

Where next for the smart energy consumer?

Findings on consumer impacts from the Low
Carbon Networks Fund so far

The logo for Citizens Advice, featuring the text "citizens advice" in white lowercase letters inside a dark blue speech bubble shape.

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About this report

To explore future consumer issues within a changing energy system, in March 2015 Citizens Advice commissioned a report from SE² Ltd on the latest findings from current innovation trials. The full research can be downloaded here: [Capturing the findings on consumer impacts from Low Carbon Network Fund projects](#).

This report takes stock of the findings from that research, and also of discussions from a workshop with stakeholders held to mark its publication. From these, as well as at a number of pointers for next steps, we have arrived at five specific recommendations for the development of current and future energy innovation (see next page).

One thing that stands out from the research is that there is not just one smart grid, either physically or conceptually. To reflect the range of possible impacts for consumers, we break these down into four areas, moving from innovations requiring the most active consumer input to those where the consumer is most passive: **smart saving**; **shifting usage**; **new technology**; and **behind the scenes**. Lastly, considering all of these together, we ask **what next** for innovation if it is to continue to serve energy consumers' needs?

Views? Questions? Please contact conrad.steel@citizensadvice.org.uk.

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Recommendations

Recommendation 1 Future projects based on behaviour change and efficiency should align with existing local initiatives. Smart grids should be a facilitator of local delivery of energy efficiency, not a rival or duplicate.

Recommendation 2 Responses to domestic demand-side response still need more systematic testing, including the influence of demographics, price signals parameters and use of household automation. There should also be investigation of how 'safety nets' for limiting participants' financial liability could be made viable as business as usual, not just an unrealistic feature of trials. Future projects should aim to test these variables, and Ofgem should provide a detailed cross-referencing of the data already available.

Recommendation 3 Low carbon technologies, and in particular electric vehicles, should be seen as a key enabler for domestic demand side response. They can be flexible with little disruption to the consumer, and they should offer a chance to engage consumers around new behaviours and attitudes.

Recommendation 4 A standard framework should be provided for projects taking part in the Network Innovation Competition to monitor complaints, participant demographics and satisfaction and attitudes. The last could be captured by a standardised exit survey at the end of each project.

Recommendation 5 To speed up dissemination and implementation of results from the LCNF, Ofgem should publish an annual round-up of network innovation projects (summarising both new findings and the deployment of ideas from completed projects) and a series of short thematic reports on LCNF findings so far.

Introduction: taking stock of the LCNF

Our electricity networks are changing. With a growing need to incorporate more renewable energy sources while maintaining security and affordability of supply, network companies are facing regulatory pressure to rethink their technical and commercial processes in novel and innovative ways. A new class of 'smart grids' is taking shape, characterised by more flexibility, more communications and more IT being used to monitor and respond to energy flows in real time. At the forefront of this innovation are the projects being carried out under the LCNF (see box).

The **Low Carbon Networks Fund (LCNF)** was set up by Ofgem to stimulate innovation in electricity networks. Between 2010 to 2015, £500m was made available for new trials and partnership projects.

Thanks to this funding, around 60 projects have now been completed or are underway. New LCNF funding is now closed, but its place will be taken by a similar scheme, the Networks Innovation Competition. Our researchers spoke to the 13 projects that have worked most closely with domestic consumers.

Consumers have a lot to gain from these bill payer-funded projects. Between them, they should enable around £900m of savings over the course of the next price control (the regulatory period over which Ofgem sets the networks' allowed spending, now running 2015-23). They could also deliver other benefits such as improved reliability and a smoother, simpler customer experience. But some of the new measures now being considered may carry a risk for consumers as well. Mishandled, consumers could see a service that has generally been simple, standardised and essentially invisible - the supply of electricity to their homes - become increasingly complex.

This is the context for our recent research into what has been learned about the consumer impacts of smart grids, good and bad, from the LCNF so far. Three reasons led us to commission this research:

- **Trial results are starting to become available** as some of the larger projects complete, creating valuable new insights and raising new questions...
- ...but there has been **too little focus on the consumer experience** as opposed to the technical outcomes in findings and conclusions to date...
- ...and there has been **too little collation of findings**, making it difficult to compare results or gain a comprehensive overview from different projects.

Smart saving: behaviour change, fabric efficiency and community schemes

Energy efficiency and community schemes can cut bills and increase sustainability at the same time. The benefits and challenges are well known, but smart grid innovation may open up new dimensions. For example, interactive feedback loops can use data to create and reinforce good energy behaviour. The growing need for flexibility on the network may also increase the value of community energy action.

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- Our research found that the big challenge in this area is customer engagement, and the key to success is often a local approach. Many local energy initiatives already exist, so working with councils and community groups - as several projects have done - is a key way for smart grids to build on this potential.¹
- Energy efficiency and behaviour change are multifaceted issues, and projects and policy need to join up the full range of issues involved. For example, demand-side response and the use of heat pumps depend on good home insulation, as this makes heating flexible. Efficiency standards and behaviour change frameworks will be vital groundwork for future developments.
- Several LCNF projects have found it hard to motivate enough behaviour change to have a significant impact at network level. Partly this is due to a tendency to focus either on groups who have already 'gone green', or on disadvantaged groups who are harder to engage. To identify the right target groups, can new data and profiling help? Or is it just about finding the happy medium between those who have gone green already and those with no interest in doing so?

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Relevant projects include: Ashton Hayes, Energywise, Less is More, My Electric Avenue, New Thames Valley Vision, NINES, SAVE, Smart Hooky, SoLA Bristol.

¹ For more on the need for local delivery, see: Citizens Advice. (2015) [Closer to Home: Developing a framework for greater locally led delivery of energy efficiency and fuel poverty services.](#)

Shifting usage: demand-side response

Of all the impacts smart grids may have on energy consumers, demand-side response (DSR) has the potential to be the most direct. Encouraging consumers to change when they use electricity could deliver major benefits to decarbonisation and affordability in future, if it can be made accessible, safe and fair.² There are questions about how and when this resource will be commercially viable. But the work of several LCNF trials gives major insight into the opportunities DSR may offer.

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- It is now well understood that time-of-use tariffs may create winners and losers. The research shows that trials have produced different results, but all find a large group end up paying more than with a flat tariff. There are many ways consumers' financial liability could be limited, but the impact this would have on both consumer response and commercial outcomes needs to be explored.
- The dataset on DSR still needs to be expanded. Despite very useful emergent findings we do not have a full picture of the influence of demographics, price signal parameters - including price differentials between bands, duration, time of day and pricing patterns - or smart appliance use on DSR responsiveness. What data has been or is being collected is not always easily comparable. It would be a useful time for Ofgem and others to refresh past summary papers.³

Recommendation 2 Responses to domestic demand-side response still need more systematic testing, including the influence of demographics, price signals parameters and use of household automation. There should also be investigation of how 'safety nets' for limiting participants' financial liability can be made viable as business as usual, rather than an unrealistic feature of trials. Future projects should aim to test these variables, and Ofgem should provide a detailed cross-referencing of the data already available.

Relevant projects include: Customer-Led Network Revolution, ECHO, Energywise, Low Carbon London.

² For more on the consumer issues around demand-side response, see: Citizens Advice. (2014) [Take a Walk on the Demand Side: Making electricity DSR work for domestic and small business consumers.](#)

³ e.g. Element Energy for DECC and DEFRA. (2014) [Further Analysis of Data from the Household Electricity Usage Study: Electricity Price Signals and Demand Response.](#)

New technology: towards smart homes

Smart grids might affect energy consumers' behaviour or how companies interact with them. But they will also influence how technology in and around the home develops. Our research looked at LCNF projects working with smart appliances, electric vehicles, heat pumps, domestic-level generation and storage of electricity and/or heat and energy, and efficient technology such as LED lighting. Larger, more two-way load from these sources will pose a challenge to networks. At the same time, they will also make load more flexible. The opportunity from trials at this point is to understand how different types of consumers might respond to these technologies, how they can benefit, and where any problems might arise.

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- Trial findings suggest that emerging technology will be key to empowering consumers to engage with the smart grid, so long as it is reliable and simple to control. Intelligent and interconnected solutions where the consumer is passive have been particularly effective, suggesting scope to build on these in future.
- Several projects have experienced issues with reliability of equipment, installation and customer communications. There may be a need for a framework to promote best practice, as already exists for microgeneration.
- Solutions based on in-home technology risk favouring richer consumers. Trial conditions have reduced the commercial pressures that would tend to cause this, but there is now a need to investigate low-cost or subsidised alternatives.

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Relevant projects include: Customer-Led Network Revolution, ECHO, Energywise, My Electric Avenue, Low Carbon London, New Thames Valley Vision, NINES, SAVE, SoLA Bristol.

Behind the scenes: network measures

Our research focusses on the direct consumer impacts smart grids may have. But this is only the tip of the iceberg. In tandem with their consumer-facing innovations, networks are investigating new ways of managing energy before it reaches consumers' homes. Automated voltage control, self-healing grid and enhanced fault prevention are not phrases most consumers will need to learn, but they may have an important (positive) impact on the service they receive. Usually these new approaches are intended to be invisible to the consumer, but there may be a few cases where they become noticeable. This may well be a reasonable price to pay for the benefits delivered, but it is important to ask what consequence this might have, how likely these are and how they should be monitored.

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- While our research did not consider the majority of LCNF projects that are only looking at upstream network measures, from those we did look at it was obvious that the distinction between upstream and consumer-facing is not always clear cut. The boundaries will only become more blurred as the role of consumers becomes more developed and heterogeneous. It remains essential always to consider how consumers are affected by change, even if the intention is that any measures taken are indiscernible. Good practice is being developed in how to test whether any impacts are in fact visible to consumers or not.
- Even where consumers are not directly involved, in some cases their data may be. It is not sufficient just to obtain consumers' legal permission to use their data in this way if it is not clear what they are signing up for. The use and any consequences need to be clearly explained. This is likely to pose a major challenge moving to business as usual from trial conditions, where data rules and expectations are different.
- Innovations in technical network processes are not the only changes going on behind the scenes. One of the characteristics of smart grids is to bring together different areas of services and infrastructure. Future upstream smart grid measures should be seen as part of a wider picture of updating infrastructure, for example the introduction of minimum standards for housing efficiency.

Relevant projects include: CLASS, Low Carbon London, New Thames Valley Vision, NINES.

What next: how future innovation can serve electricity consumers

The innovation our research looked at will continue to matter to consumers in two ways. One is future innovation trials (no more new LCNF funding will be awarded, but several projects are still in early stages, and its place will be taken by the Networks Innovation Competition). The other is the implementation of trials so far as business-as-usual. Between them, the thirteen projects considered in our research have received funding of around £170m. It is therefore imperative that the good work that has gone into them is now turned into good results for consumers.

Where next

- One area in which the research often found room for improvement is capturing the consumer experience. Several trials have found it difficult to monitor complaints. A number have recognised the importance of demographics, but data is often vague or patchy. And while some trials have made an effort to monitor participant attitudes through surveys and interviews, the findings suffer from a lack of comparability. In at least one case our research suggests these have been reported in a way that exaggerates the positivity of responses.
- Consumers will only see a return on their investment in innovation funding if ideas from the LCNF make the transition into business-as-usual. Better reporting on the 'afterlife' of LCNF projects should be introduced. This would have the dual function of encouraging the adoption of innovation and collating new findings. There is also a need for further thematic reports on LCNF results.

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