The Role of Research in Developing Energy Policy

Andrew Robertson

The future of the UK electricity sector attracted a lot of attention in 2013, from politicians, policy makers and the public. Much of this extra attention can be attributed to the process of Parliament debating new legislation to reform the electricity market, which took place throughout the year and culminated in the Energy Act 2013. Decarbonising the electricity sector has been identified as a short term priority for cutting UK greenhouse gas emissions in response to the risks of climate change. As a result, the sector is going through a huge transition and the proposed Electricity Market Reform package is intended to guide the sector through this low carbon transformation, whilst making sure energy remains secure and affordable.

The scale and rate of change in the electricity sector means that there is a strong need for energy research and a big potential for new research to influence policy. Over the past year, Carbon Connect has examined the future roles of three broad options for electricity supply – fossil fuels, renewables and nuclear – looking at what the evidence says, pointing out policy challenges and encouraging well-informed and constructive debate [1-3]. This article outlines examples of the areas –Carbon Connect looked at where research is, or could be, particularly influential and uses them to demonstrate some of challenges policy makers face in using research to develop policy.

Bioenergy

By 2020, bioelectricity is anticipated to provide between five and eleven per cent (20 – 40 terawatt hours) of UK electricity production [4], and by 2050 bioenergy could account for around ten per cent of total UK energy production (currently around two per cent). It will also reduce the costs of decarbonisation by up to around £44 billion per year [5] ('energy' refers broadly to the content of fuel used for electricity, heat and transport purposes). Environmental groups have raised concerns about the true carbon impact of increased use of bioenergy, which is often assumed to be zero, and there has been intense and complex debate about this. There are many different biogenic feedstocks that can be used for energy production, including woody biomass (such as forestry by-products), energy crops (such as miscanthus grass) and waste derived materials (such as landfill gas). Carbon impacts can arise throughout the feedstock supply chain and are highly contingent upon actual practices and selection of a counterfactual against which to measure. There is a bewildering range of possibilities and scope for a lot more empirical research to better understand impacts of real world practice, for example, how land-use change can impact natural carbon stores.

Bioenergy presents a huge opportunity for cost-effective decarbonisation, however, there are risks that real carbon impacts are higher than assumed. In response, UK policy makers have been working with the research community on an emissions calculator for bioenergy; assimilating existing research and identifying gaps to inform policy making. The Government is also progressively phasing in a regime of reporting, assurance and compliance to make sure that biomass used for electricity production meets sustainability criteria [6]. These sustainability criteria will be reviewed and progressively tightened, as the evidence base develops [6]. This provides a good example of where the speed of policy development is neck-and-neck with research, and where policy makers respond with pragmatic, flexible and multipronged solutions.

Future grid balancing

The electricity system, and the increasingly connected energy system it is part of, will undergo significant changes over coming decades, as unabated fossil fuel plants are replaced by low carbon alternatives (including varying electricity generation such as wind power), more small generators are connected to local electricity networks, and potentially substantial volumes of the transport and heat sectors are electrified. As well as substantially increasing demand, which could partially be offset by energy efficiency, many of these new assets could drive greater variation in both supply and demand. These trends are likely to be accompanied by a large increase in measures which flatten, or enable the flattening of, supply and demand. Such measures include smart meters and grids, demand side response (temporarily turning off or down appliances that consume electricity), interconnection with other countries and storage. The uncertainty around each of these trends and their interactions means that overall, it is very unclear what the dynamics of the power system and the system security challenges will be in coming decades, particularly beyond 2030.

Unanswered questions remain about the additional costs of managing a future electricity system, for example one with a high proportion of wind power. Research so far has indicated that the additional costs are modest up to wind penetrations of say 20 per cent in the short term, but there is little research looking at far higher levels that could arise further into the future [7]. More research in this area would help policy makers to better understand the potential implications of different technology mixes and to put in place policies to make sure that the right balancing tools are available when needed. The shortage of research in this area currently muddies the waters of debate, perhaps unnecessarily so.

Nuclear research and development

Research and development into new fission reactors and into advanced and alternative fuel cycles, such as thorium, could offer many benefits to the UK and others, particularly if high nuclear deployment emerges as favourable for cost-effective decarbonisation or if uranium prices rise substantially [8]. Despite the return of nuclear power to Government plans for power sector investment in 2007, a 2013 review by the Government's then Chief Scientific Advisor (Sir John Beddington) found that the UK's research and development activities were focused on either on-going activities, such as decommissioning and waste, or on fusion technology for the very long term future, with a gap in-between [9]. The Government's initial response to the Beddington review has been promising, however, with the UK rejoining several major international initiatives and establishing the Nuclear Innovation Research Advisory Board and Nuclear Innovation Research Office to help define a national programme of nuclear energy research and development.

This example highlights the importance of there being strong alignment between Government strategy and the work of the research community. It also points to the important role that Government plays in funding research and consequently in influencing national and international research priorities.

Conclusions

The speed of policy development and finite resources of policy makers means that considering and digesting all the relevant research is difficult. Researchers can make this easier by not just producing research, but also by communicating it in a targeted and succinct way to policy makers. Policy can sometimes move faster than research meaning it is often designed on incomplete and imperfect information. Policy makers and researchers can lessen the challenge by giving early indications of areas where new research is needed. The Department of Energy and Climate Change's Developing DECC's Evidence Base [10] is a good example of where this is beginning to happen more. Efforts by Government to be more transparent about the evidence used to inform policy are helping to build stronger and more productive relationships between research and policy communities. The Department of Energy and Climate Change's 2050 pathways calculator and work on developing a Bioenergy Emissions and Counterfactual calculator are good examples of this.

References

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[6] DECC (2013) Government Response to the consultation on proposals to enhance the sustainability criteria for the use of biomass feedstocks under the Renewables Obligation

[7] UKERC (2006) The Costs and Impacts of Intermittency: An assessment of the evidence on the costs and impacts of intermittent generation on the British electricity network

[8] Carbon Connect (2014) Power from Nuclear

[9] HMG (2013) A review of the civil nuclear R&D landscape in the UK

[10] DECC (2014) Developing DECC's Evidence Base

About the Author

Andrew manages Carbon Connect and its work on energy and climate change policy. This includes leading independent research inquiries and organising a programme of events for parliamentarians, business leaders, academics and civil servants to work towards better energy and climate change policy. Prior to joining Carbon Connect, Andrew worked at the National Audit Office conducting financial and value for money audits across central government and specializing in undertaking value for money studies of energy and climate change programmes. Andrew trained as an Associate Chartered Accountant and studied Music at Fitzwilliam College, Cambridge.