that the Green Paper recognises the role that energy plays in the economy and productivity. We also note the importance attached to keeping energy costs down for businesses. We would note that low energy *costs* do not necessarily equate to low energy *prices* as costs can also be reduced by using energy more efficiently. This applies to all sectors of the economy, not just energy intensive industries.

For example, the Committee on Climate Change recently reported that energy efficiency measures helped households to cut gas and electricity use by 23% and 17%, respectively, since 2009, saving the average household £290 a year. They project that more active energy efficiency measures could help businesses save energy and cut energy costs, e.g. energy efficiency could deliver potential savings of around 16% of annual electricity consumption and 5% of gas consumption for the commercial sector, and 10-15% savings for energy-intensive manufacturing by 2030.¹⁸ We welcome the Government’s plan to review opportunities to support greater energy efficiency in the power and industrial sectors. However, there is little consideration given to how energy efficiency might be improved in other sectors of the economy. This is a significant oversight.

The risk of focusing solely on the price of energy is that it can lead to perverse outcomes. For example, the strategy states that:

¹⁶ HM Government (2017) ‘Building our Industrial Strategy Green Paper’ P.89

¹⁷ HM Government (2017) ‘Building our Industrial Strategy Green Paper’ P. 90

¹⁸ Committee on Climate Change (2017) ‘[Energy Prices and Bills – impacts of meeting carbon budgets](#)’ March 2017, p. 57

During the last five years action has been taken to reduce the impact of policies on the electricity bills of eligible energy-intensive industries up to around 80 per cent. This mitigation – including compensation worth around £260 million for 2016 – is paid either by other consumers or the taxpayer.¹⁹

In other words, consumers/citizens now bear a disproportionately large burden of these policy costs.

We think that the strategy should focus on “affordable energy services” *instead of* focusing on “affordable energy” (i.e. low energy prices). This different framing would incorporate demand reduction as a route to reducing bills as well as price reduction and create a driving force for the creation of innovative business models in the energy sector. We recommend that the proposed long-term roadmap to minimise business energy costs should primarily be designed as a way to encourage active uptake of energy efficiency measures by business and industry.

At the same time, it is important to be conscious of the “rebound effect”, whereby energy efficiency savings are “taken back” by changes in behaviour. For example, improvements in engine efficiency make cars cheaper to run, which might encourage drivers to use their cars more often. Or they might spend the money saved on even more energy intensive activities, like taking a flight to go on holiday.

Understanding the scale of the rebound effect is important as many policies to improve energy efficiency are intended ultimately to reduce energy use and therefore carbon emissions. The energy implications of automated vehicle technologies is one area where a better understanding of rebound dynamics is needed.

4.1 Energy productivity

There is potential to combine carbon emissions reductions and economic benefits by pursuing energy productivity improvements in parallel with promoting low-carbon energy technologies. The global Energy Transitions Commission (ETC) has argued that to achieve the Paris Agreement targets, a 3% annual improvement in average global energy productivity is needed up to 2050.²⁰ This could help to enable economic growth and provide energy services for all in a low carbon pathway, by increasing the economic value generated by each unit of energy used.

A second report for the ETC highlighted potential measures to improve energy productivity across transport, industry and buildings sectors.²¹ These could include technological improvements or modal shifts to improve the energy efficiency of service provision, and structural and behavioural changes to enable more economic activity to be generated with a given level of services. For example, advanced process techniques in chemical production could save 20% of total energy, and

¹⁹ HM Government (2017) ‘Building our Industrial Strategy Green Paper’ P.91

²⁰ Energy Transitions Commission (2016), Shaping Energy Transitions, Position Paper, April 2016

²¹ Vivid Economics (2017), Economic growth in a low carbon world: How to reconcile growth and climate through energy productivity, <http://www.energy-transitions.org/sites/default/files/Economic-growth-in-a-low-carbon-world.pdf>

industrial combined heat and power systems with use of waste heat could reduce energy demand by 10-50%, whilst maintaining economic output.

The UK has been in the Top 10 internationally in energy productivity improvements over the last decade, thanks to a largely service-based economy and support for energy efficiency measures.²² Further action would be needed to maintain this position alongside the industrial development supported by the Industrial Strategy. We recommend that the Government investigates the potential for energy productivity improvements in UK transport, industry and buildings, and the measures that may be needed to overcome inertia in order to realise these improvements.

4.2 Efficiency first

We strongly suggest that the Government adopts “Efficiency first” as a principle to underpin the entire industrial strategy. “Efficiency first” is a principle applied to policymaking, planning and investment in the energy sector. Put simply, it prioritises investments in customer-side efficiency resources (including end-use energy efficiency and demand response) whenever they would cost less, or deliver more value, than investing in energy infrastructure, fuels, and supply alone.

It means developing the discipline to systematically test policy proposals and investment decisions asking the question whether or not the same outcome could be achieved more cheaply through demand-side measures generating more societal value. It does not simply mean to spend more money on or to always prioritise energy efficiency. But it requires considering efficiency explicitly before investments are locked into new costly supply-side infrastructure.

5. Responses to specific consultations questions

1. Does this document identify the right areas of focus: extending our strengths; closing the gaps; and making the UK one of the most competitive places to start or grow a business?

Understanding where the UK’s strengths lie is an important part of the picture, but this must be considered in a relative sense by understanding which other countries also possess strengths in these areas. This would allow for a more strategic (and realistic) assessment of where the UK might become a world leader.

27. What are the most important steps the Government should take to limit energy costs over the long-term?

Improving energy efficiency is the best way to limit energy costs. As noted above, all sectors of the economy can benefit from improved efficiency, not just energy intensive industries. Focusing solely on energy *prices* can lead to perverse outcomes (such as an inequitable distribution of policy costs between households and industry). By focusing instead on *energy service costs*, efficiency measures can receive greater priority as a mechanism for keeping down costs.

²² Ecofys (2015), The 2015 Energy Productivity and Economic Prosperity Index, <http://www.ecofys.com/en/publication/the-2015-energy-productivity-and-economic-prosperity-index/>

We also advocate the adoption of the “efficiency first” principle to ensure that opportunities for demand side measures are explored ahead of any decision to increase supply side (see above).

28. How can we move towards a position in which energy is supplied by competitive markets without the requirement for on-going subsidy?

Support policies (such as regulation and subsidies) are a necessary part of the innovation process. Without them, early stage innovations (those that are still emerging or exist only in small market niches) are unlikely to gain the internal momentum to break through and compete with established technologies and practices.

However, once innovative technologies are established subsidies can be removed as long as this is signalled well in advance and done in a gradual and predictable manner, within a long-term regulatory framework. Sudden, unexpected changes in policy not only damage those industries in receipt of the subsidies, but also undermine wider investor confidence in the sector. Unfortunately, recent energy policy decisions in the UK have not followed best practice and the UK continues to fall down the rankings in EY’s global Renewable Energy Country Attractiveness Index.²³

29. How can the Government, business and researchers work together to develop the competitive opportunities from innovation in energy and our existing industrial strengths?

We welcome the emphasis on coproduction with industry, but in order to achieve the objectives of the industrial strategy it is of utmost importance to also include other stakeholders, or groups (such as regional and local representatives, users, civil society, etc). Several countries have started to experiment with different forms of such participatory joint decision making processes and a systematic analysis of these may provide some successful ideas for adopting these approaches to the UK context.

30. How can the Government support businesses in realising cost savings through greater resource and energy efficiency?

Our research shows that “intermediary” individuals or organisations often have a key role to play in facilitating the delivery of successful building energy efficiency programmes. Such actors can include for example, housing associations, construction companies, architects, building managers and local authorities. They can play a number of roles in the process, including sharing information and knowledge, creating and facilitating new networks and piloting innovations. Examples of such intermediaries exist, for example, in Finland, where a government agency Motiva has enabled significant energy savings in industry through energy auditing and improvements working together with the industry.²⁴

²³ EY (2016) ‘[Renewable Energy Country Attractiveness Index](#)’ October 2016, Issue 48

²⁴ Kivimaa, Paula and Martiskainen, Mari (2016) [Innovation towards low energy buildings and the role of intermediaries in the transition - review of scholarly case studies in Europe](#). In: Kähkönen, Kalle and Keinänen, Marko (eds.) Proceedings of the CIB World Building Congress 2016: volume I - creating built environments of new opportunities. Tampere University of Technology. Department of Civil Engineering, Tampere, Finland, pp. 103-114. ISBN 9789521537417

Kivimaa P. (2014) ‘[Government-affiliated intermediary organisations as actors in system-level transitions](#)’ *Research Policy* 43: 8, 1370-1380

In the UK, the use of public procurement frameworks such as the Greater London Authority's RE:FIT programme (another example of an "intermediary"), have played an important role in expanding the market for energy service contracts in the public sector. In this case, the RE:FIT programme helped public sector organisations overcome the significant transaction costs associated with setting up an energy service contract (such as preparing, negotiating, establishing, executing, monitoring and enforcing a contract).²⁵

Government should consider carefully what barriers might exist to realising greater energy efficiency for businesses and consider whether it might be necessary to create new intermediary organisations to help overcome them, or whether additional support might be given to existing actors in order to facilitate the process.

We recommend that a strategic focus is given to identifying the potential for energy productivity improvements in transport, industry and buildings that could reduce energy costs whilst enhancing economic value. Measures to help achieve these improvements, such as overcoming barriers to energy efficiency and supporting intermediary organisations, could then be identified. This would help improve competitiveness of UK businesses and contribute to meeting our future low carbon targets.

6. About the Centre on Innovation and Energy Demand (CIED)

CIED is a collaboration between researchers from the Science Policy Research Unit (University of Sussex), Transport Studies Unit (University of Oxford) and the Sustainable Consumption Institute (University of Manchester). It is one of six Research Centres on End Use Energy Demand funded by the Research Councils UK Energy Programme. Our primary focus is on the processes of innovation – both technological and social – that will contribute to energy demand reduction for a more sustainable energy future.

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²⁵ Nolden, C., Sorrell, S., and Polzin F. (2016) '[Catalysing the energy service market: The role of intermediaries](#)' *Energy Policy*, 98 420-430