Revisiting urban energy initiatives in the UK: declining local capacity in a shifting policy context

Introduction

In the early 20th century there was considerable interest in and hope for localised initiatives, particularly in urban areas, that would help transform more centralised energy systems such as those found in the UK. There was a significant literature looking at such initiatives (Cowell, Ellis, Sherry-Brennan, Strachan, & Toke, 2017; Rutherford & Coutard, 2014; Seyfang & Haxeltine, 2012), much emphasising the variety among such initiatives in terms of the processes involved and the outcomes achieved (Rutherford & Coutard, 2014). It showed "how differing contexts, actor constellations and historic developments shape the transformation of energy systems towards greater sustainability" (Rohracher & Späth, 2014). For Rutherford the transition to a new energy regime "must be seen as a heterogeneous process" linked to "multiple arrangements, mobilisations and control … by particular interests and groups" (Rutherford, 2014). Bulkeley and colleagues saw the complex relationships within localities as necessarily giving rise to heterogeneity. Using the concept of 'experiments' in urban energy, they argue that "experiments work by establishing new circuits, configuring actors in new sets of relations" (Bulkeley, Broto, & Edwards, 2014). This was to the extent that Emelianoff (2014), in her research on Hannover and Växjö, found energy pathways to be "very contrasted and even contradictory" (Emelianoff, 2014). Indeed, Rutherford and Coutard (2014: 1368) even argued against "any notion of an urban energy transition as a clear, homogeneous, singular, consensual pathway of socio-technical change towards a (more) sustainable urban energy configuration".

What is apparent from the work on diverse urban energy initiatives, is that these are indeed 'experiments' and thus may fail or succeed, survive or close. Nadaï et al. (2015) see such local experimentation as a positive but rather unpredictable force for change (Nadaï et al., 2015). In their study of energy retrofitting in Manchester, Hodson and Marvin (2017) contrast the top-down 'ON'

model for the city-region as a whole with the 'IN' approach based on ad hoc initiatives across the city-region and characterise the latter is comprising multiple, local fragmented activities and being fragile (Hodson & Marvin, 2017). Rutherford and Coutard (2014), in their broad overview of the different areas of research looking at urban energy transitions, emphasise that within such diversity "the processes of change and their outcomes are highly contingent, debatable and reversible; and implementation is often difficult to achieve compared with ambitions" (pp. 1366-7).

This diversity needs to be placed within the broader context of energy transitions to 'more sustainable' or 'more efficient' use and production of energy, which are equally acknowledged by scholars, policy-makers and industry as being one of the challenges facing our contemporary society (Rifkin, 2011; Singer, Denruyter, & Yener, 2017). Energy transitions have been and are being framed by, at least, three important developments: the ascent of renewable energy; shifts in energy geopolitics; and the liberalisation of energy markets.

We have seen a substantial growth in renewable energy production and consumption around the world driven by debates around climate change and peak oil, security of energy resources, and energy prices and affordability. For example, the share of renewable energy in the EU's gross final consumption of energy in 2004 accounted for 5.5%, while in 2015 the share rose to 17%. Moreover, the EU has agreed to increase this share to at least 34% by 2030 (IRENA, 2018). Renewable energy is increasingly central to worldwide total energy consumption growth, with the share of renewables meeting global energy demand expected to reach 12.4% in 2023 (IRENA, 2018). This means that an energy transition will continue, despite commentators such as the International Energy Agency (IEA) arguing that transitions to cleaner energy systems have 'stalled' worldwide as we are all locked into fossil fuel and growth dependent lifestyles (Clark, 2013; Haas, 2019; Smil, 2016).

Changes in the geopolitics of energy markets have been marked by tensions and synergies between Russia's multiple role in the international energy arena, as a producer, consumer, exporter, importer and transit state, and the fast emerging and dynamic energy actors in Northeast Asia such as China,

Japan and South Korea (Shadrina & Bradshaw, 2013). For example, China has become an important energy producer while increasing industrial standards and investing heavily in low carbon energy as part of its drive to decarbonise its energy systems (Urban, 2009). China is shifting decisively away from coal, guided by a long-term economic policy to lead in future energy markets and to support sustainable growth, clean air and a political vision of a 'beautiful China' and a 'return to blue skies' (IEA, 2017). China is also setting up demonstration cities for energy transitions and renewable energy development. This means that China's energy choices and decisions will play an important role in influencing energy transitions happening elsewhere.

Energy markets, and especially electricity markets, have also undergone liberalisation and privatisation since the 2000s, ostensibly in order to introduce greater competition and efficiency, reduce prices and increase market transparency. This has meant the reform of existing regulatory frameworks but also the introduction of new independent energy operators into the markets. Pollitt (2012) notes that despite modest efficiency gains and improving the governance of energy utilities via independent regulators, energy liberalisation has failed to deliver tangible benefits to household and communities in many countries or to lead on energy transitions unless communities are willing to bear the cost, which is often significant (Pollitt, 2012).

The above-mentioned macro-scale developments that underpin energy transitions at the global and national level set the context for change in urban energy systems, thereby affecting the lives of urban communities. This raises the question of how local energy initiatives and communities have fared in changing circumstances over recent years within a radically-altered political, economic and social context for such projects. The next section outlines the contextual shift that has occurred in the UK since 2010 (the year of a General Election) and then revisits a database of such initiatives within the UK, collected in 2010-11, to see how they have fared and look at patterns for survival and closure. This highlights the importance of community-based initiatives as ongoing projects and the paper

then looks at these in more detail. After a brief methodology section, the paper discusses findings from 12 cases leading to a final conclusion summarising findings and making recommendations.

C**hanges in the UK's energy policy landscape since 2010**

The UK's energy policy landscape has changed significantly over the last decade. Within the wider context of urban energy transitions briefly discussed above, changes can be understood from at least three perspectives: the wider ideological context of neoliberalism and, more recently, populism; the UK's political and economic landscapes shaped by changes in government, austerity measures and Brexit, which have had an impact on all national policy sectors; and the specificity of the UK's energy sector and policy.

First, the wider context of neoliberal ideology, rooted in Thatcherism in the UK and ongoing since the 1980s, has seen reforms in most policy sectors, including a restructuring of the public sector to be part of a 'deeper neoliberal hegemony' (Clifford & Tewdwr-Jones, 2014). Neoliberal ideas have influenced and been re-produced in the UK through a shift towards state decentralisation or devolution under assumptions of strong national economic growth which, some argue, have led to 'complexity, experimentation, fragmentation and incoherence with largely negative implications for territorial equity and justice.' (Pike & Tomaney, 2009). This has gone alongside marketization and financialisation of local government (Raco, 2018); and the emergence of the localism or 'big society' agenda, where the state takes a back seat and transfers some decision-making powers to communities and neighbourhoods (Bessusi, 2018; Turcu, 2018). There has also been liberalisation of energy markets discussed above and attempted decentralisation of the energy system (McKenna, 2018).

In addition, it can be argued that there has been a turn towards right-wing populism and post-truth politics, which have been employed to framed extreme debates and rising political polarisation on

Brexit but also other areas of public policy such as climate and energy policies (Fraune & Knodt, 2018). Populist discourses see climate-change-related policies such as the low-carbon transformation of national energy systems as legitimate only if they benefit the nation and some core groups directly or even exclusively (Rydgren, 2007). Climate change policies and science have also been subject to post-truth politics whereby well-established positions are challenged, such as the devastating reality of climate change and the economic merits of global free trade which liberals and experts accept as self-evident (Jasanoff & Simmet, 2017). The divide between climate science and climate denialism is not as deep in the UK as it is in the US, but is still present via 'climate silence' in some of the mainstream media.

Second, specific milestones in the UK's political and economic landscape have shaped policy outlooks. These are: the 2010 change in government; the economic and financial crises of 2007-2008 followed by austerity measures since 2012; and the Brexit referendum of 2016. In 2010, Britain's long-standing centre-left New Labour government lost power to a predominantly centre-right Coalition government, followed by a centre-right Conservative government in 2015. Governments since 2010 have pursued a neoliberal agenda in most policy sectors. The new governments also implemented two consecutive waves of austerity measures (2012-2016 and 2016-2020) in a bid to respond to and reduce national debt. These have hit local government hard and, affected and re-framed most policy sectors at the national level, including energy policy (Rydin & Turcu, 2014; Turcu, 2018). For example, by 2016 subsidies for onshore wind had been withdrawn, and the Zero Carbon Homes Standard and the carbon capture and storage (CCS) demonstration programme cancelled. The Green Deal energy efficiency programme in the residential sector failed and CRC (Carbon Reduction Commitment) Energy Efficiency Scheme in the commercial sector is due to be abolished in 2019.

Brexit (the UK move outside the EU) will impact on both the UK's role within the EU's Single Energy Market (Electricity and Gas) and the nature of its energy policy. While it makes good economic sense for the UK to stay in the EU energy market, some commentators argue that some of its energy policy

will be rolled back following Brexit, as some of UK's European-set targets around renewable energy and the roll-out of smart meters have proved to be 'too expensive' for the public purse. The UK's renewable energy target set at 15% of gross final consumption by 2020 remains an expensive ambition driven by the government's determination to push up renewable energy production despite the need for substantial up-front investment (Pollitt, 2017). Leaving the EU may prove a moment to re-consider renewable energy investment and targets. It may mean more large-scale local experimentation and innovation with solutions that combine technology pull-and-push factors at the local level, a combination of public, private, crowd-funded etc. investment, outside the influence of EU legislation. It has been argued that the UK could become the 'California' of Europe promoting energy experimentalisation and innovation at a faster pace than the rest of Europe, i.e. similar to what California does relative to the federal level in the US (Haas, 2019).

Third, the particularities of the energy sector are important to understanding energy policy in the UK. The main focus has been on the decarbonisation of the energy system, mainly via electrification, but also via using other energy sources (Keay, 2016). There is also a secondary focus on energy in transportation and a tertiary focus on energy efficiency which has been poorly addressed to date (UKERC, 2016). It has been argued that this has been shaped by the ideology of an energy policy stuck between a half-planned (ring-fenced by the 2008 Climate Change Act and legislated carbon budgets to 2032) and half market-oriented model (nurtured by the UK's long standing and ongoing liberalisation of energy markets) which may mean that energy policy performs a continuous balancing act between energy centralisation and decentralisation (Keay, 2016). This affects the various policy frameworks and programmes, provided by the government usually in partnership with utilities and local authorities, that have supported community-based energy projects over the years (Strachan, Cowell, Ellis, Sherry-Brennan, & Toke, 2015).

How have localised energy initiatives fared in this changed context? This paper takes the opportunity to go back to data on urban energy projects collected in 2010-11 and update information on those

projects, enabling an assessment of the extent to which they have survived or not. The next section presents these results before discussing the follow-up research.

Change in localised urban energy initiatives: patterns of survival and closure

The 2010-11 database collated information on 182 projects as part of the CLUES research project (see www.ucl.ac.uk/CLUES where the original database can be found). That research highlighted the increasingly heterogeneity of urban energy systems and the tendency towards urban experimentation at the interface between urban and energy policy (Rydin et al., 2013). The database was not intended to be a representative sample of such initiatives but rather to highlight the different forms that such initiatives were taking. They covered a range of projects from the collective support of the installation of renewable energy technology at the urban, neighbourhood or building scale to community engagement, behaviour change initiatives, new forms of partnership, etc. They concerned any aspect of the urban energy system (Alanne & Saari, 2006). Projects that were excluded were those involving individual behaviour by a single household or individual private sector developments unless they had implications for the energy chain.

The collation and analysis of the database were based on a co-evolutionary approach looking across the governance, economic, social and technological dimensions of urban energy projects and the analysis considered how different pathways combined these dimensions in distinctive ways (Rydin et al., 2013). The research grouped the projects into 51 distinct pathways using a cluster analysis: "these energy pathways are neither static, not mutually exclusive, but instead represent a range of options that might overlap, reinforce or clash with each other as they either are rolled out and up-scaled, or disrupted and disconnected" (Rydin et al., 2013: 638). This implied that the fate of the individual projects over time was important. New projects may emerge but the longevity of existing ones is an important dimension of change in urban energy systems. The question then becomes a

longitudinal one of how the diverse localised energy projects have fared over time. To update our knowledge of these projects, the first stage was to go systematically through the CLUES database and, in each case, use internet-based methods supplemented with telephone calls to find out the current status of each initiative i.e. on-going or ended. It was possible to collect information on 178 of the projects. Three conclusions could be drawn.

First, it was clear that the changing policy framework had resulted in the end of a number of projects. These could be termed **policy-related initiatives** referring to the importance of specific policy frameworks offering grants, subsidies and other incentives to new energy efficiency, generation and/or distribution measures. Although care should be taken with descriptive statistics as the original database was not representative, it can be noted that almost a fifth of projects fell into this category. A key example of this was the number of initiatives in the original database dependent on the Feed-In-Tariff (FIT) policy framework, set up in 2010 and offering payments for a range of renewable energy technology installation to a capacity of 5MW or 2kW for CHP schemes. This scheme proved highly popular because the guaranteed sale price for surplus electricity not only recouped the original investment but offered a profit stream. The scheme closed in early 2016 and its replacement offered a much lower tariff and limited the number of installations supported. The FIT was just one example of a number of policy frameworks that were withdrawn, changed, downsized or came to the end of their planned lifetime since the original database was collated. Other policy frameworks included: the 2010-2012 Low Carbon Communities Challenge (DECC, 2012); the Community Energy Saving Programme 2010-2012; and in London, the Low Carbon Zones 2009-2012. Some projects were nested within the Warm Zones Programme which was set up in 2001 and ran for four years; since 2005 it has operated nationwide, first under National Energy Action, and later as a Community Interest Company since 2008. Such energy projects, while potentially successful in achieving energy and carbon savings, are constrained by a set life-span, often built-in from the start by a time-limited

policy framework. This points to the importance of policy risk as a key factor curtailing the longevity of projects and their role in enabling significant change in energy systems.

Second, the projects focussed on installing new technology had finished and showed no evidence of producing further installations locally. Such **investment-dependent projects** were well represented within the database; again, the figure should be treated with caution but towards two-thirds of the projects in the updated database fell into this category. Within these, there was a strong focus on decentralised energy generation and distribution but also some demand management measures such as energy efficiency retrofit. The leadership of these projects came from actors across the public, private and third sectors and public subsidies played a part in promoting such investment but many had gone ahead without such an incentive. The updating revealed that, by and large, these initiatives had been completed successfully with the relevant technology installed; we could find only three cases where the project appears to have failed completely in that the technology was never installed.

Thirdly, the variety of different actors that were still actively pursuing urban energy initiatives had shrunk and the only projects that seemed to offer scope for an ongoing localised movement were a range of **community-based initiatives**. A corpus of 33 projects (or just under a fifth of the total) could be classified as such, that is small-scale, driven mainly by social and sustainability motives and developed by community and civil society groups. They came in different forms – i.e. local campaigns and training for energy reduction; neighbourhood installation of solar panels, community owned energy co-ops, networks of transition towns – and involved different organisations including informal associations of neighbours or interest groups, social enterprises, volunteer organisations, co-operatives, foundations etc. Typically, they are grassroots and/or bottom-up initiatives that operate from the local level within the civil society and involve networks of local actors. Community-based projects seemed particularly interesting for further investigation because they offered more variation in terms of current status when compared to the previous two categories, i.e. more were ongoing.

Thus, we set out to understand why some were continuing and some had completed, and how the energy component of their activities related to other community-based action. This required further qualitative research, as detailed in the next two sections.

Methodology

In total, 33 community-based projects could be identified from the 178 projects in the updated database; 12 of these were selected for further research on the basis of variety in the kind of project, *prima facie* evidence as to longevity or closure and geographical spread. This qualitative work comprised internet-based research of background documentation, supplemented with telephone or face-to-face semi-structured interviews. It proved challenging to find interviewees in some of the projects and, in total, 10 interviews were undertaken with key actors who knew about the history and contemporary status of these projects.

Analysis of this data was structured by the insights from previous published research from the CLUES project which, in addition to collating and analysing the database, had looked at 9 UK case studies and 4 overseas cases in depth during 2011-12 (Chmutina & Goodier, 2012, 2014; Chmutina, Sherriff, & Goodier, 2014; Chmutina, Wiersma, Goodier, & Devine-Wright, 2014; Devine-Wright & Wiersma, 2013; Goodier, Chmutina, Poulter, & Stoelinga, 2013; Guy, Sherriff, Goodier, & Chmutina, 2016; I. Goodier & Chmutina, 2014; Wiersma & Devine-Wright, 2014). Drawing on these published results, it was possible to summarise key factors identified as influencing these initiatives, as summarised in Table 1. This framework was used to consider 12 case studies; in addition, the analysis was sensitive to the impact of the contextual changes outlined above and how these interacted with project-specific factors. For clarity, in the text below the projects are, in the first instance, referred to by their location (highlighted in Table 2 below).

[Insert Table 1 here]

Community-based urban energy initiatives: why did they survive (or not)?

Community-based projects are defined above as relatively small-scale, driven by social and sustainability motives and developed by community and civil society groups, coming in a variety of forms and using different nomenclature. They have been seen as important determinants of change in energy systems, both in terms of achieving more democratic, just and responsible outcomes but also in terms of raising awareness, communicating the problem of climate change and prompting behaviour change and mobilising citizen action (Chilvers, Pallett, & Hargreaves, 2018). Our analysis of stabilising and destabilising factors in our case study projects is summarized in Table 2 and some key conclusions can be drawn.

[Insert Table 2]

In terms of technological factors, these projects did not face significant challenges, mainly using existing established smaller-scale technologies or relying more on behaviour change than technological innovations. However, it was clear that skills and expertise was needed to operationalise and optimise the technology and groups had to have this in-house or bring it into the network. This echoes existing literature on the importance to community-based initiatives of existing skills and interpersonal networks (Bomberg & McEwen, 2012; Middlemiss & Parrish, 2010; Van Der Schoor & Scholtens, 2015; Walker, 2008).

The dynamics of social interaction were central to these community-based projects. Problems in maintaining and leveraging such interaction were found to be significant in determining the longevity of the projects. Leadership and volunteering could be disrupted by ill-health, retirement and other unforeseen circumstances given the dependence on what was often a rather small core group;

replacements were not always forthcoming. The lack of volunteering commitment among the local community and leadership challenges due to difficulties in replacing key personnel played a part in stymieing projects in Bridport, Portishead and Moseley. The level of community involvement and the existence of strong community leadership were vital for galvanising and then maintaining action in these energy projects. Research has found that community participation and mobilisation in energy projects works best in communities with certain characteristics. They are usually small and informally organised before being formalised; dynamic, growing and shrinking as needed; involve highly committed individuals and strong local leadership; share a common vision around common priorities and understanding; and have a diversified portfolio of activities which can range from energy education to energy production and energy consultancy/advisory roles (Van Der Schoor & Scholtens, 2015). This was confirmed by our cases. In particular, community leadership is vital for sourcing finance, learning new skills, engaging with other relevant stakeholders, and identifying and deploying relevant knowledge (Martiskainen, 2017).

Chilvers and colleagues (2016) looked specifically at community participation in UK energy transitions systems and identified patterns of public participation as being one of two main types: centred/dominant (i.e. these are centred around institutional actors and usually narrowly framed around the government's policy agenda, focussing on gauging public and behaviour change); and decentred/diverse/emergent (i.e. driven by actors beyond formal state, market and scientific institutions; manifested through bottom-up initiatives such as community art or performance, activism, and energy poverty groups). Community engagement can be characterised as centred in 5 of our projects: three of these (Bristol, West Oxford and Dane Valley) were centred around financial arrangements supported by the government's FiT programme; and two (Hackney and Bristol) were dominated by local government and a research institution (Centre for Sustainable Energy). In the remaining seven projects, decentred patterns can be identified; these were represented by resident-

led initiatives from the bottom working sometimes in close cooperation with other civil society groups.

This research suggests the significance of a link to institutional support provided by established government policy frameworks and political support. These were important for the long-term development of projects in Manchester, Brighton, West Oxford, Dane Valley, Nottingham, Hackney and Portishead. Bomberg and McEwen (2012) note the salience of structural resources such as policy support in securing symbolic resources such as identity, legitimacy and the quest for autonomy. However, in line with our argument above, such policy frameworks can turn out to be short-lived. Projects in Marlow, Moseley, Birmingham and Bristol all ceased to exist due to the end of funding from grants and subsidies.

Across our 12 case studies one factor stands out: the financial model. In terms of project longevity, half of our 2010 projects are still active in 2018 mainly as a result of a sustainable financial model (the top half of Table 2); while the other half are either dormant (Bridport, Moseley or Portishead) or ended (Marlow, Birmingham and Bristol). Indeed, projects such as those in Manchester, West Oxford, Dane Valley, Nottingham and Hackney seem to be primarily driven by their adoption of a business model such as an energy co-operative, ESCO or community interest company and depended on revenue derived from energy generation. This suggests more understanding is needed of the financial models underpinning community-based projects. We found that there were eight projects in our updated database where the economic model seemed particularly important. We investigated all of these and further data could be collected on seven: Manchester Carbon Coop; Brighton Energy Coop; West Oxford Community Renewables; Dane Valley Energy Ltd; Meadows Ozone Energy Services in Nottingham; Bridport Renewable Energy Group; and Marlow Solar 100. As indicated above, three of these were highly active projects, two were still ongoing, one was dormant and one had ended.

A first point to note is that all these projects were pump-primed by a grant but their longevity depended on finding a long-term financial model that could demonstrate returns in unstable economic circumstances. For example, WOCRe in West Oxford was set up by the NGO Low Carbon West Oxford (LCWO) as an initiative that owned solar panels on local buildings, selling electricity back to the building occupiers and the surplus to the grid, benefitting from the FIT. This would create an income stream to fund the range of other activities that LCWO was engaged in. However, they were hit but a ruling that affected many community energy schemes, that a central government grant constituted 'state aid' under EU regulation and over a certain amount prohibited them from benefitting from the FIT. In the case of LCWO, they had been pump-primed by £1m from NESTA (an arts-and-technology quango) and the government's Low Carbon Community Challenge. They therefore had to divest themselves of various renewable energy assets and found themselves without the anticipated income stream for several years, although this has now been rectified.

The cooperative form – a Community Benefit Society or Community Interest Company in the UK – has considerable potential for providing a robust financial model but the details need to be worked out and this can prove a very onerous task. In four of our cases – Manchester, Brighton, West Oxford and Dane Valley – a cooperative structure was used to raise finance by issuing shares. This meant that the scheme needed to ensure there was sufficient viability to provide a return to the investors in order to sell the shares. This was linked to the identification of a very clear and delimited role for each of the organisations: housing retrofit, filling a gap that is currently not being addressed by local government in the area; fitting solar panels on roof-spaces; or local micro-hydro schemes using local watercourses. This clear focus enabled financial planning with more certainty.

However, a distinction should be drawn between the Manchester case and the others. The Manchester Carbon Coop is owned and run by the households who are its members. They only pay about £35 p.a. for which they get a variety of benefits, including a financial discount on an energy survey and materials from the Coop's procurement channels. In return they are asked to volunteer 1

hour a month. This model does not raise considerable funds and thus the Coop is dependent on grant applications to take forward its activities. Indeed, early access to the Green Deal through a pilot scheme was important in getting the project started. By contrast, both the Dane Valley and Brighton cooperatives use the model to raise funds more widely, including from non-local residents and businesses. In this way, BEC has raised over £1.5m and DVE are aiming for £0.5m from its first share issue. The history of these two projects is instructive.

Dane Valley arose from an earlier project from 2011-12 based on central government funding of £0.25m to use the town weir for hydro. They then fell foul of the same 'state aid' ruling that affected West Oxford. They asked for the scale of their grant to be reduced but central government would not take back part of the money and so the entire amount had to be returned. As a result, the current scheme is funded by a share issue on which they proposed to pay 4% return. The viability of this is dependent on a private wire agreement with a Siemens factory about 1km away, which will take and pay for all the power from the hydro plant; Siemens are also providing funds of £50k. This is a much lower risk financial model than selling the electricity to a commercial energy supplier. Despite this, the potential to pay a return to shareholders depends on all the directors providing their time voluntarily; the micro-hydro industry is fragile (Bere, Jones, Jones, & Munday, 2017).

Brighton Energy Coop (BEC) also sells shares widely and currently suggests a return of 5% p.a. The minimum shareholding is £300 and the maximum £100,000. Funds are used to pay for solar panels to be installed on local roofs (including recently a university and local schools), with the electricity either sold back to the grid or to the building owner. The latter option, as with Dane Valley, is favoured as it reduces risk. BEC are installing about two new schemes a year and currently have about 14 medium-sized arrays. Members are not completely locked-in and are able to withdraw 5% a year in total, on a first-come-first-served basis. Investments also benefit from exemption from inheritance tax. They now have 380 members and 90 more pledged but it took a long time to find the right model and the right time to launch the share offer; funding until this happened was a struggle.

The main problems they face now are with signing up roof-owners (see below) and the turnover in the solar panel installation sector, with many small businesses ceasing trading. The latter can be particularly problematic as BEC have long-term commitments to maintain the solar panels; they need firms who can provide long-term contracts and warranties or they have to renegotiate schemes.

Some cases, such as Bridport and MOZES in Nottingham, are aiming at an ESCos (energy services company). The timescale involved here seems to be much longer. There are technological, financial and legal complexities involved in establishing the private wire set-up to underpin the operation of such ESCos. Thus, Bridport have set up the shell of an ESCo but cannot find any local group to take it on and implement it. They estimate this is a long-term initiative with a 10 years horizon. MOZES also have long-term plans for an ESCo. MOZES began from an energy project run by the Meadows Partnership Trust (now the Bridges Community Trust) in about 2007 with funding from Scottish Power'. At the end of this project, MOZES was set up and won a Low Carbon Communities grant. However, they were also affected by the 'state aid' rule and were not able to benefit from the FIT. This left MOZES with a financial shortfall with regard to insuring and maintaining a number of solar panels they had installed. Meadows Partnership Trust loaned them funds for establishing another nine solar panels in a scheme that did qualify for the FIT, refinancing this from other sources. These panels currently provide the core finance for MOZES but they plan to set up an ESCo with a community battery bank and a private wire for local residents. They are somewhat constrained in that they want to create a financial model in which all local residents can share equally and not one where only those able to afford to invest will get a return.

Sometimes the financial models involve the community-based initiatives in a 'culture clash' with a more bureaucratic world. This particularly affected Bridport; BREG was awarded £50k under an EU scheme. Concerns were raised about the way the monies were handled resulting in a very bureaucratic auditing system being imposed. Not only was this described as 'bullying' by an interviewee, its very operation ran counter to the way that BREG operated. They had been used to

obtaining resources through bartering and buying second-hand materials from a local market, where VAT receipts now required were not routinely handed out. Another example concerned the proposal by BREG to develop a wood-fuel cooperative. Again, they had some grant funding to develop a project based on leasing woodland for fuel and products. They engaged with the Woodland Trust, a national NGO with considerable landholdings, to get a lease on a local woodland. However, the Woodland Trust wanted a 12 years lease under the terms of which, if BREG did not fulfil its management requirements, the NGO could undertake these on BREG's behalf and charge BREG. This was a large financial risk for the community-based organisation to bear; they favoured instead a three years lease that could be extended. BREG thus decided this was not acceptable and handed the grant on to another local organisation. Despite continued success in raising money from grants – with some 11 grants received in a row – these tensions contributed to burnout among the core group running the project. Brighton Energy Coop (BEC) faced a version of this 'culture clash' with regard to their partners, the owners of the roofs on which their solar panels are installed. BEC use 20 years leases and many roof-owners were unwilling to sign up for this length of time. In addition, many corporate or institutional property owners have many layers of decision-making to go through and schemes can stall within this bureaucracy. BEC therefore favours SMEs with their smaller scale and less hierarchical organisational culture as partners.

Finally, projects have greater longevity if they can combine a viable financial model with wider community engagement. Marlow Solar 100 was considered to have failed due to the combination of the shifts in the rates paid by the FIT and a lack of penetration into the local community. Marlow Solar 100 was based on a model using bulk-buying and the FIT to produce an estimated 8% return. They were then hit by the solar installers they were working with going out of business but the main problem was a lack of interest from local households. Despite a fall in the cost of installing panels and a promised rebate of about 12% (and potentially as much as 20%), the lack of community engagement led to the project coming to an end. The importance of engaging with the local

community can also be seen in the Dane Valley project, where it has been difficult to maintain a local identity for the scheme given the wide range of investors and the lack of direct benefits to residents in the local area. Some residents have raised concerns about the environmental impact of the scheme during the planning process and the project has needed to engage with these directly to stave off objections. West Oxford provides a counter-example of very strong local community engagement supporting two viable community energy projects.

Conclusions and Policy Implications

The research has shown the importance of changing policy frameworks in a time of political change and how 'policy risk' can affect local projects, leading to their closure. This may increasingly impact local energy projects given the ongoing rapid shifts in political and economic context. While many simpler energy technology installation projects led by a variety of actors had been completed, it was the community-based projects that seemed to offer the scope for an ongoing urban energy movement based. Here, we found that the success of community-based energy projects has been impacted negatively by variability in and eventual lack of policy and political support. Community-based groups were also found to be quite fragile and very dependent on the ability to engage the community, build good networks and, above all, establish and maintain leadership. Technological issues do not seem to play much of a role although availability of skills and expertise (either in-house or brought in from outside) is important. That said, there are limited technologies deployed in these projects (solar PV and thermal, energy efficiency retrofit, micro-hydro); these seem to be determined by the scale of the groups and their social organisation.

It was clear that the project's financial model was a central issue. These groups often relied on a source of funding from local or central government, at least to start with, and hence were subject to the policy risk mentioned above. But some were able to develop a viable financial model to underpin continuity. Several groups took advantage of structures such as energy cooperatives, which have

become a successful model in many European countries (Walker & Devine-Wright, 2008; Walker, Devine-Wright, Hunter, High, & Evans, 2010). Such structures provide a solid foundation for project activities and ensure an income stream that gives a degree of financial security. Consideration needs to be given to the range of financial models that could prove viable in current conditions of austerity politics and broader liberalisation of energy markets, especially post-Brexit. That said, there can still be tensions between the financial and bureaucratic requirements of the model and the very small-scale of the community-based projects and these deserve detailed attention.

Our research suggests that, despite their potential contribution and merits, the 'power' of community-based initiatives to bring about urban energy system change must not be overestimated. This is true especially in the UK where communities are currently seen as instrumental players and where it is assumed that 'solutions' will emerge spontaneously from the bottom (Turcu, 2018). One way to enhance the role of such community-based projects in driving change in energy systems would be to establish a long-term consistent policy framework to support such initiatives and to enhance local government capacity to support these initiatives. However, our summary of the changed political context in the recent decade and the prospects for the future suggest that neither of these are likely to be forthcoming. This puts the emphasis back onto how community-based groups can be helped to be more robust on their own in a fluid political and economic context. In line with other work on such initiatives (Seyfang & Haxeltine, 2012), we would recommend greater learning between projects, so that each project does not have to start from scratch as if often the case. But we would particularly emphasise the need to clarify, simplify and publicise the financial models that can support community-based energy projects. These can be fundamental to the longevity of such projects and yet much effort within each project goes into developing a basic understanding of how these models work.

But perhaps it is also time to consider how much emphasis should be placed on promoting and supporting community-based initiatives. By 2010 – due to energy market tightening, the

consequences of the financial and economic crisis, the UK moving from energy exporter to energy importer etc. – it appears that the emphasis had already been thrown back onto the role that 'planning' and centralisation play in decarbonising the energy system (Keay, 2016; McKenna, 2018). This meant a distancing from previous models of decentralisation, including community energy, and exploring once more the potential of UK's centralised energy system to meeting the 2050 target of 80% reduction in CO2 emissions. With increasing decarbonisation of the centralised energy systems, largely due to the deployment of major renewable energy schemes, the role of decentralised initiatives seems less significant. Indeed, interest in community energy in the UK seems to have peaked in 2014 when DECC launched its Community Energy Strategy, which recognised the importance of community energy and grassroots initiatives in sustainable energy transitions. Today the strategy is dormant and programmes that have supported community energy initiatives have been curtailed or ended. The dominant discourse in the UK's current energy policy is about smart energy rather than community energy, despite a wider acknowledgement of the role that communities play as consumers, citizens and owners (UKERC, 2016).

Thus, it could be argued that the fragility of the community-based energy sector is not such an important issue if the emphasis is to move away from bottom-up action. However, against this it can be argued that such community-based action plays other significant roles in building social capital, spreading awareness of key environmental issues such as climate change and engendering wider behavioural change. They can also be centrally important in combatting fuel poverty. At issue here is the place that the links between inequality and energy have within the wider energy policy agenda. Vulnerabilities to energy poverty or fuel poverty have been documented in the UK but also across southern and eastern Europe, South Korea, the United States, and even New Zealand (Bouzarovski 2014). This is a globally significant issue and an inherently spatial phenomenon, arising out of the interactions between social inequalities and built formations (Buzar 2007) and extending beyond the lack of capacity to pay bills to the broader structure of access to and provision of energy services. There is a central link between such fuel poverty and the quality of the housing stock, notably its

energy efficiency. Thus, energy efficiency retrofit and demand management – which many community-based initiatives cover alongside renewable energy generation – is a vital way of addressing the link between inequality and energy services.

This needs to be placed centre-stage in UK energy policy – balancing the decarbonisation being achieved through centralised means and providing a new rationale for community-based projects and for supporting community-based action. But in arguing for such community-based energy initiatives, it is vital to keep the inclusiveness of such initiatives in mind. Current successful community-based energy initiatives seem to be driven so far by skilled and/or middle-class communities and are under-represented in deprived communities (Catney et al., 2014). Furthermore, there may be a tension in relying on the robustness of the financial models for local energy initiatives as poorer households may be excluded from participation. If community-based energy projects are to be robust, with a good long-term chance of survival, and also tackle fuel-poverty alongside decentralised renewable energy generation, then attention needs to be paid to the kinds of financial model that operate successfully across diverse local communities. In an era of populism and post-politics, the importance of this could be lost.

Acknowledgement

We wish to acknowledge the research assistance so efficiently provided by Neil Cuthill.

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Table 1 Factors that stabilized/fostered or destabilized/hindered the development of urban energy projects in CLUES case studies

Technological	*Stabilising*: Appropriate use of established technology; available expertise *Destabilising*: Technological failures, perhaps due to untried technologies; lack of fit with the local environment; lack of skills
Societal	*Stabilising*: Existing community connections/capacity; use of local historical, cultural, built and environmental resources *Destabilising*: Problems of community building, failing to bring together local stakeholders; resistant social attitudes
Institutional	*Stabilising*: Strong local commitment among politicians and/or key stakeholders; supporting policy framework(s) *Destabilising*: Lack of recognition of the mutual interdependence necessary for more complex projects
Economic	*Stabilising*: An established and viable financial model *Destabilising*: Loss of economic viability due to removal of grants, market changes or market uncertainty

Source: Synthesis of references cited in text

Table 2 Analysis of 12 community-based case studies: stabilising and destabilising factors

	Current Status	Stabilising and Destabilising Factors			
		Technology	**Social**	**Institutional**	**Economic**
Manchester Carbon Coop (MCC)	Active	In-house and external expertise used	Active community; set up by a group of residents in 2008	Strong political support and local government partnership	Coop in form of Community Benefit Society incorporated in 2011.
Brighton Energy Coop (BEC)	Active	In-house and contracted-out expertise used	Small committed community core	Well-supported locally and networked more widely	Coop in form of Community Benefit Society; £1.5m + raised since 2009.
West Oxford Community Renewables (WOCRe)	Active	Established technology used	Based within charity with wider focus: Low Carbon West Oxford	Well-supported locally and networked more widely	WOCR is an Industrial and Provident Society (CIC), as is subsidiary Osney Locks Hydro.
Dane Valley Energy Ltd (DVE)	Active	Established technology used	Small committed community core	Local government support	Coop in form of Community Benefit Society
Meadows Ozone Energy Services, **Nottingham** (MOZES)	Active	In-house expertise used	Localised community group; strong volunteering	Strong local government and other local networks	Incorporated company in 2009; aiming for an ESCo for local area.
Back-to-Earth **Hackney** City Farm (B2E)	Active	n/a (behavioural change focus)	Community capacity-building activities present	Local government support	Small steady revenue from bio-energy plant since 2017 and small funds from local government
Bridport Renewable Energy Group (BREG)	Dormant	Relevant expertise found	Small core group; lack of volunteering/ leadership continuation problems	Little local government support; problems with potential partners	BREG ran as an informal advice group for 4 years, now a Community Interest Company; 'shell' for BESCo available.
Sustainable **Moseley** (SusMo)	Dormant	n/a (behavioural change focus)	Strong local networks of community groups and activism under the broader Moseley Forum	Political support dwindled	Funding ended (British Gas Green Streets grant)
Transition Town **Portishead** (TTP)	Dormant	n/a (behavioural change focus)	Lack of community volunteering/ leadership issues (leader health circumstances)	Transition Towns movement support	Funding ended (Transition Towns grant); solar-energy revenue since 2011

Marlow Solar 100 (MS100)	Ended	Established technology used	Localised community group; resistant social attitudes	Too dependent on FIT programme	Bulk-buy discount scheme for solar panels proved unviable when FIT changed
Faith and Climate Change **Birmingham** (FCC)	Ended	n/a (behavioural change focus)	Lack of community volunteering/ leadership issues (leader retired)	No Church support for environmental issues (shift to social issues)	Funding ended (Church grant)
Bristol Energy Action Network (BEAN)	Ended	n/a (behavioural change focus)	Little connections to community	No local government and Energy Saving Trust support	Funding ended (Energy Saving Trust grant)