National Infrastructure Assessment: consultation

Response from the Centre on Innovation and Energy Demand, University of Sussex

Introduction

Researchers at the Centre on Innovation and Energy Demand (CIED) are driven by an interest in 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 National Infrastructure Commission's consultation on the process and methodology for the National Infrastructure Assessment. 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 NIC's ongoing engagement work in developing its National Infrastructure Assessment.

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Response to consultation questions

Q2. Do you agree that, in undertaking the NIA, the Commission should be […] comprehensive, taking a whole system approach, understanding and studying interdependencies and feedbacks?

We fully agree with taking a whole systems approach to energy, as only then is it possible to assess possible interactions between the provision of electricity, heat and transport services into consideration. As your consultation document rightly notes, this is especially important if electricity is going to play a larger role in delivering mobility and heat services in the future. However, we also believe that despite the obvious focus of the NIC on infrastructure delivery, a whole systems approach should also take a number of other factors into consideration, including the demand side, behavioural aspects, policy and regulatory issues. It is the interplay of these factors together with infrastructures that will make up the whole energy system.

Energy-related decisions are structured by the systems that provide energy services such as heating, comfort, convenience, and personal mobility. These "socio-technical" systems involve interlinked social and technical elements that co-evolve over many decades. It is important to understand how these systems function, how they can change and how these changes can be directed and accelerated by public policy.[1]

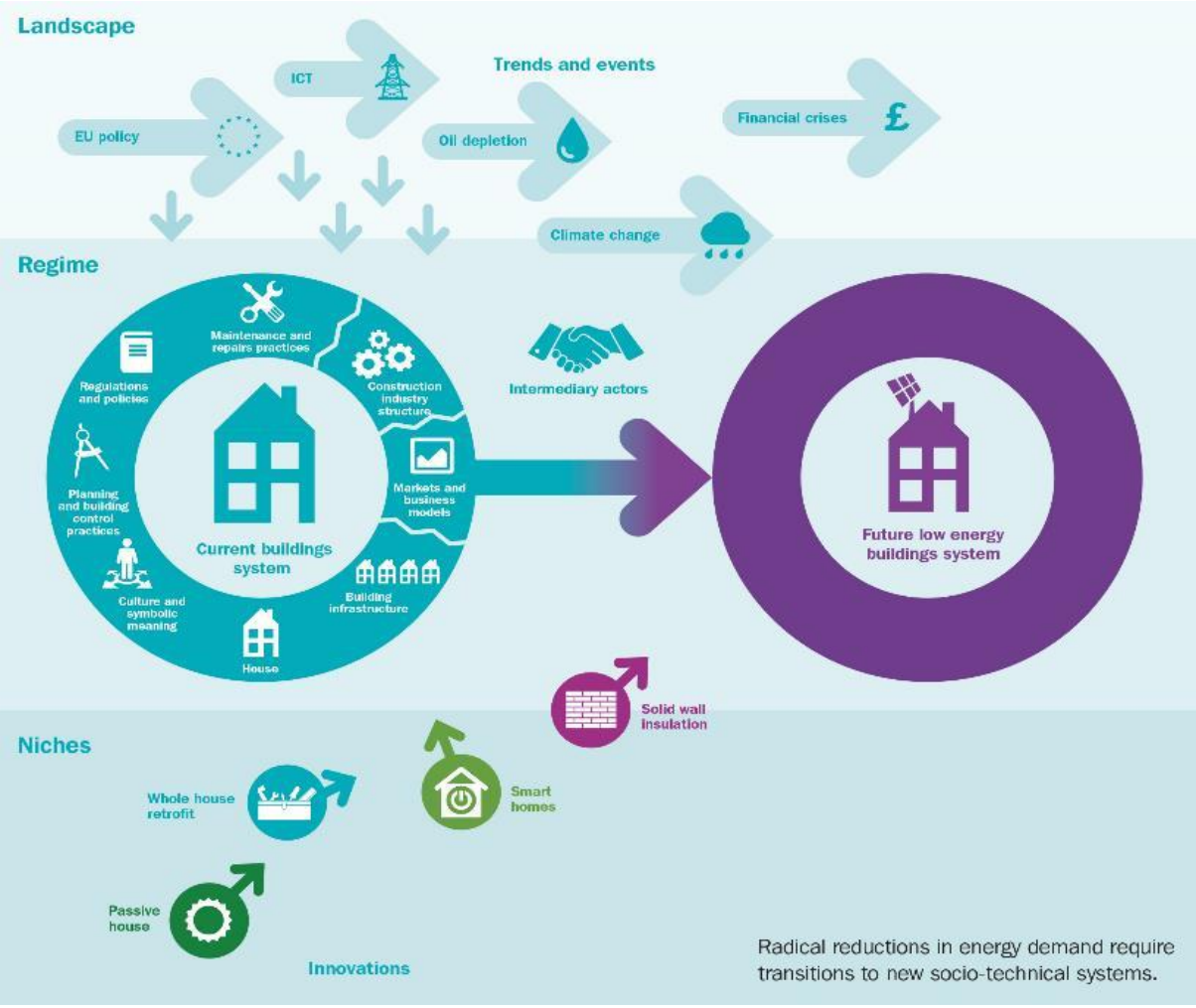
It is our view that larger and more rapid improvements in demand reduction will be required in the next decade if we are to achieve our legally binding carbon targets. Instead of focusing on physical infrastructure alone, we believe that framing the challenge in a different way – as requiring more

[1] Sorrell S (2015) 'Reducing energy demand: A review of issues, challenges and approaches' Renewable and Sustainable Energy Reviews, 47. 74-82

far-reaching changes across different scales and nested hierarchies, from users and households to city planners, politicians, and "system builders" - will bring more success in delivering significant levels of demand reduction.

The "Multi Level Perspective" (developed by Prof Frank Geels and Johan Schot) provides an analytical tool for of understanding socio-technical systems. Radical change occurs as a result of interactions between three levels: the existing system (the "regime"), the "niches" in which radical innovations are being developed and protected in some way from the dominant system and the external socio-economic "landscape" that is imposing pressures on the system. This is illustrated in Figure 1.

Figure 1: The Multi Level Perspective



Q3 Do you agree that the NIA should cover these sectors in the way in which they are each described?

Transport: We agree that it is important to consider the impact of future transport provision on the energy sector, in particular the potential implications of large-scale car, lorry and rail electrification.

Energy: We support the NIA's proposal to examine the interaction between electricity, heat and transport. We also believe that it will be crucial for the NIA to consider the role that energy

efficiency and demand reduction could play as well as intermittent renewable sources of energy and storage.

It is absolutely clear that reducing energy demand and increasing energy efficiency are some of the cheapest ways of achieving carbon mitigation. There is a wealth of evidence pointing to a variety of co-benefits that energy efficiency investments can bring, including energy security.[2] The Government's recent adoption of the 5th carbon budget underlines the importance of achieving demand reduction in order to meet our climate change obligations.

We note that there are different ways that reduction in demand might come about:

1. improving the efficiency of existing energy-using devices (boilers, internal combustion engines, refrigerators etc) and passive systems such as cars and houses (e.g. aerodynamic streamlining, loft and cavity wall insulation)
2. replacing existing devices or passive systems with radically new ones (e.g. electric vehicles, LED lights, heat pumps)
3. modifying behaviour to reduce energy use (e.g. turning off radiators in unused rooms, turning off lights when not in use etc)
4. shifting towards lower-energy behavioural practices (e.g. from car to bicycle)
5. reducing demand for particular energy services (e.g. reducing indoor temperatures, delaying the start of heating, giving up foreign holidays)
6. developing entirely new socio-technical systems that use less energy (e.g. intermodal transport systems, compact cities)

While all six options imply some level of technological and behavioural change there are marked differences in the balance between them. Specifically, options 1 and 2 mainly entail technological change; options 3-5 mainly entail behavioural change; and option 6 entails far-reaching and interlinked changes in both.

We suggest that the NIC should consider all of these routes in its assessment.

Q5 The NIA will seek to pull together infrastructure needs across sectors, recognising interdependencies. Are there any particular areas where you think such interdependencies are likely to be important?

As described in our response to Q3, the interdependencies between energy, transport and heat are likely to be particularly important in delivering a vision that is compatible with achieving our long-term carbon targets.

Q8 Do you agree with this methodological approach to determine the needs and priorities?

We agree with the NIC's proposed use of scenarios to explore different plausible futures. Economic growth and population growth are not necessarily good determinants of increasing energy demand (even if technological advances are taken into account) and have in fact consistently overestimated the need for more generation capacity in the UK.

[2] For example, see IEA (2014). Capturing the Multiple Benefits of Energy Efficiency. Paris, IEA/OECD Publishing

Q10 Do you believe the Commission has identified the most important infrastructure drivers? Are there further areas the Commission should seek to examine within each of these drivers?

In addition to the list of drivers identified in the consultation document, we believe that end users should also be considered as an important driver. User environments (such as user practices, behavioural routines, beliefs and skills) and wider societal factors (such as cultural discourses, norms and social acceptance) will also affect the extent to which new technologies are adopted. We believe that insights from social science should play a key role in the development of future scenarios.

As well as considering the drivers for change, we believe it would also be useful for the NIC to consider barriers to change. This includes existing infrastructure, incumbent industries and industry structures, skills and capabilities and the habits and aspirations of consumers.[3]

About the Centre on Innovation and Energy Demand

The Centre on Innovation and Energy Demand (CIED) is a collaboration between researchers from the Sussex Energy Group at the Science Policy Research Unit (SPRU), University of Sussex; the Transport Studies Unit (TSU) at the University of Oxford; and the Sustainable Consumption Institute (SCI) at the University of Manchester and is one of six Research Centres on End Use Energy Demand funded by the Research Councils UK (RCUK) Energy Programme.

CIED sits at the forefront of research on the transition to a low carbon economy. We investigate new technologies and new ways of doing things that have the potential to transform the way we use energy and achieve substantial reductions in energy demand.

Our approach moves beyond an exclusive focus on technology and energy supply. We understand that low-energy innovation does not happen in an "empty" world, but within the context of existing systems that may create barriers and active resistance. Our research explores how innovations are adopted by people and organisations, how they become more widespread within societies and how this process is shaped by market forces, government policy, social interactions and cultural norms. The innovations CIED examines include new technologies, new energy systems, novel business models and behaviours and combinations of all of these. We use this knowledge to develop practical policy recommendations.

Our research is:

Interdisciplinary drawing on ideas from economics, history, innovation studies, sociology and urban geography.

Multi-method including qualitative and quantitative techniques ranging from historical and contemporary case studies, surveys, modelling and econometric analysis.

[3] Kivimaa P and Kern F (2015) 'Creative Destruction or Mere Niche Creation? Innovation Policy Mixes for Sustainability Transitions' SPRU Working Paper Series (SWPS), 2015-02: 1-28. ISSN 2057-6668

Practical and relevant because we investigate low-energy innovations relevant to transport, industry, households and non-domestic buildings, and work with stakeholders to better understand their adoption of low-energy innovations.

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