Comparing community energy development in Finland and the UK

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Keywords

community energy systems, energy savings, renewable energy, niches, innovation

Abstract

This research paper focuses on the development of community and local energy projects in Finland and the UK. Finland has relatively little citizen-led community energy activity, but in the last few years small, innovative local projects have started to emerge. UK, on the other hand, has had a surge of interest in community energy for several years. This paper looks at community energy in the two countries through the eyes of four case studies, two in each country. These include citizen-led sustainable energy activities such as replacing fossil fuel based heating with renewables and developing local energy efficiency activities. Community energy is approached through strategic niche management theory and seen as a niche, a space within which innovative activity can take place, develop and potentially diffuse. Data from interviews with 12 community energy practitioners and 10 intermediary organisations are used to answer questions on what is a community energy niche and how do projects interact with that niche. The successful development of community energy projects is often down to several factors. The community energy projects analysed for this research have been aided by dedicated leaders, external funding sources and the ability to seek new information, adapt that to each individual circumstance and learn in the process.

Introduction

Problems caused by climate change and rising energy prices have meant that households and communities are seeking new ways by which to tackle their increasing energy consumption and related costs. By working together, communities have the power to mobilise their members and develop sustainable energy projects such as renewable energy generation or energy efficiency measures. This research focuses on the development of community energy in two European countries. In 2009 the European Commission established a target to increase members states' renewable energy generation to 20 % by 2020 and reduce carbon dioxide (CO_2) emissions by 20 % below 1990 levels in the same timeline (EC, 2009).

This article compares the development of community energy in Finland and the UK. These countries were chosen for comparative case study analysis as they are at different stages of development regarding low carbon energy initiatives, especially at the community level. Citizen-led community energy activity has flourished in the UK in the past five years, while it is still relatively new in Finland. This article aims to unveil the potential differences and similarities of community energy development in these two countries, by reflecting on semi-structured interviews with community energy practitioners, i.e. people who have been active in developing projects in their local area. In order to find out whether there is a concept for successful community energy projects, the UK, where there is a lot of activity in this area, is reflected on another country in the EU, Finland, which has much less actual citizen-led community energy projects. This article aims to answer the following overarching research question: what is a community energy niche and how do projects interact with that niche?

What is community energy?

The focus of this article, 'community energy', has several definitions in the energy research and policy literature (see for instance DECC, 2013; Schweizer-Ries, 2008; Walker & Devine-Wright, 2008). Community energy projects can include initiatives such as energy saving projects, renewable energy co-operatives, energy advice groups and energy awareness campaigns. What is common to them is that they are usually activities initiated by groups of citizens rather than led by businesses, large commercial organisations or national governments. Some of these projects also have links to their local authority, for instance in the form of funding support and advice on local planning. Many of these projects also aim to reach wider audiences, encouraging others to engage with sustainable energy and take action (Walker & Devine-Wright, 2008). In the UK energy research literature communities who set up energy projects are usually understood to mean people who either share locality (i.e. live in the same geographical region) and/or have shared interests (e.g. shared interest in politics) (Walker, 2008).

Walker (2008, p. 4401) divides community energy projects in the following categories: 1) co-operatives, such as windfarms and community heating projects; 2) community charities, such as associations and organisations; 3) development trusts which raise funds for community energy projects; and 4) shares owned by a local community organisation, for instance in energy projects. The definition of community energy can be wider than just locality and interest. Walker and Devine-Wright (2008) go further by extending their analysis of community energy to process and outcome. Process is about who the project is developed by and outcome about who it is developed for (Walker & Devine-Wright, 2008, p. 498). In the case of Finland, citizen owned energy projects are still sparse, but the concept of 'local energy' (*lähienergia*) is being increasingly discussed (Vehviläinen et al., 2010). These are low carbon energy projects developed within the local area, using local knowledge and networks. In Finland, there are also several municipal energy companies, though those are not considered to be community energy projects within the remits of this research as the focus is on projects that are led by citizens. The definition of community energy hence varies to some degree in the two countries. The term community energy is thus not fixed. In this research, community energy is defined as low carbon energy generating or energy saving projects, which are developed by groups of people who live in the same locality.

WHY STUDY COMMUNITY ENERGY?

Before explaining the theoretical framework chosen for this article and deeper analysis of the community energy projects in Finland and the UK, it is important to explain the rational behind this research and why focus on community energy. In relation to wider European energy policy objectives of low carbon energy production, demand reduction and energy security, local energy solutions can have a part to play in providing energy generation and saving at the point of usage. Through their local and tacit knowledge (Darby, 2006), motivation and inspiration, local communities can often have the best ideas on how to deal with issues such as climate change facing their neighbourhoods. Local communities and civil society groups can be "well placed to influence government and business, using their varied relationships with decision makers and key stakeholders to demand more ambitious progress on tackling climate change" (Scott, 2010, p. 3). Sustainable behaviours such as car sharing schemes, organic food groups and community wind farms are examples of local communities coming together, forming new behaviours and believing these will benefit them and the environment.

Benefits of community energy schemes can include monetary benefits as project costs may be shared (Walker, 2008), regeneration of local areas (Walker, Hunter, & Devine-Wright, 2007), raising awareness of sustainable actions (Walker et al., 2007), expanding knowledge through learning from social networks (Darby, 2006) and others' experiences (Vehviläinen et al., 2010) and reducing emissions (Rogers et al, 2008). However, the latter can be difficult to measure, as evaluation of emissions savings especially from community energy projects is still relative sparse. In a recent survey of 119 community energy projects in the UK, 61 % measured their energy generation, 52 % measured their energy saving and 50 % calculated their carbon footprint (Park, 2012). Furthermore, communities are not always necessarily harmonious and projects can also face fraction within the groups of people who organise them (personal communication with one interviewee who did not want to be linked to his/her community energy project at all). This article concentrates on community energy projects in which local citizens have decided to produce low carbon energy generation or energy saving solutions, which can address both heat and electricity. It does not include projects initiated by commercial energy utilities or local authorities, even though the projects may have links to them in the form of information, advice and funding. Hence key motivators, drivers and doers of the community energy projects are the local citizens themselves.

Community energy and sustainability transitions

The theoretical framework used in this article is based on an interdisciplinary approach using concepts from socio-technical transitions, especially strategic niche management (Geels, 2002; Geels & Deuten, 2006; Smith, 2007), and previous research on community energy (Rogers et al., 2008; Vehviläinen et al., 2010; Walker, 2008; Walker & Devine-Wright, 2008; Walker et al., 2007). Key framing for this study is the transition from fossil fuel based 'dirty' energy solutions to low carbon, 'green' energy solutions. The transition to a more sustainable energy system can be achieved by developing new low carbon energy generation technologies but also by changing the way consumers and end-users, in this case communities, utilise those technologies and behave in the system. Transitions are usually complex, long term processes, which create shifts in socio-technical 'regimes', for instance in the way by which energy is supplied and used in the system (Raven et al., 2010). The change in socio-technical regimes can be initiated by pressures in the 'landscape' level, examples of which include for instance the requirement to develop low carbon energy innovations in order to deal with climate change. These innovations (e.g. new technologies, behaviours) take place in protected spaces, or 'niches', which allow for "*radical novelties*" to develop (Geels & Raven, 2006, p. 377). Niches have the potential to transform an existing regime, and they usually start to develop at the local level, in local projects.

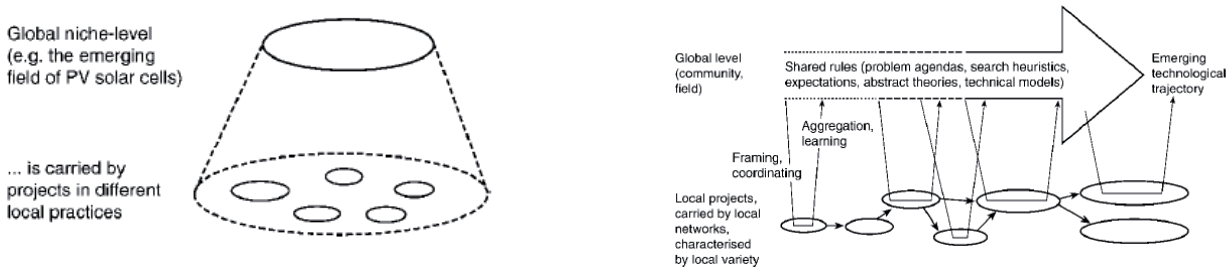

Figure 1. Local projects and the emerging niche at global level (Geels & Raven, 2006).

Once established and replicated, a global niche level emerges, for instance a new field such as solar PV (Geels & Raven, 2006). Transitions can take a long time due to institutional, social and technological lock-in (Raven et al., 2010). Regimes exist because certain laws and regulations are in place, social networks support old systems and large incumbent actors rule technological artefacts and infrastructures (Raven et al., 2010).

Strategic Niche Management provides an insight in the way new innovations, or niches, develop and potentially diffuse. Niches are defined as "spaces that shield experimental projects with radical innovations from too harsh selection pressures from incumbent regimes" (Raven, 2012, p. 126). Previous research has identified different types of niches, for instance 'technological niches' (new developing technologies) (Verheul & Vergragt, 1995), 'small market niches' (separate from existing market regime) (Geels & Raven, 2006) and 'green niches', sustainable actions which take place at civil society level (Geels & Raven, 2006; Seyfang & Smith, 2007; Smith, 2007). Geels and Deuten (2006) differentiate between local knowledge (space where technologies operate) and generic global knowledge (space shared between actors in a technical community), and recognise that "new technologies emerge as small technical steps in response to local problems, and only later give rise to new technical trajectories" (Geels & Deuten, 2006, p. 266).

Niches usually start to develop at the local, grassroots level and they can have the potential to challenge and transform an existing regime. In order for local knowledge to reach global level, it needs to be in a form that is context-free and replicable to other places, conditions and locations (Geels & Deuten, 2006). Global knowledge creation includes the creation of standards, formulating best practice and establishing intermediary actors – professional organisations and networks – which create platforms for collective interests and provide generic knowledge to the global field beyond the local actors (Geels & Deuten, 2006). Intermediary organisations are developed as part of "a new technical community" and they also operate through forums such as conferences, seminars and technical journals (Geels & Deuten, 2006, p. 267–268). In order to diffuse and reach the mainstream regime level niches require protection (Raven, 2012). For niches to replicate and diffuse, shared knowledge and learning from other projects and networks is important.

COMMUNITY ENERGY AS A NICHE?

Grassroots innovations are embedded in socio-technical transitions theory in a sense that they can be seen as innovative, 'green niches' (Seyfang & Smith, 2007, p. 585). Such innovations are usually created especially to promote sustainability in response to the needs of the local community and with an aspiration that one day such initiatives may become a norm: "niche practices that resonate with widespread public concern sometimes catch on, get copied, become adapted and spread" (Seyfang & Smith, 2007, p. 589). Community energy projects usually operate at the civil society or grassroots niche spaces, which can provide a protective environment (Smith, 2012). These 'grassroots innovations' combine the more technology-focused strategic niche management with bottom-up civil society action (Seyfang & Smith, 2007). Grassroots innovations, such as car share clubs, composting networks and community energy, are often driven by "social need and ideology" (Seyfang & Smith, 2007, p. 591) and undertaken by civil society actors (citizens, community groups, voluntary organisations and social enterprises) rather than dominant market players such as businesses or utilities.

This article approaches the concept of community energy as a niche, a space within which innovative activity can take place, and analyses how projects in two different countries, Finland and the UK, interact with that niche. The development of community energy projects, where citizens come together and develop their own low carbon energy projects, often involve innovative practice or activity (Seyfang & Smith, 2007). In the case of the community energy niche, intermediary organisations such as funding bodies, advisory organisations and voluntary networks can act as sources of protection by providing information, funding, help and shared learning.

Community energy cases

In order to analyse the community energy niche, two countries with a different level of community energy projects are chosen for analysis: the UK and Finland. Both countries use a mix of energy generating technologies including fossil fuels and renewable energy generation, but they differ in institutional structures in a sense that the UK's socio-technical energy system is largely dominated by centralised actors with six large energy companies dominating the market. Finland, on the other hand, has a more decentralised system compared to the UK, with municipal actors who have both large and medium scale generation. What is common to both countries is that they use a mix of energy generation sources, are either building (Finland) or considering to build (UK) new nuclear plants and are obliged to increase their share of renewable energy generation under EU policy. By 2020, Finland is expected to increase its share of renewable energy generation to 38 % (compared to 30.5 % in 2008) and the UK to 15 % (compared to 2.2 % in

2008) as per EU targets[1] (EU, 2013). However, despite the interest in large conventional energy projects, there also remains an interest in low carbon renewable energy projects at the local, community level, in both countries.

Community energy is analysed in a cross-national context, i.e. the nations/countries are defined as geopolitical and sociocultural entities (Hantrais, 2009). Given the resource limitations of this research, two community energy projects in the UK and in Finland were chosen for closer analysis, and projects were selected according to expectations about their information content (Flyvbjerg, 2011). As Flyvbjerg puts it, "generalizability of case studies can be increased by the strategic selection of cases" (Flyvbjerg, 2011, p. 306). Furthermore, small-scale qualitative cross-national research can have the advantage that it allows the researcher to study certain phenomena "'from inside', in their cultural and social context, in actual local practices, and in people's everyday life" (Gómez & Kuronen, 2011, p. 685). The four community energy projects were selected as *maximum variation cases* (i.e. they were different in organisation, size, type of technology and location) (Flyvbjerg, 2011). Maximum variation criteria for the chosen projects were: projects that had different types of community organisation; projects that involved different types of technologies (e.g. either energy saving or low carbon renewable energy generation); projects that had different types of funding structures; projects that were located in different geographical locations and projects that interacted with the community energy niche in different ways. This allowed the collection of rich and diverse data from fieldwork and the analysis of potential common themes emerging on community energy project development (e.g. motivations, leadership), shared learning (e.g. funding sources, information), networking and any evidence of potential diffusion by sharing experience (Geels & Raven, 2006).

UK CASE

Community energy in the UK has flourished in the last five years, with several hundred projects being planned and developed across the country. There is an increasing interest from citizens to get involved in community energy projects and various funding programmes have supported such activities, including the Community Sustainable Energy Programme (CSEP), Feed-in Tariffs, Renewable Heat Incentive as well as several funding programmes provided by energy utilities and local authorities. Previous research has identified at least 500 community renewable energy projects in the UK (Burton & Hubacek, 2007; Park, 2012; Walker, 2008). However, the actual number of projects is likely to be larger as previous research has only been able to take a snapshot of the UK's diverse community energy sector. Despite a recent surge in interest, activity and funding in community energy development in the UK, projects still take time and effort to develop. The UK projects chosen for closer analysis were selected from a sample provided by project Community Innovation for Sustainable Energy, of which this research forms a small part. Based on maximum variation case selection Lyndhurst Community Centre, located in Lyndhurst, Hampshire, and Hyde Farm Climate Action Network, located in Balham, London, were chosen as cases of community energy projects in the UK. These cases are very different in organisation, technology, location and they interacted with the UK's community energy sector in different ways.

Lyndhurst Community Centre

Lyndhurst Community Centre is a charity-run community building located in Lyndhurst, New Forest, Hampshire. It was built in 1962 and has over the decades become a hub of the village. Over 40 local community groups and businesses regularly use the Centre, and activities range from art, aviation, photography, music and sport to farmers' markets and other special events. During 2009 and 2010 Lyndhurst Community Centre went through a complete, £700,000 refurbishment and as a result the building now houses an improved library, new kitchen, meeting rooms and a biomass boiler. Funding for the project came from various sources, including The Big Lottery, New Forest National Park Authority, local authorities and the local community. Lyndhurst Community Centre was the first community centre in the New Forest to install a biomass heating system, creating also opportunities for local wood fuel supply networks to develop. The refurbishment's part-funder, the New Forest National Park Authority facilitated links between local wood fuel supply and demand, also creating uses for previously unmanaged woodland. Most of the Lyndhurst project's networking was conducted locally.

Hyde Farm Climate Action Network

Hyde Farm Estate, located in Balham, south London, mainly consists of residential houses built between 1896 and 1916. The area was designated as a Conservation Area in 1996 and most of the 1,800 houses in the area are two-bedroom maisonettes or two to three bedroom houses of Edwardian character. A proportion of housing in the estate was originally allocated to injured war veterans. In 2007, a group of 3–4 Hyde Farm residents set up Hyde Farm Climate Action Network (CAN). They had an interest in energy and climate change issues and felt strongly that they wanted to explore how they could take action within their own neighbourhood. Most of them lived in houses with single brick walls and single glazed sash windows and which were hard to keep warm. Hyde Farm residents have run several local activities to tackle energy consumption and raise awareness of climate change amongst residents. These have included for example the installation of draught-proofing and insulation measures, creating community gardens and developing renewable energy generation. Hyde Farm has received external support from programmes such as the Energy Conscious Households in Action (ECHO Action) run by the European Energy Programme and the British Gas Green Streets programme. The Hyde Farm case had strong networking in the local area as well as with national organisations in the UK.

FINLAND CASE

In Finland, community energy as a citizen-lead activity does not exist as widely as in the UK yet. Instead, several energy projects have been developed together with local authorities or municipal energy companies and local district-heating networks are common. In the last two years, however, there has been interest towards more independent projects, separate

1. These figures are based on EU definition as share of renewable energy in final energy consumption, which includes renewable fuels usage and renewable electricity and heat production. Final energy consumption is energy used by industry, households, services, agriculture and transport.

Table 1. Summary of community energy projects.

Case	Lyndhurst	Hyde Farm	Ylä-Kivelä	Kaakonoja
Type of community organisation	Charity	Voluntary network	Housing co-operative	Resident's Association
Technology	Biomass woodfuel	Energy saving	Solar and pellets	Air source heat pump
Funding structure	Grant funding, donations	Grant funding (services)	Residents, grant funding	Grant funding
Location	Lyndhurst, UK	London, UK	Keuruu, Finland	Valkeakoski, Finland

from local authorities. Some funding programmes have also supported community energy projects, such as the Finnish Innovation Fund's (Sitra) "Maamerkit" programme, which has funded ideas for local energy action. The project selection in Finland was hence limited to a smaller sample size than in the UK and selection was conducted with the help of researchers from the Finnish National Consumer Research Centre and their contacts within the Finnish energy researcher field. However, the criteria for the projects were the same as in the UK (maximum variation). Based on the maximum variation criteria, Ylä-Kivelä Apartments in Keuruu and Kaakonoja Residents' Association in Valkeakoski were selected as projects for further study.

Ylä-Kivelä Apartments

Asunto Oy Keuruun Ylä-Kivelä is a residential apartment block in Keuruu, central Finland. The block was built in the 1980 and has 40 apartments and around 50–60 residents. Most of the apartments are owner-occupied and private landlords rent out the rest. In 2009 the block became the first in Finland to replace an oil-based heating system with a solar thermal and pellet heating system. Between the years of 2006 and 2008, the residents in the Ylä-Kivelä apartment block were thinking about other alternatives for their forthcoming oil-based heating system refurbishment. The block had an oil heater, which was around 30 years old and had come to the end of its life. One resident, who was also a caretaker of the block at the time and in charge of the blocks maintenance, started to consider different heating options for the apartment block. At the time the price of oil was rising in the global market, which also reflected heavily on the price of oil-based residential heating. One of the options considered in Ylä-Kivelä was joining the local district-heating network, but this too had its drawbacks, as Keuruu is one of the most expensive district heating areas in Finland. Therefore, alternative options to oil and local district heating were needed and renewable energy became a viable option. Most of Ylä-Kivelä's networking was conducted within the local area, but this activity was rather limited.

Kaakonoja Area Residents' Association

Kaakonoja Area Residents' Association is a residential community association based in Valkeakoski in central Finland. Kaakonoja has around 700 houses built during the 1950s and 1960s. The majority of houses in Kaakonoja are detached, though there are also some modern apartment blocks. The Kaakonoja Area Residents' Association was formed in 1983 and has approximately 250 fee-paying members (membership fee in 2011 was 8 Euros per household). It is a not-for-profit organisation and all income generated by the Association is recycled back to its activities. The Association has organised several events to its members, including spring garden clearing, theatre visits and travel to Sweden and Russia. In 2008 members of the Residents' Association run a nine-month project identifying and ranking air and ground source heat pumps (AGSHPs) suitable for their area. Two residents who have lived in the area since the mid 1970s initiated the Kaakonoja Area Residents' Association Heat Pump Project. A retired journalist, who was also an active member of the association, had an interest in cheaper heating options and together with his neighbour of 30 years (a retired electrical engineer), they started to brainstorm various heating options for their houses. They were partly inspired by a visit to the annual Housing Fair in nearby city Hämeenlinna in 2007[2]. Both men felt that their oil-based heating costs were increasing year-by-year and they wanted to explore some alternative, cheaper options. At the time several heat pumps models were entering the Finnish market, but it was difficult to find independent information from a trustworthy source on various heat pump models. In order to fill this gap, the Kaakonoja Area Residents' Association decided to run a project, which ranked available heat pump models according to certain variables (such as maximum heating output, outside temperature range within which the models operates, cooling power, energy efficiency, noise and guarantee). Following the study, they ended up with three models that were most recommended for the houses in their area and by summer 2012, around 120 houses in the area had installed a heat pump (some of them had installed two pumps). The project also had active networking within the local and regional area.

Community energy in Finland and the UK

Following in-depth semi-structured interviews with community energy practitioners in both Finland and the UK, an analysis of key themes was drawn for the community energy projects. Evidence of niche activity within the community energy projects was analysed in relation to leadership, learning, external funding, networking and sharing experience for instance by organising events (Geels & Raven, 2006). In addition, interviews with the 12 community energy practitioners asked

2. The Housing Fair is an annual event organised by the Housing Fair Finland Co-op. The event consists of new housing areas built to showcase latest research in housing and construction. The Housing Fair is run in co-operation with each host municipality and the area's residents. http://www.asuntomessut.fi/en/english-home

Table 2. Evidence of within community energy projects.

Key themes	Lyndhurst	Hyde Farm	Ylä-Kivelä	Kaakonoja
Monetary ££/€€	Heating costs high	Heating costs high	Heating costs high	Heating costs high
Physical problem	Old building needed refurbishing	Old houses needed refurbishing	Old oil boiler needed replacement	n/a
Environmental	Improve energy efficiency	Climate change concerns	Improve energy efficiency	Improve energy efficiency
Leadership	Clear project initiator and leader	Clear project initiator	Clear project initiator and leader	Clear project initiator and leader
Community cohesion	Several previous activities together	Get to know neighbours better	Several previous activities together	Several previous activities together
Knowledge	Little knowledge about renewables	Little knowledge what to do about climate change	Little knowledge about renewables	Little knowledge about renewables
Learning from others	Visits to other local renewable energy projects	Visits to other local climate action groups	Visits to one other local apartment block with renewable energy	Visits to other houses with heat pumps
Networking	Active local networking	Active local and national networking	Some local networking	Some local networking
External funding	Several external funders (Big Lottery, EU Leader, National Park, local authorities)	Two external service providers (Echo Action, British Gas)	External and internal funding (Government Energy Grant, joint loan)	External funding (EU Leader)
Intermediary organisations	Contact with several funding bodies	Contact with national and local networks	n/a	Limited to one funding body
Innovating	First community centre in New Forest to install biomass	Creating a regular draught-proofing event run by a community	First apartment block in Finland to install pellet and solar thermal	First residents association to run a renewable energy study
Evidence of diffusion	Sharing experience to other community centres; organise events	Sharing experience with several community groups; organise events	Hosting visits and sharing experience to other apartment blocks	Sharing experience to people locally and in neighbouring towns

the extend by which projects had networked with others, or whether they were aware of such networks, how they potentially learnt from others and whether there was any evidence of regular events or conference that projects were aware of. Furthermore, ten interviews were also conducted with intermediary organisations and funding bodies to build a picture of the community energy niche in each country.

In all but one case, key starting motivations for the project were physical and financial. In the case of Lyndhurst Community Centre, their community centre building was in desperate need of refurbishment and required a complete change of the existing heating system (which consisted of electric and gas heaters). In Hyde Farm, several residents lived in old Edwardian houses, which were generally cold, draughty and expensive to keep warm. In Ylä-Kivelä, the apartment block's old oil boiler was coming to the end of its life and required replacing. Kaakonoja was the only case that did not have a physical problem as such to deal with, theirs was mainly financial. In all the four projects, rising energy prices had an impact. The price of fossil fuels has had a direct link as all four communities started to considering cheaper alternatives to fossil fuels and ways by which their buildings could be made more energy efficient. In the case of Ylä-Kivelä, for instance, oil-based heating was getting more expensive and also the local district-heating network was considered to be an expensive option. In the case of Kaakonoja, most residents had electric heating with some using an oil-based system, whilst in both Lyndhurst and Hyde Farm, high gas and electricity prices had meant rising heating costs.

Hyde Farm was clearly the only case where climate change was a prominent starting motivation, whilst the other three cases were initiated with the desire to save money on heating bills. In the case of Ylä-Kivelä, for instance, the primary motivations also led to new, environmental, motivations. According to the project's key leader, as he started to pursue the project he realised that it also had environmental benefits: "so called green values became part of it and I also got more interested in these green values" (Lahtinen, 2011).

LEADERSHIP AND COMMUNITY COHESION

In two of Finnish cases and in one British case a trusted member of the local community initiated the projects. In Ylä-Kivelä, caretaker of the apartment block was a trusted figure in the building and had been previously active in organising communal activities for the residents (such as summer parties and seasonal garden clearing sessions). As one interviewee put it "our caretaker took good care of us and knew the building inside out" (Aho, 2011). In Kaakonoja, the residents' association member who initiated the project was active figure in the residents' association and the wider community. He also had a 'side kick', his neighbour since the 1970s. According to one interviewee (Knuuttila, 2011) their project leader was an active figure in the residents' association and for instance acted as their "travel agent", having organised several of the associations' trips. He was also regarded to have good general knowledge, having worked as a journalist for the local newspaper for 25 years (now retired) and he had previous knowledge for instance about potential funding sources.

In Lyndhurst too, an active local man who worked as a part-time manager for the community centre, initiated the project. He was well known to the local community, having lived in the village since the 1970s and having been active in the local council, hobby clubs and voluntary societies. In Ylä-Kivelä, Kaakonoja and Lyndhurst, the *initiators* were trusted and active members of their communities. In the interviews it became clear that these people were not only trusted because they 'got things done', but also for the way they approached various projects. They for instance spent a considerable amount of their own time finding information, digesting it and sharing it with others in the community. It was clear that the projects probably would not have happened without the active role of these figures. Only in Hyde Farm, there was less pre-existing community cohesion and trust before the project start. However, the person who initiated activities in Hyde Farm soon found like-minded people and started to build a network, getting to know her neighbours and introducing them to others.

KNOWLEDGE, LEARNING AND NETWORKING

People who are interested in developing community energy projects, do not often know where to start or find information from. This was also the case in all four community energy projects across the two countries. Interviewees mentioned that they had a lack of knowledge when they first started to explore renewable energy, energy saving measures and also up to a point activities related to tackling climate change. The residents especially in Hyde Farm, Ylä-Kivelä and Kaakonoja felt that they did not know where to start when it came to finding information about energy efficiency and especially what they could do in their own homes. As a resident at Kaakonoja put it: "we did not have any information so we had to create it" (Mäkelä, 2011), whilst a resident in Hyde Farm said that as she started getting more and more interested in climate change, she wanted to do something about it: "I started to think that we need to reduce our carbon emissions by x amount, drastically, but I don't know what my carbon emissions are, I don't know how to measure it" (Sheehan, 2012). In Lyndhurst too, information was limited at the start of the project: "They really wanted to use green energy in the new building but they had no idea how to go about it or what that energy should be" (Gingell, 2012).

First points of information for people involved in the community energy projects were usually internet search engines, trade associations and local companies operating in the field. In all four cases people who took part in the community energy projects also felt that they did not really know which type of information was reliable and whom they could trust. This was especially the case in Kaakonoja where one interviewee said that they did not really trust the Finnish Ground Source Heat Pump Association as the person in charge of the association was also a heat pump seller himself (Mäkelä, 2011). The interviewee felt that there was a conflict of interest in getting reliable information about various heat pump technologies from this source (Mäkelä, 2011). In Lyndhurst too, people involved in the project, from the architects to the building contractors had limited knowledge about renewable energy. The varying range of information available about different types of technology models for instance can be confusing and overwhelming to those who are not directly involved with renewable energy technologies and do not have prior knowledge about the field.

In the case of Kaakonoja, residents decided to get expert help for weighing different air and ground source heat pump (AGSHP) models and applied funding to do this. They created their own network of experts and information sources in order to get reliable information on various AGSHP models. Furthermore, they willingly and openly shared the knowledge they created to others who were interested in finding out more information about these technologies. Knowledge was created largely by the project itself, its participants and external expert advisors. Networks were formed through contacts with heat pump suppliers, external experts, the media, Kaakonoja community and the wider public. As part of the heat pump project, two events were organised by the project's committee: a heat pump fair took place on 07.02.2008 in Valkeakoski Vocational College. In this event, 12 heat pump importers and suppliers demonstrated their products and an expert panel took questions from the public. The heat pump project committee expected some 100 people to attend but they were taken by surprise when around 700 visitors arrived at the fair. The heat pump project resulted in knowledge about heat pumps and an actual information pack on the various models. This information pack was freely available to anyone who was interested in it. Even though Kaakonoja Area Residents' Association created the information pack for their own use, they were willing to share it with others. Through their media contacts, the heat pump project also ensured that the wider public was aware of their project.

In Lyndhurst too, networking was important and mainly conducted within the local area. A key activity was the opening of the newly refurbished community centre, attended by around 200 people, as well as open days held at the centre to showcase their project. There was less 'active' networking activity in Ylä-Kivelä, but instead, networking took place on a more ad-hoc basis, in meetings with other apartment block caretakers and local council officers.

However, of all the four projects, Hyde Farm was the most active and also rather strategic in their networking. Their key leading person was very active in local networks and eventually ended up working for the local authority facilitating other community groups to take environmental action. Other members were active too, for instance, in 2008 the National Low Carbon Communities Network was having a large conference in Wales

and two Hyde Farm members thought that it looked really interesting. However, they were not keen to go there in person due to time and costs involved in travelling to Wales. Instead, they thought that other groups must be in the same position and they decided to hold their own event at Hyde Farm parallel to the one in Wales. They organised a video link from Hyde Farm to the Welsh conference and also had a programme of their own speakers. They invited other community groups from London to attend and around 20 of them came to the day. In other words, by networking with others, they also provided a space for learning for other community groups. Community energy networks can build up either strategically or on a more unstructured basis. Actors seek information and other people with whom to generate and share knowledge with. This is important especially so that people do not 'reinvent the wheel' and can learn from others successes as well as mistakes (Sheehan, 2012).

THE ROLE OF FUNDERS AND INTERMEDIARY ORGANISATIONS

All of the four community energy groups received some kind of external funding. In the Hyde Farm project, several of their activities received external support. In 2008 they were chosen as one of ten groups in London to take part in Energy Conscious Households in Action (ECHO Action) run by the European Energy Programme. Hyde Farm did not receive actual money from the programme, but instead they were sent a coach who had material for the group to run a series of meetings with the residents in Hyde Farm. These meetings concentrated on issues such as understanding and reducing energy consumption in the home, local food production and sustainable transport. From the back of these events, Hyde Farm residents started their own Draughtbusting Saturday event, a monthly activity to draught proof the houses in the Hyde Farm area. In 2010, Hyde Farm wanted to extend their energy efficiency efforts and applied for a British Gas Green Streets programme, under which they were awarded £100,000 in British Gas services. In reality this meant that Hyde Farm residents were able to install solar PV at a local school, solar thermal at local houses and draught proof further 60 houses.

In Lyndhurst too, their project was largely funded by external sources. The Big Lottery funded a bulk of their refurbishment £434,000 of the total £700,000 project costs, whilst a further £270,000 was raised from other sources including the New Forest National Park Authority (they funded the biomass boiler). Funding was also raised from the local community via campaigns such as 'Buy a Brick'.

The Kaakonoja project cost around €17,000 to run, of which 90 % was funded by the EU Leader fund and 10 % from the residents' association contributions (this was mainly voluntary work like leafleting). Finding funding was one of the key stages of the project, as without external funding the project would not have gone ahead. The Kaakonoja project leader was aware of the Leader funding as he had been involved in setting up the local Leader agency, Pirkan Helmi, in Valkeakoski.

In Ylä-Kivelä, the total project costs for the pellet boiler and solar thermal heating system were around €80,000. The apartment block received a Government Energy Grant (15 %), which allocates capital grants to energy projects, whilst the apartment block paid for the rest. Residents' payments were arranged by a two-tier system. Residents were given the opportunity to pay their share of the new heating system either by a one-off payment or pay it as a loan over five years. Effectively the apartment block took a loan for the five-year payments and these were added to each apartment's monthly service maintenance charge (which worked out around €0.70/square meter). Around a third of the residents paid their share by the one-off payment and the rest took out the loan option.

The residents in Hyde Farm found funding applications and the processes linked to them rather time consuming and sometimes also tricky, as applicants had to understand for instance concepts such as 'project outcome'. In Lyndhurst and Kaakonoja too, funding applications took time and effort. Applications are often long and require thorough thinking on what the project is about, what its key motivations are and how expectations will be delivered. In Ylä-Kivelä, however, the funding application was considered to be fairly easy and straightforward to do. In the UK, there are several national intermediary organisations that help groups that want to develop community energy (for instance Centre for Sustainable Energy, Energy Saving Trust, The Co-Operative Group) and each project often has also local actors that can work in an intermediary role (such as specific funding organisations) (Gingell, 2012; Sheehan, 2012). In the UK projects, Lyndhurst was active in their engagement with their funders, whilst Hyde Farm felt that working especially with British Gas was often tricky and very top-down. In Finland, there are far less intermediary organisations at the national level (yet) and advice for community energy groups remains relatively limited (Lahtinen, 2011; Mäkelä, 2011). This was also reflected in Ylä-Kivelä and Kaakonoja were there was relatively little activity with other organisations than the direct funding body.

INNOVATION AND COMMUNITY ENERGY EXPERIENCE

In terms of innovation, interviewees in all four projects felt that what was innovative about their projects was the use of technology new to them, such as renewable energy, and using it in a new setting (i.e. their own community). In the case of Ylä-Kivelä, interviewees said that their pellet-solar system itself was innovative, as it needed specific installation and adjustments in order to fit their own specific circumstances. The system was set up so that solar thermal heating is used as a primary heating source, followed by pellets and backed up by oil. Another point often mentioned in Ylä-Kivelä was that by taking part in a renewable energy project people were doing something new and different. They were perhaps behaving [as a community] in the same way as before, but showing courage by taking on a new kind of a project, which had not been done before. Like one interviewee in Ylä-Kivelä put it "you need to be brave to do a project like this" (Aho, 2011).

In the case of Kaakonoja, one the project's external advisors thought that the most innovative about the project was the way in which key people formed the project and saw it through. He mentioned that he had his own doubts at the beginning, thinking that "this was just something put forward by some granddads" (Jantola, 2011), but fairly soon it was clear to him that these men were serious and also very enthusiastic about their project. In addition he though that what was innovative about the project was the fact that people were interested in purchasing a bulk order of AGSHPs for the association's residents. So instead of looking into it as individual households, they were

clubbing together and using their residents' association as a means to form a project which would find information about various AGSHP models, rate them, recommend the best models suitable for their area and eventually lead to actual orders and installations.

At Hyde Farm, one resident was very innovative in terms of finding affordable materials to make her house more energy efficient. These included for instance materials that people could fit themselves such as professional draught-proofing strips and secondary glazing. She also found a supplier who, once he found out that the Hyde Farm residents would be ordering materials in bulk, was happy to come and do a draught-proofing demonstration at her house. The first Draughtbusting Saturday was held in 2007 and its key objectives were to demonstrate how to draught-proof sash windows and help others to install these measures too. For instance some people were afraid of going up a ladder, so others would help by doing that on their behalf. In Lyndhurst, interviewees felt that, their projects key innovation was linked to the creation of a wood fuel supply network in the area. By installing biomass and tapping into the local wood resource base, a network was also formed for wood fuel supply (Gingell, 2012).

Community energy groups can innovate by adjusting existing practices to their own individual circumstances. If something does not quite work for a group, flexibility and developing new approaches can prove beneficial. In the Hyde Farm project, for instance, a rather abstract concept of draught-proofing was helped come to life to others by applying the practice in someone's house and sharing the experience with neighbours. In Ylä-Kivelä, on the other hand, residents took on a project that was completely new to them and their neighbourhood, whilst in Kaakonoja residents took on their stride to fill a gap in knowledge in the AGSHP market.

NICHE BUILDING AND PROTECTION

Niches need protection and this can happen in the form of support from institutions and can include measures such as funding support, knowledge exchange and providing opportunities for networking. Community energy in Finland and the UK can be considered as a niche since the main energy regimes are not based on community-led energy solutions (systems operated by large incumbent commercial players and in decentralised generation plants especially in the UK). In the case of the UK, community energy as a niche has been developing for over five years and is supported by the establishment of projects, government-lead funding programmes, knowledge, shared learning, networks and also events such as the Low Carbon Communities Network conferences (DECC, 2013; Walker, 2008). However, it still remains largely as a 'radical innovation' and has not transformed the UK's energy regime yet. In Finland, on the other hand, it could be argued that community energy as a niche is only starting to develop. Some early pioneering projects have been established and researchers are starting to get interested in the field (Vehviläinen et al., 2010). Networks and conferences for citizen-led projects, however, are limited.

Learning is prominent in community energy projects, especially when groups are faced with new technologies or institutional settings. This is also relevant to organisations such as funding bodies, especially in setting up new funding programmes (Gingell, 2012). The ability to adjust relevant knowledge to each organisation's individual circumstances and local setting allows funding institutions to learn from others' experiences and choose aspects that work for them in their local area. Intermediary organisations such as funding bodies help facilitate community energy projects. They do not only provide financial resources, but also help to create knowledge, build networks and assist with strategic project management. In Lyndhurst for instance the role of the Park Authority was to provide financial resources but also direct Lyndhurst Community Centre to the direction of other biomass users and wood fuel producers. By brining users and producers together, intermediary organisations can create opportunities for supply chains to develop and aid the replication of community energy projects.

The success of community energy projects rely on the skills of those involved in them. Successful projects often have leaders who are dedicated and can get the right people involved, with the right skills sets. They also have the capabilities to use and adapt pre-existing knowledge and transferable skills in new situations. These can include for instance activities such as filling in funding applications, organising meetings and learning about new technology. If these leaders are also good networkers, as in the case of Hyde Farm, they can spread their learning to others. Innovations can take different forms and also diffuse in different ways. In the Hyde Farm CAN case, the innovation of Draughtbusting Saturday was aided through local networks, whilst in Lyndhurst help from the National Park Authority aided development of new supply chain. The spreading of community energy is evidenced in projects starting to learn from each other, reflecting on other's experiences, adapting those to their own circumstances and starting to replicate. This process is not linear or always strategic. Projects network and learn from each other, with some being very strategic in their actions whilst others take a more ad-hoc approach. Early pioneers can encourage others to learn from their experience. They can create pioneering installations that others come to learn from, whether subsequent projects are community-based or not. This creates a niche space for novel projects to take hold initially, and from which others can learn and diffuse. It is important therefore that these pioneers are open to visits and can document and discuss their experience for the benefit of others.

Conclusions and suggestions for further research

This article approached community energy as a niche, a concept that constitutes something new in the existing energy regime. It often brings together ordinary citizens who have decided to do something about their energy usage. They can be motivated by several reasons, including saving money on energy bills, reducing the impact of fossil fuel use, getting involved with like-minded people or being interested in new technology. Community energy projects can be complicated to develop. They require time and resources, both of which are often donated on a voluntary basis by the people involved in these projects. Furthermore, several projects require some type of external funding to succeed, much of which is relied upon stop-start and occasional grant funding. Despite these difficulties, community energy projects are being increasingly developed, especially in the UK. The analysis shows that there are quite a lot of similarities in successful community energy projects in Finland and

the UK. The analysis of the four projects show that there are overarching issues that community energy projects have faced:

- Physical problems, such as an ageing heating system, can lead to community action.
- Successful community energy projects often require someone to lead them and see the project's implementation through. However, a team of willing and motivated community members often supports committed leaders.
- Existing (non-energy-related) social relationships are important for community energy projects. Friends, neighbours and local contacts provide trusted leads, while the internet allows for wider searches of information and knowledge. While online sources are used widely, it seems that local, personal contacts are important ones. This demonstrates the different kinds of relationships that help the development of community energy projects.
- Community energy projects usually require external funding. Various types of funding exist, though it can be tricky for communities to know how to apply for them.
- Learning happens across the community energy context, from actual projects to the agencies that fund and advice them. Learning can be about how to certain technology works or how to set up a funding scheme, but also about how to manage projects, network with people, form useful relationships and share the learning experience.
- Networking amongst community energy projects varies from project to project. Some network extensively, while others develop in relative isolation with only a few local contacts. Networking is vital for community energy diffusion and it also prevents 'reinventing the wheel', projects can learn from others successes as well as mistakes.

There are also differences in community energy in Finland and the UK. Mainly these are related to the size of the sector:

- UK has a lot more activity in citizen-lead community energy projects, whilst interest in Finland is increasing. In the UK, community energy networks are more prominent and operate at both national and local level, while there are not many strategic networks in Finland.
- Projects in the UK tend to benefit from a wider range of intermediary organisations, whilst these do not (yet) exist in the same way in Finland.
- UK policy support measures provide more funding opportunities than those in Finland.
- There seems to be more discussion about citizen-led community energy generation in the UK at the government policy level than in Finland.

SUGGESTIONS FOR FURTHER RESEARCH

Given the limitations of this research (relatively small sample size), further research could be used to analyse community energy niche development, activity and potential for diffusion in the two countries. This would require a more historical perspective and a larger number of community energy projects. Furthermore, a deeper analysis of the influences of the prevailing socio-technical energy regimes (e.g. centralised in the UK, much more decentralised in Finland) could provide further insights on the influence of institutional structures, culture, available funding programmes and other policy support measures for community energy projects.

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Acknowledgements

This PhD research is funded by the UK Engineering and Physical Sciences Research Council (EPSRC). The PhD research is part of a project called *Community Innovation for Sustainable Energy* (CISE), which is jointly run by the University of Sussex and University of East Anglia, and is funded by EPSRC and the European Centre Laboratories for Energy Efficiency Research (ECLEER) of EdF Energy. Part of this research was also a six-week visited to the Finnish National Consumer Research Centre in Autumn 2011. This PhD research has also benefited from the François Duchene European Travel Bursary, awarded by the Sussex European Movement in 2012.