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The Evolution of Community Energy in the UK

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September 2018

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Acknowledgements

The authors would like to thank members of the Financing Community Energy project Advisory Group, and Jelte Harnmeijer of SCENE Connect, for their comments on an earlier draft of this working paper.

Executive Summary

This UKERC Working Paper seeks to understand the factors contributing to the emergence, growth and nature of community energy in the UK. It is based on a review of existing data and literature, and focuses on investigating the role of financing mechanisms and business models in the evolution of the community energy sector.

It argues that, since its emergence in the UK in the late 1990s, community energy has grown through finding opportunities for smaller scale, decentralised energy activities in the UK's highly centralised energy system. The combination of development of renewable energy technologies, and the launch of the government's Feed-In Tariff Scheme (FITS) in 2010, produced a boom in the sector, especially around solar electricity generation.

Recent cuts to FITS rates and other policy changes place community energy at a crossroads. Some renewables activity will continue, but groups are exploring a wide range of activities, partnerships, and business models. We are engaging with the sector around outputs from our research, which include a survey and case studies, to co-develop recommendations and pathways for the future.

Community energy in the UK

Community energy has grown greatly over the last two decades

The contemporary UK community energy sector (see box below for our definition) is generally held to have begun with the Baywind Cooperative in the late 1990s. Baywind raised funds direct from members of the general public – who then became equal members of the cooperative - to purchase part of a commercial windfarm in Cumbria. Since then, community energy projects have spread across the UK - from Shetland to Cornwall - and cover a range of business models and organisational structures. While the exact size of the sector is not known, the latest research suggests that there are around 300 community organisations running energy generation projects of some sort, and a range of others engaged in demand-side projects.

Community energy is about direct citizen participation and control – of a wide range of energy activities

In the UK, the precise meaning of 'community energy' has been debated ever since the term's first appearance in the 1990s. For the purposes of our research, we define community energy as any energy project that is *owned or controlled by a community or third sector body*, and/or that involves a significant degree of *direct citizen participation and control*. This covers both community companies and cooperatives operating renewable energy generation – supply-side projects; and others offering advice and practical assistance in saving energy or installing energy efficient technologies – demand-side projects. It also covers projects in the distribution sector, connecting supply with demand: this is an emerging area for community energy in the UK.

Factors in the evolution of the sector to date

Community energy is part of a wider decentralisation of the UK energy system

In the UK, the generation, distribution, supply, financing, and regulation of energy is centralised, and dominated by large players. Community energy, however, is composed of small-scale organisations, spread across the country. Rather than transforming the energy system, community energy groups have created a 'niche' within it, through learning, collaborating, and taking advantage of what opportunities do exist.

These opportunities have largely come from shifts in government regulation, and technology development. During the last three decades, UK government policies have liberalised and privatised energy infrastructure and supply, and created markets. Energy technologies, particularly for renewable electricity generation, have also developed rapidly in terms of efficiency and cost. While large companies continue to dominate the UK energy generation market, including renewable generation, the nature of renewable energy technologies makes relatively small-scale generating plants feasible. The twin shifts in regulation and technology have therefore created an opportunity for small-scale energy generation companies. Community energy groups are among those that have taken this opportunity.

Renewable energy revenues - especially from the FITS - have driven most community energy business models

What this means for community energy business models is that revenue has largely been provided by supply-side energy generation initiatives, rather than demand-side energy efficiency focused projects. Surplus revenues have been used to support a range of environmental and social projects, including energy efficiency and demand management activities. Grant funding has also been important for energy efficiency work, and for project start-up costs in general – particularly in the early development of the sector. Yet over time, advances in technology and associated supply chains, the rise of alternative finance mechanisms (in particular community shares), and the development of networks and learning within the community energy 'niche', have strengthened the sector's position and contributed to its growth.

However, the largest single step forward for community energy was the introduction of government revenue payments, in particular the Feed-In Tariff Scheme (FITS) in 2010. This was the first government price support mechanism aimed specifically at smaller scale renewables.

Recent changes: challenges and opportunities

Recent policy shifts have slowed down new activity

The publication of the government's Community Energy Strategy, in 2014, marked a high point for community energy. More recently, political change at UK level has seen the FITS and other public policies become much less supportive of community energy. While community

energy projects that are already up and running are relatively secure, new community renewables activity has slowed down considerably.

This is unsurprising: central government plays a major role in structuring the UK energy market. If new actors are to enter this market and thrive, they will need government to 'unlock' it to a degree. As energy projects are characterised by high upfront capital demands and long payback times, market and therefore policy stability is crucial for de-risking investment.

Yet community energy has strengths - and opportunities

Nevertheless, there are signs that this is not the end of the community energy story. Firstly, in various ways, the sector is much stronger now than before the advent of FITS. Numbers of groups and projects have grown, and established groups' revenues are generally secure. Alongside intermediary organisations, they are developing economies of learning, enabling additional community renewables projects to go ahead despite pressure on cost margins.

Secondly, there are new opportunities to seize. The use of alternative financing mechanisms to raise funds directly from the public, particularly community shares, has become well-established. The recent creation of the Innovative Finance ISA may unlock finance on a greater scale, if suitable projects become available.

Looking at policy and the energy market structure, the Clean Growth elements of the government's industrial strategy offer an opportunity to engage with policy. In Scotland and Wales, devolved policy actors continue to offer support targeted specifically at community energy, and across the UK, the energy market is changing. The 'Big Six' energy utilities are facing financial and political challenges, while numbers of smaller competitors are growing – new potential customers and collaborators for community-generated energy.

Another promising area of change is energy storage and demand-management technology, where new developments might facilitate the creation of viable energy services and local supply business models. Community energy groups are among the innovators striving to create viable business models in this field despite facing regulatory and infrastructure challenges.

Finally, having been largely absent in recent decades, there is renewed interest in energy from local authorities. With both 'civic' and 'community' actors sharing an interest in the social and environmental aspects of the energy system, local authorities' access to assets and resources could complement the community sector's energy project experience and grassroots networks. These synergies have been recognised in projects in Plymouth, Swansea, and Edinburgh, among others. However, with local authorities facing their own resource constraints, it remains to be seen whether municipal energy will become as common in the UK as it is in parts of Europe.

The Financing Community Energy research project

Next steps in our research: survey, case studies and engagement

The next steps in our research are analysis of our UK-wide survey of community energy finance and business models, followed by a number of in-depth case studies of community

energy organisations and their projects. We will use our research and analysis as a platform to engage with the sector and produce a range of policy and academic outputs. Our principal focus will be on potential innovations in finance mechanisms, business models, or policy, to support further growth of community energy in the UK.

Looking more broadly, two points seem clear. First, the sector is still in flux and not yet coalescing around a 'new normal'. Therefore, our research into how the technological, regulatory, customer, financial, and other resource elements of community energy business models might be viably combined is timely. Second, despite some excellent studies cited in this report, our research to date confirms the paucity of good quality and comprehensive quantitative data and analysis on the financial and economic side of community energy. It is notable that Community Energy England have also recently begun to address this gap through their annual State of the Sector survey, and we are working closely with them on our survey approach in order to maximise the use of our shared data. We hope that the next stages of our research will go some way to filling this gap and providing knowledge that can be used to support the future success of the community energy sector.

Contents

List of Figures

1. Introduction

1.1. Purpose and context

This report explores how finance mechanisms and business models in the UK community energy sector have co-evolved with each other, and in relation to other key factors (outlined below). Based on a review of the existing literature and publicly available data, it considers how community energy has grown and developed in the past, and what this suggests are important factors for its future. It is the product of the initial stage of a two year UK Energy Research Centre (UKERC) research project investigating the financing of community energy: how it has been achieved to date, and how it might be done in the future.

One of the chief drivers for this research project was the lack of comprehensive and consistent quantitative data on community energy finance and business models across the UK. Given these limitations of the available data, the analysis presented here is necessarily based on partial evidence; and while it draws some conclusions, it also raises many questions. It is hoped that these questions may serve to clarify the state of knowledge about UK community energy finance and business models, and direct present and future research to specific topics.

1.2. Analytical approach

Our emphasis in this report on the "evolution" of community energy in the UK stems from academic work examining possible future directions for the UK energy system (Foxon 2011), and the wider school of "socio-technical transitions" studies (Unruh 2000, Geels and Schot 2007). Briefly, these suggest that changes in the technologies used by societies arise from interactions between elements of different "systems" – ecological, technological, social, cultural etc. These interactions are analysed using a "multi-level perspective" (Geels and Schot 2007), which involves thinking of systems operating at different levels – "landscape", "regime" and "niche". The regime can be thought of as the existing ways of doing, held in place by institutions, business practices, regulations and so on, and sitting in deeper social and cultural landscapes. Innovations – new ways of doing – are held to emerge in niches, where actors are sheltered from pressures to fit in with the regime. A transition can occur when an innovation can be accommodated within the existing regime, or when elements of the regime are changed to allow wide-spread deployment beyond a niche.

The understanding that action takes place at multiple spatial, institutional and temporal scales, and recognition of the interaction of multiple systems, are both important insights that we will use to shape the structure of this report. They are particularly appropriate given that we are studying action that tends to take place at a distinctive scale (relatively small, often localised) and the interaction of financial and economic systems with others, notably physical (energy infrastructure), policy and politics, and more.

However, in this case, we are primarily analysing social rather than technological innovation. While community energy groups can be associated with technological innovation, it is deployment of established technologies through a novel form of social organisation (for the UK energy sector) that is their main focus; or indeed, in the case of demand-side initiatives,

promoting change in the social and cultural practices of technology use. We will therefore also draw on international comparative work on community wind generation that takes greater account of social and political elements (Bauwens et al 2016) in our analysis.

The key areas for our research project overall are financial mechanisms and business models, and we will examine the co-evolution of these in particular in this report. In addition, at landscape level we will consider the role of the UK's political and economic structures, and social and cultural factors relevant to renewables and community enterprise. At regime level we will examine energy policy, other areas of state action and policy, technology and infrastructure, and markets (beyond finance) in relation to community energy. Finally, we will look at responses and innovations from within the community energy niche – both from individual groups, and in terms of growing organisation and collaboration between groups.

1.2.1. Financial mechanisms and business models

Our principal focus in this research project as a whole is on the financing of community energy, and on community energy business models.

When we talk about "finance" here, we are referring to unearned[1] flows of money into community energy groups. Finance comes in various forms: some common forms of finance are grants, loans, bonds, and shares. Each of these is typically associated with different terms and conditions (see Table 1.1). These are distinct from revenue (money that is earned from providing goods or services, e.g. sale of electricity), and costs (outward flows of money, e.g. to pay for a wind turbine).

As regards "business models", we are informed by the business model canvas approach, which breaks down an organisation's business model into nine elements (Osterwalder and Pigneur 2010). Central to this are the "customer segments" to whom the organisation offers a "value proposition"; in other words, the groups of people whose needs or wishes the organisation meets with its goods or services. In the case of a community energy organisation, the value proposition could be cheap energy, a local community fund, or energy savings. Aroundthese core elements of the customer segment and value proposition are supporting activities, resources, financial flows in and out, and relationships with partners and customers, which enable the business to function and fulfil its offer (see Figure 1.1).

1.3. Structure and coverage

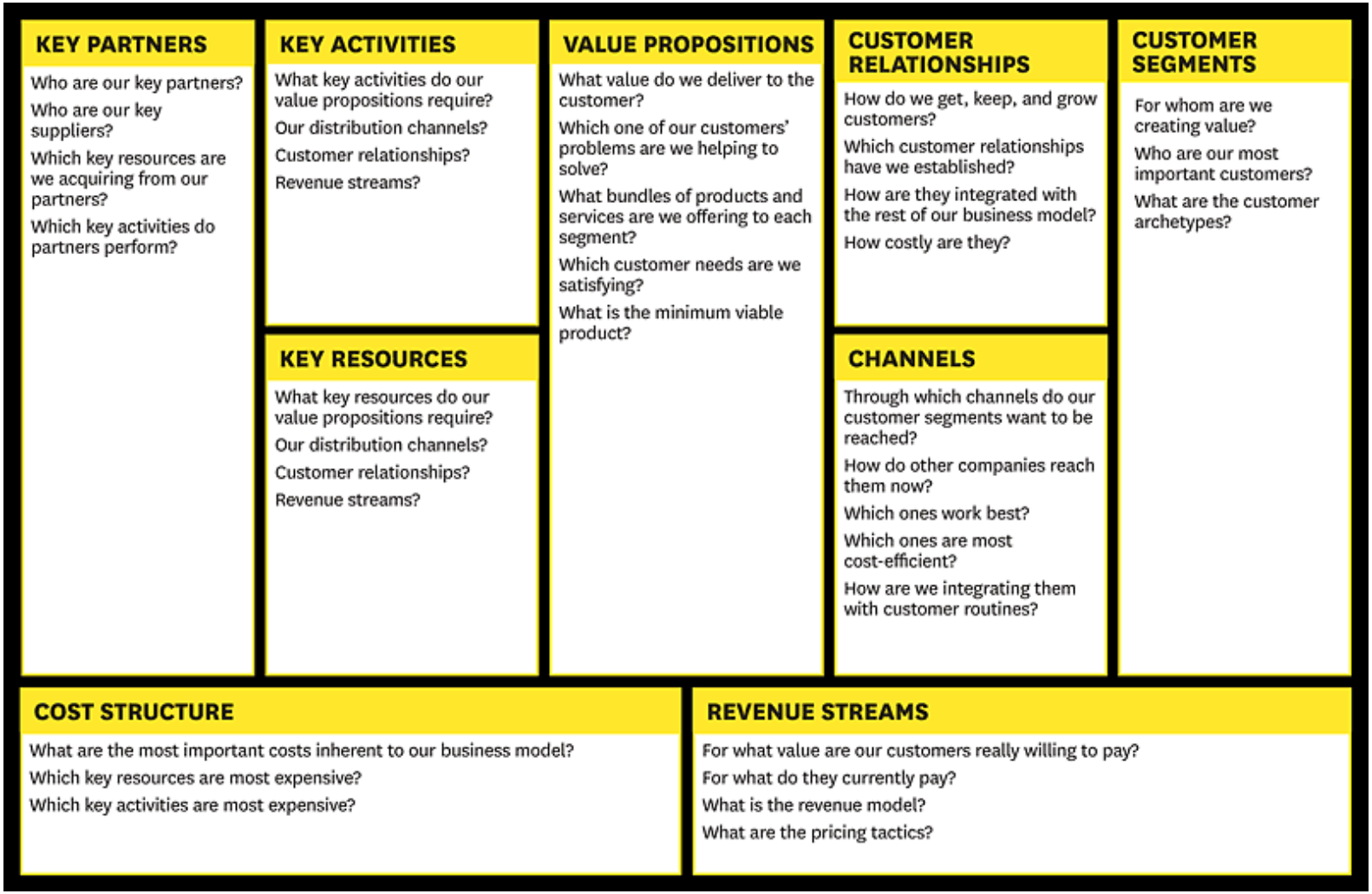
The next chapter discusses what exactly we mean by community energy, and how we are approaching the definition of this diverse and changing sector. Chapter Three describes the sector as it is today; and Chapter Four analyses how the interaction of elements at landscape, regime and niche level produced it. We conclude in Chapter Five with reflections on what our analysis suggests for the future of community energy in the UK.

[1] We say "unearned" money simply to distinguish finance from money that a community energy group may "earn" in exchange for providing goods (e.g. an energy efficient boiler) or services (e.g. supplying electricity). Earned money is often referred to as "revenue".

Table 1.1 Basic forms of finance

Type of finance		How obtained	Must it be repaid?	Other features
Grant		• By application to a grant-giving body (mostly public or third sector).	• No.	• Grant giver may require reports of spending, and attach conditions to how the grant is spent.
Debt	Loan	• By application to a lender – typically bank, building society; also available through online platforms.	• Yes. Regular repayments of principal + interest together.	• Borrower may spend loan as they wish (provided they make repayments).
	Bond, Debenture	• Borrower issues bonds or debentures – through broker or online platform. • Bonds and debentures can also be bought from third parties.	• Yes. Interest payments over the "term" of the bond; principal repaid at "maturity". • Debentures often longer-term than bonds.	• Holders may trade bonds or debentures with third parties. • Debentures often give rights to value of underlying assets of the company, if the company fails to make repayments. • Issuer may spend money raised as they wish (provided they make repayments).
Equity	Share	• Company issues shares for sale. • Shares can also be bought from third parties.	• Dividend payments made to shareholders (if company makes a profit).	• Holders can trade shares with third parties. • Shareholders may have voting rights to e.g. elect Company Directors – typically one share, one vote basis. • Company may spend money raised as it wishes, but may face scrutiny and voting challenges from shareholders.
	Community Share	• Cooperative or Community Benefit Society issues community shares for sale.	• Fixed interest rate payment made to shareholders. • Society obliged to buy back shares at face value.	• Most community shares are issued as *withdrawable* shares only, which cannot be traded with third parties. • Shareholders have voting rights on one shareholder, one vote basis. Thus a shareholder with 500 shares and another with 100 shares are equal in terms of voting power. • Society may spend money raised as it wishes, but may face scrutiny and voting challenges from shareholders

Figure 1.1 The Business Model Canvas



2. What is community energy?

2.1. Why define community energy?

The precise definition of "community energy" has been debated since it first emerged in the UK some 20 years or so ago[2]. This debate will undoubtedly continue, not least because people will continue to use the term in new ways. Indeed, flexibility of interpretation can be an advantage, giving scope for groups to innovate and find creative solutions to problems.

However, widely differing interpretations of what counts as community energy can lead to conflict or confusion – particularly when public support is involved. For the purposes of this research project, some definition is needed to delineate which groups and activities we are focussing on, and which we are not.

As Table 2.1 illustrates, surveys of the sector – and definitions used in government policy – show some broad consensus around the key elements of community energy, suggesting a broad but clear definition is possible. We draw on these in our own definition, first, to define what we mean by "energy project" and "community"; and then to set out criteria for what it is about the way the two are linked that makes a "community energy project".

2.2. Energy projects

As far as energy projects are concerned, in line with other surveys of community energy we are casting the net wide. We will include initiatives undertaking: energy generation, supply, purchase, and demand management and energy efficiency measures, and transport initiatives that focus on energy use (e.g. electric vehicle schemes). While, as previously noted, much of the attention, especially in regard to financing, has focussed on renewable energy generation, this has often been undertaken in conjunction with other energy activities around efficiency and demand management. Our wide focus also reflects the emergence of new initiatives and business model experiments around local supply, purchase and energy storage, which we are keen to explore in the primary research phase of the project.

2.3. Community

The definition of "community" is a perennial subject of debate in social science (Delanty 2003) and it is not surprising that it is used in various ways in relation to community energy. In a useful overview, Walker (2011) identifies six uses of community in "carbon governance" (see Box 2.1). This kind of diversity is recognised within the sector, as in the Community

[2] Online searches for uses of the term prior to that find only documents related to "European Community" energy policy.

Energy Coalition's Manifesto for Cooperative and Community Energy (Cooperative Energy and Coops UK 2012).

For this research, we propose to follow the lead of Databuild in their 2014 survey for DECC, where they defined community as "any citizen group or third sector body" (Databuild 2014: 10). This encompasses Walker's senses of community as an actor, and as centred on a place; as well as allowing us to study networks and groups of people brought together by other factors.

It is often the case that the "community" element of community energy groups is related to a locality; whether the group has its roots in other local groups or organisations (Haggett et al 2013), or simply invokes a strong sense of place in its self-presentation. Nevertheless, these local connections are often also mingled with connections to people and places elsewhere. Thus it is notable that Walker illustrates the concept of community as a "network" with the example of "a network of investors in a 'community' renewable energy project" (Walker 2011: 778). Certainly, many community energy initiatives have raised money from 'community' shareholders who do not live locally to the project. There are also several examples of community renewables projects operating wind turbines at multiple sites some distance apart, calling into question what exactly is the locality they might belong to (for example Four Winds in Yorkshire and Derbyshire, or Drumlin Wind Coop with six sites across Northern Ireland). Again, recent surveys and legislation at UK level do not make 'localness' a defining criterion of a community energy project.

Box 2.1 "Community" in low carbon governance

Based on a review of policy, practice and academic literature, Walker (2011) identifies six uses of the term "community" in relation to low carbon initiatives. In brief, these are:

Actor: a body of people that can act as one and interact with others.

Scale: a scale at which to act, "above the individual and households, but typically below the level of local government" – and also independent of formal government structures.

Place: the "local" community, the idea that place is important for social relationships – often carried into initiatives such as "a village or town becoming a low-carbon community".

Network: social relationships and networks – which may be focussed on one place, but may also span many places. For the latter he suggests "examples would include a network of investors in a 'community' renewable energy project".

Process: "a distinctive way of acting, involving the participation of 'ordinary people' in collaborative processes, often also very 'hands-on', involving voluntary and consensual rather than coerced involvement".

Identity: a way in which people prioritise actions, or think about themselves, which emphasises collective interests at the community scale (see above).

Source: Walker (2011): 777-778.

2.4. Community energy projects

What, then, makes a project a community energy project? Our definition of community energy projects for the purpose of this research is in two parts. We will count any project that satisfies *either one* of these parts as a community energy project:

1. Any energy project that is wholly or partly-owned or controlled by a community group; or
2. Any energy project where *two or more* of these conditions apply:
   a) a community *group* acts as "technology host" (Walker and Cass 2007: 465) i.e. the energy technology is installed on a site they own;
   b) community *members* have some formal democratic control of the project (e.g. through 'one member one vote' community shares); or
   c) there is an active role for community members in the project – perhaps taking part in collective energy-saving actions, or producing energy (e.g. through domestic solar PV) that is shared among other community members through some kind of local supply arrangement.

Existing definitions place a clear emphasis on ownership and control, and we will follow their lead in saying that we will include any project that is wholly or part-owned, or managed by a community group to be a community energy project. This would also include community ownership of a share of revenues from a project (see discussion of partnerships and shared ownership in section 3 below).

However, including a second part to the definition means that we are also open to considering other forms of citizen participation, providing that there is a clear "active" role for individuals, and some form of collective action dimension. These might be more relevant in relation to energy efficiency, collective purchase, or other demand-side activities, where ownership of a small number of revenue-generating assets may be less of an issue.

Notably, this definition excludes commercial energy generation projects that offer a "community benefit" payment to a group located near the energy installation, but no other involvement. This is not to criticise such arrangements. However, they offer a relatively passive model of community involvement in energy; our definition states that payments alone do not make an energy project a community one.

Our definition is still quite broad. However, in our search for innovative business models, it is possible we will come across a few projects that do not fit exactly into these categories. Decisions on whether to include or exclude such projects in our research will be based on the principles of ownership and control, and active participation, on which the definition above is based.

Table 2.1 Some definitions of UK community energy

Authors	Context	"community"	"energy"	"community energy project"	Notes
"Community Energy", Lancaster University 2004. Academic survey.	Conclusions from survey of community energy projects.	what is seen as making community RE distinctive is the local and the collective character of the process used and/or the outcomes achieved"	Renewable energy generation	• Outcome dimension "collective and local benefits" • Process dimension "open and participatory"	Survey examined all recipients of support (e.g. grants) from energy schemes labelled "community". This table presents their more refined definition from Walker (2007) p7.
"Manifesto for Community Energy", Community Energy Coalition, 2012.	Sector-wide campaign to influence policy.	"Most members of CCE schemes are from the local community, but some have additional members from across the country"	"owning, generating and saving energy"	"Owned by the local community through established legal structures and/or those which generate tangible local economic and social benefits."	Community Energy Coalition (2012) pp3-8.
"Community Innovation for Sustainable Energy", University of Sussex and UEA 2013. Academic survey.	Criteria for inclusion in survey of community energy groups.	"of place *or* interest"	"supply- and demand-side"	Where communities • "exhibit a high degree of ownership and control, *as well as* • benefiting collectively from the outcomes"	They add that "the sector is notoriously difficult to bound". Quotations from Seyfang et al (2013), p978: *emphasis* and bullet points added.
"What is community energy and why does it matter?", paper by Community Energy England. 2014	Discussion paper by sector umbrella body.	"a group of individuals brought together by a common sense of collective identity" "geographical … or people have a common interest"	"projects generating electricity and heat, energy efficiency and demand reduction and energy supply"	"democratic control… sharing benefits… active participation"	Community Energy England (2014) pp2-3.
"Community Energy in the UK", Databuild Research 2014. Survey for UK Government.	Criteria for inclusion in survey of community energy groups.	"Any citizen group or third sector body"	"Any project involving collective action to buy, manage, save or generate energy"	the community group must be either: • Responsible and/or accountable for the delivery of an energy project in the UK; or • Intending to take responsibility for the delivery of an energy project in the UK in future	Databuild (2014), p12.
FITS Order and guidance 2016, UK government.	Clarifying terms in FITS legislation.	"any of the following which has 50 or fewer employees: a charity; a subsidiary, wholly owned by a charity; a community benefit or co-operative society; or a community interest company."	• electricity generation at <5MW scale (i.e. within scope of FITS). • "community energy" special treatment: solar PV up to 50kW capacity.	"an eligible installation – which is wired to provide electricity to a building which is not a dwelling; and in relation to which the FIT generator is a community organisation"	Definitions of "community organisation" and "community energy installation" taken from Ofgem (2016), p6.

3. The community energy sector in the UK today

This chapter describes the community energy sector in the UK. It discusses estimates of the sector's size and distribution across the UK, and outlines the range of activities and organisations involved. It also explains some features of the range of legal and ownership structures that community energy organisations use.

3.1 Mapping the scale and diversity of community energy

At the outset, we should note that it is difficult to accurately map the scale and diversity of community energy in the UK. As noted in the previous chapter, the "sector" in fact comprises a wide range of activities. Activities that focus on energy demand, such as promoting energy efficiency, energy saving or demand reduction all clearly require different models of organisation and finance, than energy supply activities such as generating renewable energy – whether electricity or heat.

Data on the current and historical extent and nature of these activities at community level is limited. What data does exist is either a function of the administration of public sector support programmes, from grant funding to price support schemes such as the FITS; or collected in academic and policy research surveys. There are two chief problems with such data. Firstly, administrative data does not always differentiate consistently and reliably between community energy groups and other energy actors. Secondly, there is likely a tendency in both administrative and survey data towards a focus on larger organisations (more likely to fill out surveys), involved in costlier projects (more likely to require financial support). Both these trends are likely to lead to an overrepresentation of community renewable energy projects in the data, as these projects are more capital-intensive than those promoting domestic energy saving, or demand management for example. The existence of "below the radar" community groups is well known in research and policy on the third sector in general (Phillimore et al 2010), and it is probable that there are community groups working on energy demand that fall into this category.

Thus while surveys suggest that both supply- and demand-side community energy projects are often undertaken by the same or closely related organisations (Seyfang et al 2013: 982, CEE 2017), it is quite likely that many organisations focussing entirely on demand-side activities are missing from this survey data. Indeed, while surveys of the community energy sector regularly receive between 100 and 200 responses (e.g. Seyfang et al 2013, Databuild 2014, CEE 2017), a 2014 study for DECC found evidence of over 5000 community energy organisations – the majority of which were small groups undertaking demand-side activities as part of the Energy Saving Trust's Green Communities programme, but not registered with any other community energy support organisations (Databuild 2014: 19).

In this report, we will nevertheless retain an analytical separation between supply- and demand-side projects, due to their different financing and business models. The next sections of this chapter trace the development and current extent of community energy projects; in the context of the above discussion on data, it is clear that there will be more material concerning supply-side than demand-side projects. However, we will draw on what

disaggregated data and analyses we can, to try to ensure as balanced a coverage of the sector as possible.

3.1.1. Community supply-side projects

3.1.1.1 Historical development

Most early renewable electricity projects in the UK were domestic, dating back to the late 19th century. More recently, some were organised collectively, for example in the 1970s at the Centre for Alternative Technology in mid-Wales, or Fair Isle in 1982. But in general they were micro-scale and "off grid". Government support for renewable energy development was weak. Wilson (2012) argues that it was largely a tokenistic response to environmentalist criticism, with much greater government effort directed towards nuclear power and the exploitation of North Sea oil and gas. Therefore, while wind energy was growing rapidly in some locations in the 1980s (notably Denmark and California), it remained very small scale in the UK. This began to change in the 1990s.

The first grid-connected commercial wind farm in the UK was a 4MW installation at Delabole in Cornwall in 1991. This project was initiated and owned by a local farming family, who built it on their land[3]. A trickle of commercial projects followed. However, when the Baywind Cooperative in Cumbria bought part of their local wind farm at Harlock Hill in 1997, they were still among the first wind power generators in the UK.

Further community wind projects followed in the 2000s, some led by Scottish community land organisations, and others across England and Scotland developed through the Energy4All network – itself a spinoff from Baywind (for more on both of these phenomena, see 4.3.2 below). Community hydropower was also pioneered in the Scottish Highlands by the Assynt Crofters Trust in 2000 (Assynt Hydro Ltd 2000), and in England by Torrs Hydro in Derbyshire in 2008 (Torrs Hydro 2008). Several small-scale solar PV systems were installed by community centres and others across the UK in the 2000s (CEI dataset).

Those were all electricity generation projects. Community heat generation projects have used a range of renewable technologies – biomass boilers, heat pumps (both ground and air source), and solar water heating. Unlike renewable electricity generation, these technologies have existed for some time in the UK (Smith 2005); also unlike electricity, there is also no technology-neutral "national heat grid" for them to connect to. Most community heat projects have therefore been relatively small scale, and limited to heating single buildings – often community centres, village halls etc. Another model has been for community groups that own woodlands to sell firewood for domestic and institutional heating (Regen SW 2016c), particularly in rural areas where many buildings may not be connected to mains gas (e.g. Sleat Community Trust undated).

3.1.1.2 Overview of market size and recent trends

[3] It has since been bought by Good Energy, and as the original turbines neared 20 years of use, repowered at 9.2MW (Good Energy 2016).

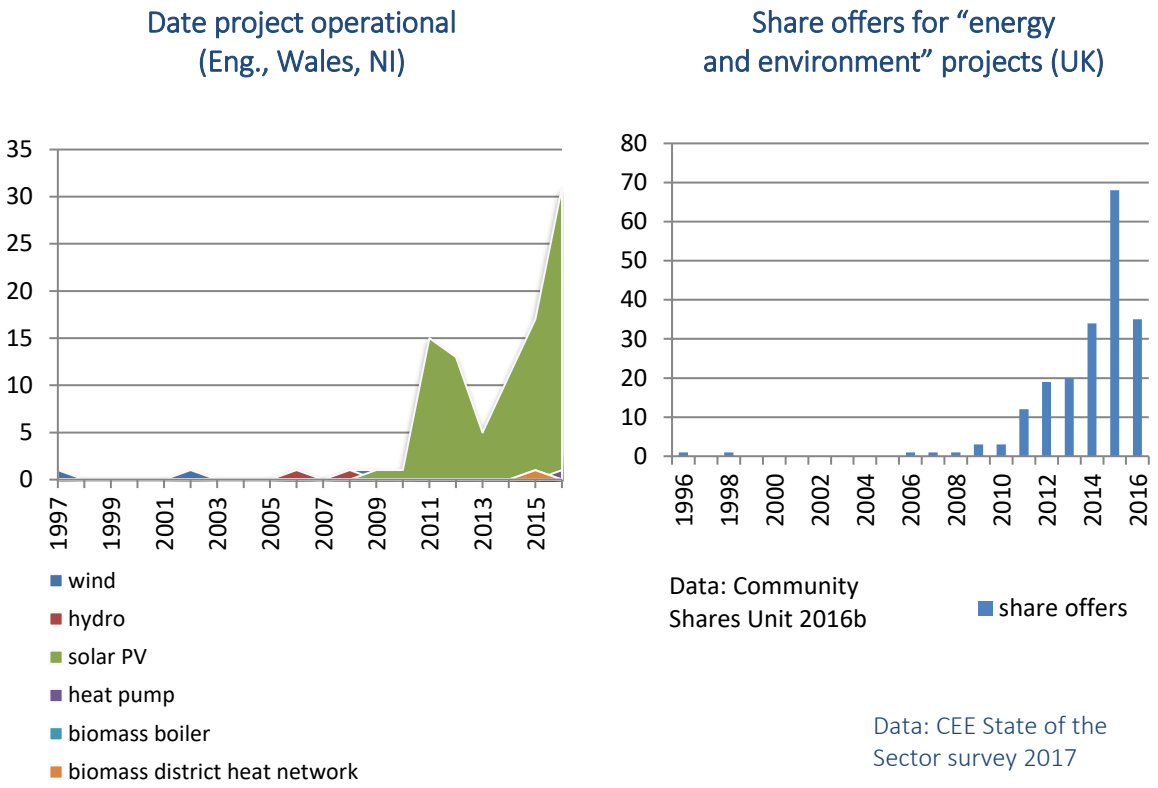
Since those initial projects, the number and scale of community energy generation projects has increased. In 2014, Databuild reported 511 community energy organisations working on renewable energy generation, based on analysis of existing administrative datasets (Databuild 2014: 27). In 2004-05, the first survey of community energy in the UK found 83[4] renewable energy projects with "known community involvement and/or substantial local impact" (Walker et al 2006). More recent surveys have returned figures of 147 (CISE dataset 2013,) and 179 (CEE 2017: 13) organisations engaged in energy generation, although the latter figure excludes Scotland.

Survey data suggests that the numbers of community renewable energy projects have grown consistently since the mid-2000s, and has accelerated since 2010. This is illustrated in the charts shown in Figure 3.1 below. The extent to which the acceleration in community renewables in England, Wales and Northern Ireland has been dominated by solar PV is also notable. It is now estimated that there is 121MW of community energy generation capacity in England, Wales and Northern Ireland (CEE 2017: 14), and 67 MW in Scotland (most of which is wind-generated electricity; CEE 2017: 9).

Nevertheless, in terms of amount of energy generated, community generation remains a relatively small part of the UK energy mix, both in terms of cumulative generation of the sector as a whole, and of the size of individual projects. The best current estimates are that community generators account for around 1% of UK renewable electricity generation (CEE 2017: 14, BEIS 2016b: 143). The largest UK community energy generator is Point and Sandwick Power in the Western Isles, which owns a 9MW capacity wind farm (Point and Sandwick Trust 2016); this is comparable to the average UK onshore wind farm size, according to data from members of Renewable UK (Renewable UK undated).

[4] However, a further 72 "community building projects" and 10 "very small scale projects" may have involved renewable energy: it is not clear from the analysis.

Figure 3.1 Growth of community energy groups and share offers[5]



Data: CEE State of the Sector survey 2017

3.1.2. Community demand-side projects

As noted earlier in this chapter, data on community energy demand-side activity is particularly patchy. Unpublished analytical notes to the Embedding Sustainable Technology at Local Level dataset (Walker undated) comment that "The number of energy efficiency projects which are funded or supported by community-orientated energy programmes in the UK … is small". The notes further state that energy efficiency programmes tend to be run by local authorities, or NGOs with a poverty rather than an energy focus. This observation still holds, even in relation to initiatives such as the government's Community Energy Saving Programme, which was in practice a series of partnerships between energy companies, social landlords and local authorities – barely featuring any community group of the sort discussed in Chapter Two (DECC 2011).

That said, there is patchy evidence of a large number of grassroots community groups engaged in some way with the demand-side of the energy system. Almost 3000 groups were registered with the Energy Saving Trust's Green Communities network (Databuild 2014: 19), whose activities included organising communities to produce low carbon plans, facilitating

[5] It is unclear why there is a sudden drop at the end of the share offers chart. While the compilers of the underlying data do note that their information was more limited for share offers after 2014 (Community Shares Unit 2016c), other sources also indicate a reduction in community energy projects following various regulatory changes in 2015 (see Chapter Four for more details).

energy saving measures (e.g. insulation) in homes and community buildings – and sometimes renewable energy (CSE undated, Energy Saving Trust undated). Surveys have to an extent uncovered groups working on demand-side only: the CISE dataset contains 27 groups working on energy efficiency but not on generation, and a further five working on energy behaviour change alone. Similarly, the State of the Sector Survey found 33 organisations working on demand-side projects alone. However, it is clear that a substantial number (but not all) of community groups involved in energy generation also work on energy demand.

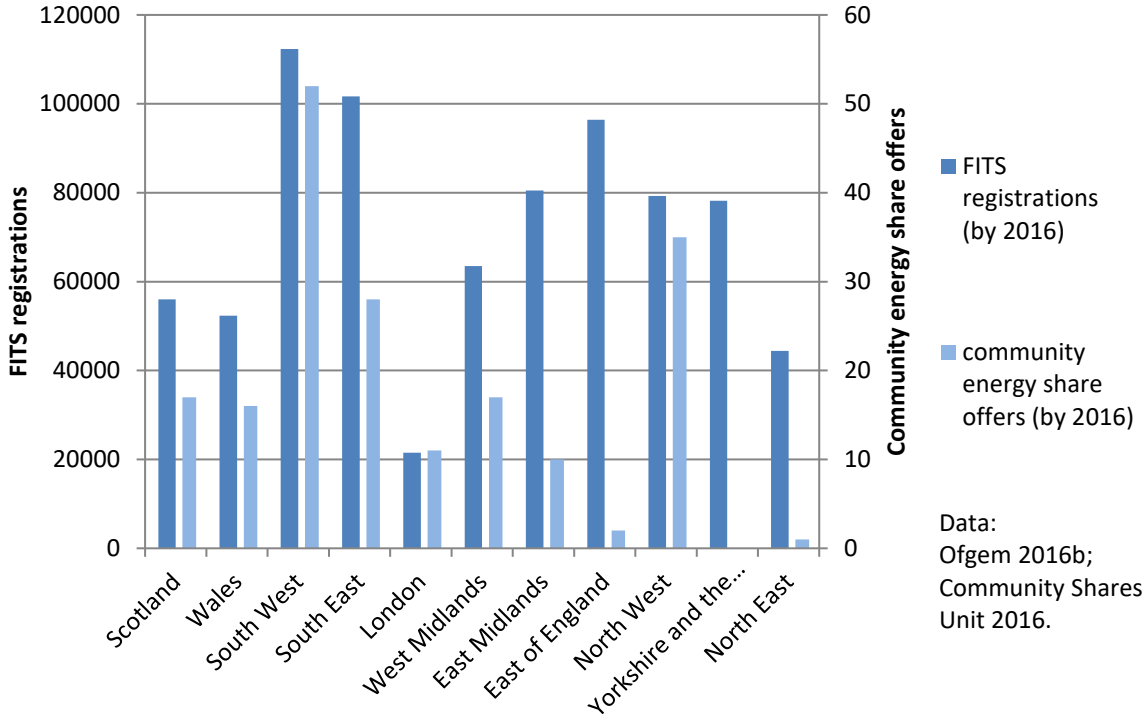
The range of activities carried out in relation to energy demand is considerable, as surveys and support programme evaluations reveal (this paragraph draws on Seyfang et al 2013, and DECC 2012). Many are concerned with providing information about energy issues to the public, and promoting the reduction of energy demand. These include publishing and distributing newsletters and leaflets, managing stalls at community events, showing films, etc. In addition to the general provision of information, many groups also engage in providing services to specific individuals or organisations, such as carrying out building energy audits, or using thermal imaging cameras to help people identify where they might insulate their homes better. Some go a step further again, carrying out physical works, such as fitting insulation, or installing more energy efficient appliances.

3.2. Geographical distribution of initiatives

Community energy groups are found across the UK, from Cornwall to Shetland. However, as surveys and the maps in the Appendix show, there appears to be concentrations of activity in Scotland and South West England, and to a lesser extent in London and the South East of England, and North West England (Seyfang et al 2013: 981, Databuild 2014: 20). It is notable that this pattern is somewhat different to the distribution of renewable electricity generation in general (see Figure 3.2), and even to the distribution of the technologies most popular with community energy groups, solar PV and onshore wind (Regen SW 2016a:30-33). Clearly the development of any renewable energy project is not simply driven by the availability of an energy resource, but also affected by social, economic and political factors – planning context, grid connections, access to finance, etc. However, this difference in the distribution of community and other projects suggests that there are particular factors influencing community energy initiatives – which we will explore in the next section of this report.

While community energy initiatives are disproportionately found in rural areas relative to the distribution of the population, the available data indicates that there is little difference between rural and urban groups in the spread of activities they engage in (Databuild 2014: 26). Whhile there is a tendency for groups that undertake only “awareness raising” activities (which are the least financially demanding) to be found in the most deprived areas, there does not otherwise appear to be much relationship between the wealth or deprivation of an area and the level and type of community energy activity there (Databuild 2014: 25).

Figure 3.2.1 Geographical distribution of community energy share offers vs. all small-scale renewables



3.3. Legal structures

As Table 3.1 indicates, community energy groups come in a range of legal structures: cooperatives (both 'bona fide' and community benefit societies), community interest companies and others (Databuild 2014: 43). Most legal structures give individual group members some protection from financial risk, placing financial liability with the organisation rather than its members. Nevertheless, surveys also indicate that a significant minority of initiatives are unincorporated (13% - Databuild 2014: 43-44, 20% - Seyfang et al 2013: 981) and while some of these might be just at an early stage of development, and others might be engaged in energy behaviour change promotion (which likely carries less financial risk), this is not clear from the available data.

Table 3.1 Legal structures commonly used by community energy organisations

Name	Governance	Limited liability?	Fundraising (NB all can take out loans)	Asset lock?	Charitable status?	Eligible for SITR*?	Recognised in FITS**?
'bona fide' Cooperative	• Purchase share to become member • Run for benefit of shareholders • One shareholder one vote	Yes	• Can issue Community Shares	Possible	Difficult	No	Yes
Community Benefit Society ('bencom')	• Run for benefit of wider (defined) community • One shareholder one vote	Yes	• Can issue Community Shares	Yes	Possible	Yes	Yes
Community Interest Company (CIC)	• Run for a defined social purpose.	Yes	• Can issue bonds • Can issue ordinary shares	Yes	No	Yes	Yes
Company Limited by Guarantee	• Nominal fee to become member (often £1) • One member one vote	Yes	• Can issue bonds • Cannot issue shares	Possible	Possible	Yes if charitable status	Yes if charitable status
Charitable Incorporated Organisation/ Scottish CIO	• Nominal fee to become member (often £1) • One member one vote	Yes	• Can issue bonds • Cannot issue shares	Yes	Yes	Yes	Yes
Charitable Trust (unincorporated)	• Board of Trustees	No – trustees individually liable	• Can issue bonds • Cannot issue shares	Yes	Yes	Yes	Yes

Sources: Databuild 2014, Community Shares Unit 2015, Thorlby 2011, HM Treasury 2016

Notes

* SITR: Social Investment Tax Relief. Note that organisations "generating or exporting electricity" are not eligible (Palin 2015, HM Treasury 2016).

** Recognised in FITS: meets definition of community group set out in FITS regulations.

Beyond the general benefits of incorporation, different structures offer different particular advantages. Some are eligible to apply for charitable status, which offers various tax exemptions (Thorlby 2011), although government specifically removed energy cooperatives from eligibility for several popular investment tax relief schemes in 2015 (Palin 2015). Cooperatives can also give their funders the security of having a say in the governance of the organisation, by funding their work through community share issues. Unlike ordinary shares, community shares give each shareholder one vote, regardless of the number of shares they have purchased (Community Shares Unit 2015b).This may encourage small shareholders that their participation is still meaningful. On the other hand, companies limited by guarantee do not formally link membership with fundraising, and are therefore able to offer membership for as little as £1, which it could be argued is yet more financially inclusive. Further, 'bona fide' cooperatives are legally obliged to work for the benefit of their members, whereas community benefit societies (or 'bencoms') are explicitly able to work for the benefit of a wider community. This may widen the scope of activities that the organisation can engage in and also means they may be eligible for charitable status, which a group working only for the benefit of its members cannot be (Community Shares Unit 2015b).

3.4. Structural elements of community energy business models

Community energy groups do not operate a single business model. In this section we use the business model canvas analysis to explore the diversity of community energy business models to date.

3.4.1. Value propositions

Surveys of the sector have generally addressed the motivations of community energy activists, rather than asking the individuals or organisations that use their services why they do so. Therefore, they offer only limited and indirect insight into what value propositions might drive customers' interaction with community energy groups.

However, they do confirm three principal types of value proposition that drive community energy groups' work, around environmental, economic, and political values (Seyfang et al 2013: 981-2, Databuild 2014: 30-35, Fenna 2015, CEE 2017: 24-26). The chief environmental goal might be the reduction of carbon emissions and mitigating climate change – realised through low carbon energy generation, or reducing energy use. Economic motivations range from helping energy consumers save money through reducing energy consumption, to generating income for a community group or the wider community, creating jobs, and contributing to local economic regeneration. Political values are not related to party politics, but rather concern ideas of local autonomy, community empowerment, or the democratisation of control over the energy system.

3.4.2. Customer segments, channels and relationships

Energy generation activities tend to involve two customer segments: firstly and most commonly, energy supply companies, purchasing energy to sell on to end users; secondly,

the end user of the energy - for example, the church hall with solar panels on the roof. In the latter case, the customer may also be the owner or operator of the system, either directly, or in partnership with another community energy organisation. However, beyond such 'behind the meter' arrangements, there are very few cases of community energy organisations supplying local customers, for a range of practical and regulatory reasons associated with the physics and governance of the electricity system. In contrast, sales of renewable heat tend to be direct to end users through a local network (one example is the Springbok Sustainable Wood Heat Cooperative), or associated with installing biomass boilers, selling woodfuel etc. (Regen 2016c).

There is also a 'hidden' customer in most energy generation: the government, whose interventions in energy markets (through the RO and FITS for example) significantly affect generators' revenue streams. In return, the government hopes to 'buy' - or shape - an energy system that meets policy goals.

Energy efficiency and other demand-side activities tend to involve much greater numbers of end-user customers. This makes customer recruitment and relationship building more central to business models focussed on these types of energy activities.

3.4.3. Key activities

While (as previously noted) we cannot be sure that the available data is representative of the full range of community energy, the most recent survey (CEE 2017: 13-18) suggests that renewable electricity generation dominates the activities of community energy groups. There appears to be very little activity around sustainable heat generation, although there may be more at more micro scales (e.g. biomass boilers for community buildings - van Veelen 2017).

Energy efficiency and demand-side measures remain a secondary activity at best for most groups (CEE 2017: 13), reflecting the general difficulties in creating sustainable demand management business models in the current energy regime. On the one hand, many groups have been able to provide information and encouragement to citizens regarding saving and managing their energy use, on the basis of volunteers providing this service for free. Yet activities that demand more financial and human resources, and have a greater element of risk– like the sale or installation of energy saving technologies – have been taken up by fewer groups, and they have largely financed them from grants, or income from renewable energy generation (Seyfang et al 2013: 983-5,Databuild 2014: 38, CEE 2017: 17). There are cases of groups that have gone on to develop business models where low carbon energy efficiency services pay for themselves, e.g. Carbon Coop in Manchester, who sell their advisory and retrofit services to domestic households: but these appear to be in a minority.

Finally, while some community energy groups have formed energy services companies (e.g. Ovesco in Sussex), none have yet ventured into retailing energy to domestic or commercial customers (although there are now some trials of innovative local supply-type business models in progress: see Energy Local website).

3.4.4. Resources and partners

Community energy groups mobilise both internal and external resources to perform their activities. Many rely heavily on voluntary labour to manage their projects, but a minority also employ staff (Seyfang et al 2013: 985, CEE 2017: 11-12). However, groups developing

renewable energy projects typically need specialist technical, legal and financial services that they do not possess internally.

One way to access these skills and resources is to buy them in from external suppliers. Sometimes these are from local companies: community energy groups may wish to use them to benefit their local economy, but must first take care to ensure that they have the necessary specialist knowledge, insurance etc. for energy projects (DECC 2014: 7-8). Increasingly, however, there are professional services firms specialising in community and small-scale energy generation, and there are also several advisory and support companies created from within the community energy sector (see below). Finally, renewable energy hardware (turbines etc.) is generally imported, although, as with professional services, there is a growing supply chain of installers and maintenance engineers in the UK.

A different way to access external skills and resources (including financial resources) is to fundamentally change the ownership model of the project, and share ownership with another company. Community energy projects shared with commercial developers are generally structured around one of three basic business models: split ownership, joint venture, and revenue sharing (Vaughan-Morris et al 2015: 14). Split ownership involves the two parties owning specific parts of the generating installation, e.g. one wind turbine each, or a certain number of solar panels. This was used by Baywind, and subsequently several other wind coops. Joint ventures involve both parties providing finance and sharing risk but also returns. This structure was used by the Neilston Development Trust, who purchased (and subsequently sold: Wright 2017) a 28% equity stake in a local wind farm – thus entitling them to 28% of the pre-tax profits generated. Shared revenue offers the lowest risk to a community initiative, who buy in to a share of the revenue relatively late in the project. However, it also offers little empowerment for the community, with the commercial partner developing and controlling the project, and it can therefore be hard for the community group to raise commercial finance (Vaughan-Morris et al 2015: 14).

On the one hand, such partnerships appear to offer a promising match between community groups' local support and commercial developers' resources - it is clear that many joint projects have been brought to fruition, and there remains considerable interest in such partnerships for the future. On the other hand, research into stakeholder perspectives on shared ownership projects tends to highlight practical difficulties and mutual mistrust between commercial and community expectations and rationales for energy projects (Hinshelwood 2001, Goedkoop and Devine-Wright 2016). Perhaps this is an area where longer term collaborations, such as that over many years between Energy4All and private sector developer Falck Renewables, can help reduce the 'transaction costs' (North 1991) of partnerships, i.e. the effort and time necessary to build trust and find mutually acceptable ways of working together.

Intermediary companies that have emerged from within the community energy sector are another form of partnership. Businesses such as Energy4All, Sharenergy, and Mongoose seek to empower individual initiatives through support and partnership working while sharing their values much more closely. Their business model centres on providing services to community renewables initiatives, ranging from day-to-day administration to project management, finance raising, environmental and other technical advice and support. While they do not command the internal financial reserves that a commercial developer or finance company might, they have the potential to develop "economies of learning" within the

community energy niche (Unruh 2000: 820, Seyfang et al 2014) and to empower smaller and less experienced community energy initiatives.

3.4.5. Revenue and expenditure

The chief revenue earning opportunities for community energy groups have been around the sale of energy, particularly electricity. Revenue comes from a mix of customer payments for energy, and any government-backed incentive schemes (Fenna 2015: 12, CEE 2017: 27). In the case of heat, the relevant scheme is the Renewable Heat Incentive (RHI); for electricity, the schemes are the Feed-In Tariff Schemes (FITS) for installations with a capacity up to 5MW, and the Renewables Obligation (RO) for larger installations.[6]

Revenue for energy efficiency activities can come from sale of goods and/or services, such as efficient appliances, or installing insulation (SOTS 2017 dataset, CISE dataset). However, many groups offer such services for free, or act as a broker connecting community members with service providers. It is not clear from the data to what extent, if any, community energy groups receive fees for such brokerage services. As they are often seeking to maximise uptake of energy efficiency services for broad environmental or fuel poverty reasons, and keen to act as an 'honest broker', it may be that few groups see this as a revenue-earning opportunity.

Comprehensive data on community energy expenditure across different sorts of activities is hard to come by (and this is a gap in the data that our research is designed to address – see Chapter Five). However, it would appear that renewables projects are associated with much higher levels of expenditure than other types of activity. Capital costs can be particularly high. One study notes that, for commercial projects, technology costs may comprise 50% or more of "total project cost" (Harnmeijer et al 2015: 8). Community energy organisation accounts available online also show high levels of capital cost: for example, Chase Community Solar record almost £1m of "fixed assets" (likely to be mainly solar PV panels) compared to on-going costs of less than £100,000 (Chase Community Solar 2016). As regards wage expenditure, few community energy organisations employ staff; the great majority that do are engaged in renewable energy generation (SOTS 2017 dataset). Some organisations do not employ staff directly but contract administration, maintenance etc. out to third parties, including community energy support organisations described in the 'Resources and partners' section above. These support organisations account for almost one third of employment in community energy in England, Wales and Northern Ireland (CEE 2017: 11-12).

Whether community renewables projects incur higher costs than commercial projects was investigated in Scotland (Harnmeijer et al 2015). The authors found that whilst community-led projects are not on average more costly than similar scale commercial projects, they do experience greater cost variability – this is due to a mix of factors often including inexperience and lack of power in the markets. However, the same study found that partnership ownership models offered significant cost savings to community energy organisations (almost 50% less per MW), when compared with 100% community ownership projects (Harnmeijer et al 2015: 18).

[6] See Chapter Four, and in particular Table 4.1, for more details of these.

4. Factors shaping the development of community energy

The previous chapter offered a picture of the UK's community energy sector today. In this chapter, we draw on the theoretical perspectives mentioned in the introduction to analyse how external factors have shaped the possibilities for community energy business models, and how community energy organisations have responded.

We begin with a brief characterisation of some of the landscape features – the UK's wider political economy, and the social and cultural dimensions of collective social movements around the environment and community development. We then look at the energy regime as it affects community energy – taking into account roles and interaction of state, market and third sector actors. Finally we examine some of the ways in which community energy has interacted with these elements of the energy regime.

4.1. The wider 'landscape'

4.1.1. Political economy

From rather uncertain beginnings (Wilson 2012), environmental and renewable energy issues are now staples of public policy discussion in the UK and of government agendas (Pearson and Watson 2012). Although the UK was relatively slow to develop its own renewables energy industry (IRENA 2013), there does now exist a renewables industry that is said to employ between 117,000 and 250,000 people (REA 2016 and RenewableUK 2017 respectively).

Nevertheless, government concern for the environment does not necessarily translate into support for community initiatives. Notwithstanding the "localism" drive of the 2010-15 government, the UK is notable for its centralised, big actor-driven, political and economic structure and culture. This is the case not just in the energy sector, but in others also: particularly relevant to our research is the centralised nature of the UK finance sector (Berry et al 2015). Politically, local governments in the UK have fewer areas of responsibility and finance-raising powers than many of their counterparts in Europe and the OECD (House of Commons 2009, Whitney et al 2016).

In countries where community energy has achieved a greater share of energy generation than in the UK, it seems it is often as part of a more decentralised political and economic structure. Thus in Germany, municipalities and regional development banks have been significant actors in local and community energy development. Such actors are weaker, or absent, in the UK (Nolden 2013, Hall et al 2015b).

4.1.2. Social and cultural factors

The prevalence of community and cooperative ideals in Denmark, and the strength of environmentalist anti-nuclear movements in Denmark and Germany, are all cited as important cultural and social factors driving the growth in community energy in those two countries (Bauwens et al 2016, Toke 2011). Some suggest that the pro-renewables

environmental movement in the UK is relatively weak. Instead, broad processes of 'counter urbanisation' and 'middle class rurality', and the emergence of landscape-conservationist organisations and protests, mean that the strongest social movements have opposed rather than championed wind power (Bauwens et al 2016). The absence of such a combination of social and cultural factors is suggested to have made the widespread construction of wind farms in rural Spain much less politically contentious (Toke 2011).

That is not to say, however, that there is no support for community energy projects in the UK – even among the middle-class rural in-migrants that Bauwens et al, identify as often a source of opposition. It is notable, for example, that analyses of investment in community energy (and other "positive investments") highlights concentrations of community shareholders in relatively wealthy rural areas (e.g. Ethex 2015: 13, 19). More broadly, parallel with (and indeed linked to) the increasing prominence of environmental concerns in politics, referred to above, has been the rise of social movements with an environmental focus. Some of these, such as the Transition Towns movement (Haggett et al 2013, Seyfang et al 2014), and others with a community development focus (e.g. the Scottish community land movement previously mentioned), have provided spaces for people interested in community energy to make connections with each other, and develop projects.

Furthermore, community energy enjoys some cultural power in the UK, even beyond the environmental movement. It is cast as a key actor in moves towards "a more open, democratic and sustainable energy market", in contrast to the "Big Six" who are accused of using their dominance to exploit consumers (Merrick 2014). Like community enterprise in general, it can use "community" as a polyvalent symbol to build cultural power (Tilly 2002, Cohen 1985); in other words, it can get a wide range of people to do things, by meaning different things to different groups of them. Thus, for example, it can appeal to economic liberals as market-orientated enterprise, separate from the state; to socialists as collective action to take control of economic resources; or to greens as small-scale and environmentally and socially responsible.

4.2. The energy 'regime'

Some aspects of the UK energy regime – the configuration of institutions, technologies and practices involved in the production and consumption of energy in the UK – have changed markedly in recent decades. Others have not. Here we consider these changes (or lack of them) in relation to community energy. For the sake of analysis, we break the regime down into the following constituent parts: energy policy; technology and infrastructure; finance and markets; and policy beyond energy.

4.2.1. Energy policy

The last three decades have seen a major shift in UK energy policy, with privatisation and liberalisation shifting ownership of energy generation, distribution and supply from the state to the private sector; and several reforms creating and shaping energy markets (Mitchell 2008, Toke 2011). The same time period has seen the introduction of policies to encourage renewable energy generation. Major schemes include the Non-Fossil Fuels Obligation (NFFO, which ran from 1990-2002), the Renewables Obligation Certificates (ROCs, introduced 2002),

Table 4.1 Principal government renewable energy support policies

Scheme	Dates open to new projects	Jurisdiction	Description
NFFO SRO NFFO-NI	1990 – 2002	England and Wales Scotland Northern Ireland	Renewable and nuclear electricity generators bid for fixed-term premium rate contracts for electricity supply. Five rounds of contracts were awarded.
RO RO(S) NIRO	2002 – 2017 2002-2017 2005-2017	England and Wales Scotland Northern Ireland	Generators of renewable electricity awarded 1 RO Certificate per MWh generated. These ROCs can be traded: electricity suppliers are obliged to present a certain number to government, or pay a penalty. ROCs were initially technology neutral, with a single price for all ROCs, but later some variation in rates for different technologies was introduced. Some aspects of the scheme function slightly differently in Scotland and Northern Ireland.
FITS	2010 – ongoing	England, Wales, Scotland	Available for renewable electricity generating installations of less than 5MW only. Generators receive fixed payments for total electricity generated ("generation tariff") plus small extra payments for electricity not used on site but exported to the grid ("export tariff"). Complex range of tariff rates depending on technology and scale; rates for new installations have decreased each quarter since inception ("degression"). The FITS does not operate in Northern Ireland, where all generators come under the NIRO.
RHI	2014 - ongoing		Generators of renewable heat receive payments in proportion to amount of heat generated. Rates vary with technology and domestic/non-domestic installations.
CfD	2016 - ongoing		Low carbon electricity generators bid for contracts with government-backed Low Carbon Contracts Company. LCCC aims to pay difference between market price of electricity and extra cost of low carbon generation.

Sources: Ofgem website; Pearson and Watson 2012; Lundie et al 2016; Grimwood and Ares 2016.

the Feed-In Tariff Scheme and Renewable Heat Incentive (FITS and RHI, introduced 2011 and 2014 respectively) and most recently Contracts for Difference (CfD, introduced 2015) – see Table 4.1 for a summary of these. Taken together, these policy changes have allowed new actors to engage in energy generation, and to use renewable energy technologies: community energy groups are among the organisations that have seized this opportunity.

Notwithstanding that, recent changes in energy policy have been less favourable to community energy. Rather than a continued drive towards decentralisation, government has invested in supporting very large-scale projects (BBC 2016), and several measures that supported community and renewable energy - notable the FITS, certain investment tax reliefs, and planning guidelines - have been weakened or removed (Palin 2015, Pratt 2016, IWA 2017, Stone 2017). At the end of 2016, the Renewable Energy Association listed 15 "government policy measures impacting renewables since May 2015" in what it called "the most challenging time the nascent renewable energy industry has ever faced" (REA 2016: 10, 2).

In contrast to the succession of programmes targeting energy supply, policy on energy demand has changed less. While there have certainly been policy initiatives promoting energy efficiency, the central thrust of energy policy still focuses on supply rather than demand (Watson et al 2017, Pearson and Watson 2012: 37, Hoggett 2017: 84). There has been relatively less attention given to incentivising demand management by energy users, or a shift in supply-side business models from payment for supply to payment for service provision business models (which could encourage more efficient provision of 'energy services' such as power or heat). Demand-side policies have focussed more on larger scale actors, measures relating to domestic housing tended to either target new house building (beyond the scope of most community energy groups, although not some development trusts) or social landlords (see IEA undated). More recently, the Green Deal, as an energy saving programme explicitly aimed at incentivising individual households to undertake energy efficiency works, might have appeared to offer scope for community energy groups to enter the energy efficiency market in greater numbers, but the programme was poorly designed and failed spectacularly to achieve its target uptake by householders (Rosenow and Eyre 2016).

While renewable energy generation is possible at much smaller scales than typically used for fossil fuel-based energy generation, the scale at which energy policy is focused has changed little. Energy policy and regulation is set at UK level, rather than being devolved or localised. Energy generation and energy consumption are matched at a national level, using large scale transmission and distribution networks. The distribution network is owned and managed at regional level, but integrated into a UK wide transmission system, and subject to UK wide regulation and pricing. Energy supply companies are obliged to offer their energy UK-wide.

In terms of public financial support, it is true that there have been a range of grant and advice schemes created to support community energy, in particular at more regional levels (see Figure 4.2). Yet it was 20 years from the establishment of the first renewables price incentive scheme (NFFO) to the introduction of price incentives specifically aimed at smaller scale generation, which is best aligned with community energy (FITS and RHI). Given New Labour's ideological enthusiasm for governing "through community" (Levitas 2000), and the proliferation of locality-focussed initiatives in other policy areas – such as regeneration (e.g. Neighbourhood Renewal, New Deal for Communities; Lowndes and Sullivan 2007) and health

(e.g. Health Action Zones, Healthy Living Centres; Perkins et al 2010) - this is a little surprising. It suggests that energy remained somewhat insulated from the wider policy landscape.)

4.2.2. Technology and infrastructure

The fuels and technologies used to generate electricity in the UK have also changed, with not only a shift from coal to gas, but also the spread of a range of renewable energy technologies – chiefly wind turbines, hydro turbines and solar PV cells. These technologies have developed to become both more productive and cheaper (IRENA 2014), and a wider supply chain of experienced installers and advisors has grown across the UK. Much of the actual manufacturing of renewable technologies remains outside of the UK (IRENA-GWEC 2013: 134), but earlier bottlenecks in supply for small-scale projects (Gubbins 2007, Harnmeijer et al 2015: 8) seem to have been reduced (e.g. ReNews 2015).

Until recently, technological innovation has chiefly impacted the generation of energy, but more recent technologies relating to the demand-side – especially smart meters, and electricity storage – have begun to be deployed. These in turn open the possibility of changes from passive to more active and flexible management, and regulation of the transmission and distribution infrastructure. This might enable a shift of scale in energy systems, and make local generation-*and*-supply business models more viable – which could be of interest to many community energy groups (Ofgem 2016a).

4.2.3. Finance and energy markets

The financing of community renewables projects generally follows a standard energy project finance cycle (see Figure 4.1 below). This begins with smaller amounts of money upfront to pay for a feasibility study, to slightly larger sums to develop a more detailed plan and get land use planning approval, to large amounts to pay for construction and installation. Once installed the project begins to generate revenue and money borrowed can start to be paid back.

Figure 4.1 Project finance: risk and return

Source: DECC 2014: 3.

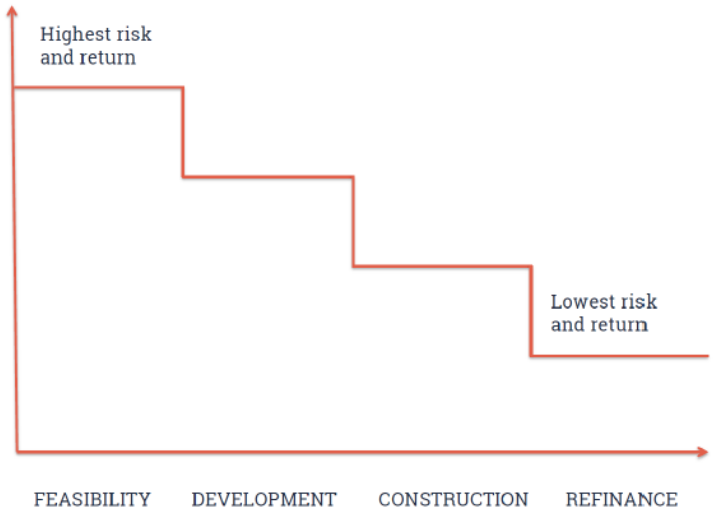
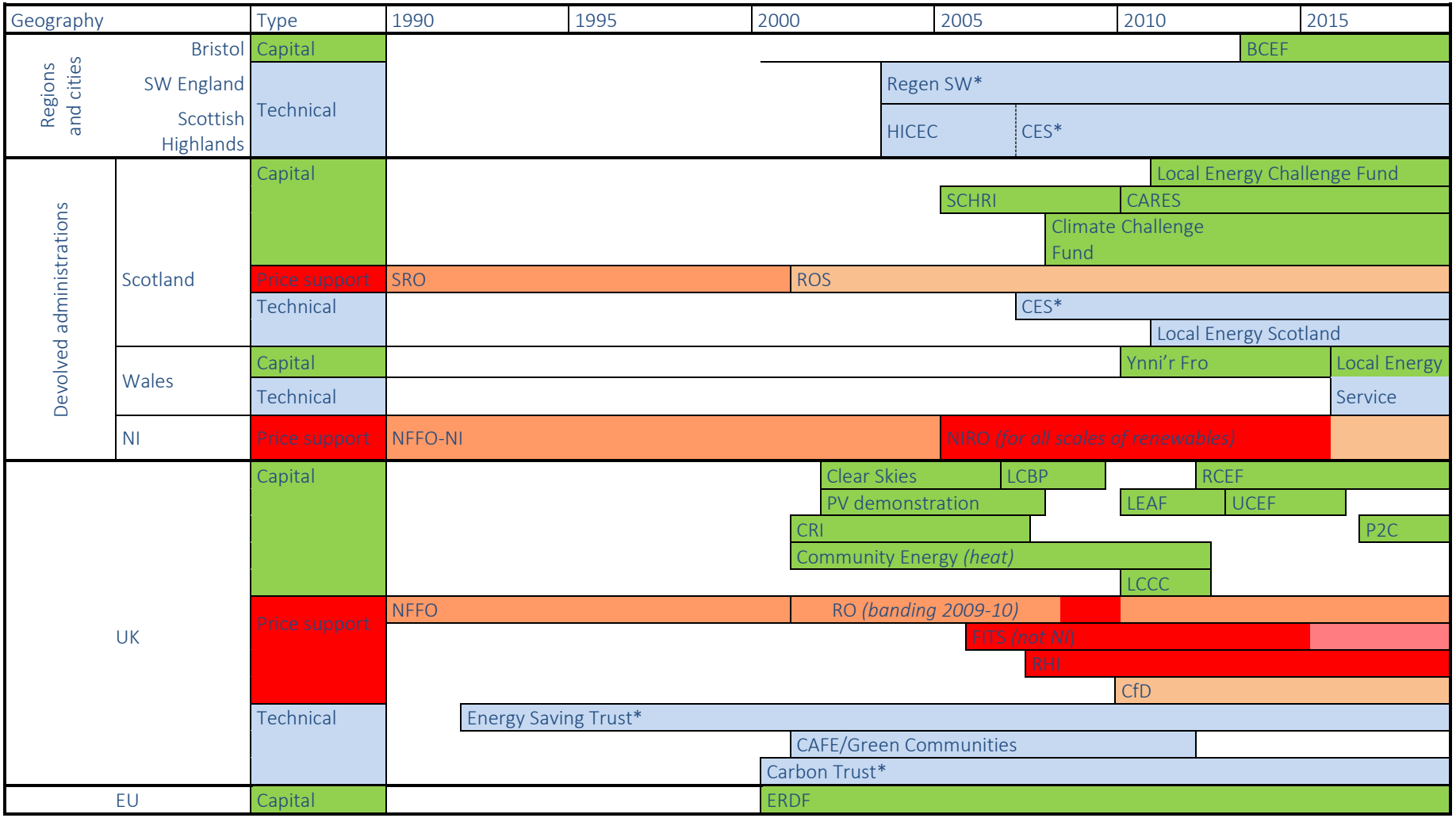


Figure 4.2 Major programmes of state support for community energy



Sources: International Energy Agency, Northern Ireland Department for the Economy, Brook Lyndhurst and Capener (2016), Ofgem

Notes

1. Includes renewables and energy efficiency support programmes.
2. The table currently does not include state-backed lending bodies which offered loans on favourable terms for community energy projects, e.g. Renewable Energy Investment Fund (REIF) in Scotland. These may be incorporated in a future iteration.
3. Many capital (grants and/or loans) programmes also included a technical and advisory element.
4. Focuses on major programmes, specifically targeting community energy, and initiated by state bodies. Some small programmes (<£1m total) are omitted for clarity; more general forms of state support for community groups are omitted, as are third and private sector initiatives and organisations.
5. However, some relatively large and now-independent support organisations, that were established and 'spun-off' by state agencies, are included (denoted with an *).

Key

BCEF	Bristol Community Energy Fund	NFFO	Non-Fossil Fuels Obligation
CAFE	Community Action for Energy	NFFO-NI	Non-Fossil Fuels Obligation – Northern Ireland
CARES	Community And Renewable Energy Scheme	NIRO*	Northern Ireland Renewables Obligation
CES	Community Energy Scotland	P2C	Power to Change
CfD	Contracts for Difference	RCEF	Rural Community Energy Fund
CRI	Community Renewables Initiative	RHI	Renewable Heat Incentive
ERDF	European Regional Development Fund	RO*	Renewables Obligation
FITS	Feed-In Tariff Scheme	ROS	Renewables Obligation (Scotland)
HICEC	Highlands and Islands Community Energy Company	SRO	Scottish Renewables Obligation (Scottish version of the NFFO)
LCBP	Low Carbon Buildings Programme	SCHRI	Scottish Community and Households Renewables Initiative
LCCC	Low Carbon Communities Challenge	UCEF	Urban Community Energy Fund
LEAF	Local Energy Assessment Fund		

*The Renewables Obligation is a UK-wide scheme. However, it operates slightly differently in Scotland (the ROS), and is the sole form of price support for renewable electricity in Northern Ireland (the NIRO) where there is no FITS.

Standard practice in the UK is for energy developers to finance the initial, riskiest stages of the cycle from their own reserves, or bank loans (Blyth et al 2015). Yet these options are generally not available to community energy groups, many of whom are small, lack substantial reserves and have little or no credit history. While some solutions have emerged from within the movement (see below), external grant funding has been vital to financing the initial stages of many projects. Much of this comes from the public sector (see Figure 4.2) but other sources of funds include the Big Lottery, charities, and a range of large companies, including energy companies such as Northern Powergrid, or others – such as Marks and Spencer (Northern Powergrid 2016: 8, CEE 2017: 19-20, van Veelen 2017: 8).

Even for the less risky stages of projects, community energy groups face obstacles. They generally develop one small-scale project, in an industry where developers tend to raise finance for several larger-scale projects across which risk can be spread; and they may struggle to find technical, legal and other advisors to help prepare business and technical plans to the "investment ready" standard which commercial financiers are accustomed to (Nolden 2013, DECC 2014, Hall et al 2015b).

This lack of fit with the prevailing UK finance regime has meant that the rise of two new (but related) niches in the finance sector has been important for community energy. One has been that of 'ethical' finance companies and products. Key actors have been banks like the Coop or Triodos, that have offered loans to relatively small scale community energy projects that are underserved by mainstream finance.

Also significant has been the emergence of online alternative finance. The internet was in its infancy in the early days of UK community energy, now alternative finance "platforms" offer a space where fundraisers (of many sorts, not just energy groups) can appeal directly to potential funders in the general public (Davis and Braunholtz-Speight 2016). This moves investment decision-making power away from fund managers, steeped in mainstream finance culture and often contractually obliged to maximise financial returns, and transfers it to ordinary citizens who may be motivated by a more diverse blend of financial, social and environmental concerns. Alternative finance platforms have offered loans and bonds to smaller scale renewables projects, but online community share issues have been particularly relevant to community energy. While the cooperative structure of members holding non-transferable shares is long established, the use of the internet to offer such shares to the wider public to finance community energy projects is relatively new. From a handful in the mid-2000s, community share issues hit a peak of 101 in 2015 (Community Shares Unit 2016: 9). Renewable energy projects have driven much of this activity (Community Shares Unit 2015: 13-14), and community shares have become a major source of capital for community renewables projects (CEE 2017: 21-22).

Revenue streams for community energy generation have changed little, consisting of revenues for energy sold plus any renewable energy incentive payments available. Customers for energy sales have mostly been energy supply companies; however, some groups have been able to conclude Power Purchase Agreements with local end users. However, the conditions and levels of income available have changed markedly, particularly thanks to the policy shift from NFFO and ROCs to the more generous and accessible FITS in 2010. The growth in community energy post-2010 appears to reflect these changed market conditions (CEE 2017: 14, CISE dataset); certainly there has been a dramatic growth in deployment of

small-scale renewable electricity generation since the advent of the FITS[7]. The post-2010 growth of new energy supply companies, receptive to community energy generators such as Cooperative Energy and Good Energy, may also have improved prospects for community energy groups.

There is some evidence that the costs of undertaking community renewables projects appear to have come down. This is attributed to the development of economies of learning within the sector (Harnmeijer et al 2015), and general reduction in the costs of wind and solar technologies (IRENA 2015).

4.2.4. Policy beyond energy: economic and planning policies, legal structures

Operating at a spatial level below the UK-wide regime, and lacking the power to restructure energy markets or price incentives, some state institutions have nevertheless adopted policies to create protected niches within which community energy can grow – often as part of a socio-economic development strategy. The clearest example is Scotland, where successive Scottish Governments have made capital funding and technical support available for a decade now (see Figure 4.2), and announced targets for the expansion of "community and local" energy generation. Some of this stems from regional action by Highlands and Islands Enterprise, who created the Highlands and Islands Energy Company (which became Community Energy Scotland - CES) to foster the growing community wind power sector in its region. At the other end of the UK, the South West of England Regional Development Agency created Regen SW (now simply Regen) in 2004. Although there are important differences – Regen's remit is wider than community energy alone, and dedicated funding for community renewables in the South West cannot match that in Scotland, it is striking that both the UK regions where community energy is most developed are home to relatively long-established local renewable energy support agencies.

Another key area of policy has been land use planning and environmental regulation. This is a complex area, with power and responsibilities shared between local authorities (which set local policies and where most of the process takes place), and central government (which sets guidance and can on occasions overrule local decisions). Although direct decision-making power still rests with local authority officers (or eventually with higher level politicians), planning processes offer a space to wider social and cultural movements referred to above to give voice to their views about renewable energy – for and against. In relation to community energy, its chief impact has been on energy generation, although with differential impact on different technologies. Onshore wind has been the subject of particular planning controversy, and the UK is said to be one of the most difficult places in Europe to get permission to construct wind farms (Toke 2005, IRENA 2013: 134, Bauwens et al 2016: 143-4). The then

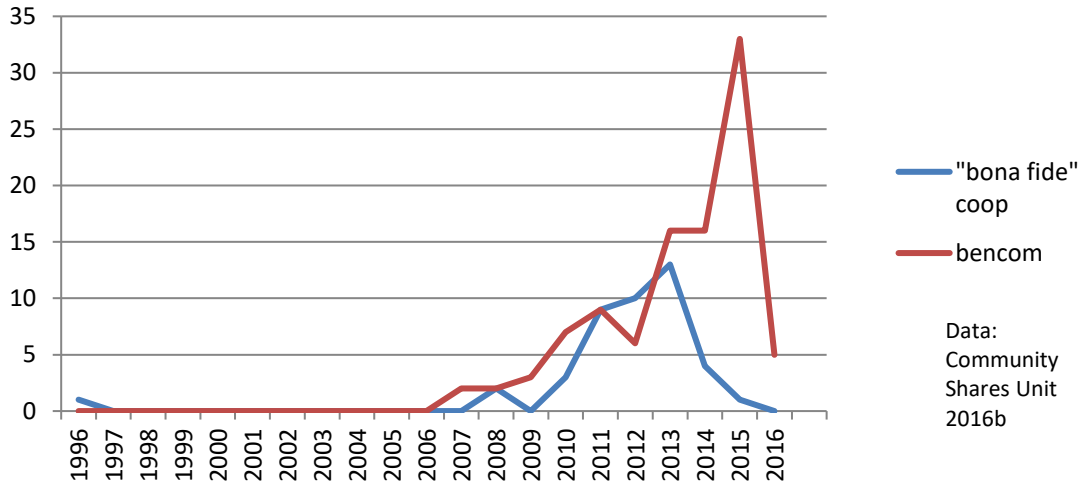
[7] The Renewable Energy Planning Database maintained by BEIS records 105 operational renewable electricity installations of 1 - 5MW capacity from 1990 (inception of NFFO) to March 2010 (when the FITS became open to applications), and 654 such installations becoming operational from April 2010-December 2016. The FITS register records over 800,000 installations in total since 2010, the vast majority of which are small domestic solar PV installations (Ofgem 2018).

Labour government issued guidance encouraging onshore wind in mid-2000s (DTI 2006 appendix d). However, the Conservative government in 2014 took powers to override local planning decisions and veto onshore wind farms (Malnick 2014), and in 2015 changed planning guidance to set higher hurdles for onshore wind to get planning permission. Some local authorities have responded positively by designating permitted areas for wind, but many have not taken this step, and some estimate that onshore wind will be "undevelopable" in the majority of local authority areas in England (Stone 2017: 4).

As regards the law that regulates how groups can constitute themselves, community energy has drawn on many long-established legal structures such as cooperatives, companies limited by guarantee, and charitable trusts, as detailed in Table 3.1 above. The creation of the Community Interest Company (CIC) form in 2005 has attracted some take up from within the sector, but not on a large scale (CEE 2017: 11).

More recently, new energy cooperatives have been increasingly registered as community benefit societies ("bencoms"), rather than 'bona fide' cooperatives (see Figure 4.3). This shift was linked to the Cooperative and Community Benefit Society Act 2014, which stipulated that the members of cooperatives should be able to participate directly in the business of the Society. Following this, the Financial Conduct Authority began refusing to register energy groups as cooperatives (Vaughan 2014). As clarified in subsequent guidance from DECC (2015), given that most community energy groups sell any energy they generate to the national grid rather than directly to their members, this meant that community energy groups had henceforth to register as community benefit societies, to which no such member participation rule applied. Further points about charitable tax status being open to community benefit, but not cooperative, societies, also drove the rise of 'bencoms'.

Figure 4.3 Registrations of community energy cooperatives over time[8]



[8] Similarly to Figure 3.1.1, Figure 4.3 also indicates a substantial drop in new community energy projects – especially cooperatives and community share offers - since the 2015 changes in public policies affecting community energy. See Section 4.2, and Chapter 5 for more discussion of these.

4.3. Action within the community energy 'niche'

The final, smallest scale level of the multi-level perspective is the "niche". Niches are conceptualised as spaces where "radical" technological innovation is made possible by some combination of factors that shelter it from the pressures of the dominant regime (Geels 2002: 1261). Through the interplay of changes at multiple levels, innovations initiated in niches can go on to significantly influence, or even displace, the regime (Geels and Schot 2007).

Can a community energy niche be said to exist in the UK? It is important to remember that we are focussing on a social rather than a technological innovation – *community* action on energy, whether supply- or demand-side. Nevertheless, we have identified several factors – public policies such as the FITS, technological development, alternative financing mechanisms and institutions - that have combined to create a niche that has enabled community initiatives to survive and grow, despite their lack of 'fit' with various aspects of the prevailing energy regime.

However, it is equally clear that, despite this, the social and economic aspects of the overall energy regime have not been significantly disrupted by community energy. While the MLP emphasises multi-level processes, some researchers have examined the community energy niche in itself; and suggested that it is relatively weak, describing it as "nascent" or "emerging" and hampered by a lack of self-organisation (Seyfang et al 2014: 43).

Having previously discussed the landscape for community energy and its place in the energy regime, in this section we examine action within the community energy niche. We first discuss some of the way that individual groups can be seen to have adjusted elements of their business models in response to regime conditions. A second subsection examines some ways in which, notwithstanding the diversity in the sector, community energy groups are increasingly interacting and creating a more coherent niche.

4.3.1. Action by individual community energy groups

Firstly, the types of energy activities and technologies that community energy groups have chosen to engage in have clearly been shaped by the energy regime, and the nature of niche protection. Renewable energy generation is the one area of the energy regime where there has been substantial change in policies and technologies that have enabled smaller-scale actors to enter the market and survive. Community energy groups have thus focussed on energy generation to provide their revenue.

Early stage financing was identified as a particular problem for community energy in the prevailing energy regime, and it was noted that many groups were dependent on grant funding for the initial stages of project development. Two innovations that aim to reduce this dependence are of note. Firstly, there is the rise of the "pioneer" community share issue. This is essentially the use of a community share issue to finance the risky feasibility and project development stages of a project. This might be seen as drawing on a community's "internal reserves", or alternatively, given the risks involved, as more akin to a donation than a financially-motivated investment. Nevertheless, some community energy groups have raised tens and even hundreds of thousands of pounds through this method (Sharenergy 2015).

Secondly, there is the Energy4All approach, which uses a small percentage of revenues from existing E4A-established energy cooperatives to create a support and funding service to help new groups get their projects off the ground (CEE 2017: 19, Energy Prospects undated.) As other community energy projects mature and begin to pay off their loans, there might be scope for established groups to fund further intra-sector collaboration of this nature,[9] thus strengthening the community energy niche.

4.3.2. Knowledge, intermediaries and niche development

The development of the technical, regulatory and market knowledge necessary to engage with the energy regime successfully has been partly driven by interventions from regime actors (such as regional development agencies) mentioned previously, who helped set up bodies such as Community Energy Scotland, or Regen (previously Regen SW).

There has been an increasing emphasis on internal knowledge development and sharing from within community energy. Firstly, there have been new umbrella and network organisations formed. Community Energy Wales was set up in 2012, and Community Energy England was formed in 2014. While the former was set up with Welsh Government funding, both aim to be financially self-sustaining through membership fees, they also engage in networking and policy advocacy work. At a smaller scale, networks such as Community Energy South, or the Bristol Energy Network, have promoted knowledge sharing and collaborative working, and others are emerging e.g. in North West England.

Another form this has taken is the establishment of companies providing development services to other community energy groups. Baywind Cooperative pioneered this approach by setting up Energy4All in 2002 (as noted above). However, E4A has gone on to establish Energy Prospects in 2010 (see above), and also Sharenergy in 2011, the latter specialising in smaller scale energy cooperatives. Elsewhere, Communities for Renewables CIC was launched in 2014, and in 2015 Bath and West Community Energy spun-off Mongoose Energy, both of which have subsequently worked with community energy groups across the South West (and further afield). Their activities have reached a significant scale, with recent data indicating that they provide almost 30% of the employment in community energy outwith Scotland (CEE 2017: 12).

These “intermediaries” can be seen as helping new or under-resourced groups engage on better terms with the existing energy regime, through providing technical knowledge, contacts, and labour time (most including producing key documents such as share prospectuses, or undertaking day-to-day administration, among their services).

The role of niche-level networking and learning can also be seen in some patterns in the adoption of legal structures by community energy groups. Thus, the popularity of cooperative structures can in part be traced to the first community renewables initiative, Baywind, which was a cooperative. Members of Baywind subsequently established Energy4All in 2002, a cooperative dedicated to further establishing renewable energy coops (Energy4All undated). Energy4All’s success in doing this meant that many community renewables projects were structured as cooperatives, both through their direct intervention (their website lists 24 groups they have helped establish), and through the setting of a precedent, the development

[9] Thanks to Clare Reger of the University of Sheffield for this observation.

of expertise and familiarity with the operation and financing of such organisations (e.g. TLT Solicitors 2007).

While there is a mix of legal structures used by Scottish community energy groups, it is notable that there are many more companies limited by guarantee with charitable status (van Veelen 2017: 9). This form was popularised in the community land movement – where community groups formed "development trusts", in practice companies, to buy the land their community was situated in[10]. Beginning in the 1990s in the Highlands and Islands, with community landowners typically in locations with a good wind resource and in search of income-earning opportunities, this movement has strong links with community energy, and many community landowners have established energy generation subsidiaries (Braunholtz-Speight 2015, van Veelen 2017).

[10] Again there was a mixture both of direct intervention (with the same solicitor advising many early community land initiatives) and the 'lock in' effects of establishing a precedent.

5. Conclusions

This report has sought to understand the factors contributing to the emergence, growth and nature of community energy in the UK. In particular, as the initial output from the Financing Community Energy research project, it has focussed on investigating the role of financing mechanisms and business models in the evolution of community energy as it is today.

This chapter summarises the analysis, and discusses some possible future directions for community energy. It concludes by outlining the next steps for our research project, and some of the key lessons that we take from this report.

5.1. Analytical summary

In the UK, the generation, distribution, supply, financing, and regulation of energy is centralised and dominated by large-scale actors. Community energy has been working very much against the grain of this; and has failed to disrupt the prevailing regime significantly. Instead, community energy groups have adapted to fit into the regime, through learning, collaborating, and taking advantage of opportunities.

The current UK energy regime has to a considerable extent been created by UK government policies liberalising and privatising centralised energy infrastructure and supply, regulating markets, etc. However, market actors (and state actors beyond the UK) have also driven change in energy technologies, as the efficiency, cost and availability of renewable energy generation has improved greatly. This technological change has largely been absorbed by the regime: large companies continue to dominate, including in respect of renewable energy generation. Nevertheless, the nature of renewable energy technologies permits smaller-scale generating plants, and so the twin shifts in regulation and technology have also created an opportunity for small-scale energy companies to enter the generation market. Community energy groups are among those that have taken this opportunity.

Regarding community energy business models, revenue earning has largely been provided by supply-side energy generation initiatives rather than demand-side energy efficiency focused projects. Surplus revenues from this have been used to support a range of environmental and social projects, including energy efficiency and demand management activities. Grant funding has also been important for energy efficiency work, and for project start-up costs in general – particularly in the early days. Yet over time, advances in technology and associated supply chains, the rise of alternative finance mechanisms (in particular community shares), and the development of networks and learning within the community energy “niche”, have strengthened the sector’s position over the last 20 years and contributed to its growth.

However, the largest single step forward for community energy was the introduction of government revenue payments, such as the FIT, the first government price support mechanism aimed specifically at smaller scale renewables. However, subsequent political changes have seen the FITS and other public policies become much less supportive, and new renewables activity stall.

This is unsurprising: central government plays a major role in structuring the UK energy market. If new actors are to enter this market and thrive, they will need government to

'unlock' it to a degree. As energy projects are characterised by high upfront capital demands and long payback times, policy stability is crucial for de-risking investment.

5.2. Looking ahead

5.2.1. Energy in the UK

The politics of energy policy are clearly key to the fortunes of community energy: yet, as discussed in Chapter Four, at present the direction of UK energy policy is unclear. On the one hand, programmes to support small-scale renewable energy generation have been scaled back in various ways, while there has been renewed government commitment to nuclear energy. Yet, on the other hand, the 'Big Six' energy utilities that dominate UK markets currently face simultaneous financial and political challenges. Their business models are under pressure from falling profits and difficulties in accessing bank finance (Shrubsole and Cameron 2014, Blyth et al 2015), while in the UK, politicians across the political spectrum debate interventions to lower retail energy prices (Peachey 2017). Some advocates of community energy believe that this represents an opportunity to engage with them to transform the regime (Baines 2017).

Another area of change is demand-side technology, where new developments might facilitate the creation of viable energy services and local supply business models. However, regulatory and infrastructure challenges remain here.

Finally, having been largely absent in recent decades, local authorities are again entering the energy system (having played a major role in some areas over a century ago: Berka 2016). Municipal energy is relatively common in Europe (e.g. Hall et al 2015c). Both community and municipal energy are interested in the social and environmental aspects of the energy system. It is possible that local authorities' access to low cost borrowing and staff resources could complement community energy groups' experience of grassroots organising and running small scale energy projects. Yet with local authorities also undergoing severe cuts to their income and resources, achieving this may not be straightforward.

5.2.2. Community energy

Community energy companies that have projects up and running are relatively secure: however, prospects for new energy generation projects have been negatively affected by the dramatic fall in FIT rates in 2016. This has several possible implications.

Firstly, some proposed responses to the cut in FIT rates – shared ownership projects, and end user power purchase agreements – recall the business models characteristic of the earlier, pre-FITS days of community renewables. These demonstrated that a community energy niche can be established despite relatively weak government protection.

Yet community energy is in a stronger position now. As we have noted earlier, the niche has developed: numbers of groups and projects have grown, older groups' revenues are generally secure, and they and intermediary organisations are developing economies of learning (Harnmeijer et al 2015). It has also connected with other niches in finance and technology. The use of "pioneer share offers" to fund the feasibility stage of projects, draws on the growth of "community" enterprise in other sectors such as finance. More generally,

the continued rise of alternative finance – now with the possibility of investing in community energy through an ISA – bodes well for the financing of small scale schemes. While demand-side technology deployment faces challenges (as noted above), community energy groups are among those investigating how to create viable business models in this field.

Secondly, with revenues down, keeping costs down will be vital to projects' viability. Evidence suggests that community energy groups develop their second project more efficiently (Harnmeijer et al 2015); this and the rise of new intermediaries from within the sector suggest that keeping costs down may be possible. Understanding how different business models affect costs and revenues will be key to our research.

Finally, in keeping with our understanding of community energy as a social rather than a technological innovation, it seems that it is the social impact of community energy that practitioners and policymakers particularly value. However, with margins being squeezed due to falling FIT rates, the amount of surplus revenue that any future community energy schemes can generate for investing in social or local environmental projects may also fall. This may not affect the direct impact of these schemes on decarbonising the energy system, but it may discourage those whose motivations for developing community energy are more about raising income for community development, as well as reducing the potential for community supply-side projects to generate money to fund demand-side projects.

5.3. Financing community energy: where next for our research

The next steps in our research are a UK-wide survey of community energy finance and business models, followed by a number of in-depth case studies of community energy organisations and their projects . This report will be combined with research and analysis from the survey and case studies, and the feedback from stakeholder engagement events, to produce a range of policy and academic outputs. Our principal focus will be on potential innovations in finance mechanisms, business models and policy, to support further growth of community energy in the UK.

The findings from this report, summarised earlier in this chapter, support this focus on the interplay of finance, policy and business models. Looking more broadly, two points seem clear. Firstly, with the sector still in flux and not yet coalescing around a "new normal", research into how the technological, regulatory, customer, financial, and other resource elements of community energy business models might be viably combined is timely. Indeed, in addition to the Financing Community Energy project, there are other community energy finance and business model research projects underway in the UK at both regional (Regen 2016) and EU (COALESCCE 2017) levels. Secondly, notwithstanding some excellent studies cited in this report, our research to date confirms the paucity of good quality and comprehensive quantitative data and analysis on the financial and economic side of community energy. It is notable that Community Energy England have also recently begun to address this gap through their annual State of the Sector survey, and we are delighted to partner with them on our survey in order to maximise the use of our shared data. We hope that the next stages of our research will go some way to filling this gap and providing knowledge that can be used to improve the fortunes of UK community energy.

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Appendix: The geographical distribution of UK community energy

Figure A1: Community energy across the UK in 2014

Source: Databuild 2014

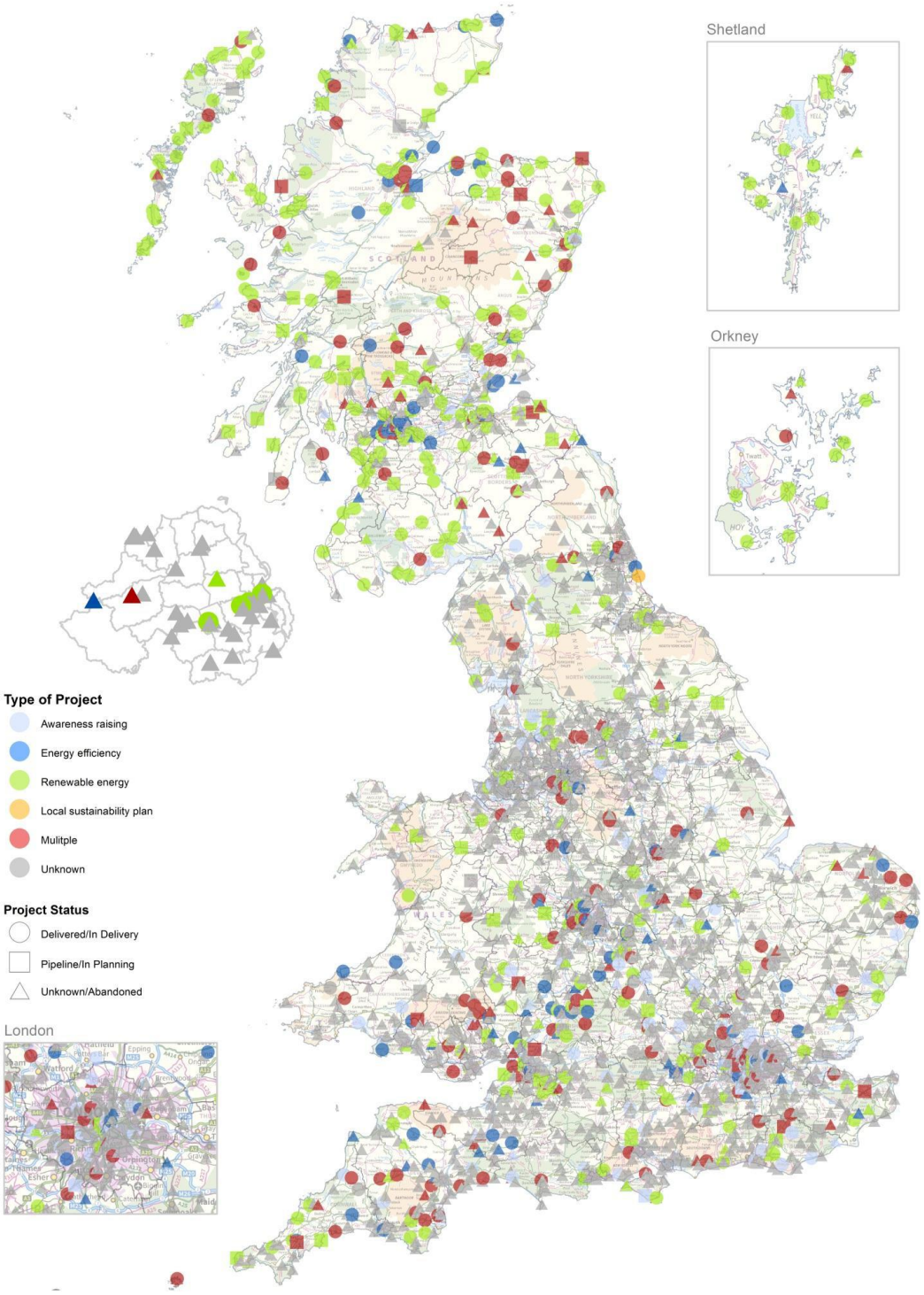


Figure A2: Community energy groups in England by local authority in 2016

Source: Centre for Sustainable Energy 2016

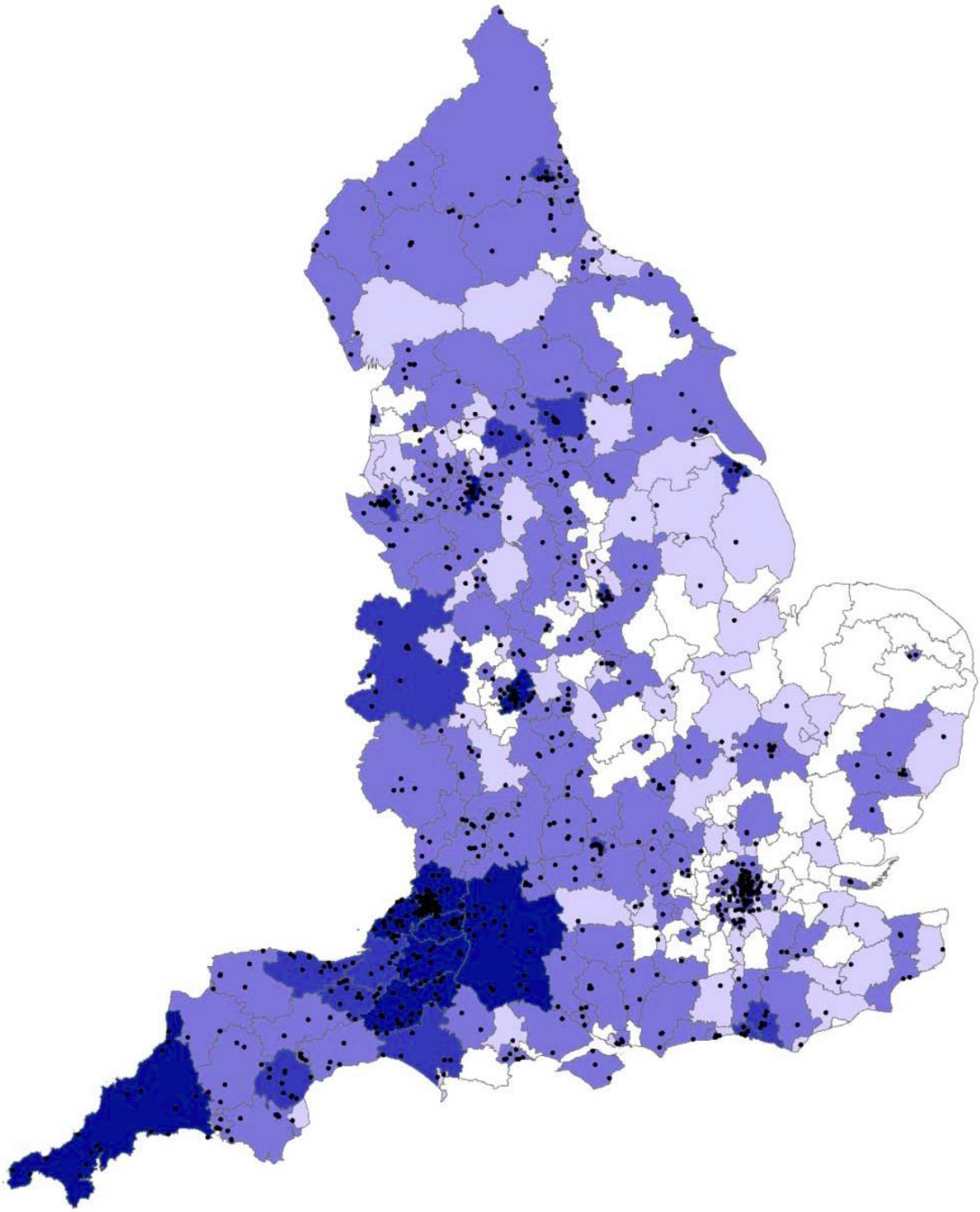


Figure A3: Community-owned operational renewable energy projects in Scotland, June 2016

Source: Energy Saving Trust 2016

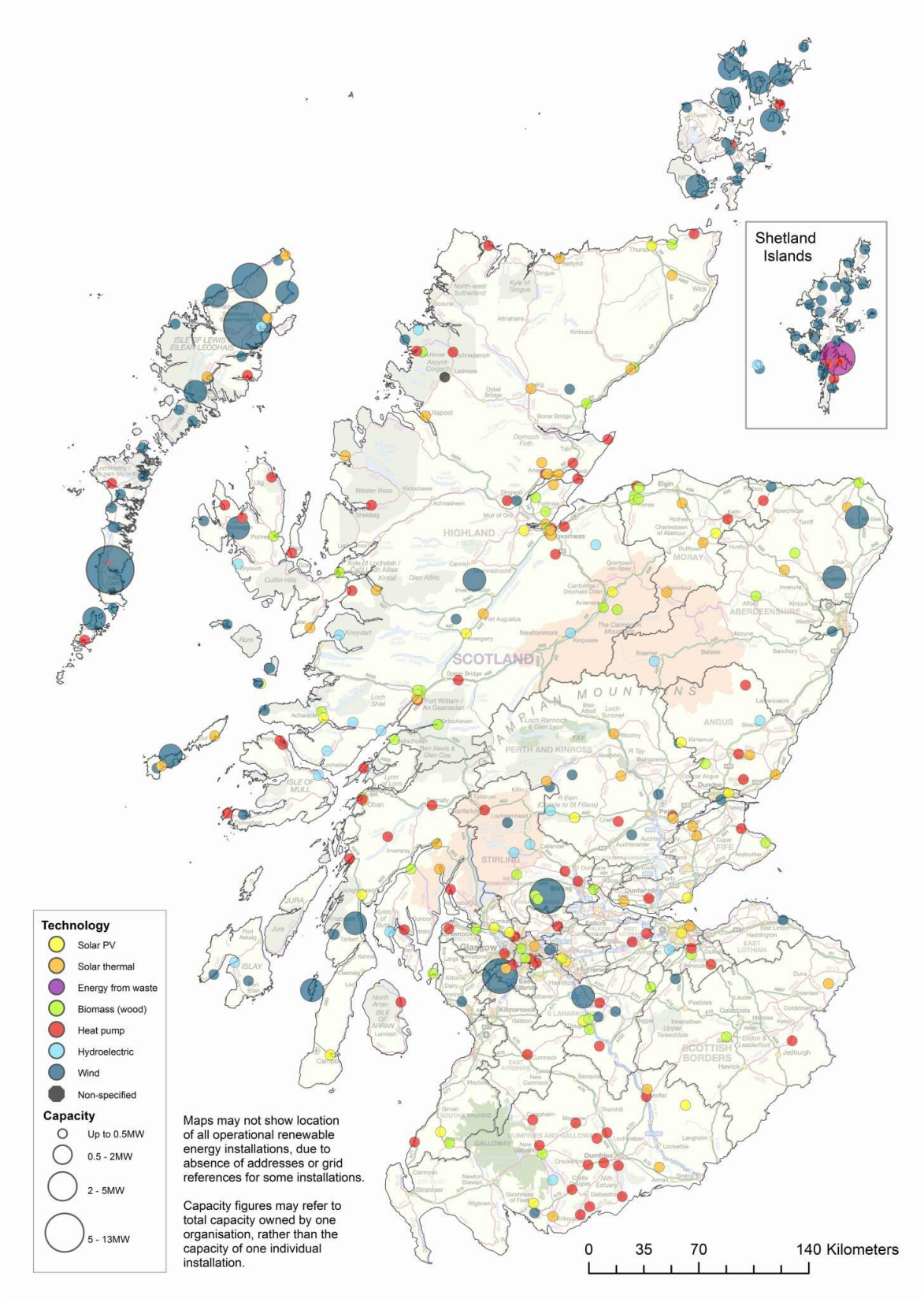
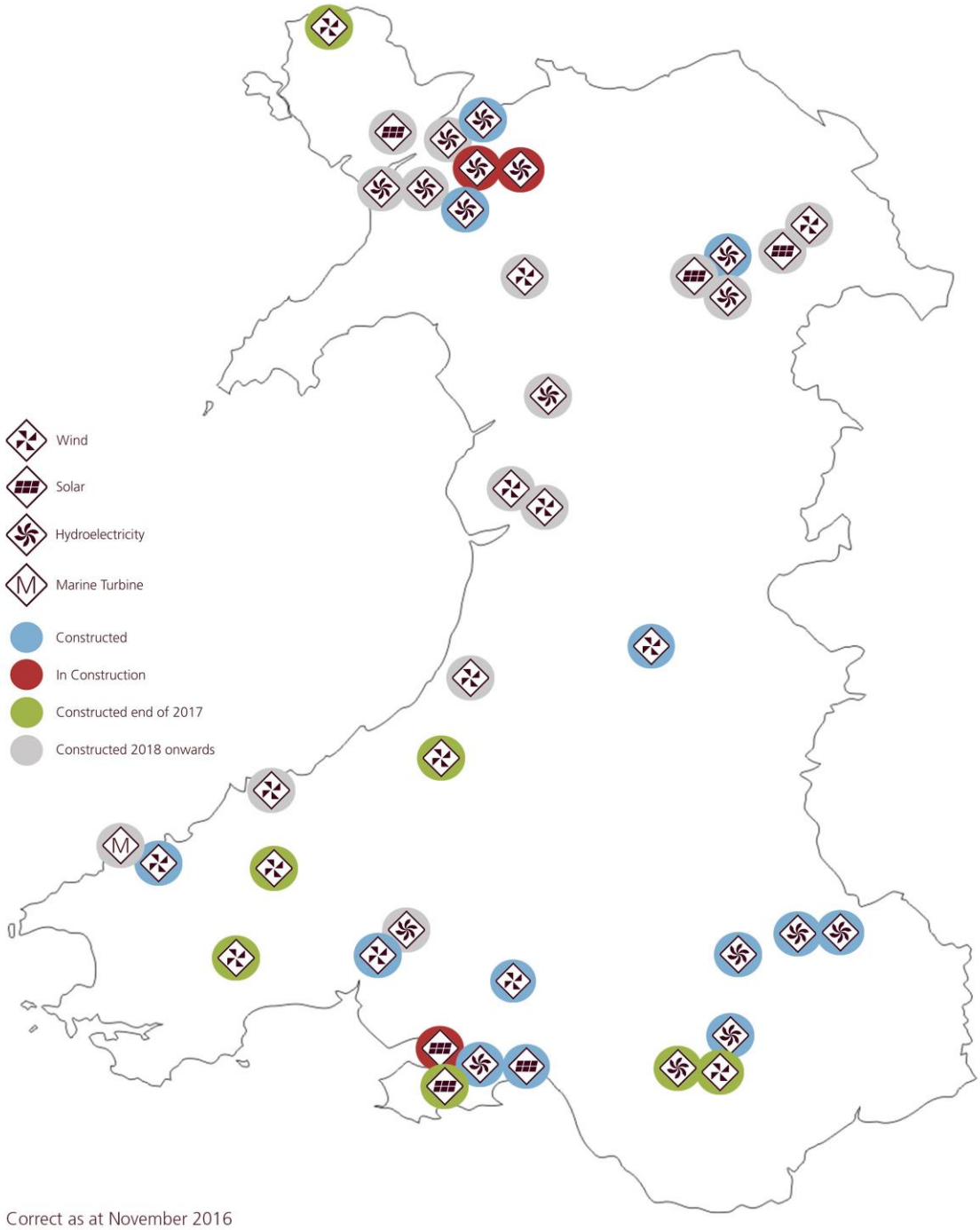


Figure A4: Local renewable energy projects in Wales, 2017

Source: Ynni Lleol/Local Energy, Welsh Government



Notes on the maps

The maps give an indication of the geographical distribution of community energy groups in the UK. However, there are some points that need to be born in mind while interpreting them.

Firstly, they do not all map the same sort of energy activity. While the UK and England maps cover "community energy" across various sorts of activities, the Scottish and Welsh maps focus on renewable energy generation only.

Secondly, they do not map exactly the same kind of group. The precise definitions of "community" and/or "local" energy differ from one map to another. Nevertheless, they give some indication of the geographical distribution of active small scale energy projects with a local or citizen participation element.

Thirdly, the country-specific maps are more recent than the UK one. They all date from 2016, whereas the all-UK map is from Databuild's 2014 report, and therefore likely reflects the situation in 2013 at the latest.

Finally, none of them are comprehensive. The Databuild map illustrates the "unknowns" in the mapping by using grey triangles to represent projects where both the type of energy activity and current status of the project was "unknown": it can be seen that there are very many of them.

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