The new 'civic' energy sector: civil society institutions and energy infrastructure transitions in Germany and the UK

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Realising Transition Pathways

Whole systems analysis for a UK more electric low carbon energy future

Realising Transition Pathways

'Realising Transition Pathways' (RTP) is a UK Consortium of engineers, social scientists and policy analysts. The consortium is managed by Professor Geoffrey Hammond of the University of Bath and Professor Peter Pearson of Cardiff University (Co-Leaders). It includes research teams from nine British university institutions: the Universities of Bath, Cardiff, East Anglia, Leeds, Loughborough, Strathclyde, and Surrey, as well as Imperial College London and University College London. The RTP Project [www.realisingtransitionpathways.org.uk] commenced in May 2012 and is sponsored by the 'Engineering and Physical Sciences Research Council' (EPSRC: Grant EP/K005316/1). It is a renewal and development of the earlier 'Transition Pathways' (TP) project, which was initially established in 2008 with the joint sponsorship of E.ON UK (the electricity generator) and the EPSRC. This project addressed the challenge of the so-called energy 'trilemma': the simultaneous delivery of low carbon, secure, and affordable energy services for the electricity sector. It developed and applied a variety of tools and approaches to analyse the technical feasibility, environmental impacts, economic consequences, and social acceptability of three 'transition pathways' towards a UK low carbon electricity system. These pathways explore the roles of market, government and civil society actors in the governance of a low carbon energy transition.

The research within the RTP Project seeks to explore further the constraints and opportunities in realising a low carbon UK energy sector, including those stemming from European developments. This project includes studies on the horizon scanning of innovative energy technologies over the period to 2050, the feasibility of demand responses, uncertainties in economic analysis, the estimation of investment costs of the different pathways, and the implications of markets for investment decisions about energy technologies. Further work is being undertaken on conceptualising, mapping and analysing 'actor dynamics' in the contemporary UK electricity sector, historical transitions and case studies, integrated energy networks modelling and evaluation, and 'whole systems' energy and environmental appraisal of low carbon technologies and pathways. The consortium is also developing their initial work on branching points on pathways, in order to identify and explore other potential branching points on the core transition pathways.

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Abstract

There has been a surge of interest all aspects of the energy sector from city-regions, municipalities, communities and citizen investors across industrialised countries. Whilst corporate utilities and nation states are familiar actors in the energy system, the emergence of municipal energy companies, community energy schemes and alternative energy finance are less well understood on a systemic level. This research defines these municipal and civil society institutions as the 'Civic Energy Sector', and argues that under the right circumstances, this sector could become a substantial element of the entire energy system. This paper presents findings from comparative case analysis of the United Kingdom's latent civic energy sector, with the expansion of this sector in Germany. The ability of the sector to shape energy futures is demonstrated in Germany. Here, municipalities, citizen investors and co-operatives own between 40-50% of low-carbon capacity, grid infrastructures are being re-communalised, municipalities own significant supply market share, and citizen finance is well established. The analysis uses framings from evolutionary economics to demonstrate the strong links between forms of finance and forms of ownership, and how the civic energy sector can expand by building compatible institutions across the energy value chain.

Keywords:

Civic Energy Sector, institutional finance, evolutionary economics, transitions.

1.0 Introduction

"Economies are typically divided into public and private sectors. The extent of the mix between the two depends on the nature of the society of which they are part"
(Palazzi et al, 1990)

"…institutions vary along two dimensions, the role of government (statism) and degree of collaboration (corporatism) between market and non-market factors…"
(Provance *et al* 2011 p.5632)

Much research and policy analysis assumes that the nature of contemporary energy systems depends on the mix of the two institutional worlds of the state and the market. This basic division establishes a dichotomy between private exchanges in a market setting and government-owned services organized by a public hierarchy. This divides people into consumers or voters, with little room for citizenship[1]. The dominant market logic assumes that most decisions are taken within a market context which purely private actors engage with, subject to regulatory frameworks. The alternative is a state or government-led logic, in which the (centralised) state exercises much greater control over the energy system. Yet beyond the state market dichotomy, a third "institutional world", that of civil society, can have substantial effects on energy systems, leading to different potential transition pathways[2]. To date, systemic international comparisons of these non-state, non-corporate institutions on energy systems have been rare. This paper argues that a 'civic' energy sector, comprising citizen, community, co-operative and municipal actors, is having material effects on energy futures, but that these effects depend on wider institutional and cultural factors. These are explored through a comparative case study of the emerging civic energy sectors in Germany and the UK, focussing on the electricity value chain.

This paper is structured as follows. Section 2 comprises a two part literature review. First, a gap in the energy research space regarding systemic effects of non-state, non-corporate actors and institutions is identified, and the characteristics of civil society institutions described. Secondly this research is framed as a co-evolutionary analysis of non-statist/non-corporatist institutions in the energy sector. This leads to the research questions. Section 3 describes the international comparative case methodology adopted. Section 4 presents empirical results on the whole electricity value chain from generation, through distribution to supply and critically finance. Section 5 analyses these results in terms of compatible value frameworks and proposes these actors and institutions are best conceived

as a civic energy sector. Section six concludes by reflecting on the importance of defining a 'civic' energy sector for energy policy in liberalised markets.

2 Concepts and theoretical frameworks

2.1 Community and Municipal energy: two sides of the same coin?

Why is the concept of a 'civic' energy sector needed? Community energy literatures form a body of work that has explored civil society participation in the energy sector, but they have often analysed the internal dynamics of the sector as opposed to taking a systemic perspective. This lack of systems level treatments of the impact of civil society on energy systems is surprising, given the wealth of research on collective ownership and community energy. In practice, research on the institutional world of civil society has tended to either focus on the generation element of the energy value chain[3,4,5,6] or, where it does analyse the sector more broadly, interrogates the dynamics of group formation, policy suitability and barriers to entry.[7,8,9,10]

In parallel to the community energy debate, there is a growing understanding that the municipal level has the potential to be a key actor in energy transitions[11,12,13], particularly in a decentralised future[1415]. However, research into municipal or 'urban' institutions in the energy sector has also tended towards analysis of their internal workings; or the alignment of 'institutions, techniques and artefacts' that bring urban actors into the energy space[16,47]. This is useful in understanding the institutional context in a particular time and place, but not so instructive as to its impact on the wider energy system[17,18].

What has been missing is an investigation of the systemic impact of both community and municipal actors, which are subject to a different set of institutional circumstances than either state or corporate interests. Building on calls for a multidisciplinary approach to the effect of civil/civic society on energy transitions[19] this paper investigates the actors and institutions of civil/civic society and their effects on two national energy systems. This is important because non-state, non-corporate business models can offer real benefits to the energy system; including both socio-environmental outcomes such as economic development, decarbonisation, self-determination and [fuel] poverty alleviation, and systems/technical benefits such as grid balancing and energy efficiency[14,20,7]. The energy transitions school[21] has argued that the incorporation of civil society as an actor in the energy sector can broaden the potential for transformative systems change by expanding the options for energy system governance[2].

Civil society and the civic sphere have often been proposed as a third element of contemporary society, beyond market and state. Civil society is able to provide goods and services in a way which claims to transcend both the bureaucracy and ideologies of state forms of welfare and service provision, and ameliorate the amorality of pure market approaches[22,23]. Following the Oxford English Dictionary definitions, civil society is defined here as a 'community of citizens linked by common interests and collective activity', whereas 'civic' is defined as 'relating to a city or town, especially its administration; municipal'. As such, any reference to civil society can exist beyond territory and municipal actors/councils, whilst 'civic' has a particular geography and incorporates the local state or municipality. The form of civil society that rose to prominence in response to the market fundamentalist years of Reganomics and Thatcherism *("There's no such thing as Society"[24])* was referred to as the neo-Tocquevillian school, which held that "partnership between all three sectors of society working together – public, private and civic – is the best way to overcome social and economic problems" (see[25]p.11). Much deeper engagement with the definition and forms of civil society is possible (ibid). However, for our purposes, what is important is that these are institutions beyond pure market and state forms of provision, with shared norms and values which differ from the profit orientation of the private firm or the national politics of the state. What these values are in the energy sectors of two developed western nations, and how they manifest in the institutions active in that sector, is the focus of this work.

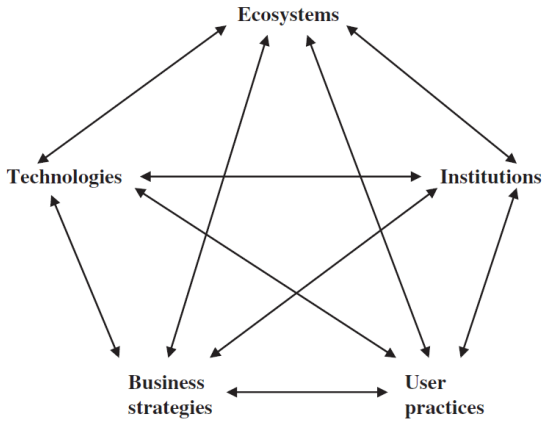
2.2 Co-evolutionary approaches and institutions

This research aims to understand the systemic impact of civil and civic society actors and institutions on energy systems. The research team adopts a co-evolutionary framework [26] to present the 'institutions' of civil society as critical elements in the development of energy systems. Co-evolutionary analysis is built on approaches to understanding socio-technical systems change [27] evolutionary economic analysis of the role of institutions[28,29] and historical analysis of industrial change[30]. Here, physical energy infrastructure co-evolves with socio-economic institutions, regulatory agencies, incumbent actors and social norms[31]

Co-evolutionary approaches are useful because they enable a focussed analysis of the human, environmental and technical elements that produce socio-technical systems. These systems are always contingent to a particular place and time. In this framework, each system is able to internally evolve, but this evolution influences and is influenced by the dynamics in other systems. Foxon (2011) [26] argues that socio-technical and techno-economic change for sustainability can be analysed through the coevolution of ecosystems, technologies, institutions, business strategies and user practices

(Figure 2.1). These elements of the system *co*-evolve because they have significant causal impact on each other's ability to persist. The power of a co-evolutionary approach is not only to explain each individual system, but to analyse the causal influences between them. Investigating only the institutional or technological innovation elements of an energy system may be useful, but for greater insight, we need to appreciate how these elements influence and are influenced by the other components.

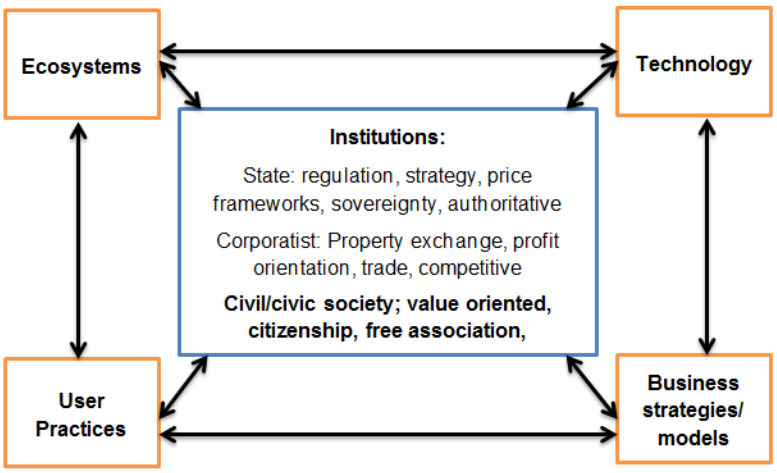
Figure 2.1 Co-evolutionary framework for socio-technical systems change



Source: Foxon (2011[26] p.2262)

Recent co-evolutionary contributions have analysed the institutional and business model elements of the energy system[32,11.] Pertinent examples are how the institutional rule systems of state policy and market regulation influence the business models of energy utilities, micro generation firms and energy storage technologies [33,32] (also see[5]). Some treatments have centralised single elements of the framework such as business models/strategies (see[11]) to act as a focussed unit of analysis in the wider forces shaping system change. For this research we centralise the 'institutional' element of the system (figure 2.2) and isolate those institutional elements that are not part of the normative statist/corporatist dichotomy.

Figure 2.2: Centralising institutions within the co-evolutionary framework.



The term 'institution' can be hard to define. We begin with Foxon's (2011[26]) definition; institutions are 'ways of structuring human interactions'; following the institutional economics tradition of North (1990[29]). Here institutions are "the rules of the game", which can include regulatory frameworks, property rights and standard modes of business organisation ([26]p.2262). We can also borrow from both Provance *et al* (2011[5]) and Aalto (2014[34]) who define master institutions or politico-socio institutions that frame the ways in which property and value exchange are organised, how the means of production and surplus value are owned/distributed, and the means of command and control within each sphere; they show how formal institutions and energy business models are derived from these higher level 'master' institutional contexts. In a related contribution in this journal, Kungl[35] uses neo-institutional field theory to investigate the shared value framings of the institutions of the corporate utility on the German energy sector. As Mitchell[36] and Smith[37] demonstrate; the values and political economy of different institutions permeate into the mechanisms of energy system transitions.

Whilst Foxon's[26] initial framing excludes cultural norms and values from the institutional system (preferring to locate these in the 'user practices' element of co-evolutionary analysis), here, common value frameworks are brought into the institutional analysis. This is because much civil society activity rests on some form of shared values, which are critical pre-conditions for community energy and institutional management of other resources[37,3,38,39.] "As manifestations of shared values, institutions influence agents' preferences, choices, and actions as well as aggregate economic and environmental outcomes" ([40]p.360; also[35]). Thus, our institutional definition includes the macro level organisation of property exchange, rule systems etc.; but also investigates shared values as important co-constituents of the institutional world, indeed they are critical constituents in a context of civil society participation[41,42]. As this master institutional context diverges across space, a comparative analysis of

two national energy systems should yield fruitful analysis of how institutional context affects business models, technical systems, user practices and the wider ecosystem. Specific research questions follow; what are the systemic effects of civil/civic society institutions on energy systems? Which values are in fact shared by these institutions? What effect does this institutional compatibility have on ownership across different parts of the energy value chain? And what does the relationship between the state and civil society in the energy sector mean for energy policy?

3.0 Methods: Comparative case study of Germany and the UK

To answer these questions, an international comparative case study of the emerging civic energy sectors in Germany and the UK was undertaken. Sovacool[43] calls for comparative approaches when studying energy society interactions as they can increase the robustness and applicability of results. The UK and Germany are interesting due to their different experiences of electricity market liberalisation. Where the UK's market liberalisation was imposed on a nationalised and centralised electricity system, German market liberalisation took place in the context of a more decentralised and municipally-led post-war reconstruction[44] particularly in the west. Further, the historic centralisation of the UK state is in contrast to the decentralised model of the German federal system and principles of local subsidiarity. Both systems are of a similar technical maturity and sophistication, ruling out any bias based on system development phases. This approach enabled investigation of non-state and non-corporate institutions in the energy sector where they could be expected to differ based on institutional contingencies.

This study utilised a qualitative research design, comprising primary research, consisting of in-depth semi-structured interviews, and secondary documentary analysis of policy and statistical publications. Interviewees were selected that had interests in the finance, ownership, or governance of the energy systems in the UK and Germany. Primary data is drawn from in-depth interviews with 35 individuals from across the electricity value chain in the UK and Germany. The sample comprised 6 utility executives, 9 energy finance providers (from hedge funds and pensions funds to citizen and co-operative finance), 6 project developers, 5 institutional investment professionals, 2 policy professionals, 2 energy journalists, 2 energy lobbyists, 2 academics, and 1 municipal energy officer. Whilst direct quotes from each case are used, the majority of sourced quotes focus on the German case, in which the articulation of the non-state, non-corporate energy sector is more sophisticated.

The findings of each case study were analysed in terms of civic sector involvement in the two countries across the electricity value chain of generation, transmission and distribution, and supply. Importantly, finance is closely discussed, as the financial institutions of energy transitions are important actors and

drivers of system coevolution, and the value set of German banking institutions more generally have been based on the deployment of finance for productive, fixed capital formation, as opposed to the Anglo-american model, which has followed a more speculative pat[45]. Financial institutions are therefore a key element of the energy system which are often under-represented in energy research, this account investigates the links between the type of finance at work in the energy system and the ownership models they are compatible with.

4.0 Results: Civic sector involvement across the electricity value chain in Germany and the UK

Prior to 1945, European electricity systems were the remit of local authorities or civic groups[46,44]. In the UK circa 300 of these organisations were involved in electricity supply[47]. Wollman *et al*[44] find the move to nationalised energy systems in France, Italy and the UK in the post war period, a key moment in the move away from a decentralised and diverse energy sector. Pond[48] describes the successive Conservative governments of 1979-1997 as leading a liberalisation of the UK energy system which was without precedent, but benefitted from having a fully nationalised industry to privatise.

In Germany, there was no nationalisation of the electricity system. In West Germany in particular, post-war reconstruction retained the principals of local self-government, remaining largely under municipal ownership. The 'stadtwerke' (literally 'city works' or municipally owned utilities) provided energy services. European market reforms led by the UK's marketisation agenda[49] struggled in Germany, which did not have a state owned energy sector to privatise. Instead, the German energy sector remained largely under municipal control until European directives, specifically 96/92/EC[50], forced local monopolies to break by introducing the right to switch supplier and requiring the unbundling of generation, supply and transmission[51]. In Germany, this posed a challenge to the Stadtwerke which had operated regional integrated monopolies; though many saw this as an opportunity to invite private capital into their shareholder structure or divest themselves entirely of energy obligations.

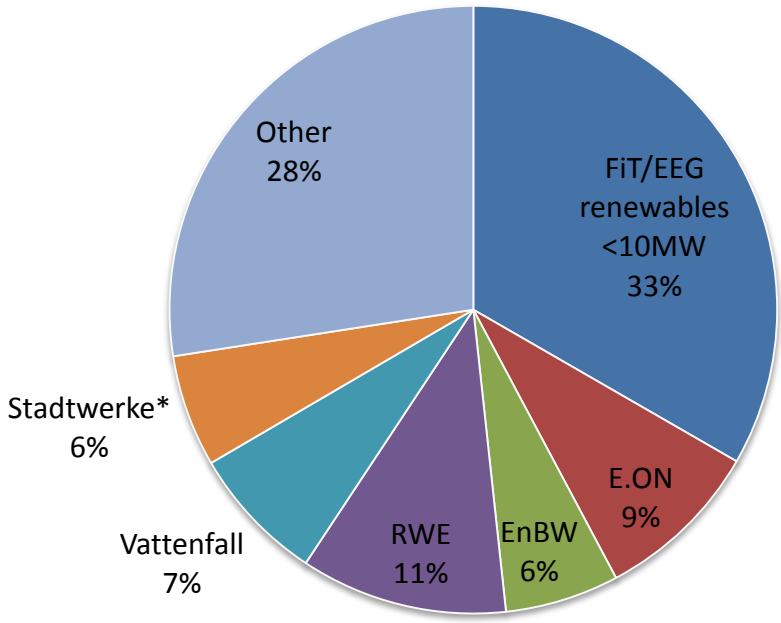
Market liberalisation saw a reduction in Stadtwerke overall, from circa 900 to 600[44]. However, there has been a turn back to municipal and community ownership of energy infrastructures in Germany, often referred to as re-communalisation[52]. This primarily refers to the reestablishment of the stadtwerke but also incorporates other non-state and non-corporate ownership structures, such as co-operative ventures. Overall the number of Stadtwerke active in energy has risen to approximately 850[53]. As of 2012, 170 communities had won back the distribution grid concession contracts, 60 new stadtwerke had been formed[52] and much of the post-liberalisation dilution of municipal equity in stadtwerke is being reversed[44].

4.1 Generation

In the UK, following market liberalisation, electricity generation assets have been almost exclusively owned by corporate utilities[54, 55, 56]. In 2014, there were 32 companies classed as Major Power Producers, whose primary business was electricity generation, accounting for 82.7% of total installed capacity of 96,903GW[57]. Following a series of mergers and entry of a small number of large international utilities, a 'Big Ten' of generation companies emerged, which includes the 'Big Six' vertically-integrated energy utilities, alongside ESB, Drax, GDF Suez and AES. In 2012 these ten companies collectively owned 85.8% of UK generation assets[58]. The remaining 14.2% is made up of 64 medium sized private companies and corporate entities. The 'Big Six' utilities own 47% of renewable capacity[57]. Whilst renewable energies have a less concentrated ownership structure than thermal generation, beneficial ownership remains predominantly in private hands (ibid). The community energy sector owns only 0.3% of renewable capacity; approximately 60MW[59]. Comparable figures for municipal generation assets are unavailable but are unlikely to exceed 1%[11]. Recent research has shown common value sets being pursued across municipal and community actors in the generation sector; these include: regional economic development, fuel poverty reduction, energy system decarbonisation and self-governance/self-determination[20]. These outcomes describe a shared value set across these civic institutions, which is outside shareholder return or national political orientation.

In Germany, installed capacity as measured by the Federal Networks Agency was 196,133 GW and comprises 707 individual power producing companies[60]. There is a lower concentration of ownership in thermal generation with the 'Big Four' (E.ON, EnBW, RWE and Vattenfall) owning 33.4% of total generation capacity (ibid). Importantly for this analysis, 6% of total installed capacity is owned by Stadtwerke[61], where part or all of the beneficial ownership rests with municipalities. 33% of installed capacity is made up of <10MW installations supported by the German Feed in Tariff (EEG) with a diverse ownership structure which is expanded on below. The remaining 28% comprises hundreds of companies with individual installations, some larger corporations with multiple sites and several co-operative and citizen wind parks (figure 4.1).

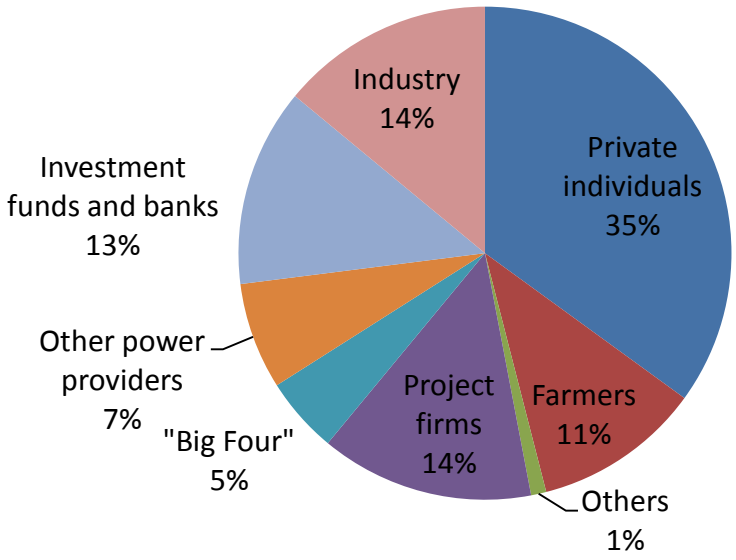
Figure 4.1: German installed capacity by ownership 2014



(Source: Bundesnetzagentur, 2014[60])

Whilst conventional generation in Germany incorporates significant elements of municipal, citizen, co-operative and community ownership, it is the ownership structures of installed renewable capacity that vary most markedly from the UK. In the UK, ownership of renewable capacity outside private companies remains negligible, whereas in Germany, ownership of renewable generation assets is diverse and incorporates multiple non-corporate, non- state models (figure 4.2).

Figure 4.2: Ownership of installed RE capacity in Germany (2012)



(Source: German Renewable Energies Agency, 2013[62])

For the German renewables sector, industry, Germany's 'Big Four', project firms, other power providers and investment funds/banks account for only 53% of capacity ownership. This is further complicated by the fact the Stadtwerke are classed as 'other power producers' even though much of their beneficial ownership accrues to the municipality. Also the structure of the German banking sector means much of the 'investment funds and banks' capacity is owned by banking groups with values based structures, such as the co-operatives banks. As such a proportion of 'investment funds and banks' can be classed as citizen financed (section 4.4).

For the 35% of renewables under 'private individuals' this constitutes structures through which energy co-operatives, private householders and communities develop renewable energy assets. To date, more than 800 energy cooperatives have invested over 1.3 billion euros in renewable energy projects[63]. The co-operative share has increased to constitute 21% of the 34GW installed capacity under citizen ownership[46]. The researched sample also explained many of the farm based schemes incorporate co-operative ownership structures due to the strong co-operative movement in the German agricultural sector[19].

An important driver of this civic ownership of renewable generation is the creation and retention of value within local economies:

"We're really democratising the energy system by allowing everyone in Germany the opportunity, or giving everyone the opportunity to participate in the system. And that's something that has put the Energiewende [energy transition] *at the heart of political priorities."*

(Energy Journalist, 2014)

"So you can feel this entrepreneurship and this regional community thing in this kind of business. It is very impressive that there is millions and millions in investments in the region from the money of the people into regional projects using regional craftsmen etc. I think this is the key story of energy co-operatives in Germany. It's more about regional development."

(Co-operative Banking Group Executive, 2014)

Respondents from Germany identified the creation and retention of local value, decarbonisation, economic development and stability, and self-determination/subsidiarity as primary goals, forming a common, but not uncontested value set for stadtwerke, co-operatives and citizens in their participation in the energy generation sector.

4.2 Distribution

Considering transmission and distribution networks, the privatisation of the UK energy system moved these functions to a regulated approach[32]. Following mergers, the 14 original regional distribution networks are now operated by seven groups[64], five of which are in turn owned by international conglomerates, corporations or investment funds[65]. Distribution networks form natural monopolies; as such these assets (both in the UK and Germany) operate on an allowable revenues regulated by specific formulae[66,67]. Whilst there has been recent interest from UK municipalities in distribution networks[68], ownership of distribution assets outside private hands in the UK is rare.

The evolution of networks followed a different path in Germany, with hundreds of grid concessions at multiple scales. According to the VKU (Association of municipal utilities), around 60% of distribution concessions in Germany remain with stadtwerke. Co-operative ownership of distribution infrastructure is uncommon, but at least 9 co-operatives run distribution infrastructures in Germany[69]. Whilst some of the re-communalised concessions are small, there have been large re-municipalisations. The most successful of these was in Hamburg, where in September 2013, 50.9% of voters voted in favour of a re-municipalisation and the city has agreed purchased the grid from Vattenfall for between 495 and 550 million Euros[70]. There are several reasons cited for re-municipalisation/communalisation trend. Respondents consistently identified acceleration of renewable penetration and retention of energy value as key drivers:

"..The clear goal is to accelerate the energy transition and the ways to operate the grid in terms of supporting the change to renewable energies […] another motivation is this empowerment idea yes, this is something I have observed in many citizen driven energy co-ops, the do it yourself philosophy. We can do it on our own."

(Source: Co-operative energy developer, 2014)

Several respondents questioned how the acceleration of grid investment to integrate renewables could be achieved through re-communalisation, given that municipal/citizen grid operators are subject to the same allowable revenues structure as private grid operators. Some recent studies show the values accruing to municipalities from smart grid investments include, but are not limited to: increased tax bases, employment opportunities, and energy security,[71,72,68]. This would support the case for grid infrastructure under local ownership to be cross subsidised from revenues outside the regulated charge structure.

Revenues from grid operation were also found to be an attractive proposition for local actors. Municipalities recognising the benefits of high-quality grid infrastructure within their own territory, are prepared to accept a lower return on the asset base, and stipulate that retained revenues be re-invested in smart grid services:

"The main effect [of being municipally owned] *is we are not talking every quarter, every year about results and profits. The communes* [municipalities] *are long term oriented, because they are very much interested in a very good and safe reliant infrastructure."*

(Stadtwerke executive, 2014)

The re-municipalisation of grid infrastructure is not wholly unproblematic. Issues arise when capital is unable to be raised through equity issue without diluting municipal control [73], and, where municipalities or co-operatives wish to develop generation capacity (which can generally be more profitable), grid infrastructure has to compete for discretionary capital expenditure[74].

In Germany there is a heterogeneous ownership structure for electricity distribution assets which is tending towards re-communalisation. Proponents believe this will accelerate the energy transition and retain values from energy infrastructures locally. Similar to generation, our respondents identified the creation and retention of local value, decarbonisation, economic development/stability, and self-determination as primary goals of their participation in the energy sector.

4.3 Supply

In relation to supply, i.e. selling of electricity to domestic and business users, the UK market is dominated by six suppliers who own 95% of domestic supply and 80% of commercial supply[75]. There have been efforts to promote new entrants, leading to 24 companies offering electricity and/or gas supply to households and 30 companies offering electricity and/or gas supply to commercial consumers[76,77]. However, whilst the market shares of the big six are falling overall, the domestic supply market is still argued to be uncompetitive and there have been concerns raised by the regulator as to the poor outcomes being realised by householders and SMEs[75].

There are signs of diversification of business models in the UK domestic supply market, with new entrants including a number of low-carbon energy suppliers, a co-operative supplier, and a private supplier focussed on promoting community energy[1]. These smaller ecologically or socially focussed suppliers also offer business services, but supply market diversification for commercial customers is largely accounted for by supplier arms of private generation firms[76]. This supply market structure demonstrates a very few non-corporate agents. Whilst still unrealised in the UK, there is significant interest in achieving supply market penetration from civil society groups[20]. This includes burgeoning interest in setting up new municipal supply companies:

"….[with] *the establishment of an energy company with a fully obtained gas and electricity supply licenses […] we would be able to get into that whole area where we can sort of drive sustainable and local low carbon energy zones to drive economic growth in that area."*

(Municipal Energy Officer [UK], 2014)

Recent research[20] has shown a dissatisfaction with the utility business model arising in civil/civic society groups. This dissatisfaction is based on a number of missed opportunities to secure economic and socio-environmental outcomes using the supply market's direct consumer access. These civil/civic society actors that are agitating for change in UK supply market are motivated by a similar value set: local economic development, decarbonisation, self-government and self-determination.

In contrast, the German electricity supply market comprises over 1000 companies[78]. This however includes approximately 850 Stadtwerke that often will only supply domestic customers within their territorial footprint, though larger Stadtwerke will supply business customers beyond their territory. The same is true for the 60-70 co-operative utilities reported as active in energy supply by the sample. On average, though, a German household is able to choose between 102 electricity suppliers[79]. Estimates of municipal market shares in energy supply range between 31%[80] and 46%[81]. The domestic market share of the Big Four reported by BDEW (2012) was 43.8%, which similar to the UK case has declined in recent years but only from a high of circa 50% (Buchan, 2012).

A supplier landscape with a high degree of municipal involvement in the form of Stadtwerke changes the use to which profits from electricity supply are put. The VKU, the association of the Stadtwerke state that their members:

"…do not primarily pursue private commercial objectives but are guided by public welfare obligations. In our democratic system, they operate under local self-administration to serve "citizen value", i.e. to

[1] Ovo Energy has a specific commitment to supporting local and community energy

meet the needs of the local community. The type of capital they form and secure is a community-oriented asset."

(Resolution of the VKU Executive Committee of 26 February 2008, available at[82])

Whereas almost 100% of the profits from the UK electricity supply companies are distributed via international capital markets, the profits from stadtwerke, which comprise between a third and a half of the electricity supply market, can be used for a number of social, environmental and economic development goals which may or may not be energy related. For instance, the Stadtwerke of Cologne returned circa 265 Million Euro in added value to the city in 2011, most of which was derived from energy services and supply[83].

Respondents identified the advantages of being a municipal utility rather than a corporate utility:

"It is the possibility to make earnings. Before, 100 years ago it was to cover the needs of inhabitants and now it's about the local economy"

(Stadtwerke executive, 2014)

"[City name] was one of the first cities in the beginning of the 90s that set up a local climate protection concept in 2006-07 this was a programmes with measures. This was decided by the city council, in 2008 there was a climate alliance with the city and the Stadtwerke"

(Stadtwerke executive, 2014)

Yet stadwerke are diverse organisations. Respondents described a spectrum of stadtwerke from those that were supportive of citizen energy to those which were ambivalent or hostile due to the effect of citizen energy on their business models. These results do not describe municipal energy companies as universally positive, unproblematic entities, nor is municipal ownership a pre-determinant of energy transition[35]. It was however clear that their ability to appropriate value from energy supply, means that a proportion of energy value can be locally retained and recycled into decarbonisation and energy transition, the fiscal stability of the local state, and/or cross subsidy of the goals of civic actors and civil society.

4.4 Finance

Finance, and the sources of capital for energy transitions, are not often investigated in civil society literatures, yet they are a key part of the institutional makeup of the energy sector. The centralisation of energy supply in the UK, mirrors a similar centralisation of the banking and finance sectors[84]. Blyth *et al*[85] show that only 50% of recent UK generation fleet finance has come from utility balance sheets, as such other sources of finance are at work in the UK's energy sector. Which financial institutions this capital comes from is important, because it affects the types of renewable energy preferred by

investors, the energy business models they prefer to invest in, and the financial vehicles they prefer to invest with[86]; the UK respondents described the non-utility element of capacity investment:

"Pretty much all wind has been financed in two ways: half has come from the balance sheets of the utility companies and the other half has come from banks, project finance from banks"

(Institutional Investment Professional, 2013)

In the UK, relying on utility balance sheet finance and project finance from banks means relying on two highly centralised and internationalised sources of private capital. The statistics for the UK banking sector are closely correlated to those for the energy supply sector. In 2011, six banks accounted for 92% of personal current accounts, 85% of mortgages and 88% of small business accounts[87]. This centralised banking system with a small number of large providers is the same sector utilities and renewables developers have drawn on for debt finance. Another striking contrast with the German case is the diversity of ownership structures. In the UK in 2011, 82% of total deposits resided in commercial banks with only 18% in mutual hands[88], whereas for Germany, only 36% of deposits rested with commercial banks, 24% with mutual and 40% with not for profit savings banks (ibid).

This has had two effects on UK energy investment. Firstly the availability of capital for the UK energy sector is tied to volatile financial markets[85] and secondly the ability of multinational and investment capital to lend to small/medium scale projects is very low[59]. Commercial banks were very exposed to capital market volatility during the financial crisis[84], reducing the capital available for energy system investment[85]. As such, recent UK energy policy packages have been design to attract the 'mainstream' investment community[89], i.e. pension, sovereign wealth, insurance and hedge/private wealth funds:

"The main way we have to finance the transition is going to be through project finance, but the banks who currently do manage project finance aren't going to be able to do it, so the ***mainstream investment community*** *is going to be looked to"*

(Institutional Investment professional, 2013 [our emphasis])

However, utility balance sheet finance, project finance from international banks, and mainstream investment finance is unlikely to capitalise myriad citizen, municipal and co-operative distributed renewable energy schemes of £20m and below:

"…there's not many banks out there that will loan on small scale community schemes. You can only talk to the big banks if you're borrowing millions of pounds, that's when they're really interested in you."

(Co-operative energy developer UK, 2013)

In the UK it has been difficult for civil society energy schemes to source appropriate levels of finance; an issue explicitly recognised in the UK Government's community energy strategy as a 'finance gap' for projects where 'city' level project finance does not usually start below £20m (see[59]p.52). This may be partially addressed by the UK's Green Investment Bank, capitalised with £3.8bn public funds, that has lent £2bn to date to predominantly independent private power provision or larger public sector projects[90]. There are movements toward a smaller scale citizen finance sector in the UK. Companies such as Abundance[2] and Pure Leapfrog[3] are offering citizen finance debentures for small scale investors, or are building portfolios of projects in order to reduce financial risk through aggregation. The County of Hampshire is in the process of establishing a community bank tasked with delivering a low carbon economy. They explicitly cite the German banking model as key to supporting renewable energies[91]. For now however the finance gap remains real for smaller scale energy schemes led by civil society groups.

The expansion of citizen, municipal and co-operative stakes in the German energy sector has been enabled by financial institutions that incorporate three traits unfamiliar in the UK's centralised sector: local subsidiarity, common public benefit values and promotional lending. There is a well-established local banking sector in Germany, in which the scales of loans are more compatible with distributed energy schemes. The two main institutions comprising this sector are the German Savings Banks Group (Sparkassen and Landesbank) and the German Co-operative banks (Volks and Raiffeisen Banks). The savings banks and co-operative banks are not small players - in 2014, they together comprised over 62% of all small business loans, almost 100% of loans to tradespeople, 50% of consumer credit, 42% of loans to municipalities and 60% of mortgages[92]. However, each regional Savings or co-operative bank is a separate business under the institutional form of a savings/mutual bank. Where the UK has 162 banks, Germany has 2,000[84]. Though much like the stadtwerke, not all customers can access all savings/co-operative banks as savings and co-operative banks are territorially bound:

"The difference between a savings bank and other lenders is that the savings bank will not withdraw […] it is anchored within that local area and also bound to only operate in that local area, will have to live off the profits that it can make in that local area. […] So each and every savings bank can adapt its actual business to the condition it finds in the local area; and that is very important. That is this decentralised model."

(Savings Bank Executive, 2014)

"…the local co-operative banks, they are rooted or backed in the regions […] In Germany we have a little bit less than 1100 Volksbank and Raiffeisen banks […] we don't want to have such big units that

[2] https://www.abundancegeneration.com/
[3] http://www.pureleapfrog.org

we are not near enough to the customers and therefore we are still quite a lot of Volksbank and Raiffeisenbank so that they are anchored in the regions on a local level."

(Co-operative Bank Group Employee, 2014)

This decentralised model has been proposed as an additional banking sector for the UK, which would better support household and SME lending[93,87]. The territoriality principal and proximity to customers and business was cited several times by interviewees as key to designing small scale investment vehicles to allow citizens to invest in local energy projects. Typically the 'citizen' finance model is operated by the savings banks. Investment products are devised by individual savings banks that are suited to their local area. Customers of the bank can choose to place savings in energy schemes. These instruments may take the form of local bonds or energy savings accounts, enabling small scale savers to hold a productive stake in the energy transition. Whilst there is no special relationship to stadtwerke, as the majority lender to German public authorities, the savings bank group is closely invested in municipal as well as citizen energy schemes (see[94] p.30-31).

For the co-operative banks the natural channel for energy related investment is through the circa 800 energy co-operatives:

"So there's a close relation between the co-operative banks and energy co-operatives on the regional or local level. So ***a lot of new renewable energy co-operatives were founded or were supported by co-operative banks****. So they supported business plans so they built the right stuff"*
(Co-operative Bank Group Employee, 2014)

Both the savings and co-operative bank groups are key institutional promoters and supporters of civil ownership of energy assets, they are not passive institutions. Both have found small to medium scale renewable energy productive terrain for investment. The aims and objectives of this local banking sector are compatible with the notions of subsidiarity/self-government, economic stability, environmental protection and social welfare expressed by actors across the value chain in Germany's civic energy sector. Because of this, both of the local banking institutions of Germany actively promote local ownership and control of the energy sector:

"politically we have a very clear opinion about what we call re-communalisation. So also in Germany not all the energy suppliers are in municipal hands, there is a strong tendency to switch that and we support that switch. How do we do that? First of all we are advocating all kinds of decentralised energy supply […] this is really something where ***civil society, where communities where municipalities where people from outside the authorities*** *get together and try to create something and try to be*

independent and take some responsibility for their lives and that is something that is very close to the founding mission of the savings banks…"

(Savings Bank Group Employee, 2014 [our emphasis])

Energy co-operatives are local companies, they pay tax to local authorities. That's different to a national or international project developer who runs a wind farm here in Brandenburg close to villages and nobody is involved. So the benefits of these projects remain in the region and that is very important. ***That's why a lot of co-operatives banks support the foundation of these energy co-operatives***."

(Co-operative Banking Group Employee, 2014)

A key enabler of the growth of this local energy finance is the existence of refinancing loans from the German public development bank KfW. KfW utilises its strong credit rating to source capital market finance and offers refinancing options for renewable energy and energy efficiency loans. Between 2009-2013 the savings banks and co-operative banking group accounted for circa 74% of the €16.2bn distributed through KfW promotional energy lending (Interviewee, 2014) a great majority of this finance is for loans under €25m[95]. This is almost the opposite of the UK case, and is clearly having substantive systemic effects, as can be seen by the more than 33% of German electrical capacity being accounted for by <10mw capacity (figure 4.1). Between customer deposits and KfW finance, a strong institutional framework for risk shared investment in citizen energy is maintained.

In Germany, a dense network of locally rooted banking institutions is able to offer renewable energy loans on favourable terms to small, medium and (utilising regional partners) sometimes large renewable energy schemes. They do so because renewable energy in Germany is a sound investment, but also because it is compatible with their respective founding principles, investment priorities and governing values. These principles and governing values are closely related to the values expressed by German respondents in the generation, distribution and supply sectors and again include self-determination, local economic stability, energy decarbonisation and public welfare. The next task within this analysis was to map these actors with common values.

5.0 Mapping the civic energy sectors in Germany and the UK

The common values outlined above are a more than an ethical niche within the German energy sector. They permeate a substantial proportion of the system. In figures 5.1 and 5.2 below representative schemas of the UK and German energy systems are presented. They identify where these common values are present and the formal institutions through which they are expressed.

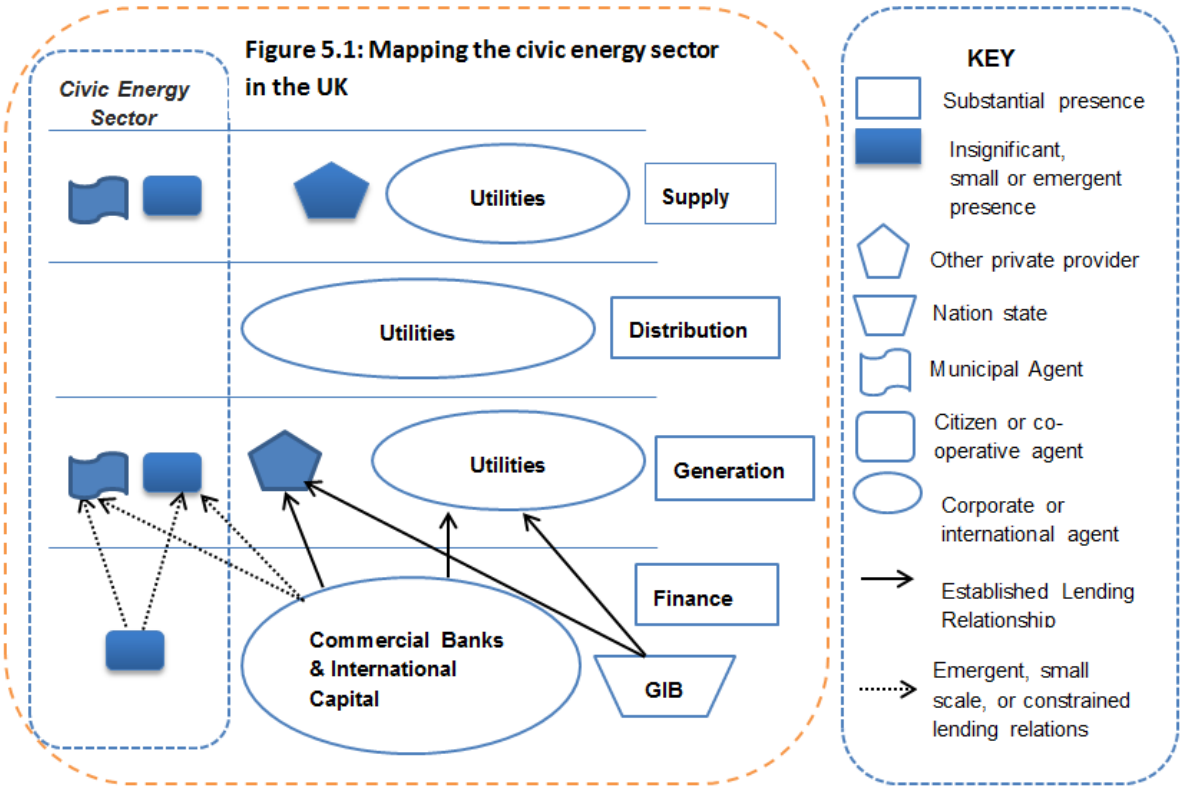


Figure 5.1: Mapping the civic energy sector in the UK
Civic Energy Sector
Utilities
Supply
Utilities
Distribution
Utilities
Generation
Finance
Commercial Banks & International Capital
GIB
KEY
Substantial presence
Insignificant, small or emergent presence
Other private provider
Nation state
Municipal Agent
Citizen or co-operative agent
Corporate or international agent
Established Lending Relationship
Emergent, small scale, or constrained lending relations

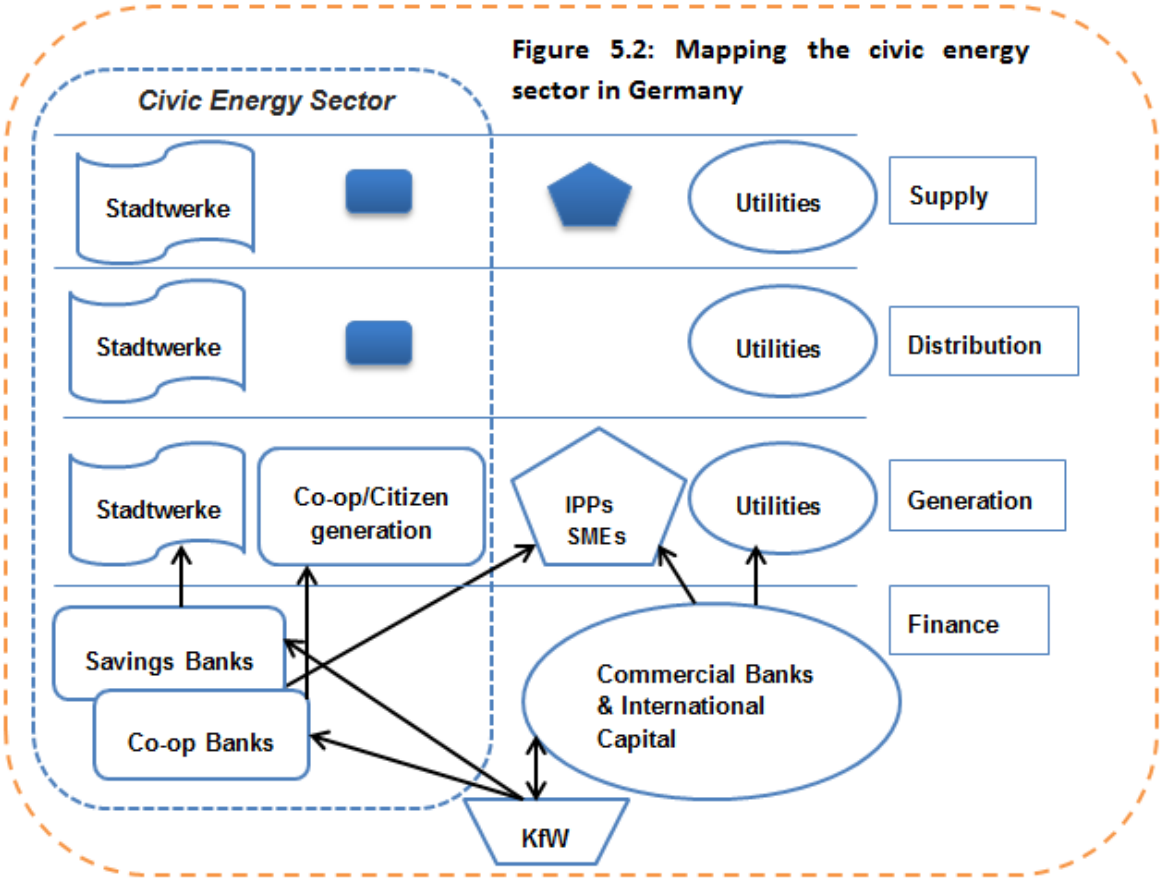


Figure 5.2: Mapping the civic energy sector in Germany
Civic Energy Sector
Stadtwerke
Utilities
Supply
Stadtwerke
Utilities
Distribution
Stadtwerke
Co-op/Citizen generation
IPPs SMEs
Utilities
Generation
Finance
Savings Banks
Co-op Banks
Commercial Banks & International Capital
KfW

5.1 Defining a civic energy sector

Whilst there have been several investigations into specific elements of the community, municipal, co-operative, and citizen financed energy sectors in both the UK and Germany this is the first attempt to propose a common value set is evident between the non-corporate, non-state institutions of civil and civic society, which has material effects on the business models of stakeholders in the energy sector and materially effects the technological system. What is clear from this analysis is that paying attention to the institutions that enable community/citizen owned generation is important to understanding the potential impact of civil society institutions on the energy sector in an international context. As such it is useful to conceive of a 'civic energy sector' which includes 'community' energy schemes, but also encompasses: municipal business models in generation distribution and supply *and* the enabling financial institutions such as citizen finance, local banking and co-operative models.

What is important in the German case is the institutional integration between these agents. This research identified retention of local value, decarbonisation, economic development/stability, and self-determination/subsidiarity as key themes for each of these groups. The values identified cut across German public opinion as well as through energy stakeholders; 83% of German citizens believe both profits and costs of energy transitions should be shared between citizens and industry, 79% support citizen participation in the energy transition and 75% support citizen management of decentralised renewables[96]. Building citizen participation into energy transitions can leverage new investment and secure acceptance beyond that enjoyed by private developers and corporate utilities alone[7,97].

Returning to our co-evolutionary framing, it is important to recognise the links between the institutions of civil society finance, the savings and co-operative banks, and the business models of the civic energy sector in Germany. Here the institutions of civil society finance have co-evolved with the business models of the civic energy sector. The local banking sector in Germany promotes civil society ownership of energy systems, pro-actively lending to co-operatives, stadtwerke and small to citizen energy groups. In turn, these groups innovate their business models in response these promotional lending opportunities[19]. In the UK, a large corporate energy sector is capitalised by a large corporate banking sector; there is no locally rooted set of financial institutions with the capacity to finance energy transitions. This dearth of civic banking has manifested in a 'finance gap' for the civic energy sector, and demonstrates the co-evolution of the forms and ownership of finance capital, and the forms and ownership of energy systems.

In order to build similar institutional integration and expansion of these stakeholders in the UK energy sector, and across other liberalised energy markets, these institutions would benefit from a definition

that marks them as distinct from the state/corporate dualism. The identification and definition of a 'civic' energy sector is rooted in two established notions arising from the notion of citizenry from the Latin 'civis' which confers two forms of collective identity. These are civic and civil society. Both of these ideas are important to this analysis, as we show they can have substantive bearing of the directions of socio technical change. Given the locally rooted, territorially bound nature of the stadtwerke, energy co-operatives, citizen energy installations and the finance that underpins them, the adoption of 'Civic' as a framing for this sector is apposite.

Whilst this research has characterised the UK's civic energy sector as niche, there is evidence of a revitalisation of civic energy participation running through recent rhetoric and research[98,99,20] This is important because the growth of institutions with compatible values can manifestly be mutually supportive, and bring new business models and institutional forms into the energy sector. Policy makers may wish to expand this sector, as it has recently been demonstrated that there are a number of benefits to liberalised energy systems that can only be pursued when electricity supply takes a much more geographic focus[20]. As such, energy policy looking to grow this sector should consider incentivising or establishing compatible civic finance models as well as using direct energy sector policies.

6.0 Conclusions

This paper has investigated impact of civil society institutions on the energy sector in the UK and Germany. Both energy systems co-evolved with the institutions of finance capital active in their respective nations. Where the UK was found to have a latent but growing civic energy sector, the German case showed a strong sector with established institutional links based on shared value frameworks. The civic energy sector in Germany incorporates municipal institutions, co-operatives, and citizen investment and re-communalisation groups. Though these groups share common values they are not always harmonious, yet they do form a substantive part of the energy system that are subject to different dynamics than state or corporate institutions. The current definition of 'community energy' in the UK[59] limits the scope for new ownership structures to expand in the energy sector by excluding municipal supply, distribution and generation and social housing providers. Equally, municipalities and the civic banking sector do not fall under traditional definitions of 'community' ownership, nor do they fall under the governance purview of the energy policy community.

We argue that the definition of this sector should be broadened to a 'civic' energy sector, which would include municipal, citizen, community and co-operative ownership structures for generation,

distribution, supply, and finance. By recognising the civic energy sector in liberalised energy market contexts, policy makers can design regulation and strategy based on an understanding that these institutions' drivers and motivations differ from state or private interests. Finally, by defining and supporting a 'civic' energy sector, energy policy can expand to take account of the sources of finance capital which underpin energy transitions, which would allow new organisational forms and sources of capital to enter the sector.

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