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Reviewing the benefits of the Low Carbon Networks Fund and the governance of the Network Innovation Competition and the Network Innovation Allowance

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Question 8: To what extent do you consider that the LCN Fund has succeeded?

The comments below can be seen as responding to Question 8 of the review document, and the intention in the Ofgem review of considering whether DNOs have maximised the benefits from the LCNF trials in their core business. As mechanisms to support *innovation*, the real test of the success of mechanisms like the LCNF and the NIC will be lie not just in the output of trials, but also in the successful deployment of new techniques or equipment in network situations where they can be assessed and tested for a number of years in real-world conditions.[1]

At this stage, we would argue that the answer to the question of how far this will happen is that we do not yet know, since we would expect to see these benefits being realised over the course of future price control periods. However, a sense of company expectations for the near future can be gleaned from the original business plans submitted under the RIIO-ED1 process on how far DNOs expect smart grid solutions, including those informed by LCNF trials, to produce savings in the 8 year ED1 period to 2023. Table 1 shows the

[1] Smart Grid Forum (2014) *Smart Grid Vision and Routemap*

forecast savings from 'smart' grid solutions against BAU for 5 of the 6 DNO parent companies' RIIO-ED1 initial business plans submitted in 2013, in proportion to total forecast cost of network operation and investment. On average, 'smart' grid approaches were forecast to save less than 2% of total spend. This is the case despite the introduction of measures aimed at transferring approaches from LCNF to BAU investment, including making qualification for fast-track acceptance of business plans conditional on production of an innovation strategy (including evidence of how they will incorporate learning from LCNF and other innovation trials into business-as-usual) and the Innovation Roll-out Mechanism.

Table 1- Expected savings from 'smart' grid solutions in the RIIO-ED1 period (2015-2023)[2]

Company	Total expenditure proposals in ED1 (£m)	Forecast savings from 'smart' grid solutions over ED1 period (£m and as % of total expenditure)	
		£m	%
ENW	1,900	34	1.8
NPG	3,224	31	1.0
WPD	7,055	128	1.8
UKPN	6,726	111	1.7
SPEN	3,720	90	2.4
Total	**22,625**	**394**	**1.7**

Indeed, Ofgem took the view that these expectations are lower than they should be, given that the LCNF itself will have cost £450 million by 2016, and the claimed savings resulting from projects (if they were all successful) were of the order of £2 billion.[3] The final ED1 determination adjusted allowed revenue on the basis that Ofgem expects to see a further £400 million of savings from 'smart' grid solutions, roughly doubling the level of ambition. This will represent only around 3.5% of total expenditure.

Question 9: To what extent do we need to continue incentivising innovation by DNOs?

Why were the figures in the business plans so modest? One potential reason is that in their planning DNOs have been using forecasts of low-carbon technologies (based ultimately on the 2011 Carbon Plan scenarios) that anticipate only slow growth in those technologies before the early 2020s.[4] While the growth of solar PV was vastly underestimated, the forecasts for EVs and heat pumps may well be right. This factor would imply that the LCNF can be regarded as successful, but that the expected returns on LCNF trials will not be realised until later, in ED2 and subsequent periods.

A second potential reason is that, as the LCNF was an innovation mechanism, one would not expect all the trials to be successful, in the sense of showing a strong case for application to network operation and investment (despite the fact that funding (especially Tier 2) was to be directed at higher levels of technology

[2] Ofgem (2013) Assessment of the RIIO-ED1 Business Plans, Ofgem (2014) RIIO-ED1: Draft determinations for the slow-track electricity distribution companies, Company Business Plans

[3] Ofgem (2014) RIIO-ED1: Draft determinations for the slow-track electricity distribution companies, p.30

[4] Lockwood, M. (2014) Energy networks and distributed energy resources in Great Britain Working Paper 1406, Energy Policy Group, University of Exeter

readiness). This factor would imply that again the LCNF can be regarded as successful, but that a crucial part of its success lies in learning what does not work as well as what does work.

Both of these factors are important in explaining why the impact of the LCNF on network investment and operation in ED1 appear modest, while at the same time not meaning that it has not been successful. However, in reviewing the contribution to the LCNF and the design of future, in our view it would be useful for Ofgem to give further thought to the steps that lie between trials of the type supported by the LCNF and NIC and BAU investment in and operation of networks. Studies of innovation emphasise the crucial and complex nature of this stage of the innovation process, which in competitive markets is the 'valley of death' involving a scaling up of risk, continuing feedbacks and difficulties in securing finance. [5] In the regulated network context, the key driver for deploying new techniques and/or equipment trialled under LCNF or NIC will be the benefits that DNOs expect they can make by reducing costs against their revenue cap. The question then is whether this driver is strong enough to overcome any barriers that networks might face in a regulated version of the 'valley of death'.

One question is whether other aspects of the regulatory regime may be acting to deter deployment, through their interaction with uncertainties that remain beyond the trial stage. For example, technologies may fail in real-world network situations over a period of time, even if they have worked well in trials (an instance of the feedback loops in conceptualisations of the innovation chain).[6] This was initially the case with new plastics-based insulation for underground cables in the 1970s, for example. This kind of uncertainty may also apply to new contractual approaches (for example for demand side response or distributed generation to reduce congestion on particular sections of network) especially with households rather than commercial providers of demand side response, since the extent to which households will honour such contracts, outside of trials, is still unknown. Technological or contractual failure in a real-life network situation may expose DNOs to penalties arising from a reduction in reliability, safety and other aspects of network performance, either within output incentive schemes or through fines for failing to meet licence conditions. Since output incentives under RIIO are stronger and more extensive than under RPI-X, these risks may have actually been accentuated by the change in regulatory regime.

Another type of interaction between uncertainty and regulation might be that even where companies have trialled a technology or approach, they will not know fully how much these will cost in real-world network situations, especially because mature supply chains for equipment in many cases do not exist, and will not exist until demand scales up. Within the context of incentive regulation, uncertainties about cost of an innovative approach will penalise companies if they underestimate these costs in a price-control settlement.

Beyond the regulatory regime, a second question is about the internal responsiveness of DNOs to it. Historically a widespread view (including within Ofgem)[7] is that DNOs have a conservative culture', based in part on a cautious engineering 'mindset' in a context where safety and reliability are paramount. This set of concerns can be seen, for example, in the comments of one DNO CEO in giving evidence to a Select Committee inquiry on network innovation:

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[5] E.g. Grubb, Hourcade and Neuhoff (2014): Planetary Economics: energy, climate change and the three domains of sustainable development

[6] Ward, J., Owen, G. and Pooley, M. (2012a) *The electricity demand-side and wider policy* Paper 5, GB Electricity Demand – Realising the Resource, Sustainability First, London, p. 54

[7] E.g. Smith, S. (2010) 'RPI-X@20' Beesley Lecture, http://www.rpieurope.org/Beesley.shtml

> "Most of the things that will need to change in order for the distribution networks to do the kinds of things to which you have referred already exist; it is not technology that is not already out there, but it is just not applied in the public networks in this country. We do not need to invent things that do not exist but we need to apply them and really understand how they would work. We are talking here about the public electricity supply network which needs to be absolutely safe. We need to understand how it would operate in reality rather than in a laboratory or test case."[8]

One key issue here is whether concerns about safety, reliability (and also corporate reputation) lead to DNOs (or engineers in DNOs) being *excessively* cautious, whether they are assessing risks accurately, or indeed whether more institutionalised processes of risk aversion are meaning that they are not even looking at new techniques or equipment or trying to assess their risks at all.

In summary, in our view more thought needs to be put into the middle part of the innovation chain, and two specific areas looked at:

1. reviewing how the full range of regulatory incentives may affect the take-up of LCNF outputs where there is residual uncertainty about their performance in real-world network situations, and

2. getting a better understanding of the nature of the 'culture' of decision making within DNOs, exactly where and how attitudes to risk work, and where and how better information and education about risks may help facilitate a more appropriate take up of LCNF outputs.

The LCNF and NIC are aimed at supporting the development of individual technologies or groups of technologies and approaches. However, the direction of travel in the electricity system is towards decentralised generation, demand response and localised storage, with the integration of transport and heat. The role of DNOs will change fundamentally. Some jurisdictions are already anticipating these developments and are moving ahead in their governance frameworks. For example New York State, in its Reforming the Energy Vision (REV) agenda,[9] is aiming to transform electricity distribution companies into distribution service providers (DSPs) that facilitate platforms for local markets in a range of products. In Britain such a transformation will require wider institutional changes, including greater integration between distribution and transmission (we would argue in an integrated independent system operator entity[10]) and further regulatory change. But it will require continuing support for innovation as well. In particular, it will require a greater focus on the testing of end-to-end systems and platforms. Projects such as CLNR are a step in the right direction but far more is needed.

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[8] Phil Jones, quoted in Energy and Climate Change Committee (2010) The future of Britain's electricity networks Second report of session 2009-10, Volume II, HC194-1: Ev55

[9] http://projects.exeter.ac.uk/igov/lessons-from-america-new-york-states-reforming-the-energy-vision/

[10] http://projects.exeter.ac.uk/igov/new-thinking-energy-distribution-service-providers/