Energy Policy 63 (2013) 543–552

Contents lists available at ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

Governing community energy—Feed-in tariffs and the development of community wind energy schemes in the United Kingdom and Germany

Colin Nolden *

Department of Geography, College of Life and Environmental Sciences, University of Exeter, Exeter EX4 4RJ, United Kingdom

HIGHLIGHTS

- Scalar path-dependency and lock-in are inhibiting the development of community energy in the UK.
- Feed-in tariffs alone do not provide greater opportunities for multi-scalar energy transitions.
- Multi-scalar approaches to technological diffusion allow new engagement potentials to develop in the community energy niche.

ARTICLE INFO

Article history:
Received 4 April 2013
Accepted 12 August 2013
Available online 13 September 2013

Keywords:
Governance of innovation diffusion
Feed-in tariff
Community energy

ABSTRACT

This paper analyses the development of community energy in the UK by comparing it to Germany in relation to decentralisation, scales and ownership structures particularly of wind energy. Varying approaches to energy generation at the community scale provide interesting insights into the impact of policy innovation as well as the capacity of national energy frameworks to foster socially innovative engagement practices beyond the purely technological diffusion of innovations. By examining interactions between technological and social innovations with the help of a qualitative analysis, opportunities for potential generators not traditionally engaged in energy generation to tap into these innovation systems are analysed. This paper suggests that greater commitment to diversification beyond the implementation of policy measures such as the feed-in tariff is required to provide communities with the capacity to develop new generation practices in terms of scale and ownership. The UK in particular is struggling to protect these new generation practices which allow communities to derive benefits facilitated by specific energy policy measures according to their potential. It concludes by indicating areas where niche protection might need to be expanded if community energy is to play a greater role in the UK's ambitious transition to a low-carbon economy.

1. Introduction

Community energy (CE; defined in more detail in the 'Current discussion on community energy in the UK' section) plays a negligible role in all large European economies but large utilities are particularly dominant in the UK. Only 0.3% of electricity generated does not originate from the Big Six UK utilities, British Gas, EDF, E.On, nPower, Scottish Power and Scottish and Southern Energy (Mitchell, 2012). For electricity derived from renewable energy technologies (RETs) the share of community owned generation is higher, with the share of community owned onshore wind turbines estimated at around 10% (Carrington, 2012). Compared to other countries, however, this is also a small share as recent figures indicate that around 51% of Germany's 53 GW installed renewable energy capacity is owned by citizens (40% by individuals and 11% by farmers), 6.5% by the four large market incumbents (E.On, RWE, EnBW and EWE) and 7% by other utilities (BMU, 2012a; Buchan, 2012). As Germany's share of electricity derived from RETs stands at 20.1% (BMU, 2012b) the total share of electricity generation capacity not owned by utilities stands at around 10%.

Much of Germany's successful diversification of ownership particularly of RETs has been put down to its Erneuerbare-Energien-Gesetz or Renewable Energy Act, a feed-in tariff (FiT) system (see Mitchell, 2008; Couture and Gagnon, 2010). It is structured to encourage specific technology promotion and actively 'pick winners' (Mitchell et al., 2006; Fuchs and Wassermann, 2009; Woodman and Mitchell, 2011). The lack of diversification in the UK's energy sector, on the

* Corresponding author. Tel.: +44 7964188697.
E-mail address: c.nolden@exeter.ac.uk

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http://dx.doi.org/10.1016/j.enpol.2013.08.050

other hand, has been attributed to the UK's original Renewables Obligation (RO). It is a quantity-based instrument designed to encourage competition on a technology-neutral playing field. Both instruments aim at achieving cost reduction, price-based mechanisms such as FiTs through stepped reductions in tariffs while quantity-based instruments rely on competition between producers in the electricity market (IEA, 2008).

As the benefits of diversifying supply are becoming more obvious, the governance of RETs in the UK is slowly shifting towards specific technology promotion with the introduction of technology specific banding in its RO (DTI, 2007) and the introduction of the small-scale FiT in the UK (DECC, 2010). The FiT in particular is designed to encourage new scales and ownership models of RETs by 'bringing renewable electricity generation into communities around the country' (HMG, 2009a: 43) and to promote social innovation by increasing public engagement and behaviour change. Referring in particular to the concept of energy generation 'by citizens for citizen' (HMG, 2009a: 64) in Germany, the UK Renewable Energy Strategy (HMG, 2009a) indicates a desire to make generation derived benefits available to everyone and to promote a multi-scalar rollout of renewables similar to countries such as Germany that pioneered price-based support mechanism (HMG, 2009a). The UK FiT is designed to protect <5 MW developments from the more competitive environment fostered by the RO.

In order to thrive, however, these new approaches to electricity generation require more institutional support and a more holistic governance approach than the provision of a FiT. CE in particular can only succeed if it is recognised as a diffusible social as well as a technological concept. This requires a better understanding of the wider benefits that CE can provide and how the concept can be embedded in the governance of the UK energy system and its surrounding national energy framework (NEF).

This paper analyses how the governance of the UK's NEF surrounding its FiT inhibits the widespread diffusion of decentralised RETs with the example of wind energy in community settings. Various aspects including planning, finance and investment and the role of intermediaries in the diffusion process are depicted in relation to communities and compared where appropriate with the development of community wind energy in Germany. By drawing on several interviews with experts and change agents ranging from community representatives to developers and policy-makers, the challenges associated with the UK's approach to CE governance are analysed and evaluated. It also indicates areas where new governance approaches might encourage a variety of CE pathways to develop and become socially and politically embedded. This should be of particular interest to policy-makers as it reflects the influence between energy policy and the wider governance framework at various scales and points of interaction associated with the interviewees' position within the UK's NEF.

The key questions that are addressed in this paper:

What is the role of the UK feed-in tariff and its surrounding governance framework in community energy development?

What lessons can be learnt from countries such as Germany that are considered advanced in the provision of a favourable development environment for new scales and ownership structures of renewable energy technologies?

Starting with an overview of the relevant literature and theoretical concepts regarding new scales and ownership models within the UK's energy system, the development of wind energy and community-led developments in the UK is explored. Following sections include the empirical and methodological approaches of the case study as well as the discussion of empirical data. These sections introduce analysis methods and the analysis itself which is subdivided into sections relating to finance, planning and development expertise. The paper concludes with a policy recommendation and areas that require further exploration.

2. Current discussion on community energy in the UK

Community energy has received considerable attention in recent years. Large surveys and databases such as Walker et al. (2005), Adams (2008) and Seyfang et al. (2012) document increasing diversity and societal embeddednes of community energy. Several academic studies have dealt with the meaning of CE (Walker et al., 2010), various aspects of the development process itself (Gubbins, 2007), associated social impacts (Rogers et al., 2012), participation and facilitation (Hoffman and High-Pippert, 2010; Hargreaves et al., 2013), and niche development processes (Hielscher et al., 2013), just to mention a few recent examples. Some studies have dealt more specifically with the barriers and incentives, pointing towards the difficulty of streamlining the development process (Walker, 2008) and specifically the need for a risk capital fund (Hoggett, 2010). Examples of papers with specific reference to the FiT highlight increasing societal participation (Walker and Cass, 2007) and document the growth in the UK's CE sector following its introduction (Willis and Willis, 2012). Further papers with specific reference to the FiT have dealt with the need for local energy organisations to ensure that the benefits associated with premium tariffs are spread equally (Saunders et al., 2012) and general issues with equity relating to tariffs and the organisational capacities associated with successful community energy projects (Park, 2012).

However, the relative novelty of both CE and FiTs in the UK implies that there has been little empirical investigation into their interaction, especially qualitative surveys and analysis. One of the main difficulties lies in establishing the role that CE currently plays and why its development has been less common in the UK compared to other countries. Some researchers consider CE projects in the UK as 'technically proven' (Walker and Devine-Wright, 2006: 9) although the scale of most projects associated with the term community are small-scale, such as single PV arrays on school halls or parish churches. There are also some notable examples including wind turbines, even wind farms but they are exceptions (Hargreaves, 2011; Willis and Willis, 2012). The exact definition of CE has also received considerable attention as diverse ownership structures include community-owned and self-funded projects including energy self-sufficient island communities based on grant funding as well as wind farms only partly (share-) owned by communities (Hargreaves, 2011; Munday et al., 2011; Allen et al., 2012). For the sake of this analysis, utility and commercially driven RET projects with considerable community benefits associated with their deployment are also included (explained in more detail in the methodology) due to the scale and replicability associated with co-ownership models (Vaze and Tindale, 2011).

This goes back to the point raised in the introduction about CE being more successful and considered a more proven concept in other countries such as Germany and much of what is analysed in this paper as CE relates to co-ownership as much as to community-led CE development.

3. Opportunities and barriers for community energy in the UK

Opportunities for CE and decentralised energy generation in general are arising from the need to develop infrastructures for the coming decades according to principles more in line with the transition to a low-carbon economy (RAENG, 2011). This is an unintended consequence of liberalisation, the 'dash for gas' in the 1990s and the more general lack of energy infrastructure investments resulting in the 'energy gap' (MacKay, 2010;Mitchell, 2008).

Efforts required for the energy systems' necessary transformation towards more sustainable and flexible generation capacities, a development process in excess of most infrastructural transformations attempted in the past (Geels et al., 2008; RAENG, 2011), may see CE and other decentralised generation and ownership models gaining recognition. Many community interest groups and cooperative energy developers see this as a chance to increase the share of energy generation capacity owned or part-owned by communities (Hargreaves, 2011; EST, 2012).

However, commitment towards large scale generation facilities is more widespread within the UK's governance regime of energy policy. Official strategy and policy documents (HMG, 2009a, 2009b, 2012; DECC, 2013) and recommendations from the Committee on Climate Change (CCC, 2011) foresee the large-scale rollout of offshore wind as well as gas-fired generation and nuclear power. Rather than encouraging greater diversity in terms of scales and ownership structures, this trajectory is concentrating the ownership of generation in the hands of utilities and other commercial developers. The principal centralised deployment approach of RETs, such as large offshore and onshore wind parks as opposed to smaller decentralised onshore clusters (The Crown Estate, 2012) represents a missed opportunity and reflects notions of scalar lock-in and path-dependency (adapted from Unruh (2000) and Mitchell (2008)).

As a consequence, diversification and an appreciation of social innovations beyond technological implementation rarely feature in this technological development trajectory (Bergman, 2011). It fails to actively engage the population in technological diffusion processes that are increasingly important if current consumption and generation practices are to be aligned with the government's ambitious carbon reduction targets. So far, active engagement in the diffusion of energy generating technologies has often been limited to attending consultation meetings. Recent policy innovations such as the FiT and associated policies such as the Green Deal and the Renewable Heat Incentive designed to enable public (co-) ownership and leadership of RET developments are also struggling to fulfil these expectations although the FiT has encouraged some promising developments.

4. The diffusion of wind energy and other RETs in the UK and Germany

Its introduction within the UK's RET diffusion framework often characterised by multiple market failures, the struggle to implement 'strategic deployment' incentives (Grubb et al., 2008) and where energy policy is rarely considered more than just a tool for the delivery of targets (Szarka, 2006) can be considered an unlikely policy innovation. FiTs can contribute to a more embedded approach beyond implementation targets but it is important to note that excessive support can lead to boom and bust cycles, such as the one associated with significant cuts to solar PV subsidies following the fast-track review of the UK FiT in August 2011. Similar issues also arise in relation to specific technological forcing, such as the rollout of solar PV in Germany which has seen German solar PV manufacturing rising and falling on a much greater scale between 2000 to this date as manufacturing and supply chains were first created in Germany only to be outsourced particularly to China in recent years. The upside is that Germany has arguably single-handedly driven solar PV towards commercialisation (Fuchs and Wassermann, 2009; Buchan, 2012).

The UK, on the other hand, appears to be more inclined to follow more conventional pathways of energy policy and associated infrastructural development which foresees technological replacement on a 'like-for-like' basis (Fielder, 1996; Vaze and Tindale, 2011). As opposed to technological forcing, supply chains and transmission infrastructures will not require significant transformations. Offshore wind is an exception but the UK's market leadership in this area reflects its NEF's bias for large scale as the diffusion of wind energy in other countries such as Germany followed more decentralised trajectories (Vaze and Tindale, 2011; Sørensen, 2012). Table 1 (Snyder and Kaiser, 2009) indicates comparative offshore wind turbine capacities in the UK and Germany:

Table 1
Offshore wind turbine deployment (Snyder and Kaiser, 2009).

	MW	Number of sites
UK	598	9
Germany	12	3

Table 2
Onshore wind turbine densities and installed capacities (BWEA, 2011).

	MW	Turbines	Area (km^2)	Watts/capita	WTs/ 100 km^2
UK	3,580	2,664	244,755	58	1.09
Germany	26,302	21,226	356,840	320	5.95

The nature and scale of offshore wind implies that their development is concentrated in the hands of utilities rather than individuals or communities (The Crown Estate, 2012). The deployment of onshore wind energy, on the other hand, is more successful in Germany's more diverse NEF, as indicated in Table 2 (BWEA, 2011).

Combined with the numbers provided in the introduction it is evident that the UK not only has a much lower density of onshore wind turbines (as indicated in the last colume) but their ownership is also highly concentrated in the hands of utilities. Comparable earlier figures by Toke (2005) and Stenzel and Frenzel (2008) reinforce notions of this incumbency in the UK wind energy sector.

5. Embedding communities

As a consequence of the dominance of utilities in the UK's energy market one commentator suggested it might be easier for 'Government to provide incentives for the construction of relatively few nuclear power plants than to change the behaviour of millions of UK households' (House of Commons, 2007: 12). On the other hand, there is evidence that this domination of asset ownership is slowly being challenged as the governance of energy is changing with mounting pressures. In 2007 'independently regulated competitive energy market' (DTI, 2007: 8) were favoured as the most cost-effective and efficient means of delivering objectives. In 2011 'continued grandfathering, supporting the principle of no retrospective change to low-carbon policy incentives, within a clear and rational planning cycle' (DECC, 2011: 7) was prioritised. In 2012, incumbent Minister of State Greg Barker went even further by referring specifically to 'community engagement in the energy sector [which] will be vital to our vision of the development of energy in the UK in the coming decades'.

In Germany, on the other hand, energy policy appears to be considered part of an interwoven industrial and technology (even agricultural) policy strategy with competencies distributed among various ministries, making short-term changes unlikely and thereby reducing uncertainty (adapted from Harding (2000)). A recent addition to this system of checks and balances is the introduction of a long-term strategy known in Germany as 'Energiewende' (BMU, 2012a), or 'energy turn' (Schwaegerl, 2011). This transition foresees communities actively planning and facilitating energy

projects. In the words of the parliamentary secretary of the state, Germany's 'energy turn is a community and citizen project' ('Die Energiewende ist ein Kommunal- und Bürgerprojekt', BMU, 2013).

CE in particular requires a protected and managed niche (Smith, 2007; Smith et al., 2010; Hargreaves et al., 2013) as opposed to a level playing field in order to scale-up as the nature of communities in Germany and more so in the UK's NEF imply that they often operate below the threshold where economies of scale apply. The FiT provides protection from market forces and CE arguably represents a separate experimental niche directly linked to the FiT in the sense that it allows for the testing of capacities to accommodate these new development trajectories. It also encourages the exploration of what changes might be envisaged within the prevailing regulatory state paradigm to encourage developments that are generally considered beneficial.

6. Shortfalls of the UK FiT in relation to CE

However, the UK FiT's limitation to developments <5 MW, its position as a secondary policy measure to the RO and the lack of facilitation for FiT scales of development within the planning and financial provision system are restricting the potential for CE, despite growing interest. The relative novelty of the FiT (it was only introduced in April 2010) also implies that social innovations associated with this scale of energy deployment have yet to materialise as it takes 15–20 years for people to develop capacities, skills and competences to socially incorporate technological diffusion and to make technologies perform well (Negro and Hekkert, 2010). Local experiences in particular play a very important role in locally embedding process as Raven and Geels (2006) pointed out. The lack of skills in certain areas of technological diffusion in the UK, however, implies that technological diffusion in the UK is dominated by foreign companies and foreign expertise (see Foxon et al., 2005; Mitchell, 2008). Successful diffusion of RETs also appears to be linked to their framing as solutions to multiple problems.

UK CE can therefore be conceptualised as a separate niche within the energy policy subdivision of the FiT, which in turn is confined to the technological niche of RETs. As a result, CE in the UK finds itself at the tail-end of decision-making and only recently has the recommendation regarding minimum payments to communities hosting RET developments increased from £1000 to £5000 per installed MW (DECC and DCLG, 2013). Various forms of CE in Germany, on the other hand, in many cases lay the foundation for local economic regeneration and a workforce geared towards exploiting localised energy derived economies (BMU, 2012a; VKU, 2012). Municipal utilities in particular often provide a bridging element between local generation and energy markets (Bulkeley and Kern, 2006; VKU, 2012). This in turn is beneficial for the production sector and its momentum is sufficient to place decentralised renewable energy generation at the heart of regional political decision-making which is challenging the incumbent energy framework along with other pressures associated with the 'Energiewende' (Buchan, 2012).

7. Methodological approaches to the analysis of community energy

The empirical investigation of the governance of these trajectories and the resulting NEF that is inhibiting the development of CE in the UK in the following sections combines qualitative research analysis with the literature analysed in previous sections. It provides the theoretical and practical foundation for issues analysed in support of the aims set out in the introduction.

CE represents the geographical area of analysis because of its nature as the smallest unit of collective action capable of creating a critical mass to move from idea to implementation. It also represents an incubation room where technological diffusion and social innovation combine to foster new generation and engagement practices. The universality of communities and their increasing recognition in energy policy provides ample space for the analysis of interactions. Within the framework of the diffusion of onshore wind, CE is hereby defined as the installation of electricity generation technologies in geographical communities with one or more of the following attributes:

- Communities actively engaging in technological diffusion through community-led projects, or
- Through the (part-)ownership of municipal utilities, or
- Communities benefitting from technological diffusion through co-ownership, business taxes, community funds and/or share offers from commercial developments.

Thirty-five actors representing communities, CE development networks and policy makers were interviewed for this purpose following a recruitment process which resembles the snowball sampling technique. The semi-structured interviews were conducted between July 2010 and October 2011 although some catch-up interviews and updates occurred until October 2012. Twenty of the interviews, which were recorded and transcribed in all but once case, were used for this analysis and they are numbered according to the order they appear in this paper to protect the interviewees' anonymity. Most of the interviewees are located in the Southwest of the UK where relatively low population densities and a good wind regime provide good wind development opportunities.

For the purpose of this analysis the interviewees are classified as follows:

- Energy activists—Engagement or the wish to actively engage in collective energy generation within a community. This does not exclude the wish to engage in/receive benefits from the development of decentralised RETs by utilities or commercial developers.
- Change agents—Engagement in the deployment of decentralised RETs associated with community benefits both in terms of ownership and/or benefits. These individuals and organisations facilitate and manage cooperation, coordination and knowledge transfer among the agents of the implementation process.
- Facilitators—Engagement in the governance of energy policy and relating long-term decision-making strategies by investors, individuals, business or communities. This level of decision-making influences the capacities of both energy activists and implementation bodies to engage and gain profit from the deployment of decentralised RETs in the long term.

Both energy activists and change agents represent bottom-up development ambitions while facilitators represent the top-down NEF. The literature reviewed in previous sections and throughout the analysis to help embed and contextualise the findings spans official government documents, academic research papers and some grey literature from newspapers and other non-peer reviewed articles.

8. Data analysis

The interview data was analysed by combining elements of historical analysis, case study research and the analysis of literature relating to FiT, energy policy, technological diffusion and social innovation in line with Ritchie and Spencer's (1994) Framework Analysis. Coding involved the selection of recurring themes

and repeating ideas using statistical and word-processing tables and the following key areas were identified:

- Feed-in tariff and community energy
- Planning
- Finance and investment
- Intermediaries in the diffusion process
- Replicability and knock-on effects.

This approach to analysis was chosen to ensure that the governance of CE was analysed in relation to various positions within this particular framework of policy, technology and social interaction. Feeding changes in practices, often as a result of the changing governance frameworks, into an experimental framework created a methodological and theoretical focus on, and reflection of, actions and their consequences (adapted from Sørensen et al. (2010), Sørensen and Mattson (2008)).This approach also enabled the assessment of interactions and processes of cooperation, coordination and knowledge transfer, which was necessary for the classification of interviewees according to the abovementioned categorisation of requiring, providing and facilitating processes as specified in the previous section.

9. Findings

9.1. The feed-in tariff and community-led development

As indicated in previous sections, CE is not yet a widely diffusible concept in the UK. The FiT has increased the financial viability particularly of community led-developments as well as the awareness of opportunities for communities. However, planning issues and the lack of finance during the crucial at-risk stage often result in smaller scales of generation being installed than might be possible even within the already small scale of the UK FiT.

Prior to the introduction of the FiT, grants were one of the few means of community access to energy generation. The nature of grants in the UK's competitive energy market framework implied that few communities were able to benefit and successfully develop projects. Replication of success stories was unlikely but the certainties they provided are seen by some researchers as a more secure pathway for CE development (Park, 2012). Most of the interviewees such as the change agent quoted below, on the other hand, consider grant dependency as one of the main limiting factors hindering the widespread uptake and acceptance of decentralised renewable energy generation.

> Lots of the community projects that are up and running at the moment were grant funded so the question is how do we mainstream this, how do we make them available, how do we make projects work in the future when the grants aren't available (I1).

Within this context, many of the interviewees consider the FiT a liberator from grant dependency as grants limit the entire support to winning communities, a position also supported by some researchers in the field (see Fudge et al., 2011). The need to deal with RO also ceased with the introduction of the FiT (for <5 MW developments) and this has improved the financial viability of small scale wind energy developments.

> Once you get to say a single wind turbine, a 500 kW wind turbine or 1.5 MW wind turbine the feed-in tariff has made that economically viable on more sites than it used to be under the ROC [Renewable Obligation Certificate] system (I2).

The problem with the FiT, however, lies in its insularity as a policy without a structured support framework. Economic viability alone, particularly in a community framework, does not determine whether a planned development goes ahead. In this context, another change agent has criticised the FiT as 'a very unambitious toolkit' (I3) as the guarantees provided by the FiT alone do not have the capacity to attract third party finance (Timms and Hume, 2009; Hoggett, 2010). The unfamiliarity with CE developments acts as a further barrier to their development as these change agents indicate.

> [The FiT] doesn't in itself transform everything. It doesn't address the key risk; the key barrier […] is the risky bit at the beginning, which is risk money. […] The FiT doesn't provide that risk money, all it does is provide a viable income (I2).

> There has most definitely been an increase [in interest] but the barrier to development has nothing to do with the FiT. The barrier to development is the risk of spending up to £50,000 for an application and getting a 'No' at the end of it. When it comes to a community, its ability to raise risk capital to put towards making an application, only for that application to fail is not easy to do. […] Quite often, a community project also does not get to planning because the grid costs are too high (I4).

The problems of developing CE that these two interviewees point to span the lack of available finance during the at-risk stage, the uncertainty of planning outcomes and grid connection costs. The latter in particular has received considerable attention as one of main barriers for the development of CE in the UK (Willis and Willis, 2012). The costs associated with grid connection vary considerably and in many cases determine the feasibility of entire projects, especially for rural communities (I5). According to a National Grid representative, within this context a facilitator, 'the only scale in the UK is the national grid' (I6) and generation that cannot be centrally controlled is generally avoided. Decentralised developments below 5–10 MW are often not connected due to the costs.

The FiT is therefore an essential step towards enabling economic viability of community-led renewable energy generation projects but this form of social and technological organisation can only thrive if it is accompanied by more fundamental changes to the UK's NEF. The FiT needs to be accompanied by institutional learning and a more holistic approach towards niche creation and protection if CE and other small scales of RET diffusion are to play a greater role the provision of electricity. The following sections take a closer look at uncertainties associated with finance and investment and the planning system.

9.2. Finance and investment

One attempt at overcoming the access to finance issue raised by the interviewees in the previous section is the launching of a community share issue (Co-operatives UK, 2012). This can be a viable way of raising capital within a community but the total volume that can be raised locally tends to be fairly low. As one change agent pointed out, if their financing before implementation was totally reliant on the immediate geography their investment volume would be limited to 'dynamos for pushbikes' (I7). Larger developments, particularly those in excess of £1 m, have a larger range of available funding possibilities as the Co-operative Bank and Triodos Bank are venturing into this form of niche finance (I8). As a general rule, however, one change agent noted that 'nobody gets out of bed for less than £25 m for project finance so you are starting at 21 MW before you can seriously think about project finance' (I9), which limits economically more attractive developments to established utilities and other commercial developers.

Government backed banks and the Green Investment Bank in particular are often mentioned as vehicles capable of providing the financial backing that is currently lacking for CE but their focus is currently limited to large-scale projects (RegenSW, 2011; GIB, 2013). The following two quotes from change agents indicate the desire for more structured financial support with the help of government backed banks or loan schemes as a means of encouraging further technological and social learning through community-led developments.

> How you create the vehicle for risk capital so that communities can not only do the simple things of tapping into existing schemes but start thinking about 4 MW wind development which need a couple of hundred grand, at risk, would require a rather small fund [and government] could go quite a long way with that (I9).
>
> If there was a green energy bank that knew what the returns were and were handing out loans in order to allow people to install systems that can be paid back, I'm sure there would be renewable systems all over the country [as] people don't want to pool their financial resources until something is there to see that they can have something tangible to put their money into (I10).

Another approach to institutionalising smaller developments suggested by an interviewee would be the introduction of Small Firm Loan Guarantees to provide incentives for low carbon investments (I11). The absence of government backed banks is, however, considered the main barrier for CE in the UK.

In comparison, German regional state-owned banks, known as Landesbanken, play an important role in providing loans for community-scale renewable energy developments in Germany (I11). Energy activists and change agents alike point towards Germany's Landesbanken and the KfW Bank, its government-owned development bank, as the most important financial institutions encouraging decentralised and CE development in Germany.

> [Germany has] policies where they instruct the banks and the banks are instructed because they are owned and controlled by the Laender and so if they say you must lend at 3%, you must lend (I12).

The KfW Bank has the capacity to provide subsidised interest rates as long as there is no competition from commercial banks. The proximity of policy and financial availability has also provided the bank with a credit rating which allows it to borrow and lend 38 times its paid up capital (Vaze and Tindale, 2011). This system of financial provision is considered by many as a good example of a co-evolution of technological and social learning through policy with the help of financial institutionalisation and devolved lending power (Rydin, 2011). However, as many interviewees pointed out, this is not necessarily a replicable model as it has at least partly evolved as a result of both Germany's federal political structure and its coordinated approach to economic development, as opposed to the UK's liberalised approach.

> In Germany the banking system is developed around what's called Mittelstand in terms of the size of enterprises, SMEs, so you have a banking system very used to providing debt and equity and project finance for those kind of sizes and unsurprisingly […] you then develop a renewable energy support mechanism that encourages exactly the same sort of scale to come forward so the banks are all set up to do it.[…] If you look over the history, the big utilities tended to come in quite late into the renewables market in Germany. […] By putting the feed in tariff in place now it's important but there is still a lack of attention to all the other components that therefore haven't emerged that did emerge in Germany because the feed in tariff was in there from the beginning so you had a very low risk process (I9).

In line with this change agent's argument it appears as though CE in the UK is being rolled out from an entirely opposite angle. It is less of a co-evolution between economic development, policy, technological and institutional learning and lending practices that facilitate community renewable energy developments but rather development of CE taking place in spite of unfavourable institutional arrangements.

9.3. Planning

This is also evident from the UK's planning system. Low success rates for onshore wind farm planning procedures in comparison to other countries (Pollitt, 2010; see also Macalister, 2013) point towards a fundamental issue with the positioning of renewables within the UK's planning framework. The scale of community-led projects increases the relative planning risk even though their nature implies a support coalition at the local level.

> Supposedly there's a preference for community projects and supposedly they're easier but reality is that we're not experiencing great ease and I think it's just a consequence of everything that's going on at that level in the planning department of local authorities (I4).

This energy activist indicates the difficultly of CE gaining recognition as a serious pathway for RET development as it is down to the local authority to decide what constitutes a representative group within a community (King, 2011). Many CE projects therefore struggle to develop FiT eligible community projects beyond the relatively insignificant < 50 kW scale (I4; I5).

The problems for community-led developments are exacerbated by issues surrounding the planning requirements for small-scale (community) FiT in relation to large-scale (commercial) RO developments as these change agents argue.

> [Planners] want me to produce a specialised report now on the impact between that turbine and bats in that area. No one can do it. That is a condition of my planning application now. Ice fall, shadow flicker, distance, everything you deal with with a wind farm, I have to put into an application for a 20 kW turbine (I5).
>
> The issue is that [when] we have tried to put up a single wind turbine we are almost faced with the same rate, well it is not quite the same but it is comparable to developing a full wind farm and that is unfair, particularly as this is actually the people themselves wanting it. […] We have a planning system that is designed to stop large organisations effectively destroying a local community. […] That's all quite proper and probably does not go far enough but when you have a community saying we want this wind turbine that is very different to E.On saying we want a wind turbine from which you will derive little benefit (I13).

These two statements show that the efforts required for the development of community-led and other forms of small-scale wind stand in no relation to the local support and backing they might enjoy nor their actual generation capacity. Permitted Development Rights provide some fast-tracking for small turbines but their scalar limitations (DCLG, 2013) imply that if communities want to seriously engage in the benefits of RET innovation it is easier to get utilities and commercial developers on board than to opt for community-led developments.

9.4. Intermediaries and commercially driven development

As a result of these barriers, the development of a CE niche within the UK's NEF is haphazard. The uncoordinated nature of organisational structures at the bottom-up scale of change and innovation also struggles to push for more widespread recognition of CE in light of concerted and well managed efforts associated with top-down development structures (Parag and Janda, 2010). The scope for individual or collective action and overall impact is often dependent on local circumstances and support provided by change agents driving the CE development process. When it comes to the development of wind turbines, particularly in excess of the 'community' FiT banding, which foresees wind developments exceeding 1.5 MW to be commercially driven (DECC, 2010), the need for external expertise and finance increases accordingly, as these two change agents point out.

> [As] people naturally distrust big companies, there is a role for an intermediary there to broker the arrangements between local communities and big companies, although […] if you are going for scale, big companies need to be involved but you need to control the way that they are involved (I2).

> With large projects it's no problem finding the finance [but] it's government coming up with ideas, but not detail. [This necessitates] somebody [who] stands in the middle [to] have the vision in the bigger picture. That's what we're trying to do (I14).

The problem with collaboration lies in the tendency of large companies to require the majority stake in developments. Particularly if post-FiT scales are to be considered, this approach generally requires tapping into larger-scale projects led by commercial investors. Alternatively, communities might seek to develop local 'advocacy coalitions' (adapted from Fuchs and Wassermann (2009)) by getting specialised change agencies or the local authority on board. This might provide the institutional support for more ambitious wind energy projects, which is supported by the following quote from a change agent.

> We're looking to do large scale renewable electricity projects, essentially […] a minimum of two large turbines, 5 MW and with the aim that our company […] puts up the money for the pre-planning and then goes to the market to get the construction finance, so the community doesn't have to own the turbines. [The community] can if it wants, have a share issue and buy shares in it but our definition of community energy is not that it has to be owned by the community, it has to be supported by the community, so we'd only go with projects where over 50% of the local community geographically are in support and it has to have significant benefits for the community […] between £20,000 and £30,000/installed MW/a (I15).

This level of return would be similar to what communities in other European countries can expect for similar business arrangements, particularly German communities through business taxation (I16). In Germany there is an established pattern of utilities and wind farm developers to lease or give a share of their profits derived from the FiT to the local community but these payments have been equated to 'bribes' in the UK (Yeo, 2012). The less utility-driven development pattern of RETs in Germany implies a greater willingness of the public to considered these payments 'a contribution to and a recognition of the impact on that community' (I17).

The dominance of utilities in UK RET development and government's uncertain commitment to the FiT, on the other hand, have created a sense among CE change agents that government places the responsibility of RET deployment firmly in the hands of commercial developers.

> In the UK we have always had that view that it is going to be market driven and governments […] were completely blind to the kind of sociology of the industrial landscape that they were creating. […] They didn't have any view about whether that would have an effect on long term support and they just thought we need kit in the ground, very technocratic, and if the big boys say they'll do it that's fine (I9).

According to this interpretation of the UK's NEF, it does not matter to government whether ownership or control lies in the hands of communities or an outside installer, generally a utility, or international shareholders.

9.5. Increasing scales and replicability

Most interviewees therefore call for a greater acceptance of CE's potential within the UK's energy policy governance framework so that communities avoid 'putting 50 kW turbines at the end where we could have put 1 MW turbines because that is all we needed' (SR). Approaches to CE and sustainable energy in general should not need to vary according to the communities' and the facilitating agency's position within the top-down policy framework (Smith, 2009).

> I think we need to leap frog that and get to that kind of situation in Germany where people see it as an income generating asset that is making the full use of resources available and has a kind of structure of ownership that means that people gain from having it in their back yard (I9).
> Community groups, especially with wind, need to wake up a bit and think 'actually, if they're going to stick 10 2–3 MW wind turbines there maybe we can get one turbine', get them to stomp up all the costs for the turbine, you know it costs £1 m on its own, and then get the benefit from it and pay it off as a mortgage on the turbine (I18).

The two change agents call for greater flexibility on behalf of communities when it comes to CE development. Germany's success in increasing the diversity of scales and ownership structures of RETs lies in the wide range of approaches spanning community-led and utility-led developments (Buchan, 2012). In the UK, CE appears to be a tolerated parallel development but government is struggling to recognise it as an opportunity and not a threat.

> Trying to unwind these and make the two markets work in parallel and work in parallel efficiently, is a bit of a holy grail, really. How can you have nuclear power and off shore winds compete on an equal footing with small scale decentralised electricity, very difficult basically. The only way to do that is to simplify the regime so that it recognises that these are going to be relatively small scale compared to the larger centralised system that will always exist, or certainly will exist for the foreseeable future, and enable them to strive and operate in a bit of a niche so the two markets […] can separate the big centralised system from the decentralised system so they can mesh up (I19).

This change agent calls for separate rules for CE and other forms of small-scale decentralised electricity generation from RETs. In the absence of an appropriate governance approach for this parallel development, scalar advantages of commercial developments provide the best prospects for communities to benefit from economies of scale in terms of wind energy innovation. The FiT scale, on the other hand, provides greater potential beyond the exclusive technological diffusion of innovations. However,

replicability of various scales can only be ensured by policy aims supporting experimentation and innovation which help to build awareness and familiarity of what is possible so community groups and local authorities in particular come forward for ideas in support of renewables (Vaze and Tindale, 2011).

Evidence from Germany shows attitudes changing along with changes in energy derived benefit distribution and the argument of communities potentially driving policy innovation might be reinforced if there is a genuine possibility of local economic regeneration through 'area-based approaches' (CAG Consultants, 2010). Changing the model of ownership and of local benefits accordingly 'would make a massive difference' (I20), according to a facilitator for legal aspects of CE development.

Elements of this approach are evident in Germany. The social-democrat/green coalition government of the federal state of Rheinland-Pfalz passed a law reducing the restrictions on wind energy developments in order to encourage more development of this type. Locally, planning is determined by a land-use/zoning plan, which is set up, maintained and updated by each local authority individually. This localised approach enables each community to decide on renewable energy planning in accordance to German and European land-use and conservations legislation and unlike their UK, particularly English counterparts, many do so as it is considered an economic necessity for communities struggling with their finances (I16).

10. Discussion and conclusion

The analysis of the FiT in relation to CE development in the UK reveals that a governance framework set up in support of large-scale developments is unlikely to change with the introduction of a single policy measure. The result is that CE in the UK is currently far from what might be considered mainstream.

However, FiTs play an important role in encouraging communities to consider the community-led option in favour of selling or leasing land to get utilities or commercial developers on board. The latter are more likely to encourage greater generation capacities to be installed but this greatly reduces the communities' influence on the development process. Community-led options, on the other hand, are more likely to empower communities and encourage social innovation through the greater embedding of energy in the fabric of people's lives at the cost of installing generation capacities unlikely to even scratch the dominant energy policy/infrastructure paradigm. The lack of institutional support within the UK NED and the small scale particularly of community-led developments imply that associated developments are unlikely to move beyond the level of an experimental niche where technological and social innovation interact.

The interviewees therefore fear that the UK government does not consider the CE niche worthy of mainstreaming and uncertainties regarding planning policy and the future of the FiT reinforce this notion. As a result, the UK CE agenda is currently being driven primarily by energy activists and change agents who aim to increase ownership and retention of benefits derived from various scales and ownership structures of electricity generated from RETs within a locality.

Nevertheless, many of the interviewees consider the FiT, leaving the uncertainties aside for the moment, the first concerted policy effort by government to provide a niche that allows energy generation and ownership of renewable energy technologies to develop beyond the locked-in and path-dependent dominance of incumbents and the exclusively top-down approach to energy provision. By breaching traditional producer/consumer divides, the FiT also provides the relative freedom to develop experimental and innovative business and investment models that might have the potential to be replicated in other geographical settings while driving technological learning towards efficiencies also at the lower end of the scale of energy generation.

The problem in relation to wind energy within the UK FiT system lies in the cut-off point at 5 MW and the banding that encourages communities to consider developing wind projects according to a specific tariff band rather than the natural resource. The complexity of the RO restricts community access to larger developments while the planning requirements for both small-scale (community) FiT and large-scale (commercial) RO developments are nearly identical. The burden of putting in a lot of effort for the planning process while returns are limited by the FiT scale reduces the attractiveness and ability of communities to develop wind energy projects.

As it stands, the UK government relies on industry to reduce costs while the FiT allows primarily wealthy individuals, businesses and communities to dabble with RETs. Innovative communities and change agents, however, are setting up various business models for various scales of development that are set to exploit the current framework to its maximum possible extent. This paper nevertheless reinforces Walker and Devine-Wright's (2006) point that CE in the UK is more likely than not to remain a co-provider of energy within a niche rather than a challenger of the regime as long as its surrounding framework does not provide more stable and targeted support.

The German example indicates that different trajectories are possible but that it takes more than the tweaking of energy policy to steer innovations towards a particular trajectory. It also appears as though onshore wind developed as an incremental innovation in Germany as the stability of Germany's NEF in relation to wind and community energy has provides ample opportunities for technological, economical and social co-evolution. The success has led to a domination of renewables, particularly wind, to an extent which suggests that they are now the dominant regime determining grid development and expansion as well as the portfolio of supporting technologies due to their volatility in terms of fluctuating generation patterns. As the wind sector in particular has a large share of community ownership it is therefore the communities that have a stake in determining the future of electricity provision well in excess of the capacity of UK communities to influence the governance of energy policy.

What this analysis therefore points towards is a situation where new niches can develop alongside incumbent regimes with sufficient political and public backing and that a multiple-provision system can and arguably needs to be developed in order to allow for sufficient flexibility in light of energy and climate insecurity. Support systems for niches and regimes also need to cater for increasing flexibility without reducing certainty and predictability. This fine line is where the UK has proven particularly trigger happy which reduces certainty and predictability and indirectly favours incumbents with sufficiently extensive portfolios capable of balancing failing projects linked to uncertainty or policy induced boom and bust developments.

Acknowledgements

The author would like to thank the many interviewees who gave up their time to provide invaluable information without which this piece of research would not have been possible. Thanks also to Stewart Barr and Rob Fish for helpful comments.

References

Adams, S., 2008. Low Carbon Communities: A Study of Community Energy Projects in the UK. Stoneleigh Park, Ruralnet UK.

Allen, J., Sheate, W., Diaz-Chavez, R., 2012. Community-based renewable energy in the Lake District National Park—local drivers, enablers, barriers and solutions. Local Environment 17 (3), 261–280.
Bergman, N., 2011. Climate Change—What Role for Social Innovations and Social Movements?. UKERC, ⟨http://www.ukerc.ac.uk/support/tiki-download_file.php?fileId=1931&display⟩.
BMU (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit—Federal Ministry for the Environment, Nature Conservation and Nuclear Safety), 2012a. Bürgerprojekt Energiewende—die Erfolgsgeschichte der Energiegenossenschaften. Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, Berlin.
BMU, 2012b. Entwicklung der erneuerbaren Energien in Deutschland im Jahr 2011. Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, Berlin.
BMU, 2013. Rede von Ursula Heinen-Esser zum Thema "Energiewende in den Kommunen" anlässlich der Diskussion mit Kommunalvertretern. Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, Berlin.
Buchan, D., 2012. The Energiewende—Germany′s Gamble. The Oxford Institute for Energy Studies Working Paper, SP 26.
Bulkeley, H., Kern, K., 2006. Local government and governing of climate change in Germany and the UK. Urban Studies 12, 2237–2259.
BWEA, 2011. International Comparisons: Turbine Densities and Capacity Factors. ⟨http://www.bwea.com/pdf/publications/RenewableUK_Turbine_Density_Study.pdf⟩.
CAG Consultants, 2010. Power to our Neighbourhoods: Towards Integrated Local Sustainable Energy Solutions—Learning from Success. ⟨http://www.ashdenawards.org/reports⟩.
Carrington, D., 2012. Germany′s Renewable Energy Revolution Leaves UK in the Shade.⟨http://www.guardian.co.uk/environment/2012/may/30/germany-renewable-energy-revolution⟩.
CCC (Committee on Climate Change), 2011. 4th Carbon Budget—Path to 2030. ⟨http://www.theccc.org.uk/carbon-budgets/4th-carbon-budget-path-to-2030⟩.
Co-operatives UK, 2012.Community Shares.⟨http://www.communityshares.org.uk/⟩.
Couture, T., Gagnon, Y., 2010. An analysis of feed-in tariff remuneration models: implications for renewable energy investment. Energy Policy 39, 955–965.
DCLG, 2013. Wind Turbines—Planning Permission. Planning Portal, Gov.UK.
DECC, 2010. Feed-in Tariffs—Government′s Response to the Summer 2009 Consultation. The National Archives, London.
DECC, 2011. Planning our Electric Future: a White Paper for Secure, Affordable and Low-Carbon Electricity. TSO, Norwich.
DECC, 2013. New Nuclear Power Station Gets Planning Permission, Press Release 2013/027, 19 March 2013.
DECC and DCLG, 2013. Onshore Wind: Communities to have Greater Say and Increased Benefits, Press Release 2013/057, 6 June 2013.
DTI, 2007. Reform of the Renewables Obligation. TSO, Norwich.
EST, 2012.Community Projects. Energy Savings Trust, ⟨http://www.energysavingtrust.org.uk/Take-action/Community-projects⟩.
Fielder, F., 1996. Integrating financial thinking with strategic planning to achieve competitive success. The Electricity Journal 9 (4), 62–67.
Foxon, T.J., Gross, R., Chase, A., Howes, J., Arnall, A., Anderson, D., 2005. UK innovation systems for new and renewable energy technologies: drivers, barriers and systems failures. Energy Policy 33 (16), 2123–2137.
Fuchs, G., Wassermann, S., 2009. Picking a Winner? Innovation in Photovoltaics and the Political Creation of Niche Markets. Report, no. 13. Institute of Social Sciences, Department for Environmental Sociology, University of Stuttgart, August 2009.
Fudge, S., Peters, M., Hamilton, J., Parag, Y., 2011. Risk, Governance and Community: A 'Revinvention of Politics' or Political Opportunism?. UKERC, ⟨http://www.ukerc.ac.uk/support/tiki-download_file.php?fileId=1963&display⟩.
Geels, F., Hekkert, M., Jacobsson, S., 2008. The dynamics of sustainable innovation journeys. Technology Analysis and Strategic Management 20 (5), 521–536.
GIB, 2013. Accelerating the Transition to a Green Economy. Green Investment Bank, ⟨http://www.greeninvestmentbank.com/⟩.
Grubb, M., Haj-Hasan, N., Newberry, D., 2008. Accelerating innovation and strategic deployment in UK electricity: applications to renewable energy. In: Grubb, M., Jamasb, T., Pollitt, M. (Eds.), Delivering a Low-Carbon Electricity System: Technologies, Economics and Policy. Cambridge University Press, Cambridge, pp. 333–360.
Gubbins, N, 2007. Community energy in practice. Local Economy 22 (1), 80–84.
Harding, R., 2000. Resilience in German technology policy: innovation through institutional symbiotic tension. Industry and Innovation 7 (2), 223–243.
Hargreaves, T., 2011. 3rd Party Case Study Content Analysis: Initial Results. CISE, Norwich.
Hargreaves, T., Hielscher, S., Seyfang, G., Smith, A., 2013. Grassroots Innovations in Community Energy: The Role of Intermediaries in Niche Development. Global Environmental Change, http://dx.doi.org/org/10.1016/j.gloenvcha.2013.02.008.
Hielscher, S., Seyfang, G., Smith, A., 2013. Grassroots Innovations for Sustainable Energy: Exploring Niche Development Processes Among Community Energy Initiatives. In: Brown, H., Cohen, M., Vergragt, P. (Eds.), Innovations in Sustainable Consumption: New Economics, Socio-Technical Transitions and Social Practices. Edward Elgar, Cheltenham.
HMG, 2009a. The UK Renewable Energy Strategy. TSO, Norwich.
HMG, 2009b. The UK Low Carbon Transition Plan. TSO, Norwich.
HMG, 2012. Draft Energy Bill. TSO, Norwich.
Hoffman, S., High-Pippert, A., 2010. From private lives to collective action: recruitment and participation incentives for a community energy program. Energy Policy 38, 7567–7574.
Hoggett, R., 2010.Funding the Future: The Case for a Pre-Development Capital Fund for Revenue-Generating Community Renewables.⟨www.ukerc.ac.uk/support/tiki-download_file.php?fileId=1307⟩.
House of Commons, 2007. Local energy - turning consumers into producersTSO, London.
IEA, 2008. Deploying Renewables: Principles for Effective Policies. International Energy Agency, Paris.
King, V, 2011. The Localism Bill—Power to the People?. BBC News,⟨http://www.bbc.co.uk/news/uk-politics-15636272⟩.
Macalister, T., 2013. Onshore Wind Sector Receives High Court Setback. The Guardian, ⟨http://www.guardian.co.uk/environment/2013/mar/08/onshore-wind-national-trust-court⟩.
MacKay, D., 2010. Sustainable Energy—Without the Hot Air. UIT Cambridge, Cambridge.
Mitchell, C., Bauknecht, D., Connor, P., 2006. Effectiveness through risk reduction: a comparison of the renewable obligation in England and Wales and the feed-in tariff system in Germany. Energy Policy 34, 297–305.
Mitchell, C., 2008. The Political Economy of Sustainable Energy. Palgrave MacMillan, Basingstoke.
Mitchell, C., 2012.Presentation given at the New Energy Security Challenges Workshop. 10 May 2012, RGS, London.
Munday, M., Bristow, G., Cowell, R., 2011. Wind farms in rural areas: How far do community benefits from wind farms represent a local economic development opportunity? Journal for Rural Studies 27, 1–12.
Negro, S.,Hekkert, M., 2010. Seven typical system failures that hamper the diffusion of sustainable energy technologies. In: Paper Presented at the International Schumpeter Society Conference, 21–24 June 2010, Aalborg.
Parag, Y., Janda, K., 2010. Midstream and sideways: considering a middle-out approach to changing energy demand. In: Paper Presented at the Energy Transitions in an Interdependent World: What and Where are the Future Social Science Research Agendas Conference, 25–26 February 2010, Sussex.
Park, J., 2012. Fostering community energy and equal opportunities between communities. Local Environment 17 (4), 387–408.
Pollitt, M., 2010.UK Renewable Energy Policy Since Privatisation. Cambridge Working Paper in Economics, 1007.
RAENG, 2011. Generating the Future: UK Energy Systems Fit for 2050. The Royal Academy of Engineering, London.
Raven, R., Geels, F., 2006. Non-linearity and expectations in niche development trajectories: ups and downs in Dutch biogas development (1973–2003). Technology Analysis and Strategic Management 18 (3–4), 375–392.
RegenSW, 2011. The Role of the Green Investment Bank. RegenSW, Exeter.
Ritchie, J., Spencer, L., 1994. Qualitative data analysis for applied policy research. In: Bryman, R., Burgess, R. (Eds.), Analyzing Qualitative Data. Routeledge, London, pp. 173–794.
Rogers, J., Sommons, E., Covery, I., Weatherall, A., 2012. Social impacts of community renewable energy projects: findings from a woodfuel case study. Energy Policy 42, 239–247.
Rydin, Y., 2011. Lessons from a German Bank could cut Energy Bills for UK Homeowners.⟨http://www.ucl.ac.uk/news/news-articles/1111/111109-Lessons-from-German-bank-cut-energy-bills-UK-homeowners?dm_i=UAA,LHOP,3YPFC4,1QR43,1⟩.
Saunders, R., Gross, R., Wade, J., 2012. Can premium tariffs for micro-generation and small scale renewable heat help the fuel poor, and if so, how? Case studies of innovative finance for community energy schemes in the UK. Energy Policy 42, 78–88.
Schwaegerl, C., 2011. Germany′s Unlikely Champion of a Radical Green Energy Path. ⟨http://e360.yale.edu/feature/germanys_unlikely_champion_of_a_radical_green_energy_path/2401/⟩.
Seyfang, G.,Park, J.J., Smith, A., 2012. Community Energy in the UK.3s Working Paper 2012-11. Science, Society and Sustainability Research Group, Norwich.
Smith, A., 2007. Translating sustainabilities between green niches and socio-technical regimes. Technology Analysis and Strategic Niche Management 19 (4), 427–434.
Smith, A., 2009. Energy governance: the challenges of sustainability. In: Scrase, I., MacKeron, G. (Eds.), Energy for the Future—A New Agenda. Palgrave Macmillan, Basingstoke.
Smith, A., Voss, J.-P., Grin, J., 2010. Innovation studies and sustainability transitions: the allure of the multi-level perspective and its challenges. Research Policy 39 (2010), 435–448.
Snyder, B., Kaiser, M., 2009. A comparison of offshore wind power development in Europe and the US: patterns and drivers of development. Applied Energy 86 (10), 1845–1856.
Sørensen, B., 2012. A History of Energy: Northern Europe from the Stone Age to the Present Day. Earthscan, London.
Sørensen, F., Mattson, J., 2008. Public–Private Co-Innovation—A Neutral Experiment of Open and User-Driven City Innovation. ICE-Project Working Paper, 2008, 1.
Sørensen, F., Mattsson, J., Sundbo, J., 2010. Experimental methods in innovation research. Research Policy 39, 313–322.
Stenzel, T., Frenzel, A., 2008. Regulating technological change—the strategic reactions of utility companies towards subsidy policies in the German, Spanish and UK electricity markets. Energy Policy 36, 2645–2657.
Szarka, J., 2006. Wind power, policy learning and paradigm change. Energy Policy 34 (17), 3041–3048.
The Crown Estate, 2012. UK Offshore Wind Report. The Crown Estate, London/Edinburgh.

Timms, D., Hume, D., 2009. MPs Briefing: Feed-in Tariffs for Small Scale Renewable Electricity. Friends of the Earth, London.
Toke, D., 2005. Are green electricity certificates the way forward for renewable energy? An evaluation of the United Kingdom's Renewables Obligation in the context of international comparisons. Environment and Planning C: Government and Policy 23, 361–374.
Unruh, G., 2000. Understanding carbon lock-in. Energy Policy 28, 817–830.
Vaze, P., Tindale, S., 2011. Repowering Communities—Small-Scale Solutions for Large-Scale Problems. Earthscan, Abingdon.
VKU, 2012. Stadtwerke-Anteil an Stromerzeugung Gestiegen. Pressemitteilung 81/12. Verband kommunaler Unternehmen, Berlin.
Walker, G., Cass, N., 2007. Carbon reduction, 'the public' and renewable energy: engaging with socio-technical configurations. Area 39 (4), 458–469.
Walker, G., Devine-Wright, P., Evans, B., Steward, F., 2005. UK Community Energy Projects Database. Community Energy Initiatives, Lancaster.
Walker, G., Devine-Wright, P., 2006.Embedding socio-technical innovation?: niche management and community-based localism in renewable energy policy in the UK. In: Paper for the Proceedings of the Future of Science, Technology and Innovation Policy Conference, 11–13 September 2006, Brighton.
Walker, G., 2008. What are the barriers and incentives for community-owned means of energy production and use? Energy Policy 36, 4401–4405.
Walker, G., Devine-Wright, P., Hunter, S., High, H., Evans, B., 2010. Trust and community: exploring the meanings, contexts and dynamics of community renewable energy. Energy Policy 38, 2655–2663.
Willis, R., Willis, J., 2012. Co-Operative Renewable Energy in the UK—A Guide to this Growing Sector. Co-operatives UK, Manchester.
Woodman, B., Mitchell, C., 2011. Learning from experience? The development of the Renewables Obligation in England and Wales 2002–2010. Energy Policy 39, 3914–3921.
Yeo, T., 2012. In: Carrington, D., Tory MP Calls for Countryside Windfarm 'bribes'. ⟨http://www.guardian.co.uk/environment/2012/jun/04/countryside-windfarm-bribes-wind-turbines⟩.