‘Pro-savers’: the role of community in energy demand reduction

Mari Martiskainen
Centre on Innovation and Energy Demand (CIED)
Sussex Energy Group (SEG)
Science Policy Research Unit (SPRU)
University of Sussex
Jubilee Building
BN1 9SL Brighton
UK
m.martiskainen@sussex.ac.uk

Colin Nolden
Centre on Innovation and Energy Demand (CIED)
Sussex Energy Group (SEG)
Science Policy Research Unit (SPRU)
University of Sussex
Jubilee Building
BN1 9SL Brighton
UK
c.nolden@sussex.ac.uk

Keywords

community, energy citizens, consumers, process, pro-saver

Abstract

Community energy provides a space for end-users and interest groups to engage with energy consumption and production at the grassroots level. Often emerging out of community-led renewable energy projects, community initiatives have the capacity to address issues such as rising energy prices, fuel poverty and the desire of independence from incumbent energy utilities. The publication of the Community Energy Strategy in January 2014 in particular marks the first attempt to institutionalise community energy within the UK energy system. Using localised and tacit knowledge, community energy groups can be ideally placed to deal with energy consumption at the point of demand. This opens up opportunities for consumers to engage not only in energy generation but increasingly also in energy demand-management, thus moving from consumption over ‘prosumption’ to ‘pro-saving’. Our three case studies provide an overview of three community energy approaches that exhibit the emergence of ‘prosumption’ and the shift towards ‘pro-saving’, a concept which includes the notion of demand reduction as well as the development of innovative approaches combining distributed energy with demand reduction and demand side response. The paper draws these examples together in order to provide an outlook for increasingly decentralised energy generation and demand-management practices along with some concrete policy recommendations.

Introduction

Community energy is gaining momentum in the UK. Community energy within this paper is understood to mean sustainable energy projects, which are initiated, developed and owned by civil society actors such as neighbourhood groups, co-operatives and voluntary organisations. The UK Department of Energy and Climate Change (DECC) places the number of such groups to a greater or lesser extent engaging in community energy initiatives at up to 5,000 (DECC, 2014a, b). Although many uncertainties surround this estimate, the UK is undoubtedly witnessing a significant increase in interest in sustainable energy engagement at the community scale. Examples include community owned renewable energy generation technologies such as solar PV panels, wind turbines and hydroelectric generation; community switching schemes to renewable heat sources such as heat pumps, biomass boilers or district heating schemes supplied with heat from sustainable sources; community energy saving measures such as rolling out cavity wall or solid wall insulation; piloting emerging and ‘smart’ technologies; community purchasing schemes for fuels but increasingly also technologies that can substitute conventional fuels; and community electricity supplier switching schemes (DECC, 2014a, 2014b).

The UK has set ambitious emissions reduction targets, while policies from the European Union have their own important influence. Under EU commitments, the UK is required to supply 15 % of final energy consumption from renewable energy by 2020 (EC, 2009) with an EU wide target of 27 % by 2030 (EC, 2015). Furthermore, the UK was the first country to introduce a legally binding climate change target. Under the Climate Change Act 2008, the UK has an obligation to reduce greenhouse gas (GHG) emissions by 34 % by 2020 and at least 80 %

by 2050 (from 1990 baseline level) (DECC, 2014d). One of the cheapest and effective ways to deal with emissions is to reduce energy demand through a range of energy efficiency measures, as outlined in the Energy Efficiency Strategy, published in 2012 (DECC, 2012). Political leaders in both government and in opposition recognise that energy efficiency has an important role in tackling emissions. In September 2014, the UK Secretary of State for Energy and Climate Change, Liberal Democrat Ed Davey indicated that the UK needs to see energy efficiency as part of the nation's infrastructure programme, and communities have a role to play in that (Martiskainen, 2014b). Around the same time, the opposition Labour party's Shadow Energy and Climate Change Secretary Caroline Flint announced that if Labour were to win the general election in 2015, they would insulate five million homes in the next ten years, i.e. 500,000 homes per year (Murray, 2014).

However, investment in both centralised and decentralised energy infrastructures continues to be dominated by incumbent organisations (Nolden, 2013b). Their established supply chains and supply and delivery infrastructures ensure economies of scale and maximisation of return on investment by maintaining the status quo (Stirling, 2014). As a result, options for alternative development pathways in terms of ownership and scale of technological deployment tend to be marginalised. Prioritisation of technologies either aligned with existing infrastructures such as gas fired power stations and nuclear power and biomass conversion of fossil-fuel power stations are supplemented with concentrated, large-scale renewable energy deployment, principally as wind farms both on and offshore. Combined, these technologies may provide a relatively secure pathway towards decarbonisation but they fail to take the benefits of other approaches into account (Nolden, forthcoming), especially local energy governance approaches that provide area-based and location-specific solutions by combining distributed generation, demand side management and demand-response.

In light of an increasingly diverse range of technologies being deployed at subnational generation scales, new opportunities for combining supply and demand using innovative technologies, business models and financial arrangements are emerging. Research by Nordman et al. (2012) from the Lawrence Berkeley National Laboratory in the US points towards the possibilities of buildings supplying and consuming multiple types of power from sources such as solar PV backed up by local battery storage as well as the emergence of nano and microgrids. As recognised by Barclays (Aneiro, 2014), the potential for rescaling energy supply and demand using these innovative approaches along with innovative business models and smart consumer involvement is potentially significant to the point of offering alternative energy system development pathways to the ones envisaged by incumbent energy utilities. The emergence of the 'prosumer' and the 'pro-saver' reflects an understanding of customers as collaborators, rather than consumers, that expertise in energy is increasingly enhanced by expertise in IT and finance, and profitability is no longer exclusively derived from energy but from innovative markets and integrated services (MacGill, 2013). 'Prosumption' implies that people increasingly engage in generation (or production) of energy as well as consumption. 'Pro-saving' goes a step further to include demand reduction as well as the development of innovative approaches that can combine distributed energy with demand reduction and demand side response.

Compared to other countries, where municipal scales and spaces of energy technologies have a long tradition, such as Denmark or Germany (Nolden, 2013a, b), growing interest in alternative scales and spaces of energy generation and demand management in the UK represents a considerable change. One benefit of the relative novelty and often haphazard nature of project development and management is the possibility of combining generation with innovative energy demand reduction approaches. In the absence of local or municipal utilities that have based their fortunes on generation, emerging approaches in the UK provide the opportunity to leap-frog some of the generation-based approaches to local energy management that have often emerged from stable socio-technical configurations and that may struggle to take alternative technological pathways and emerging business models into account.

This paper analyses the emergence of 'pro-saving' behaviour using three case studies of community energy projects in the UK. It seeks to establish what factors contribute to this emergence and how social and technological innovation may co-evolve to normalise 'pro-saving' over passive consumption. The specific research question reads as follows: *What is the role of community energy in energy demand reduction and how is the emergence of the 'pro-saver', alongside the 'prosumer' and the consumer, reflecting this trend?*

This paper suggests that 'pro-savers' will play a significant role in changing the requirements of centralised energy systems and underlying assumptions about the scale and directionality of energy technology innovations, while community energy can also be used to address challenges such as fuel poverty, as illustrated by our case studies later on in the paper. This paper's focus on the role of communities is particularly revealing as we are witnessing a diverse range of approaches to distributed energy, demand side response and demand reduction that combine technological and social innovation (Bergman, 2011; DECC, 2014a, b, c). Diffusion processes inevitably involve a social component but approaches differ in terms of the main focus. Deploying renewable energy technologies such as offshore wind turbines is an example of a more technological innovation while community food cooperatives are an example of social innovations. The following two sections provide an overview of the context of community energy in the UK and the difficulty of emerging technologies and advocacy coalitions to disrupt the incumbent status quo. The paper then moves on to discuss some of the developments within the current energy system that community energy may be able to address, such as the relationship between energy supply and demand and how that balance may be addresses through social innovations. This is followed by the methodology section, which discusses the case study approach used in this article, providing details of the data used as the basis of our discussion and research conclusions.

Challenging the incumbent UK energy system

Despite the publication of the Community Energy Strategy in 2014, the UK government has been slow to acknowledge the benefits of decentralised and community energy generation. In fact, the extent of individual and community engagement with electricity generation following the implementation of the Feed-in Tariffs (FiTs) for renewable energy generation technologies < 5 megawatts (MW) in April 2010 took many

by surprise (Nolden, 2013a), as indicated by the currently installed capacity for example of solar PV (~2.4 GW) exceeding original projections by a factor of three (DECC, 2011; Ofgem, 2015). In recognition of the potential of community energy, an increase in the FiTs for communities and allowing FiTs to be combined with grants was proposed but ultimately rejected as it would have clashed with EU state aid. Government commitment is nevertheless evident with two community projects within the same community now able to receive separate FiTs while sharing a single grid connection, charities with less than 50 employees benefiting from FiTs and the extension of preliminary accreditation validity periods for community projects to six months (Feijao, 2014).

A range of support measures such as the Green Deal and the Renewable Heat Incentive (RHI) are also increasing the potential for communities and individuals to engage with distributed generation and demand reduction, particularly for space heating (DECC, 2014b). Calls for increasing decentralisation should also play into the hands of communities as trust in the capacity of national institutions to provide local solutions is declining. Local authorities, on the other hand, are facing very significant cuts to their budgets as part of the recession induced austerity measures (see Centre for Human Rights in Practice, 2015, for an overview). Their need to focus on securing front-line services is often limiting their capacity to engage in sustainable energy related activities to facilitation between contractors, social enterprises, charities and civil society, despite increasing interest in municipal approaches to energy generation and demand management.

D3 AND COMMUNITY ENERGY

An important publication in relation to the emergence of 'prosumption' and 'pro-saving' is the D3 report published by DECC in 2014 (DECC, 2014c). It was drafted by a London based consultant and specifically addresses policy challenges to the incumbent supply focused energy system arising from increasing demand side activity. D3 encompasses demand reduction, demand side response and distributed energy. The report highlights how energy demand in the domestic sector has reduced by 22.3 % in England and Wales over the period 2005–2011 (ONS, 2013) while advanced building controls and lighting technologies as well as small-scale generation technologies such as solar PV are steadily gaining consumer interest. The capacity of these emerging combinations of technological and social innovation resulting in increased energy demand management capacity as well as energy demand reduction is difficult to quantify but their disruptive force is unquestionable.

Technological advances particularly in the area of solar PV and combinations of generation and storage technologies are co-evolving with support policies opening up to the increasing demand for distributed energy, demand management and demand-side response. As a result, bottom-up approaches such as community energy projects are gaining traction, both from a governmental perspective to bridge the emerging capacity gap at a local level and from a civil society perspective to tackle energy price volatility and dissatisfaction with the current energy delivery and management setup dominated by incumbent organisations (DECC, 2014c, Nolden, 2013a, Martiskainen, 2014b).

Communities as pro-savers?

Community energy is not a new phenomenon in the UK. There has been an interest towards alternative energy technologies to fossil fuels and nuclear energy since the 1970s (see for example a review by Smith, 2005), and small-scale sustainable energy projects have gradually emerged outside the main energy systems. The potential for community energy projects has featured in the UK's energy policy discourse since the 2003 Energy White Paper (Walker et al., 2007), culminating in the publication of the UK's first Community Energy Strategy in January 2014 (DECC, 2014b). Various support programmes providing grant money, advice and networking opportunities have emerged especially since 2000, funded by the government, local authorities and businesses (Martiskainen, 2014a). For instance, in 2010 DECC launched the Low Carbon Communities Challenge (LCCC), a funding opportunity for 22 established communities, and a web-portal, which offers advice and information specifically for community energy regarding funding options, business models and community energy events (DECC, 2014a). One key part of the development of the UK's community energy sector has been the role of intermediary organisations, those actors who operate between community energy projects and policy makers, and who can take learning from community energy projects and translate that to generalisable knowledge and advice (Martiskainen, 2014a). Intermediary organisations can also have a brokering role by managing relationships between community energy groups and actors who operate outside the community energy sector (Hargreaves et al., 2013).

MOTIVES FOR COMMUNITY ENERGY DEVELOPMENT

Community energy, particularly if the means of generation and demand management are community owned, can combine technological developments and social innovation (Bergman, 2011; Nolden, 2013a, b). The capacity for either in itself, however, may not be sufficient for successful diffusion processes as concepts such as tacit knowledge often form the 'glue' that enables ideas and concepts to be put into practice (Moulaert et al., 2013).

Community energy projects have been and can be developed for various reasons. This has been highlighted in a survey of 190 UK community energy projects by Seyfang et al. (2013b), who identified economic (e.g. save money on energy bills), environmental (e.g. reduce emissions), social (deal with fuel poverty), political (influence energy policy) and infrastructural (provide better services) motives for community energy projects. One of the key motives for community energy action has remained the steady rise in gas and electricity prices witnessed in the UK in the last few years and the costs related to services such as heating and lighting (Seyfang et al., 2013b). Despite various funding programmes and the UK government's pledges to banish fuel poverty, it still persists in the UK. There are increasing numbers of grassroots groups taking action to tackle fuel poverty, especially due to the distrust that consumers in the UK have towards the 'Big Six' energy utilities that dominate the UK's energy supply. While the Energy Efficiency Strategy (DECC, 2012) has only a short reference to communities and what their role could be in delivering energy efficiency measures, especially in relation to concepts such as fuel poverty, the

Community Energy Strategy (DECC, 2014b) mentions fuel poverty several times as something that communities especially could be well placed to address.

There has also been an increasing amount of interest from academic researchers towards the development of the UK community energy sector, evidenced for example by research projects such as the Community Innovation in Sustainable Energy, which ran for three years (Oct 2010–Sep 2013), and involved researchers from the Sussex Energy Group (University of Sussex), CSERGE (University of East Anglia) and the European Centre Laboratories for Energy Efficiency Research (ECLEER) of Energie de France.

THE IMPORTANCE OF TACIT KNOWLEDGE AND THE EMERGENCE OF THE 'PRO-SAVER'

Many community energy groups rely on volunteers who provide their time and effort, often bringing with them valuable skills and tacit knowledge. Tacit knowledge can be described as the knowledge that people have but which is not taught or openly expressed (Wagner and Sternberg, 1985). According to Darby: "The concept of tacit knowledge explains how it is that we possess the awareness and skills that enable us to select the information we want from all that is available, to carry out actions and to evaluate facts and theories." (Darby, 2006, p.2931). For community energy groups, which rely on volunteer time, tacit knowledge can be extremely beneficial. For instance, people who know their local area and networks will be able to identify and bring together people with certain skills, which are beneficial for the community group (Martiskainen, 2014a). Skills such as working with groups, facilitating meetings, enabling groups to make decisions and being able to operate effectively as a team may contribute to projects' success, especially in terms of mobilising people and identifying funding opportunities (Seyfang et al., 2013a).

Tacit knowledge nevertheless is something that is not always recognised by policy-makers to be a key part of a successful community energy group, and may not translate as easily to the policy domain as knowledge about certain technologies for example can (Martiskainen, 2014a). The UK's community energy sector is supported by a network of intermediary organisations (Hargreaves et al., 2013), which operate between community energy projects and policy makers, translating experience from projects to more generalised 'codified' knowledge that is useful for the whole sector (Geels and Deuten, 2006). Local codification, however, hinges on the capacity of community groups to exploit tacit knowledge and translate technological innovations into social innovations, a task that may not always be straightforward to do.

Shifting from consumption to 'pro-saving' at a community level may be achieved without the stage of 'prosumption'. This may be achieved for example through smart metering assisted demand and load management or the abovementioned combination of supply and storage technologies that may leapfrog several scales of generation and demand management. Furthermore, communities which are interested in getting involved in sustainable energy can have a key part to play, by bringing people together to 'do energy differently', by raising awareness of the importance of energy efficiency and enabling communities to challenge the existing supply-based energy system by encouraging them to become 'pro-savers' in their own right.

Methodology

The chosen research design used in this paper is based on a review of relevant academic and policy literature and analysis of community energy case studies. Community energy projects usually take place in civil society arenas, organised by groups which are diverse and undertake a range of different community energy activities (Seyfang et al., 2013a). Yin (2009) argues that case study methodology can be used to study "a contemporary phenomenon in depth and within its real-life context" (p. 18). Case studies are particularly useful in qualitative research, which seeks to examine a range of actors, and they can be "used where no single perspective can provide a full account or explanation of the research issue, and where understanding needs to be holistic, comprehensive and contextualised" (Lewis, 2012, p. 52). A case study approach was chosen for this paper as it allows the analysis of real-life experiences.

The case studies analysed in this paper, South East London Community Energy, Lyndhurst Community Centre and Hyde Farm Climate Action Network were chosen both for practical reasons and because they represent three different types of emerging approaches to community energy. As mentioned above, the combination of government subsidies for the uptake of distributed renewable energy technologies, increasing civil-society engagement in energy generation and demand management, and technological advancement are increasingly opening the pathways for communities. Our aim is to establish whether a shift from community energy generation towards demand management is evident. Specifically, this involves a look beyond sustainable energy supply, and towards 'prosumption' and 'pro-saving'. As mentioned earlier, figures used by DECC estimate that there around 5,000 community energy groups active in the UK (DECC, 2014b), while previous academic research has highlighted the diversity of the UK's community energy sector (see for example survey by Seyfang et al., 2013b). Due to the diversity of community energy, it is not possible to define a 'typical' community energy project. Therefore, our approach was to select three community energy projects, which can act as cases, which can test prevailing ideas and are designed so that they represent "experimental isolation of selected social factors or processes within a real-life context" (Hakim, 2000, p. 60) linked to prosuming and emerging 'pro-saving' innovation.

Data collection for two of the case studies, Lyndhurst Community Centre and Hyde Farm Climate Action Network were conducted between 2010 and 2011 (Martiskainen, 2014a) and data on SELCE in 2014. The data collection included document analysis of case, interviews with key actors and presentation attendance at Hyde Farm Climate Action Network and SELCE presentations. Our analysis does not attempt to compare the different cases, but rather to highlight the type of action and projects that community energy groups have taken in the UK.

Community energy case studies

Our three case studies are used to illustrate the different types of community energy action that have taken place in the UK, highlighting examples of 'prosumption' and 'pro-saving'. These include a community energy group that is in the process of moving towards prosumption, with an aim of also addressing fuel poverty (South East London Community Energy); a

community group, which has addressed the energy efficiency of their community building and by installing also renewable energy, have become a successful prosumer (Lyndhurst Community Centre); and a neighbourhood network, which created their own service of draught proofing and became 'pro-savers', also sharing their experience with other community groups (Hyde Farm Climate Action Network).

SOUTH EAST LONDON COMMUNITY ENERGY

South East London Community Energy (SELCE) is an Industrial and Provident Society for the Benefit of the Community founded by a group of people in London's Royal Borough of Greenwich in 2013 with the aim to generate renewable energy in South East London 'by the community, for the community' (SELCE, 2015). It is not atypical as a UK community energy project in that it relies heavily on voluntary labour, it focuses on solar PV and the FiT as a source of income and it aims to address social issues such as fuel poverty. As is increasingly the case, however, the business model is under pressure as the remuneration provided by the FiT is not sufficient to sustain the community energy group's business model as originally intended. When the original business plan was drafted, the FiT derived incomes would have been sufficient to address one of SELCE's key ambitions of helping South East Londoners paying more than 10 % of their income on energy bills reduce their bills and stay warm. A per kWh charge for electricity used by the co-op's partners (schools and community organisations) is now required to supplement the income stream, which is used to leverage funds and matching grant funding. However, tackling fuel poverty and having somebody administer an appropriate programme remains financially impossible under the current business model and the narrow margin provided by the FiT. Every decrease in the FiT makes sustaining the business model even harder and current levels of volunteering required to keep it going in the first place are considered unsustainable.

Following a difficult period of local authority indifference, as they were looking to implement their own renewable energy projects, partnering with the local authority has provided SELCE with access to schools and community organisations by leasing the roof space for 20 years and maintaining the upkeep of the solar PV installations throughout. The benefit of SELCE's approach for these organisations is that their analysis of cumulative discounted cash-flow revealed that commercial leasing arrangements offered to the local authority were only cash-flow positive in the last eight years as opposed to their own model which would provide continuous benefits throughout the duration of the FiT thanks to cheap electricity. SELCE's tacit knowledge enabled the establishment of a trusted relationship with these organisations and as a consequence also better links to the local authority. However, this example also shows how difficult it is to build an inclusive business model based on informal networks and a subsidy scheme designed to both reflect falling prices in technology, installation and administration and to actively contribute to these price reductions by encouraging diffusion (in the absence of supply chain bottlenecks). Using the FiT as a basis for further community energy engagement has nevertheless proven very popular since its introduction but falling tariffs partly reflecting falling prices, partly reflecting anticipated falls in prices often prove too haphazard for the sustenance of not-for-profit business models.

Despite SELCE's convincing business model, the local authority itself is considering the establishment of an Energy Service Company, also known as an ESCO, to derive their own income streams both from renewable energy generation and potentially also from reduced energy expenditures as a consequence of installing energy efficiency measures. Further problems for SELCE have arisen through complex ownership and management arrangements, often referred to as split incentives and the tenant-landlord problem. However, the local approach of SELCE along with their tacit knowledge of the community and the local authority has mitigated against this potential conflict of interest.

Despite these setbacks, SELCE is pushing ahead with its first share offer which will help raise money for installing solar PV panels on a community centre and two schools and provide investors with the possibility of tax breaks of up to 50 %. In total, the planned installations will have a capacity of 233 kWp, saving 94 tCO_2/a. Several intermediary organisations such as Project Dirt and Community Shares will play an important role in promoting SELCE's share offer and representing the community group as part of a wider movement towards distributed generation, demand reduction and demand side response at a community level.

LYNDHURST COMMUNITY CENTRE

Lyndhurst Community Centre is located in the village of Lyndhurst, the New Forest, Hampshire. The Community Centre was built in 1962 and is run as a charity, owned by the Lyndhurst and District Community Association (LDCA). The Community Centre is used regularly by around 40 local groups and businesses, and it also has a library. Regular activities take place at the Community Centre, including weekly exercise classes, art exhibitions, music events, local council meetings and farmers' markets.

During 2009 and 2010, Lyndhurst Community Centre went through a complete, £788,000 refurbishment. The building faced potential closure due to poor condition, which had also resulted in high heating bills. The building had for example a three-part heating system consisting of two gas heaters and one electric heater. Furthermore, the building had a high ceiling, poor quality single glazed windows, a roof that was not insulated and draughty doors, making it inefficient and expensive to run. As a result of the refurbishment project, which included energy efficiency measures and renewable energy installation, the Community Centre ensured its continuity as a central place in the village. New windows and doors were installed, together with extra insulation and lowering the ceilings. Furthermore, the Community Centre became the first community building in the New Forest area to install a biomass heating system, also acting as an example for other community groups in the New Forest area and beyond.

Funding for the project came from various sources, including the Big Lottery, local authorities and the New Forest National Park Authority, as well as from people in the local community. One of the fund raising activities included for instance a 'Buy a Brick' campaign, which allowed people to donate money towards the project. Raising funds for the project took a lot of time and effort, especially in terms of the Centre Manager having to consider issues such as business plans and expected outputs from the refurbishment such as estimated number of

users. However, the Community Centre received information and advice from the New Forest National Park Authority, as well as the Big Lottery, which was their largest funder. Nevertheless, without the persistence of the Centre Manager, those applications might not have succeeded, given his continued commitment to the Community Centre.

As one of the pioneers in the New Forest for biomass heating, opportunities were created for the development of local wood fuel supply networks. This also meant that the New Forest National Park Authority could facilitate links between local wood fuel supply and demand, creating opportunities to manage woodland that had been neglected over many years. Furthermore, the Community Centre's landlord, the Forestry Commission which has a building on the neighbouring site, was also interested in the project and potentially tapping into the Community Centre's heating system, as the biomass boiler was providing more heat than required for the Community Centre building. This shows that there would have been potential to create a small-scale heating network at Lyndhurst, if only the Forestry Commission would have been keen to get involved at the beginning of the refurbishment project. The New Forest National Park Authority acted in an intermediary role in this case, helping the Community Centre and also learning by the biomass experience themselves, though further collaborative action would have been required to enable a larger heat network to be developed from the start.

Tacit knowledge, especially of the local networks, played a key part in the Lyndhurst Community Centre case in terms of creating the project team, which was led by the Community Centre's Manager. He had an extensive network of contacts, which allowed him to establish a knowledgeable team. Not only did he know a lot of local people and businesses, such as architects, builders and lawyers that were beneficial to the project, but he was also good at spotting local talent by getting people, such as a person with a renewable energy background, involved in the project. Furthermore, as he had spent the majority of his employment role before retirement as a local director for marketing and sales for a large international corporation, he had the skills and knowledge to seek funding opportunities and fill in sometimes complicated funding applications. The Lyndhurst Community Centre's refurbishment was a success and over 200 people attended its opening day, including a local Member of Parliament. The success of the project was partly down to the skills of the people involved in the project, but also down to their willingness to act as pioneers and install, not only improved energy efficiency measures, but also renewable energy technology that was new in their local community.

HYDE FARM CLIMATE ACTION NETWORK

Hyde Farm Climate Action Network (CAN) was set up in London in 2007 by a group of neighbours who were interested in energy and climate change issues. Most houses in the neighbourhood at Hyde Farm, located in Balham, South London, were built in the Edwardian times and they have single brick walls, high ceilings and single glazed windows, meaning that many of the houses were draughty and hard to keep warm. Furthermore, as the majority of the houses in the Hyde Farm estate are located in a conservation area, there are planning restrictions to the type of energy efficiency measures and improvements that could be considered for the houses. For instance double glazing and solid wall insulation on the outside of the property are not always allowed in conservation areas. Furthermore, the group was also concerned about how much potential improvements would cost, as solid wall insulation and double glazing can be very expensive, and hence the neighbours wanted to find affordable energy efficiency measures.

The Hyde Farm CAN group started to initially meet at people's houses to talk about issues such as climate change and energy efficiency. They also applied for and received support from ECHO Action programme, which provided the group general advice on sustainable living, including energy efficiency measures. However, as the ECHO Action meetings were held in a local church hall and were often rather abstract, residents were sometimes left puzzled by what they could actually do in their own homes. One of such sessions dealt with draught proofing sash windows and as the church hall did not actually have any sash windows to demonstrate with, the group decided to hold their own draught proofing session at one of the residents' homes. This session proved popular and led to a monthly 'Draught Busting Saturday' event, where members of the Hyde Farm CAN would draught proof one house at a time, demonstrating to other residents how it was done. They found a local company to supply affordable draught proofing materials, such as professional draught proofing tapes and seals that were installed in sash windows. The group also had two members who trained others and helped them to do draught proofing, in order to demonstrate in practice what was possible and also spread knowledge within the Hyde Farm CAN members. Furthermore, the group also wanted to help specifically those who were on low incomes and this was possible through a grant they were awarded from a British Gas Green Streets programme. The funding from British Gas was in fact in British Gas services rather than in monetary form. At first, the group conducted a survey with 40 households who were interested taking part in the programme. Following the survey, which for instance asked residents what energy efficiency or renewable energy measures they had in place, Hyde Farm CAN decided to divide the British Gas services so that they would be allocated as fairly as possible, especially considering those on low incomes, while at the same time optimising energy savings and choosing maximum carbon per pound value. Hyde Farm CAN estimated that they would get the best energy savings from a combination of measures. With the Green Streets aid they received £20,000 worth of solar PV installation at a local primary school (the parents invested further £11,000). Furthermore, three houses were installed with solar thermal water heating, while six houses received loft insulation and nine residential boilers were replaced with more energy efficient models. As British Gas did not offer draught proofing at the time, Hyde Farm CAN negotiated with them and proceeded to install the draught proofing measures themselves, with material acquired from British Gas. This allowed the Hyde Farm CAN group to draught proof 60 houses.

The Draught Busting Saturday concept proved a popular and an affordable way for the Hyde Farm CAN members to improve the energy efficiency of their homes, as well as help those who were on low incomes. The group were very keen to get as many neighbours involved as possible and especially with the Draught Busting Saturdays, they were keen to help each other and act together as a group to improve not only the energy efficiency of the houses but also the community coherence of their neigh-

bourhood. Physical problems such as old housing can initiate community energy projects, with issues such as finding solutions together as a group also playing a key part. The Hyde Farm CAN group was also active in sharing their experience with other community groups, for instance by organising events. Furthermore, one of the core members of Hyde Farm CAN ended up working as a Sustainability Officer at the local authority and spread her experience from the Hyde Farm CAN with other community groups. These included especially issues such as how to apply for funding and deal with funders. This shows that community energy initiatives have the potential to spread through actors who work in intermediary roles and can translate experience from one project to another. If some of the softer, tacit skills and knowledge, such as how to set up a community group or organise meetings, may be challenging to translate to other projects, at least in the Hyde Farm CAN case issues such as how to apply for funding, how to deal with funders and how to apply certain energy efficiency measures in their local setting were lessons that could be shared also with others.

Discussion

THE EMERGENCE OF THE 'PRO-SAVER'

The case studies provide a brief overview of different approaches to community energy in the UK. Only the Hyde Farm CAN case focuses specifically on energy demand reduction through draft proofing, while SELCE and Lyndhurst Community Centre provide useful insights into the nature of energy engagement and the transition towards prosumption at the community scale in the UK.

SELCE, as mentioned above, is a community energy group facing issues similar to many other community energy groups in the UK that placed high hopes in the FiT but were subsequently overburdened with administrative and bureaucratic requirements. An example of a community energy group that has successfully taken advantage of the FiT is Brighton Energy Co-op (BEC, 2015). By focussing on the sustainability of its business model it has succeeded in raising £700,000 for its solar PV projects. Arguably, other priorities, such as fuel poverty alleviation, however, have had to be scaled back in the process. The difficulty of community engagement in 'prosumption' is evident from these examples as the commitment required to sustain co-operative business models often limits the capacity to take a step towards energy demand management and 'pro-saving'.

Lyndhurst Community Centre shows how community groups can address not only energy efficiency concerns, but also become prosumers within the energy system by creating their own energy supply. The Lyndhurst case demonstrates how the refurbishment of the community centre building created opportunities for local wood fuel supply networks to emerge. In Lyndhurst Community Centre's case the means of energy generation are owned by the community centre itself, indicating how technological developments can be adapted innovatively by community groups (Bergman, 2011; Nolden, 2013a, b). Furthermore, the use of tacit knowledge was evident especially in the form of using local networks for funding opportunities as well as for the actual project delivery.

Despite Lyndhurst Community Centre acting as a pioneer in biomass heating in the New Forest, this case had somewhat less evidence of a community energy concept being actively shared to other groups, as was the case at the Hyde Farm CAN case. At Hyde Farm, the community group addressed a problem that was facing many people in their local community, i.e. how to improve the energy efficiency of draughty and hard to heat houses. The renewable energy installations and the Draught Busting Saturday concept demonstrated not only the ability of Hyde Farm CAN to grasp technological measures and modify those to suit their community's needs, but the group was also willing to share their experience and learning with other groups. Furthermore, the group at Hyde Farm did not just accept the operating structures of their funding organisation, the incumbent British Gas, but wanted to proceed with the Draught Busting Saturday concept. In other words, Hyde Farm CAN became 'pro-savers', engaging with and addressing renewable energy and energy efficiency within their community and beyond.

SOCIO-TECHNICAL CHANGE AND EMERGING CHALLENGES FOR EXISTING ENERGY SYSTEMS

In terms of socio-technical change, shifting engagement with energy at a community scale could potentially be paradigmatic, with an increasing number of communities and individuals seeking multiple engagement pathways with energy through a combination of demand reduction, demand side response and distributed energy, as opposed to just distributed energy generation. As our case studies show, community energy projects can have differing motivations, which can be addressed through different types of sustainable energy measures and installations, including both energy efficiency measures and renewable energy. Community approaches with a particular focus on fuel poverty alleviation already indicate the power of the 'pro-saver' with conventional technologies but significant advances towards demand side reduction and energy management at the community scale have yet to emerge. Business models relying on generation technologies and associated subsidies, on the other hand, rarely prove sustainable, while merging demand and services provides a greater challenge to the incumbent energy system in this context.

The UK's specific energy policy aside, 'pro-saving' is growing in potential and importance thanks to technological innovation and the rescaling of energy governance. Most of it is currently limited to distributed generation and demand reduction but falling prices of storage technologies, especially for electricity thanks to growing emphasis on electric mobility, is providing greater opportunities for deeper socio-technical change in terms of demand side response or entirely off-gird solutions. Known as 'grid defection' (RMI, 2014), this approach combines distributed generation and demand reduction to an extent that it does not require backup from a centralised provision infrastructure. This does not address the 'pro-saving' required for effective demand side response but it helps illustrate that conventional wisdom regarding consumers, even 'prosumers' requires a serious rethink, particularly at the community level.

Conclusion

As mentioned in the introduction, the often quoted figure of 5,000 community energy groups is questionable as a result of the very marginal business case of community energy based on co-operative and social enterprise engagement. As our case

study SELCE for instance shows, community energy is challenging, even despite the existing mechanisms that ensure support for renewable energy generation.

Greater possibilities of socially embedding technologies and in moving consumers to 'pro-savers' may lie in the combination of social innovations with different technology sources as well as emerging IT supported management practices. The community scale is of particular importance in this context as it allows inertia among individuals and groups to be tackled by addressing specific issues that arise through tacit ('sticky') knowledge (Gertler, 2001) and tacit support for the sake of community empowerment. The rapidly diversifying scale of technological application in particular also enables the development of community energy coalitions independent from centralised energy supply infrastructures and subsidy schemes.

Liberation from subsidies and top-down technological diffusion aids, such as the FiT or grant programmes that have been designed to be more to the funders' needs than the actual communities' needs, is particularly important for community energy as it implies a step towards maturity and empowerment. For instance by effectively replacing the FiT with a storage and distribution option at a household, building or multi-building scale, the focus shifts from pure generation to demand management and a prosumer is transformed into a 'pro-saver'. In its simplest form it could include storage capacity, such as a car battery, to an existing solar PV system. This constellation would reduce the need for grid electricity even after dark and stimulate energy demand reduction in light of volatile energy prices.

POLICY RECOMMENDATIONS

Combinations of technological with social innovation are particular important in fostering alternative development trajectories to the incumbent centralised, supply focused energy system not only for communities but potentially for a wide range of actors at the sub-national scale. Developing the applicability of emerging technologies to the building or community scale also encourages the development of business models with a significant engagement and empowerment component.

Policy recommendations depend on how these emerging collections of technological and social innovations are perceived. It they are considered a threat to the centralised system, which is assumed to maintain its grip and capacity to steer innovations, governments may shy away from providing any structural support to accommodate alternative scales to the existing demand management options. If, on the other hand, it is considered as an opportunity to foster a more decentralised and empowered energy system, expensive plans to 'green' large-scale energy generation and supply infrastructures could be scaled down to accommodate and foster a greater range of 'pro-saving' social innovations.

RECOMMENDATION FOR FUTURE RESEARCH

There is further research needed for the concept of the 'pro-saver', especially in community settings, including both technical and social aspects. The role of tacit knowledge for instance could be explored further, as well as what technical options there are for rescaling the energy system in the UK and transforming from the current state of affairs to a more centralised system that would truly support community energy. Above-mentioned private wire microgrids (Nordman et al., 2012), for example, provide options for combining demand reduction with demand side response and distributed energy. The potential for community engagement and empowerment should not be neglected in this context. Certain IT, information and lighting services may be provided at very low cost and entirely separate from expensive centralised supply infrastructures. In these instances, demand may be entirely removed from conventional supply infrastructures (see point above about 'grid defection'). All these emerging areas of technological and social innovation require more attention to assess their capacity in relation to centralised generation infrastructures.

References

Aneiro, M., 2014. Barclays Downgrades Electric Utility Bonds, Sees Viable Solar Competition, http://blogs.barrons.com/incomeinvesting/2014/05/23/barclays-downgrades-electric-utility-bonds-sees-viable-solar-competition/ [Accessed 27.02.2015].

BEC, 2015. Powering renewable energy in Brighton, Brighton Energy Co-operative, http://www.brightonenergy.org.uk/ [Accessed 27.02.2015].

Bergman, N., 2011. Climate change – what role for social innovation and social movements? Energy and people: futures, complexity and challenges conference, Lady Margaret Hall, Oxford, 20-21 September 2011.

Centre for Human Rights in Practice, 2015. Reports on the Impact of Public Spending Cuts on Different Disadvantaged Groups within the UK, University of Warwick, UK.

Darby, S., 2006. Social learning and public policy: Lessons from an energy-conscious village. Energy Policy, 34, 2929–2940.

DECC, 2011. Feed-in tariffs scheme: consultation on Comprehensive Review Phase 1 – tariffs for solar PV, Department of Energy and Climate Change, London, UK.

DECC, 2012. The Energy Efficiency Strategy: The Energy Efficiency Opportunity in the UK. November 2012. Department of Energy and Climate Change (DECC).

DECC, 2014a. Community Energy. Department of Energy and Climate Change. https://www.gov.uk/community-energy [Accessed 27.02.2015].

DECC, 2014b. Community Energy Strategy. Department of Energy and Climate Change, London.

DECC, 2014c. D3: Opportunities for integrating demand side energy policies. Department of Energy and Climate Change, London.

DECC, 2014d. Reducing the UK's greenhouse gas emissions by 80 % by 2050. Department of Energy & Climate Change, Committee on Climate Change, Department for Environment, Food & Rural Affairs and Department for Transport.

EC, 2009. Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC Text with EEA relevance. European Commission.

EC, 2015. Energy Union: secure, sustainable, competitive, affordable energy for every European, European Commission – Press release 25 February 2015, Brussels, Belgium.

Feijao, S., 2014. FITS: UK government publishes response to consultation on support for community energy projects. 2 Degrees Network. https://www.2degreesnetwork.com/groups/2degrees-community/resources/fits-uk-government-publishes-response-consultation-support-community-energy-projects/ [Accessed 27.02.2015].

Geels, F.W., Deuten, J.J., 2006. Local and global dynamics in technological development: a socio-cognitive perspective on knowledge flows and lessons from reinforced concrete. Science and Public Policy 33, 265–275.

Hakim, C., 2000. Research Design. Succesful designs for social and economic research. Second edition. Routledge, London.

Hargreaves, T., Hielscher, S., Seyfang, G., Smith, A., 2013. Grassroots innovations in community energy: The role of intermediaries in niche development. Global Environmental Change 23, 868–880.

Lewis, J., 2012. Design Issues, in: Ritchie, J., Lewis, J. (Eds.), Qualitative Research Practice. A Guide for Social Science Students and Researchers (Original published in 2003). SAGE Publications Ltd, London, pp. 47–76.

MacGill, I., 2013. From Energy Consumers to Prosumers – Engagement of users in both self-generation and energy management. Presented at the EUAA Conference, Brisbane, Australia. October 2013.

Martiskainen, M., 2014a. Developing Community Energy Projects: experiences from Finland and the UK, Doctoral thesis, Science Policy Research Unit (SPRU), University of Sussex, Brighton. http://sro.sussex.ac.uk/51506/ [Accessed 27.02.2015].

Martiskainen, M. 2014b. Davey: Energy Efficiency Key Agenda in Upcoming Elections. Sussex Energy Group at SPRU. October 2, 2014. http://blogs.sussex.ac.uk/sussexenergygroup/2014/10/02/%C2%ADdavey-energy-efficiency-key-agenda-in-upcoming-elections [Accessed 27.02.2015].

Moulaert, F., MacCallum, D., Mehmood, A., Hamdouch, A., 2013, The International Handbook on Social Innovation – Collective Action, Social Learning and Transdisciplinary Research, Edward Elgar, Cheltenham, UK.

Murray, J. 2014. Labour declares "war on cold homes". Business Green. http://www.businessgreen.com/bg/news/2371662/labour-declares-war-on-cold-homes [Accessed 27.02.2015].

Nolden, C., 2013a. Regulating the diffusion of renewable energy technologies: Interactions between community energy and the feed-in tariff in the UK. PhD Thesis submitted to the University of Exeter, February 2013.

Nolden, C., 2013b. Governing community energy – feed-in tariffs and the development of community energy schemes in the United Kingdom and Germany. Energy Policy, 63: 543–552.

Nolden, C., forthcoming. Spatial lock-in and scalar path-dependency in the UK electricity sector: A local energy perspective.

Nordman, B., Christensen, K., Meier, A., 2012. Think Globally, Distribute Power Locally: The Promise of Nanogrids. IEEE Computer Society: Washington DC.

Ofgem, 2015. Feed-in Tariff (FIT): Quarterly statistics, Office for Gas and Electricity Markets, https://www.ofgem.gov.uk/environmental-programmes/feed-tariff-fit-scheme/feed-tariff-reports/feed-tariff-fit-quarterly-statistics#c-c2990921523887664 [Accessed 27.02.2015].

RMI, 2014. The Economics of Gird Defection, Rocky Mountain Institute, Boulder, CO, USA.

SELCE, 2015. We are SE London Community Energy, South East London Community Energy, http://selce.org.uk/ [Accessed 27.02.2015].

Seyfang, G., Hielscher, S., Hargreaves, T., Martiskainen, M., Smith, A., 2013a. A Grassroots Sustainable Energy Niche? Reflections on community energy case studies. 3S Working Paper 2013-21. Norwich: Science, Society and Sustainability Research Group.

Seyfang, G., Park, J.J., Smith, A., 2013b. A thousand flowers blooming? An examination of community energy in the UK. Energy Policy 61, 977–989.

Smith, A., 2005. The Alternative Technology Movement: An Analysis of its Framing and Negotiation of Technology Development. Human Ecology Review 12, 106–119.

Stirling, A., 2014. Chapter 4: Making Choices in the Face of Uncertainty: Strengthening Innovation Democracy. In: Peplow (ed.) Innovation: Managing Risk, not Avoiding it. Government Office for Science, London.

Wagner, R.K., Sternberg, R.J., 1985. Practical Intelligence in Real-World Pursuits. The Role of Tacit Knowledge. Journal of Personality and Social Psychology 49, 436–458.

Walker, G., Hunter, S., Devine-Wright, P., 2007. Harnessing Community Energies: Explaining and Evaluating Community-Based Localism in Renewable Energy Policy in the UK. Global Environmental Politics 7, 64–82.

Yin, K.R., 2009. Case Study Research, Design and Methods, Fourth Edition. SAGE Publications, Thousand Oaks.

Acknowledgements

This paper is based on research, which has been enabled through the Centre on Innovation and Energy Demand, funded by the RC UK's EUED Programme (grant number EP/KO11790/1). This funding is gratefully acknowledged.