Climate politics

Designing energy policy under uncertainty

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Countries need to significantly curb their greenhouse gas emissions if the world is to avoid the worst impacts of climate change. But no one is sure how best to do so. New research highlights the key uncertainties driving energy policy debate in the UK.

Policymakers are divided over how best to decarbonise the global energy system. Many studies focus on what we know about current technologies' ability to meet emissions reduction targets. But understanding what policymakers don't know is equally important. Such uncertainties give rise to debate about the best policies to transform countries' energy systems. Jim Watson and colleagues suggest in a new article in *Energy Policy*[1] that more time and better data is unlikely to resolve these conflicts, and that decisions must inevitably be based on imperfect knowledge. They map 14 significant sources of uncertainty, and set out potential actions to mitigate such conditions.

A major debate in the UK's parliament prior to the election was whether the Conservative-led government would loosen the country's mid-term emissions reduction target, known as the fourth carbon budget. Watson and colleagues carry out an assessment of the feasibility of the budget (covering the years 2023 to2027), and the implications that sticking to it could have for policymakers and other stakeholders. In doing so, Watson and colleagues give a good impression of the complexity decision makers face when designing energy policy.

They illuminate eight instrumental factors that introduce uncertainty into decision making: the availability of finance for low carbon power generation, commercialisation of low carbon power generation technologies, diversity of heat decarbonisation pathways, heat pump performance, district heating investment and business models, energy efficiency improvements and demand reduction, diversity of transport decarbonisation pathways, and electric vehicle adoption. They also identify six systemic uncertainties: fossil fuel availability and price, bioenergy availability and price, material scarcity, ecosystem service impacts, public attitudes to energy system change, and political commitment to a low carbon transition.

They point out the unexpectedness of change, showing that actual developments often lie outside the range of imagined future. So, how helpful is this in terms of meeting the fourth carbon budget?

Decision-makers need to understand what the climate change and energy policy choice complexities are, and Watson and colleagues identify a useful framework to assess this. They set out out some basic rules for making decisions in a time of uncertainty: policymakers need to set about 'opening up' the process to get the public involved and connected, need flexibility and diversity of options within energy policy, need to learn from best practice, and need to set about ensuring their country, region or locality uses as little energy as possible.

But while the article gives a good overview of energy policy uncertainties and what the most rational processes are to deal with that situation, it does not include any references to where rapid energy change has occurred. Were it to have done so, it may have concluded that some decision-making variables are more important than others in meeting emission reduction

As Watson and colleagues show, most energy policy choices can be made to seem uncertain. But what they fail to illuminate is that a technology pathway way to meet the carbon budgets requires a very different energy system[2] with different practices. Not only will different technologies be necessary[3], markets, business models, system operation, customer involvement will also have to change. Each of these has the potential to alter the energy system in different ways so that different companies and stakeholders gain (or lose) from different pathways. This leads to a vast amount of contradictory information flowing from stakeholders anxious that their preferred pathway is chosen.

The energy policy choices made by a country depend on the governance of that country. This doesn't just depend on political will (which is one of Watson and colleagues' six systemic uncertainties) but on the very practical realities of governance and policy design, such as laws, technical realities, economic incentives, and social and cultural preferences. These are known as the 'enabling environment'[4], which makes 'doing something' possible and economic, and enables someone or something to take action. How these three things come together is less well understood[5].

Moreover, 'uncertainty' is a double edged sword. For any country which does not really want to implement an effective energy or climate policy, uncertainty can always be a reason to undertake more research. As the article concludes "efforts to overcome uncertainties have resulted in complex solutions or a tendency to inertia or inaction". On the other hand, if a country wants to put policies in place to meet a carbon budget or any other goal, there being 'uncertainty' about the future does not stop it from doing it.

Apart from the technical and design[6] aspects of policy effectiveness, what stops a policy from working or what makes it work is, ultimately, public connection and reaction. Andy Stirling has likened this to 'murmurations'[7] or 'emancipating transformations'[8]. He argues, this is not so much about orderly, structured 'responsible policy' but caring for enabling of unruly distributed collective action which occasionally becomes, when something is supported widely across society such as household photovoltaic panels, like a societal murmuration.

Because of this, change can happen very rapidly. Globally, investment in renewable energy technologies has risen from $US 39.5bn at the beginning 2004, to $US 214.4bn by end 2013, excluding hydropower installations larger than 50 MW. Net renewable capacity investment[9] was greater than net investment in fossil fuels ($US 192bn versus $US 102bn) for the fourth year in 2013.

At a technology-specific level, lessons can be learned from the rapid growth of solar photovoltaics (PV). Around the globe[10], 2.6 GW of solar PV had been deployed at the start of 2004. By the end of 2009, this had jumped to 23 GW, with 139 GW installed by the end of 2013. In Great Britain, solar PV increased rapidly as a result of the introduction of the small–scale Feed-In Tariff. There was almost no solar PV in Britain at the start of 2010 (despite 20 years of a renewable energy policy) but two years later at the start of 2012, there was about 1 GW, and as of the end February 2015, there was 5,229 MW in over 668, 714 installations[11].

At a country level, Germany[12] and Denmark[13] are often used as examples of rapid change. These countries act as beacons and as voluntary research, development, demonstration and dissemination pilot studies that push prices down, increase operational knowledge and best practice, and

eventually act as drivers elsewhere in the world. For example, in Germany[14], in 1991, 3% of electricity was from renewable sources, now 23% is. Of that portion, only 5% is owned by the so-called 'big four' energy companies. This has transformed the face of the German energy market: for example, there were 66 energy co-ops in 2001, now there are 888.

That suggests Germany's conventional utilities have more or less lost their retail market in the last decade. This is leading to existential change of the German electricity system with two of the big four, E.on and RWE, losing profits, experiencing falling share prices and restructuring as a consequence. It has also led to an avalanche of financial analysts[15] prophesying the end of the conventional utility model.

Watson and colleagues thoroughly review the uncertainties surrounding technology pathways to meet the fourth carbon budget. But the fact remains that some countries embrace change and opportunities, while others don't. 'Just Do It'[16] might seem like a glib slogan, but a country which keeps to the basic policy lessons of Watson and colleagues' research, takes note of what the public like and are doing, keeps an eye on real-world experience, 'just does it' and learns by doing has the best chance of meeting its targets.

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