Oxera

Agenda

Advancing economics in business

RPI – X@20: is more innovation needed on energy networks?

Ofgem, the GB energy regulator, is conducting a root-and-branch review of the way it regulates Britain's gas and electricity networks: RPI – X@20. One key theme is whether Ofgem needs to do more to stimulate innovation on the energy networks to help deliver a low-carbon energy sector at value for money to consumers. The innovation funding incentive introduced in 2005 has already delivered a step change in R&D spending for electricity distribution networks, and Ofgem is now considering ways to encourage innovation, including open competitions and an innovative 'prize'. Hannah Nixon and Hannah Cook, Ofgem, provide an overview of the current thinking in this area

The challenge of reducing carbon emissions to tackle climate change and wider sustainability issues is having a growing influence on Britain's energy sector. Our work at Ofgem is reflecting those challenges as we think ahead on customers' behalf.

As the physical link between those producing energy and end-consumers, networks are key.[1] One of our projects, RPI – X@20, is looking at the new and significant challenges faced by gas and electricity networks arising from the need to meet the sustainability challenge while continuing to provide value for money to consumers. These challenges could bring new costs. It is therefore crucial that the regulatory regime continues to provide strong incentives for efficiency while ensuring that networks are proactive in playing their part in delivering the low-carbon economy.

The level of uncertainty about the future shape and size of networks is unprecedented. Over the past 20 years there has been little technological innovation that has challenged the way network companies plan, invest in and operate their networks. Forecasting future network requirements has primarily been about predicting energy demand growth (largely driven by economic growth). There has also been reasonable confidence that, over their long lives, assets will be used. In future, a variety of different types of technology may need to be trialled to determine what works in practice and what is cost-effective. To support this, it is important that networks have incentives to engage in innovative projects, recognising that, by the very nature of innovation, some initiatives will fail and that there is valuable learning even when projects fail.

Although the various environmental targets may be met without further innovation on the energy networks, this is likely to be very expensive and to have its own environmental impact through an expansion in the footprint of the existing networks. In the long term, if we and network operators learn from the successes and failures of innovation, we expect to be better placed to understand how to deliver efficiently the networks we need for a low-carbon energy sector, providing better value for money to consumers.

What do we mean by innovation?

Established definitions of innovation emphasise that it is a process which, in its broadest sense, captures all stages involved in exploiting new ideas, in the form of new or improved products or processes.[2]

There are many areas where energy network companies could innovate. These include the physical equipment deployed on the networks, the way the networks are operated, the companies' corporate/financial structure and the services they offer to consumers. There are also a number of different phases in the development of an innovative product or solution, from R&D to small-scale trials to commercial deployment of the solution.

Innovation on the energy networks

Since privatisation, energy network companies have sought to innovate in areas where they have incentives to do so. For most of the last 20 years, innovation has been primarily focused on reducing operating costs and

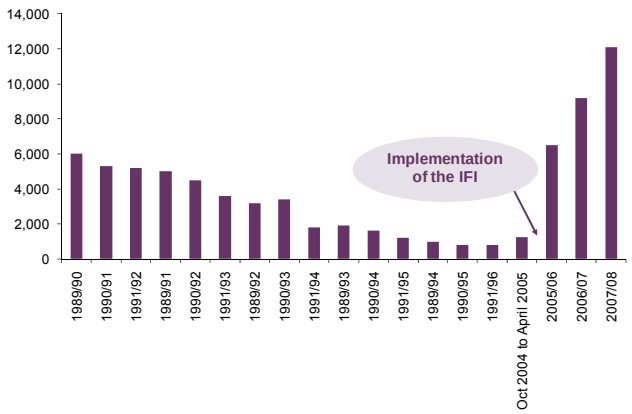
capital structures. There has been a declining trend in R&D spend in the GB energy networks sector since privatisation. In response, we have increasingly recognised the need to stimulate more innovation, and each of the regulatory packages for the energy networks now contains a specific R&D mechanism (the innovation funding incentive, IFI[3]) designed to achieve this outcome. Figure 1 illustrates that, since the implementation of the IFI for the electricity distribution networks, there has been increased R&D spend.

Evidence suggests that, in the absence of specific incentives, networks have not actively engaged in technical innovation. Although other parties (eg, academics, energy service companies and local councils) have progressed early-stage innovations, such as ideas, these are not being trialled on the networks. The current electricity distribution price control review (DPCR) proposes further development of the IFI. The proposed Low Carbon Network (LCN) fund would significantly increase available funding to £500m over the next five years. The LCN would also widen eligibility beyond the monopoly networks and allow the funding of larger-scale trials of new technologies.[4] RPI – X@20 provides Ofgem with an opportunity to take a step back from existing arrangements to determine whether something different is needed in the future.

What is the driver of greater levels of innovation?

In the absence of the 2020 and 2050 climate change targets and the government's commitment to the decarbonisation of the electricity sector, we do not think that significant changes to the regulatory regime would be needed to deliver the required level of innovation. But we think that significant innovation is needed if energy networks are to play their part in the delivery of a low-carbon economy efficiently, given the scope and scale of the associated targets.

Figure 1 GB electricity distribution R&D spending ('000s)



Source: Ofgem.

The need to deliver a low-carbon economy will increase costs for existing and future energy consumers. It may be possible to deliver a decarbonised electricity sector using current network technology but there is a concern that this option is very costly. We anticipate that innovation could allow for alternative routes to be identified that deliver the same outcomes at lower costs to consumers. There will be times when innovations fail but, over time, it is likely that learning will limit overall increases in costs.

Can the existing regulatory framework deliver greater innovation?

It is generally accepted that the best way to stimulate innovation is through effective competitive markets. However, GB energy networks are regulated monopolies (traditionally termed natural monopolies) and therefore the potential to introduce effective competition within these markets is more limited. Where feasible, we are keen to stimulate innovation through the regulatory framework using competitive processes.

Incentives to innovate to achieve cost reductions are also inherent in the existing regulatory regime. Retaining such incentives is crucial. It is possible that modifying the existing regimes could deliver incentives for wider innovation without making available specific funding for innovation. Such modifications to the regulatory regime could include:

- setting clearly defined outputs that networks need to deliver;
- clarifying the way that any profits or losses from innovation will be treated under the regulatory regime, recognising that, by definition, some innovation will 'fail';
- equalising incentives between operating and capital expenditure, encouraging networks to make efficient choices about the actions that they take and changes they implement and not to have a bias towards delivering capacity through assets rather than innovative arrangements on the demand side with customers;
- moving to a definition of efficiency that focuses on the long term, thereby promoting actions that are least-cost for consumers over time.

The question is whether such modifications to the regulatory framework are sufficient to stimulate the right amount of innovation in a timely manner. In terms of timing, many network companies, by their own admission, have run down much of their R&D capability largely in response to the regulatory incentives to improve operating efficiency. Rebuilding this expertise will take time, suggesting that innovation may not be

delivered quickly enough. In terms of the quantum of innovation, network companies may be slow to deliver the amount required to facilitate the low-carbon energy sector for a variety of reasons that could include:

- benefits from innovation may accrue to a wide range of parties;
- the upfront costs of innovation may be significant;
- the long-term private cost to network companies from choosing not to innovate is not significant because the costs associated with continuing to deploy existing technologies are generally funded under a price control.

The absence of a significant and credible carbon price may also lead to too little innovation. Network companies may discount the future benefits of innovation to facilitate a low-carbon energy sector if the carbon price is low or they doubt the political commitment to meet the targets. In time, appropriate output definition and a robust carbon price may allow for this externality to be taken duly into account by the energy networks, but this is likely to take some time and we have challenging targets that will need to be delivered over the next ten years.

In this context, a specific stimulus for innovation may be needed to deliver the step change in innovation to facilitate the transition to a low-carbon economy—if only for a time-limited period.

What form might a specific innovation stimulus take?

There are various forms that such an incentive could take. Decisions need to be made about a range of issues, including the parties that are eligible to participate, the forms of innovation covered and the treatment of benefits. The full spectrum of features that need to be considered are set out in Figure 2.

Below we present three possible models. These options are not comprehensive in terms of covering all possible combinations of features for a scheme, but are intended to provide a basis to be explored further and to provoke debate.

Pre-specified network-specific innovation: funding would be restricted to network companies with separate schemes applicable to each network sector. The scheme would be targeted at one phase of innovation (eg, R&D), with funding eligibility determined via an application, implying fairly low governance. Funding would be partial and availability would be determined on an ex ante basis.

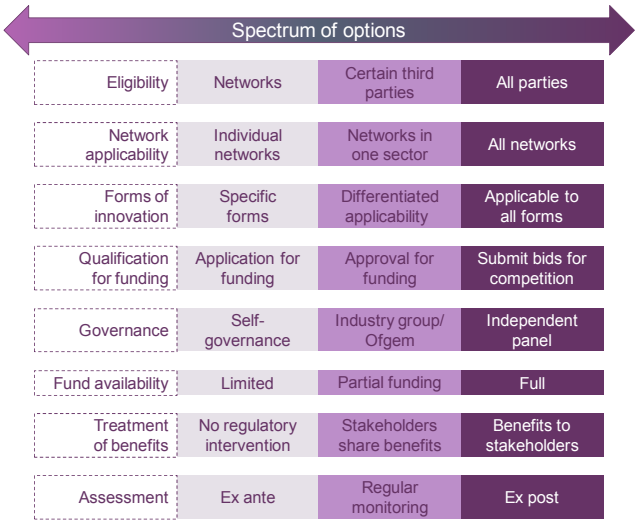
Contestable innovation: an ex ante, partially funded scheme incorporating an open competition for funding and allowing third parties that meet certain criteria to compete to take forward innovative projects in any of the network sectors. The scope of the scheme may be wide, with applicability across all the networks and all phases of innovation, allowing funds to be allocated where they are needed most. Supporting governance arrangements would be relatively strong.

Ex post 'prize': the key difference between this option and the two above is the timing of funding approval. The regulator could identify areas where innovation is needed, with success measures used to evaluate proposals and a 'prize' available for successful solutions proposed/achieved. Alternatively, any party could progress an innovative project and, if these were successful, the party could approach the regulator to seek funding/a 'prize'. Under this option, the regulations would be less prescriptive and assessment would take place ex post.

We have undertaken a high-level assessment of these potential models and think there are a number of pros and cons of each. We set out our initial assessment below.

Availability of funding: options 1 and 2 provide certainty over funding available for innovation and the way benefits/failures will be treated. Our work to date has indicated that network companies tend to be relatively risk-averse and the ability to provide greater certainty may stimulate more innovation spend, building on the IFI. Option 3 includes uncertainty for participants as it would not be clear how much innovation funding would be permitted until projects had concluded. However, significant 'prizes' could be awarded and this may provide the necessary innovation stimulus and/or encourage others with different attitudes to risk to innovate.

Figure 2 Spectrum of options for an innovation scheme



Source: Ofgem.

Costs to consumers: options 1 and 2 would provide greater certainty over funding but consumers may also be exposed to additional costs where innovation fails. In contrast, option 3 would not incorporate funding for projects that fail, rather the companies progressing the innovation would need to pay for this. While this would mean that consumers would face less risk associated with innovation, it may deter parties from taking forward innovation in the future.

Achievement of efficiency: option 1 would restrict innovation funding to network companies. Although networks have responded to incentives to innovate in the past, they remain relatively risk-averse and therefore may not be best placed to progress thinking in this area. In contrast, options 2 and 3 allow third parties to take the lead in progressing innovative projects. This may bring new ideas to the fore, as well as allowing companies that are better placed to take forward innovative projects (eg, information, communication and technology companies) to engage in this way. This may lead to greater long-term efficiency where truly innovative projects are progressed.

Meeting the environmental targets: the transition to a low-carbon economy means that the lack of an effective carbon price will need to be addressed. While the networks may perceive limited benefits from seeking to address this externality, third parties may be motivated by potential benefits for them. For example, if an innovation could facilitate more rapid connection of renewable generation, renewable generators may have greater incentives to progress the development of these technologies. Options 2 and 3, which permit third parties to lead innovative projects, may therefore deliver benefits in this area.

Direction of innovation: the inclusion of stronger governance arrangements under option 2 and the availability of a 'prize' under option 3 could help to direct where innovation may be most needed (eg, to facilitate the 2020 and 2050 environmental targets).

On the basis of our assessment, we think that all of these examples have the potential to stimulate network innovation depending on the precise form that they take. Further analysis of these examples and other options is required to understand fully their merits and the implications for the regulatory regime.

However, at this point, we are not ruling out any options and would welcome views/ideas of interested parties regarding the best way to progress these issues.

Conclusions

Ofgem is open-minded about the approach to stimulating innovation that would be most appropriate for the future. In time, it is anticipated that the regulatory framework will stimulate innovation through output measures, cost incentives and enhanced competitive pressures. However, a specific innovation solution may be needed while the enhanced regulatory framework is bedded down, given the step change in innovation needed to meet the sustainability challenges while providing value for money to consumers. There are a range of forms that an innovation scheme may take. Ofgem has committed to exploring these further, in terms of the relative merits of the various approaches.

Hannah Nixon, Partner, and Hannah Cook, Senior Manager, Regulatory Review, Ofgem

[1] RPI – X@20 is Ofgem's 'root and branch' review of the way it regulates Britain's gas and electricity networks. Further information on the review is available at: http://www.ofgem.gov.uk/NETWORKS/RPIX20/Pages/RPIX20.aspx.
[2] See, for example, Imperial College London Centre for Energy Policy and Technology and E4tech Consulting (2003), 'The UK Innovation Systems for New and Renewable Energy Techologies', a report to the DTI Renewable Energy Development & Deployment Team, June.
[3] Introduced in 2005, the IFI was intended to encourage the electricity distribution network operators (DNOs) to conduct research and development. The fund allows each DNO to spend up to 0.5% of allowed revenues on these activities.
[4] For further details on the LCN fund, see Ofgem (2009), 'Electricity Distribution Price Control Review: Initial Proposals', August 3rd.

If you have any questions regarding the issues raised in this article, please contact the editor, Dr Gunnar Niels: tel +44 (0) 1865 253 000 or email g_niels@oxera.com

Other articles in the November issue of *Agenda* include:

- **getting back on track: repackaging the rules for European rail**
- **no margin for error: the challenges of assessing margin squeeze in practice**
- **product regulation: the new standard in regulation?**

For details of how to subscribe to *Agenda*, please email agenda@oxera.com, or visit our website

www.oxera.com