Dissertation MSc. in Energy, society, and sustainability

On the emergence of local energy supply companies in Britain

Their market performance and role in the energy transition

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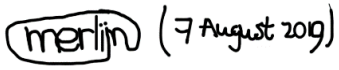
Preamble

Abstract

Great Britain faces the need to transition to a fairer, more sustainable energy system. This dissertation studies the role that energy suppliers led by local authorities could have in this transition. It builds upon previous work on urban sociotechnical transitions but has a novel focus on how market dynamics and regulatory interventions affect these local suppliers. I analyse wholesale market data and conduct five case studies to understand how volatility affects these suppliers and to build a typology of their regulatory structures. I find that regulatory interventions on energy prices can have detrimental effects on these companies, and that their social and environmental objectives cannot be achieved simultaneously. However, through their unique market position, they increase competitive pressure on incumbent suppliers to offer fairer prices to disadvantaged consumers. Lastly, their regulatory structure affects whether they take on predominantly financial or contractual risk. Further research needs to determine the efficacy of their efforts to alleviate fuel poverty.

Declaration of originality: “I hereby declare that his dissertation has been composed by me and is based on my own work.”



The errata of this document and the raw data analysed in the empirical chapters can be found online at www.merlijnkersten.nl/dissertation.

This document is set in Arbutus Slab and Open Sans. The document design is based on Van der Plas (2019).

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List of abbreviations

BEIS	(Department for) business, energy, and industry strategy
Big-Six	British Gas, E.ON, SSE, EDF, Scottish Power, npower
BSC	Balancing and settlement code
CEGB	Central electricity generating board
CHP	Combined heat and power (plant)
CMA	Competition and markets authority
CUSC	Connection and use of system code
DCUSA	Distribution connection and use of system agreement
ECO	Energy company obligation
EDF	Électricité de France
LRSP	Last resort supply payment
MLP	Multilevel perspective
MRA	Master registration agreement
Ofgem	Office for gas and electricity markets
PAYG	Pay-as-you-go
PPA	Power purchase agreement
SOLR	Supplier of last resort
SSE	Scottish and southern electricity
TfL	Transport for London
TPLS	Third party licensed supplier
WHD	Warm home discount

Chapter one

Introduction

Energy is highly prevalent in modern societies. Whereas our pre-modern ancestors consumed less than 50 GJ per annum, we currently consume about 300 GJ per year (Rutter and Keirstead, 2012). This remarkable increase in consumption was made possible by the discovery of fossil fuels, which meant that human societies were no longer reliant on locally sourced biomass for their energy demand (Rutter and Keirstead, 2012). The discovery and subsequent widespread usage of electricity and natural gas allowed us to use vast amounts of energy at a fraction of the effort. This also means that we have become highly reliant on the energy system to sustain our modern way of life.

The energy system has its shortcomings. Fuel poverty is a major challenge across the United Kingdom[1]. This leads to households needing to choose between critical services such as heating or food (Emden, Murphy and Lloyd, 2018). Living in cold homes also leads to health issues and, in extreme cases, death (Emden, Murphy and Lloyd, 2018). Both England and Scotland have made progress in reducing fuel poverty, but it has only come down slowly (BEIS, 2018; Emden, Murphy and Lloyd, 2018; Scottish Government, 2018b).

Another major challenge is decarbonising the energy system. Historically, the energy system has been a major emitter of greenhouse gasses that has contributed significantly to global climate change, due to its reliance on fossil fuels. Despite several decennia of scientific evidence and global political efforts, greenhouse gas emissions remain severely high and there is a need for drastic, immediate measures to mitigate further hazardous climate change (IPCC, 2018). The United Kingdom was an early adapter of fossil fuel use and has a historical obligation to mitigate its greenhouse gas emissions. To its credit, greenhouse gas emissions have decreased sharply in the past two decades, but this was mainly because generators switched

[1] It is difficult to compare fuel poverty rates across the different countries of the United Kingdom, as they have different fuel poverty metrics since it is a devolved issue. In England, a household is fuel poor if it has above average fuel costs that, if fully met, would leave it below the poverty line (BEIS, 2018). This definition results in 11.1% of English households being fuel poor (BEIS, 2018). In Scotland, a household is fuel poor if it spends over ten percent of its income on energy (Scottish Government, 2018b). This definition results in 31.9% of Scottish households being fuel poor (Scottish Government, 2018b).

from coal to natural gas for financial reasons. The uptake of renewables must increase to reduce greenhouse gas emissions faster than it is currently doing[2].

The United Kingdom is therefore facing an energy challenge. It needs to both further decarbonise its energy supply and address fuel poverty, while meeting its current demand. A potential solution to this energy challenge is the emergence of local energy companies in the British market. Over the past five years, several councils and other local authorities have started local energy companies (Platt *et al.*, 2014; Laybourn-langton, 2016; Local Partnerships and Cornwall Energy, 2016), see figure 1.1. These companies generally have strong social and environmental values such as reducing fuel poverty or decarbonising the energy supply. This sets them apart from the established Big-Six energy companies and other new market entrants. I refer to them as 'local' suppliers since they are all led or established by local authorities or other localised organisations and, as I argue in the discussion, through this locality they occupy a rather unique niche in the energy retail market.

This dissertation will analyse these companies using the multi-level perspective with a strong focus on market dynamics. The next section will therefore give a short history of the British energy retail market.

1.1 History of the British retail market

Electricity grids emerged shortly after the invention of electrical appliances in the late 1800s. Due to technologies used at the time, these grids were highly localised. They were adopted mainly by those who could afford to do so, and soon became fashionable (Kay and Gooday, 2018). As the cost of electricity production and electrical appliances reduced, more and more household connected to a grid. In the early 1900s, these local grids slowly became connected until a national grid was formed at the end of the 1920s. During this time, electricity production and transmission was wholly privatised and was often undertaken by small, municipal electricity companies (Thorp and Marvin, 1995; Chick, 2007).

In 1947, the government nationalised the electricity and gas systems with the adoption of the Electricity Act (Chick, 2007). This created vertically incorporated generation, transmission, and distribution state bodies. The regulatory and ownership structures did not change significantly for the next few decades. The Central Electricity Generating Board (CEGB, British Electricity Authority pre-1957) owned and operated the national grid and large power stations in England and Wales. Electricity was distributed by fifteen regional Area Boards,

[2] The alternative, a drastic reduction in energy consumption, seems unlikely.

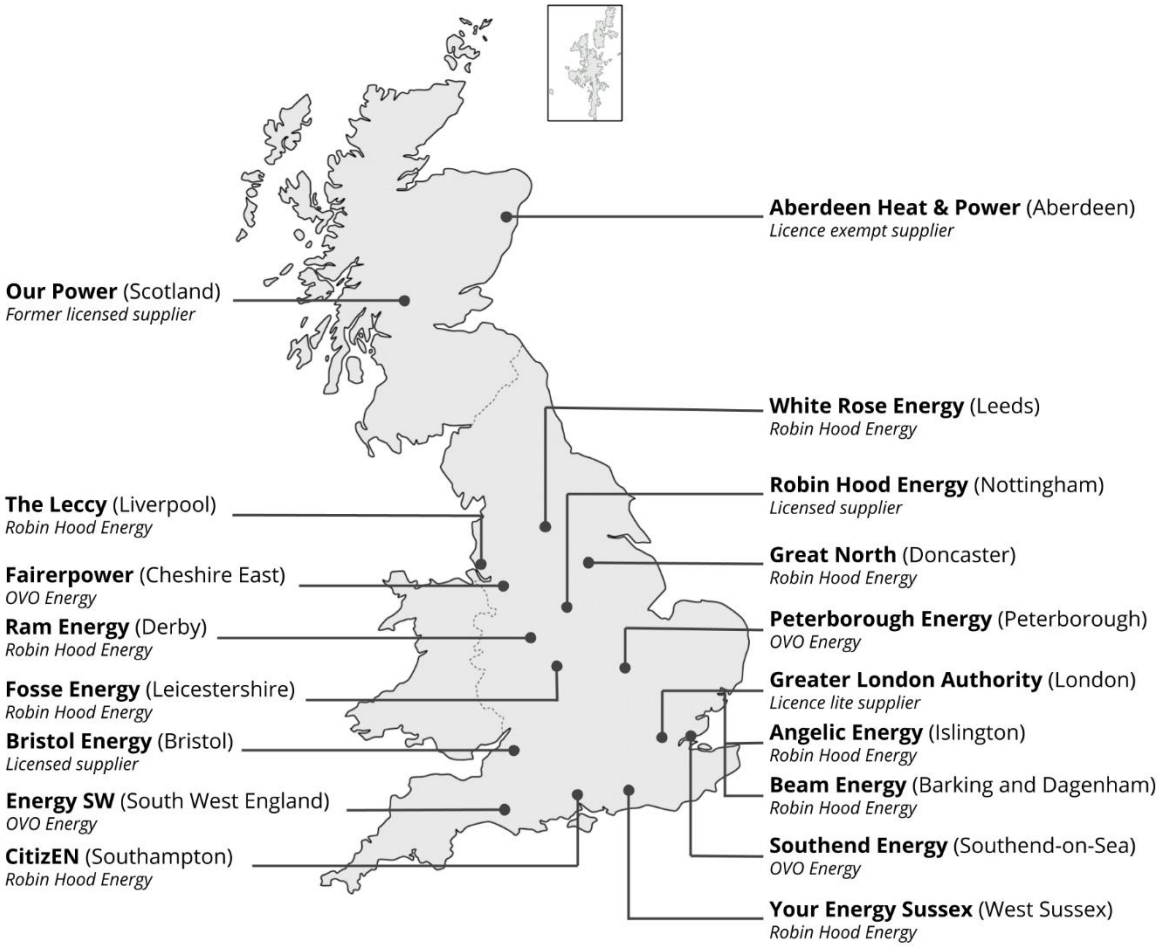

Figure 1.1 A map of the local energy companies considered in this thesis. Their area of operation is given in parentheses and approximately denoted by the lines. Note that Robin Hood Energy and Bristol Energy are required to operate nationally, but focus their efforts on their respective councils. When a company has a white label agreement with a senior supplier, this party is listed in italics (own work, see table A.1).

which had a statutory monopoly in their area. This new era of nationalised gas and electricity provision, roughly from 1950 to 1973, coincided with an 'golden age' of large economic growth and low unemployment between (Chick, 2007).

The oil shocks of the global economy in the seventies had a profound effect on the United Kingdom. Thatcher was Prime Minister and initiated the nationwide adoption of free-market capitalism[3] in government. Under the supervision of Lawson[4], Littlechild[5] and others, the United Kingdom started to privatise its energy system from 1989 onwards. By 1998 the UK had fully privatised its energy system (Littlechild, 2010). In this system, markets exist both for generation (wholesale) and consumption (retail). Distribution and transmission are carried out by the National Grid, a private company. The sector is regulated by the Office of gas and electricity markets (Ofgem), a non-ministerial government department under the responsibility of the Department for business, energy, and industrial strategy (BEIS).

In recent years, there has been a shift in focus towards decarbonising the energy supply and reducing fuel poverty. This has meant an increase in regulatory. Furthermore, Ofgem has stepped up its efforts to enhance competition in the energy markets. The next chapter will further examine these recent developments.

1.2 Research question and outline

This dissertation aims to contribute to the growing body of work on the role of localised energy projects can have in national transitions towards more sustainable, just energy systems. It asks the question of how regulatory interventions and market dynamics affect the ability of local energy supply companies to enact their vision of a fairer, more sustainable energy supply in Britain[6]. It therefore builds on previous literature on how business structures impact the role

[3] These policies are often referred to as 'neoliberal', but generally only by its opponents (Boas and Gans-Morse, 2009) As an ideology it is foundational to the electricity retail market, but this report is not concerned with a normative critique of the market but rather with a study of a specific phenomenon within this market. I have therefore opted to use more specific terms such as 'privatisation' or 'free market policies' in order to allow for a more neutral, constructive academic analysis of these phenomena.

[4] Nigel Lawson was Secretary of State for Energy (1981-1983) and Chancellor of the Exchequer (1983-1989) under Prime Minister Thatcher.

[5] Stephen Littlechild is an economist who advised the government during the privatisation of the energy system.

[6] This dissertation thus considers the energy system of Great Britain, roughly that of England, Scotland, and Wales. Northern-Ireland is part of the United Kingdom too but falls under the Irish grid and thus has a different regulatory framework.

that a company can have in sociotechnical transformations (Bolton and Hannon, 2016). In particular, I will study the risk that local suppliers encounter in the volatile wholesale market and I will present a typology of their regulatory and business structures.

The next chapter will give an overview of debates in literature on sociotechnical transitions, retail markets, and localism issues after which I will detail the methodology used to answer the research questions (chapter three). I will then examine volatility in the research market (chapter four) and the typology of local suppliers including case studies of each (chapter five). I then discuss my findings in relation to existing literature (chapter six) before drawing my conclusions (chapter seven).

Major historical events in the UK energy sector

Year	*Event*
pre-1940s	The UK energy system is established. Energy companies are predominantly municipal or local. Since the late 1920s, the UK has a national grid.
1947	Electricity Act: The energy system is nationalised with all assets transferred into central public ownership in 1948.
1970s	UK becomes a major oil and gas producer at the same time as the world experiences two major oil crises. Thatcher is Prime Minister.
1982	Oil and Gas (Enterprise) Act: First step towards liberalisation of the gas market by creating common carriage, which is extend to electricity in the 1983 Energy Act.
1983	Littlechild's seminal report “Regulation of British Telecommunications’ Profitability”, which introduced price-cap regulation.
1990	Following the 1989 Energy Act, supply to large users (1 MW) is privatised. Medium users follow in 1994.
1995	Gas Act: Privatisation of gas supply.
1998	Supply-side competition, establishment of the retail market, mortarium on gas-fired power plants (Mandelsohn's White Paper).
2006	Stern Review on climate change.
2016	Competition and Markets Authority report on the energy market.
2019	Flexible price cap for standard variable tariffs is introduced.

Table 1.1 Overview of key events in the British energy sector over the past few decades (Thorp and Marvin, 1995; Stern, 2003; Helm, 2004; Stern, 2006; Chick, 2007; Littlechild, 2010; CMA, 2016b; Ofgem, 2018a; Vaughan, 2018b).

Chapter two

Literature review

In order to be able to analyse how local energy companies interact with market and regulatory forces this chapter first reviews literature on urban sociotechnical transitions and issues of localism before exploring the ideology of privatisation and issues related to it.

2.1 Urban sociotechnical transitions

Energy systems are not merely a collection of generators, wires, and appliances; they are just as much an aggregation of codes, practises, and institutions. They should therefore be viewed as large socio-technical systems which is generally done from the view of the multi-level perspective, as set out by Geels, Burkeley and others (see for instance Geels, 2002; Smith, Voß and Grin, 2010; Bulkeley et al., 2013a). This theory analyses sociotechnical systems on threeniches (micro), regimes (meso), and a landscape (macro). Niches are spaces which are protected from market influences, where innovation can develop. The regime consists of a semi-coherent collection of codes, practises, and institutions. Together with the exogenous landscape the regime creates a certain amount inertia with causes the system to be locked into its current configuration (Unruh, 2000; Van der Vleuten and Raven, 2006). When the pressures of the exogenous landscape on the regime create a certain instability and the niche innovation has gathered enough momentum, a window of opportunity might be created in which a niche entity can breakthrough to the regime level, leading to a socio-technical transition in which all levels are modified, reordered and realigned (Geels, 2002; Bulkeley *et al.*, 2013b; Bolton and Hannon, 2016).

One frequent criticism of the multi-level perspective is that it does not give due diligence to the physical space in which niche innovations occur: instead, the theory is generally only concerned with the social (Bulkeley et al., 2013b). This sentiment is echoed by Rutherford and Coutard (2014) whose work focuses on urban energy transitions. It aims to show that cities are more than just the final link of the of the energy supply chain. They, and other authors, argue that the characteristics of urban localities affect the transitions that occur within cities, and should therefore be acknowledged. Increasingly, cities themselves are becoming actors in energy transitions (Bulkeley, Cástan Broto and Maassen, 2013). Geels (2013) theorised three possible roles for cities in these transitions. Firstly, they can be primary actors in transitions,

which is especially likely when a regime consists of an aggregation of strong, local systems. Secondly, they can initiate national transitions by creating niches within the urban sphere. Lastly, they can have an insignificant stake in transitions when they are located in highly centralised systems. Bulkeley and Castán Broto (2013) take the second view and assert that cities provide spaces for socio-technical experiments through testing various modes of governance, fostering innovation, or by becoming a 'living lab'.

Recent years has seen an increase in the involvement of cities and other local authorities in urban energy transitions, which has perhaps been most pronounced in Germany (see for instance Ebinger, Grohs and Reiter, 2011; Moss, Becker and Naumann, 2015; Becker, Blanchet and Kunze, 2016; Rocholl and Bolton, 2016; Köhrsen, 2018). Many articles use the multi-level perspective to analyse this, but there have been other approaches too such as the use of social field theory (Köhrsen, 2018), approaching it from the multi-level governance perspective (Bulkeley and Betsill, 2005), and by analysing energy as a common (Becker, Naumann and Moss, 2017). These various theories offer complementary explanations of energy transitions and can prove fruitful in their own regards. However, in my current analysis I am often concerned with issues of energy regulation and governance and the interactions of various large and small actors, for which the multi-level perspective is most appropriate.

Due to the complex nature of sociotechnical systems and the multitude of actors that inhabit them, the outcomes of transitions are far from certain. Scholars therefore produce transition pathways which consider a variety of different outcomes, given a selection likely sociotechnical circumstances. A influential study produced transition pathways based on different actors and their logics (Foxon, 2013). It looked at how actors framed key energy challenges, and how they aimed to convince others to adopt it too. The study considered three major actors: government actors, market actors, and civil society actors, which led to three core pathways: ‘central coordination’, ‘market rules’, and ‘thousand flowers’, respectively. Historically, until the onset of privatisation, the predominant logic of the British energy sector was that of government actors leading to a centralised system, which was then replaced by a private system according to market logic. In recent years, rising climate concerns have led to a more central coordination logic, whereas at the same time the government has been trying to get individuals more involved which is closer to the thousand flowers pathway. However, at the same time they have been reluctant to yield power and responsibilities to civil society, since central government might be held responsible for any failings.

2.1.1 Energy decentralisation

The emergence of local energy companies represents a decentralisation of energy governance. The United Kingdom is usually considered to be a highly centralised state, although administrative entities are never just centralised nor decentralised. Rather they exist in a continuum

based on political, socioeconomic, administrative, and cultural characteristics (Hutchcroft, 2001). Decentralisation can increase representation and accountability, but it can also increase local inequalities and create further marginalisation (Hutchcroft, 2001). When an authority becomes active in the energy sector, their citizens have (indirect) democratic control over how it sources or generates its electricity and gas, and how it prices its energy. However, it could also create inequality between local councils if some turn out to be more capable or resourceful when it comes to managing the local energy sector.

Based its well-established governance system, the United Kingdom should be able to successfully manage an energy decentralisation process (Hutchcroft, 2001), which was shown in previous devolution processes. Furthermore, there appears to be political will across the spectrum to increase responsibilities of local governments (Foxon, 2013; Hawkey, 2014). Scholars have stressed the importance of not just increasing responsibilities but also enlarging their budgets, something which central government has sometimes been hesitant to do (Webb, Hawkey and Tingey, 2016).

It is important to note that this dissertation is purely on the decentralisation of energy governance. Another important trend is the decentralisation of electricity generation. Since the era of nationalisation, the British electricity and gas system is based on highly centralised electricity generation and gas supply, which are connected to a highly developed transmission grid. Household and companies receive their electricity and gas from distribution networks connected to the transmission grid. However, recent years have seen a rise of small-scale renewable electricity generation, which are often connected to the distribution grid and thus disrupt the incumbent system. These new technologies deliver low-carbon electricity and are often community-led, but their effectiveness in green, just transitions is contested since these projects risk maintaining or aggravating existing socioeconomic inequalities (Johnson and Hall, 2014). As discussed before, similar concerns arise surrounding the decentralisation of energy governance, and therefore these processes have to be carefully managed (O'dwyer and Ziblatt, 2006; Ebinger, Grohs and Reiter, 2011).

A guide on how to manage local energy systems can perhaps be found in Campbell's (1996) seminal work on urban planning. Much like the energy trilemma found in energy studies literature (see for instance UKERC, 2014), Campbell describes a "planner's triangle" which has economic development, social equity, and environmental protection as vertices, see figure 2.1. When balanced well, these priorities lead to sustainable development. The three priorities are in conflict and cannot thus all be maximised simultaneously: this leads to resource, development, and property conflicts. It is the planner's responsibility to make a trade-off between the three vertices. Campbell's solution to arriving at sustainable development was to find two-way translations between the environmental, economic, and social.

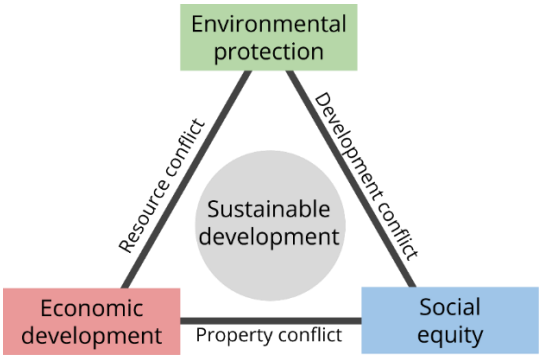

Figure 2.1 The planner's triangle as theorised by Campbell (own work, based on figure 1 in Campbell, 1996).

2.1.2 Energy localism in Germany

Other countries have also seen the emergence of local energy companies, most notably in Germany. It has a long tradition of strong and relatively independent municipal authorities, with a similar tradition of municipal energy companies (Webb, Tingey and Hawkey, 2017). Recent literature often focused on the ownership of local distribution grid network of Berlin and Hamburg. Since the onset of the 'Energiewende', Germany has incentivised distributed generation[7]. Activist movements in these cities questioned the ownership of what is often considered to be technical, neutral infrastructure due to its importance to decentralised energy production (Rocholl and Bolton, 2016). This has led some scholars to theorise decentralised urban energy systems as a commons or as a form of coproduction, opening these systems up to novel forms of governance (Becker, Naumann and Moss, 2017). The creation of new forms of agency at the local level has been signalled by others too (Bolton and Foxon, 2013), but it is unclear how the German experience translates to the British context due to a difference in governmental organisation. In general, German and other central and north European municipalities have larger responsibilities for services like energy provision and have more regulatory and financial freedom than in the United Kingdom (Hesse and Sharpe, 1991; Kern and Bulkeley, 2006; Webb, Tingey and Hawkey, 2017), which has also led to comparatively stronger public engagement with, for instance, energy issues in Germany (Webb, Tingey and Hawkey, 2017).

[7] Small-scale electricity generation, often from renewable sources such as wind, solar, and hydro, which connect to the distribution grid (instead of being connected to the transmission grid).

2.1.3 Critique: A missing perspective

The multilevel perspective offers a suitable theoretical framework to analyse sociotechnical energy transitions. There exists an extensive literature on urban sociotechnical transitions which details the role of cities in shaping energy systems. However, this literature often focuses on energy efficiency or transport issues. Local energy companies, in this regard, form a new area of local authority involvement in energy systems. Existing work on urban sociotechnical transitions does not give due diligence to market dynamics on the energy system, which have a significant effect on local energy companies and their ability to transform the energy system. This also leads to a lack of analysis of the action of the energy regulator, Ofgem. Energy companies, due to their dominant role in the energy market, are leading actors in current energy transitions. This dissertation addresses this research gap by combining market and regulatory analysis with local sociotechnical transitions

2.2. Retail market governance

2.2.1 Ideology of privatisation

The privatisation of the energy market was one of the key outcomes of market reform policies in the seventies, which occurred in an economic, political, and cultural paradigm often referred to as 'neoliberalism'. This paradigm finds it roots in the philosophical works of enlightenment philosophers such as Locke and Mill. In their view, humans are free, rational, and self-interested beings, and their work focused on liberty and equality (Gaus, Courtland and Schmidtz, 2018). These philosophical considerations were applied to other fields as well and formed what is currently known as liberalism. In political economy, liberals argue for the creation of open markets where individuals can trade freely. Government should enforce contracts and the protection of private property to enable an open exchange, and minimise further interventions. In the 1980s, after severe economic crises such as the 1973 and 1976 oil crises, a new strand developed which advocated free market capitalism and laissez-faire economic policies. It supports international trade and primarily focused on monetary policy, rather than on taxation as before. In practise, this often meant that government focused on privatisation, deregulation, and liberalisation. It was, and remains, a very controversial paradigm and so do its main advocates. Simultaneously it remains highly influential in today's politics and society. It is therefore not merely a (political and economic) philosophy, but rather it is an all-encompassing 'governmentality' as imaged by Foucault (Steger and Roy, 2013b).

In the energy market, the goal for privatisation was to increase efficiency through competition which would reduce energy prices for consumers (Littlechild, 2010, 2017). The incumbent nationalised energy providers were seen as inefficient mammoth organisations led by technocrats and engineers. In the view of Littlechild (2010) and others, these organisations did not primarily act in the best interest of consumers, whereas privatised companies would have to act to provide the best possible deals to their customers.

2.2.2 Liberalisation and the energy challenge

The initial aim of the Thatcher governments was to both privatise and liberalise the energy sector. According to Lawson, the government should only create the market in which companies could act without distortion and in which the government would not try to plan the future. This would result in the most efficient production and consumption of energy. In reality, subsequent governments have nearly continuously intervened in the energy market since its establishment (Helm, 2004). Some have therefore argued that a fully privatised and liberalised energy market was never established, resulting in the current privatised and partially liberalised energy market (Helm, 2004). Various governments have tried to marry market values to energy security, decarbonisation, and affordability issues. This has at times proven to be difficult since the government no longer has direct control over the energy market.

In recent years, one of the main regulatory focuses has been to increase competition in the market. Up until 2011, there were six companies which together had a monopoly in the retail market: British Gas, SSE, npower, EDF, Scottish Power, and E.ON (Ofgem, 2019l). A 2016 report by the Competition and Markets Authority (CMA) found that collectively they overcharged domestic customers an average of £1.4bn a year between 2012 and 2015. According to the CMA, this was due to limited customer engagement exploited by suppliers, limited competition due to regulatory and technological constraints, and a regulatory framework that does not favour the interests of customers. In response Ofgem (2018i) has implemented several price controls measures, aimed at increasing the competitive position of the most disadvantaged customers. This includes a price cap on tariffs, mandated by Parliament, to protect customers who have never switched (Ofgem, 2018a). These are often people who face difficulties in participating in the energy market (Ofgem, 2018i). Ofgem has continued to encourage new companies to enter the market, in an effort to increase competition. It has also tried to standardise the energy market to make switching easier.

Littlechild (2017) has argued that the Big-Six actually hardly made any profits in the years preceding the CMA, and Ofgem's efforts to increase competition have been counterpro-

ductive (Littlechild, 2017). He has also argued that the CMA used an incorrect method to calculate how much the Big-Six overcharged customers[8], thereby vastly overestimating the average yearly amount (Littlechild, 2017).

2.2.3 Public good in a private market

A central concern of this essay is how the public good is safeguarded in a privatised and partially liberalised energy market. This is often framed in terms of private versus private ownership, but the relationship with the provision of public good and type of ownership is indirect at best and depends wholly on the behaviour of actors in the energy system.

Instead, I explicitly focus on issues of public good in the current, privatised situation and whether the current energy system can provide it. This often takes a central role in more activist discussions of energy transitions that call for both green and just (or fair) transitions (see for instance XR, 2019). To be able to critically analyse concerns for fairness and justice, I follow Jenkins *et al.* (2016) approach to energy justice which is to study, in order, distributional, procedural, and recognition-based justice tenets. In order words, I ask questions of what, who, and how energy justice comes about and what an appropriate response might be.

In the British system, Ofgem (as the regulator) safeguards the public good in the privatised and partially liberalised energy system. This is a form of hierarchical safeguarding of the public good, by regulating the profit-seeking energy companies. However, public values are ambiguous and difficult to define objectively (De Bruijn and Dicke, 2006). The regulatory role can be quantised as maximising the welfare utility function of society (Ugaz, 2001) but the choice of what maximises social welfare is, ultimately, subjective. Therefore there is no clear 'right' way to base regulation on public good.

Littlechild (2010, 2017) approaches fairness from a classical liberal perspective. In his view, fairness in the retail market arises due to the ability of consumers to choose the energy product that matches their own needs. The retail market should allow them to make their own consideration as to the price, amount of risk, contract duration and other specifications of their energy product. Suppliers will then compete by offering products that best match the needs of consumers, leading to a better consumer experience.

As Littlechild (2017) argues, interventions often distort the market and various restrictions imposed on the market were not always justifiable. As an example, Ofgem implemented far-reaching standardisation rules in terms of how many tariffs a supplier can offer, how they present information about their tariffs, and how they can price their tariffs. This does

[8] The CMA imagines what the energy price of a fictional, highly efficient company would be (CMA, 2016a). Littlechild argues that their assumptions are unrealistic (Littlechild, 2017).

not align with the ideology of a free market. Thirty five years after Lawson described the Government's roles as setting "a framework which will ensure that the market operates with a minimum of distortion" (Lawson in Pearson, 2010, p. 7), the Government is once again very involved in energy policy, and energy policy measured featured prominently in the manifestos of all major parties in recent elections (Littlechild, 2017) and even made headlines outside of elections (BBC News, 2019b).

Even though switching rates reached an all-time high in April of this year (Ofgem, 2019l), 54% of consumers are 'inactive' meaning that they have been with their current provider and on the same tariff for three years or more (Ofgem, 2018i). These consumers are often on higher priced tariffs, and evidence suggests that energy companies use the extra revenue they receive from these customers to offer low-priced tariffs to 'active' consumers in an attempt to out-bid low-priced tariffs from other energy companies. In a free-market analysis, this is an example of the liberal ideal of free, rational, self-interested people acting in a market, where those who fail to be engaged lose out. However, research has shown that 'inactive' customers are largely disadvantaged consumers who "have low incomes, have low qualifications, are living in rented accommodation or who are above 65" (CMA, 2016a, p. 33). These are people who have difficulties switching energy suppliers, for example because of time constraints, information deficit, or because they lack digital skills. They are therefore disadvantaged by the current energy systems.

Chapter three

Methodology

This chapter discusses the methods used in two subsequent chapters. The first uses quantitative techniques to analyse the energy market, whereas the second uses a qualitative approach to various case studies.

3.1 Market analysis

Chapter four is concerned with volatility in the British retail market. To study this, I analysed publicly available Ofgem data, the official energy statistics of the United Kingdom. They are not updated regularly, meaning that the most recently available data is from either the first quarter of 2019 or the last quarter of 2018[9]. The analysis presented in this dissertation is therefor valid up until the first quarter of 2019. The data used included reports on the number of licensed domestic electricity supplier and their respective market shares (see graph 4.1 and 4.2) and wholesale financial statistics since 2004 (see table 4.1 and graph 4.2). The data used can be found online at www.merlijnkersten.nl/dissertation.

Furthermore, I used press releases from Ofgem on supplier of last resort (SOLR) processes. This data provides which companies went bankrupt and who became the supplier of last resort. Media reports on these bankruptcies (mainly from BBC News) where used to determine the number of customers these companies had when they went bankrupt. Companies that left the market through corporate decisions were found through the State of the Energy Market report published by Ofgem.

In order to better understand market exits I analysed the aforementioned data on wholesale economics and correlated it to the number of active suppliers (and their exits), see graph 4.2. The wholesale economics metrics used are the day-ahead price of gas and electricity[10], and volatility of the peak electricity, baseload electricity, and gas price[11].

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[9] From March 2019 or December 2018, respectively.

[10] This is the wholesale price of electricity, which accounts for about 36% of a typical domestic dual fuel bill, other costs being network costs (26%), operating costs (18%), environmental and social obligations (10%), VAT (5%), supplier margin (4%) and rest costs (1%) (Ofgem, 2018i).

[11] The data can be found on Ofgem's website.

The number of licensed gas, electricity, and gas and electricity suppliers was released annually (during the last quarter of the financial year, Q4) by Ofgem until 2013, after which it was released quarterly (Ofgem, 2019l).

The price of gas and electricity in the wholesale day-ahead market was released monthly from October 2009 (gas) and June 2010 (electricity) onwards (Ofgem, 2019n). To get to a single price metric, I took a weighted average of the gas and electricity prices. This was done by converting both prices to a price per unit of energy (£/MWh) and then weighting both prices according to Ofgem's typical annual domestic consumption values: 12 MWh for gas (76.67%) and 3.65 MWh for electricity (23.33%) (Ofgem, 2017). The price metric can therefore be interpreted as a generic price-per-unit-energy for a typical consumer.

Ofgem defines volatility as the monthly average standard deviation of the logarithmic price difference between consecutive trading days (Ofgem, 2019n). Ofgem distinguishes between the baseload and peak electricity volatility, of which I took the average. This was then used to produce the same weighted average of the gas and electricity volatility (see above) to produce a single volatility measure.

Note that the three metrics are not independent: volatility is based on wholesale prices, and this metric and the price metric have effect on, and are affected by, the number of active supply companies. These three metrics—licensed suppliers, price, and volatility—where then indexed to their maximum values, see table 3.1. Indexing them makes it easier to see relative changes over time, see graph 4.2, since it allows one to quickly gasp changes in the metrics and see how they correlate to changes in other metrics.

Lastly a case study of Our Power and a possible future Scottish power company was undertaken, using previously mentioned data and publicly available documents from the Scottish government and parliament. Available sources on Our Power were limited since it went bankrupt in January and many of its resources are no longer available, meaning that I made more use of secondary sources such as media articles compared to other case studies.

Maximum values of relative metrics		
Metric	*Maximum value*	*Date*
Active suppliers	70	Q2-Q3 2018
Price	£43.10/MWh	March 2013
Volatility	467%	October 2006

Table 3.1 The maximum values of the relative metrics used in graph 4.2. The absolute value of the metrics can be calculated by multiplying the relative value given in graph 4.2 by the maximum value given in this table (Ofgem, 2019n, 2019l).

3.2 Case studies

Chapter five delves deeper into how local energy companies deal with volatility in the market, and their role in the energy transition. To get a fuller understanding of their positions, six energy companies were contacted for their view on the role that they might have in energy transitions. One of these companies was a fully licensed supplier, four were white label suppliers, and one was a licence lite supplier. They were chosen as a representative sample of local British suppliers. None consented to an interview, but one did supply additional information on their company and another answered a few questions in writing[12]. Their responses have been included in chapter five.

These responses were supplemented by using previous reports on local energy companies. I present four case studies, one for each type of local energy supplier. These suppliers[13] were either the only supplier of that type, pioneers of that type, or had existing literature on them. For these case studies I used publicly available documents from the company in question and news articles on them. Due to the financially sensitive nature of some of the topics, data availability was sometimes limited. My main focus was on their business structures and motivation, combined with the history of the company.

When possible, data from similar companies or from literature was used, but due to the short duration of the project in question it was not always possible to gather enough data. This is referred to in the chapter seven, conclusion, as a point of further study.

[12] Despite being asked to do so, the respondent did not sign the Information and Consent Form that was sent to them, and I have therefore refrained from attaching their answers in an appendix.

[13] To wit: Robin Hood Energy, Greater London Authority, White Rose Energy and Aberdeen Heat & Power.

Chapter four

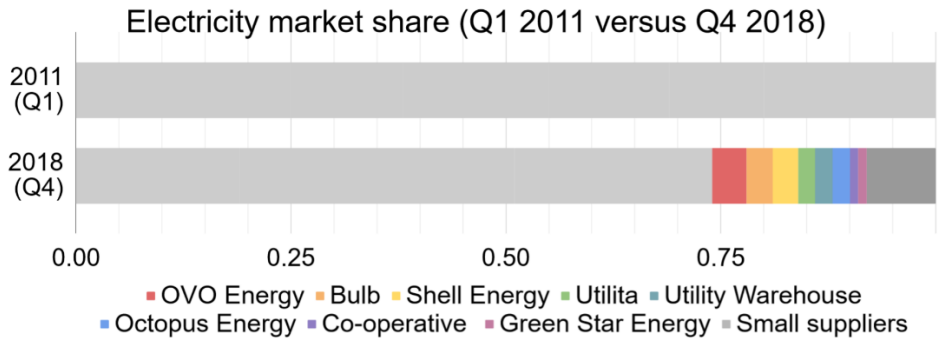
Volatility in the retail markets

In recent years, Ofgem has actively encouraged new suppliers to enter the market in a bid to increase competition. A more competitive market should lead to lower prices and an overall better consumer experience (Ofgem, 2018i). As graphs 4.1 and 4.2 show, various Ofgem policies have been successful in two ways. Firstly, the number of active suppliers rose from 10 in 2007 to 70 in mid-2018 (Ofgem, 2019l). Currently, after some suppliers exited the market, there are 62 active suppliers (Ofgem, 2019l), which is a 520% increase in 12 years. Concurrently, the market share of the Big-Six energy companies dropped from 100% in both the electricity and gas market in 2011 to 74% in both markets in the fourth quarter of 2018 (Ofgem, 2019l). Besides the Big-Six, there are currently eight medium suppliers with a >1% market share, with small suppliers making up the remaining 8% (Ofgem, 2019l). These two developments have led to a more competitive market with lower prices and slightly higher customer satisfaction, especially amongst customers of medium suppliers (Ofgem, 2018i, 2019l).

This has not just let to positive changes. A more competitive market with a higher number of market participants inherently leads to bankruptcies. Between 2016 and the present, at least fifteen companies exited the supply market, see table 4.1. Some of these were very small companies that decided to leave markets, whereas others were nationally-operating companies supplying over 200,000 customers that went bankrupt. In total, about 1.2 million consumer contracts were nullified in the past three years, which equals to about 4.4% of all energy customers[14]. This can be very disruptive to consumers, even though Ofgem aims to minimise it through its supplier of last resort (SOLR) process. In this process, Ofgem uses a competitive process to appoint another supplier to provide electricity and gas to the customers of the bankrupt supplier. They aim to minimise price increases to consumers, and guarantee any balances with their former supplier are honoured. These processes can be very costly, and Ofgem

[14] This figure assumes that no customers had their energy company go bankrupt multiple times, which given the small relative size of the bankrupt companies (none had a market share over 1%) seems like a reasonable assumption. The true figure will be between 1.4% and 4.4%. The first figure is true if the same consumers had their energy company go bankrupt every time, which is unlikely. However, in this case the figure is given by the largest companies going bankrupt within one month: Spark Energy and Extra Energy in November 2018, who together had 398,000 customers (which is very unlikely).

can decide to award a 'last resort supply payment' (LRSP) to the new supplier. Co-operative energy was awarded £14m for taking on 160,000 customers from bankrupt GB Energy in November 2016, and Octopus Energy was awarded £13m for taking on 100,000 customers from defunct Eresa Energy in July 2018 (Ofgem, 2018b, 2019d). Both of these payments were mainly meant to compensate for existing credit balances with the defunct suppliers (Ofgem, 2018b, 2019d).



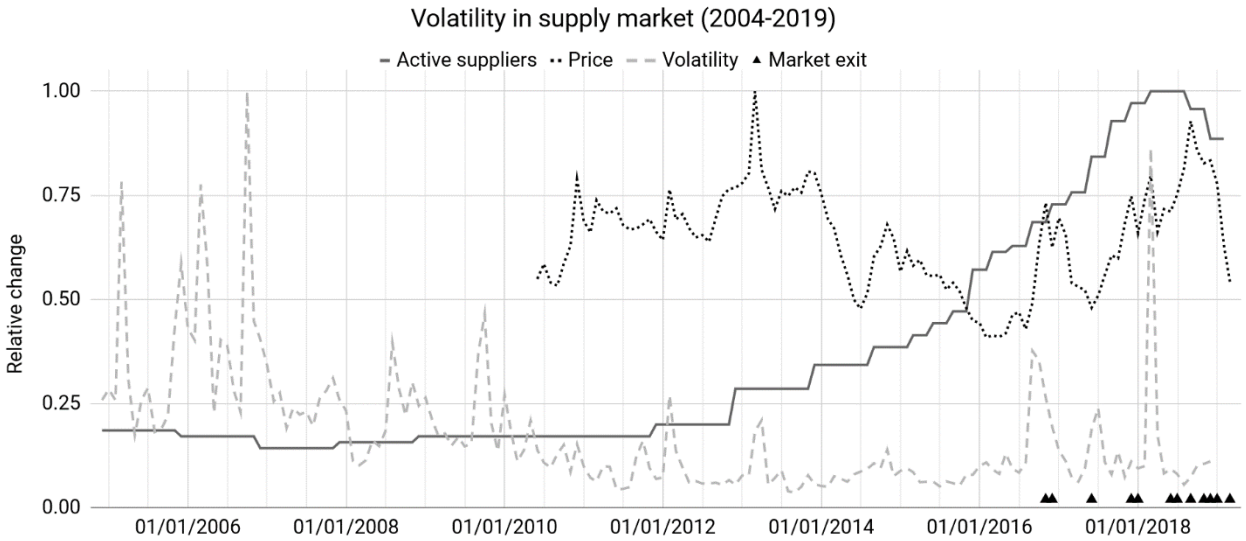
Graph 4.1 The share in the electricity market of various companies in the first quarter of 2011 and the last quarter of 2018. The Big-Six companies are represented in light grey (74%). The medium sized companies are given in colour: OVO Energy (red, 4%), Bulb (orange, 3%), Shell Energy (yellow, 3%, trading as First Utility), Utilita (green, 2%), Utility Warehouse (turquoise, 2%), Octopus Energy (blue, 2%), Co-operative Energy (purple, 1%), and Green Star Energy (lilac, 1%). Small suppliers are grouped together in dark grey (8%) (own work, data from Ofgem, 2019). For the raw data see www.merlijnkersten.nl/dissertation/marketshares.csv

Supplier market exits (2016-2019)

Time	*Supplier*	*New supplier*	*Type of exit*	*Customers*
2016	Tempus	None	Corporate decision	
Nov '16	GB Energy	Co-operative Energy	SOLR process	160,000
June '17	The Energy Deal	Robin Hood Energy	Corporate decision	
Dec '17	Brighter World	Robin Hood Energy	Corporate decision	
Jan '18	Future Energy	Green Star Energy	SOLR process	10,000
June '18	Flow Energy	Co-operative Energy	Corporate decision	230,000
July '18	Iresa	Octopus Energy	SOLR process	100,000
July '18	Usio Energy	First Utility	SOLR process	7,000
Sep '18	Gen4U	Octopus Energy	SOLR process	500
Nov '18	Extra energy	Scottish Power	SOLR process	108,000
Nov '18	Spark Energy	OVO Energy	SOLR process	290,000
Dec' 18	One Select	Together Energy	SOLR process	36,000
Jan '19	Our Power	Utilita	SOLR process	38,000
Jan' 19	Economy Energy	OVO Energy	SOLR process	235,000
Mar '19	Brilliant Energy	SSE	SOLR process	17,000

Table 4.1 Domestic electricity and gas market exits between 2016 and 2019. This data was collected using Ofgem's press releases on SOLR processes and its State of the Energy Market 2018 report, after which media publications were searched for customer numbers[15]. (own work, data from: BBC News, 2018a; Ofgem, 2018c, 2018f, 2019a, 2019b, 2019d; Vaughan, 2018; BBC News, 2018b, 2019a, 2019b; Crisp, 2018; Ofgem, 2018d, 2018e, 2018b, 2018a; Ambrose, 2019; Peachey, 2019b, 2019a).

[15] Ofgem does not publish these, presumably since this is sensitive financial information.



Graph 4.2 The relative change in the number of active suppliers (solid line), price (dotted line), and volatility (striped line) metrics between December 2004 and March 2019. Note that price data is only available since June 2010, and that before December 2013, supplier data is only available in a yearly resolution. After December 2013, it is available quarterly. The graph also shows market exits in triangles at the bottom as given in table 4.1. Note that there were two market exits in July 2018, December 2018, and January 2019. Own work, data from Ofgem (Ofgem, 2019n, 2019l) and table 4.1. For the full data, see www.merlijnkersten.nl/dissertation/marketdata.csv.

4.1 Price volatility

In order to better understand market exits I analysed wholesale market financial data and correlated it to development in the retail market. Graph 4.2 shows how volatility in the wholesale market, the price of a unit of energy in the wholesale market, and the total number of active suppliers changed from the last quarter of 2004 to the first quarter of 2019. It also shows when the market exits occurred, see table 4.1

As can be seen in the graph, the number of suppliers remained largely constant until the last quarter of 2012 at 10-14[16] companies, after which it rose to 70 in mid-2018 before reducing to 62 at the end of 2018. The rise coincided with a drop in energy price between March 2013 and August 2013, with an additional low in July 2014. After that it intermittently rose and

[16] These were the Big-Six and a few dormant or niche suppliers.

fell again, reaching peaks in winter of 2016-2017 and spring 2018, before almost reaching a new maximum price in September 2018 after which it fell again. This also meant that the volatility of the energy market, which had been very low between 2010 and 2016 after being very high pre-2010, increased as well with notable peaks in September 2016, July 2017, and March 2018.

These whole-sale price and volatility hikes after August 2016 coincided with the market exits of several companies as outlined in table 4.1. Most of these exits occurred shortly after peaks in the wholesale price and volatility, suggesting these companies did not have the financial means to survive financially turbulent times. This sentiment is echoed in literature and in the media but it cannot be verified from graph 4.2 since it merely shows a correlation between the metrics and market exits.

4.2 Volatility and local companies

As of July 2019, one local energy supplier has gone bankrupt, Our Power. This can, of course, always change, but other local energy companies appear to be faring well in the volatile energy market. Previous research has suggested this is because of the link with local authorities. They are generally trusted by their citizens, whereas traditional energy companies are not (OVO Energy, 2014; Local Partnerships and Cornwall Energy, 2016). Furthermore, due to their very nature local authorities are committed to a locality and offer long term stability. This reduces the risks of operating an energy supply company (Hawkey, Webb and Winskel, 2013; Laybourn-langton, 2016; Local Partnerships and Cornwall Energy, 2016). As an example Robin Hood Energy is led partially by the Nottingham City council and supplies the electricity for the trams of Nottingham (Whitfield, 2019). The Greater London Authority (GLA) is another example, where the licence lite power purchase agreement (PPA) between the GLA and Transport for London (TfL) reduces risks for both local generators and TfL, and it offers credibility to the PPA.

4.2.1 Case study: Our Power

In 2015, a new supplier 'Our Power' was formed, which aimed to provide cheap tariffs to Scotland's most disadvantaged homes. It was led by various Scottish housing organisations and other community organisations[17]. It aimed to have 200,000 customers by 2020 by offering tariffs that were ten percent cheaper than standard tariffs, which would allow for £11m in savings

[17] It was not a 'local' energy company like the other companies considered in this treatise. However, the housing organisations that led it have a similar commitment to place as a local authority has. Furthermore, it received significant loans from the Scottish government. Lastly, its objectives and business model resembled those of local companies and it is therefore constructive to study why it went bankrupt.

for their customers over the five year period (Low, 2018). Our Power was backed by multiple loans from both private and public investors. The Scottish Government lend them a total of £9.1m (Scottish Government, 2019), to help them to establish the company. This was justified as the company aimed to address fuel poverty and energy prices, both of which had risen sharply in the preceding years (Low, 2018; Scottish Government, 2018b).

However, issues with the payment system of Our Power resulted in reduced cash flows and late payments (BBC News, 2019a). Furthermore, the company was further impaired by volatility in the gas and electricity market, as described previously, see graph 4.2. This led to their bankruptcy in early 2019, when Ofgem appointed Utilita as SOLR for their 38,000 customers (BBC News, 2019a; Ofgem, 2019k). The fact that despite the large financial investments in the company and the backing of local organisations and a national government[18] the company still went bankrupt within four years of becoming a registered supplier, is testament to the difficulties of establishing a licensed supply company in the British energy market.

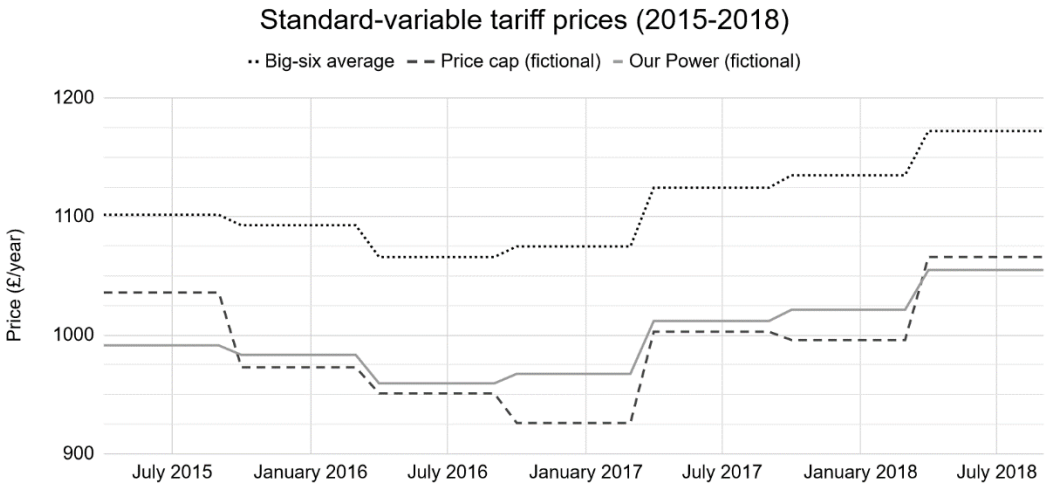
One factor influencing the demise of Our Power was the introduction of price caps in the retail market, first for prepayment tariffs[19] in 2017 and then for default tariffs in 2019 (Ofgem, 2018a). These caps put a limit on the price energy suppliers can ask for their services, in a bid to force suppliers to stop overcharging inactive customers. Ofgem estimated that the price cap it installed on default tariffs in January would result in a £1bn savings for consumers per year (Ofgem, 2018a)[20]. Our Power targeted the same customers by offering them prices that more truly reflected the actual cost of procuring the energy. However, the difference between their tariffs and those of other energy companies, and thus their competitive advantage, reduced because of the price cap, making it more difficult for them to find new customers (BBC News, 2019a).

The tariff that Our Power was aiming for aligned closely with the price cap as imagined by Ofgem, as shown in graph 4.3. When Ofgem introduced the price cap for default tariffs, it gave an indication of the level it would have been set at in the past (Ofgem, 2018a, p. 15). Graph 4.3 compares this fictional price cap to the historical average prices of Big-Six default

[18] Energy regulation is not a devolved matter, but alleviating fuel poverty is (Scottish Parliament, 2016).

[19] The British system has two main energy tariffs. Fixed tariffs are offered with long-term contracts. Standard variable tariffs are offered short term and are more expensive. Most consumers pay through debit debit or online, but some (often consumers in debt to their supplier) pay through prepayment meters or pay as you go (PAYG) meters, which only supply energy if the consumer is in credit (Citizens Advice, 2019).

[20] As an example, the price cap for January until April 2019 was set at £1,137 for a typical duel fuel customer paying through direct debit whereas such a customer would pay £1,206 on average if buying energy from the Big-Six (Ofgem, 2018a).



Graph 4.3 Six-month average standard variable prices between April 2015 and September 2018. The Big-Six average is based on historical data, the price cap and Our Power prices are fictional (see text). Own work, data from Ofgem (2018a, 2019l). The raw data can be found at www.merlijnkersten.nl/dissertation/price-data.csv.

tariffs (Ofgem, 2019l) and to the tariff Our Power was aiming for[21]. It gives average prices over six months, since the price caps would have been set for that period. As can be seen, the objectives of Our Power and the price cap of Ofgem align rather closely for most six-month periods. This again shows how the competitive position of Our Power is compromised by the price cap.

The Scottish government has been planning to launch a public, Scottish energy company. In a way, Our Power can be seen as a pre-cursor to this potential future public company, with a study by Low (2018, p. 17), commissioned by the Scottish parliament, remarking that "Our Power is not strictly speaking a publicly owned company, but it has many of the attributes of a publicly owned company." A Scottish public company would presumably have a similar business strategy as Our Power by supplying energy to Scotland's disadvantaged communities, and perhaps this company can avoid the mistakes that led to Our Power's bankruptcy. It will need to have a proper payment system and robust savings to survive market volatility. The

[21] There is little data available on the tariffs of Our Power because it went bankrupt. Instead, I used the price Our Power aimed for: ten percent lower than the Big-Six (Low, 2018). Although this does not reflect its actual prices, it is helpful in showing the similar intentions of the price cap instated by Ofgem and the objectives of Our Power.

Scottish government could become both a supplier and generation to become a vertically integrated company that is active in both the retail and wholesale market, since this reduces risk.

Chapter five

Typology of local energy actors

Energy systems are generally highly complex, firstly since they involve a wide variety of actors. In this current treatise, two of the main actors are Ofgem, who regulates the gas and electricity markets, and the British Government who is responsible for setting out energy policy. Another important set of actors are the users of the energy system, in particular domestic customers of energy companies. Other users include businesses and industry, both domestic and in markets who have interconnections with the British system. Further major actors important to the current analyses are the various energy suppliers that are active in the British market including local energy companies.

An important creator of niches is Ofgem, who has special regulatory frameworks for new market entrants such as their sandbox initiative[22] or their licence lite offering. These licences support both new low-carbon technologies, but also system innovations such as integrating electric vehicles into the energy system. Other important creators of niches, as discussed below, are local authorities and other governments, who can help shield starting companies from market influences and other landscape pressures.

The principal exogenous pressures in the privatised British energy system are financial, such as the pressure to remain profitable. However, other pressures exist too. Examples are social concerns, for instance about fuel poverty, environmental concerns and cultural concerns such as arise when building wind farms in pristine landscapes.

Secondly, energy systems are complex because they are multifaceted and there is a multitude of perspectives from which they can be analysed. Energy provision is often viewed as something neutral. In this view, the only concern for the energy system is to ensure that a light turns on when a switch is toggled. This does not correspond to reality, where energy systems are complicated systems where many different actors operate according to divergent agendas. It is therefore key to view energy systems as being socio-technical in nature, in which social, political or cultural considerations have similar leverage as technical ones.

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[22] The regulatory sandbox allows innovators to experiment with new products without having to adhere to all rules (see Ofgem, 2018b).

As an example, as we have seen the United Kingdom has chosen to privatise and partially liberalise its energy sector. This means that financial and economic considerations now have a significant influence on the energy sector, whereas in the nationalised system engineering and political considerations had more leverage.

In order to have a meaningful discussion about the roles of local energy companies in Great Britain, it is important to distinguish between the four major regulatory models that exist for energy companies. They are detailed below.

5.1 Fully licensed supplier

Since the inception of the retail market, most companies have been fully licensed suppliers, such as for example the Big-Six. They are permitted to supply gas, electricity or both to customers throughout Great Britain. Fully licensed suppliers need to adhere to various industry codes set by Ofgem, some of which other types of suppliers do not need to adhere to[23]. Due to these and other requirements, experts estimate that an independent licensed supplier needs about 10,000-25,000 customers in order to be commercially viable (Local Partnerships and Cornwall Energy, 2016).

Furthermore, large suppliers need to pay extra levies for national energy efficiency and fuel poverty schemes (Energy company obligation, ECO; and Warm home discount, WHD) (Ofgem, 2019i, 2019h, 2019m). Currently, companies join these programmes if they have more than 250,000 customers (ECO and WHD) or supply more than 500 or 1400 GWh in the domestic electricity or gas market, respectively (ECO) (Ofgem, 2019i). In practice, this amounts to having a slightly less than 1% market share. In the near future, companies with more than 200,000 customers need to participate in some parts of the WHD scheme, and companies that have more than 150,000 companies or supply more than 300 or 700 GWh in the domestic electricity or gas markets, respectively, need to participate in the ECO scheme from 2021 onwards (Ofgem, 2019i). Some current suppliers have argued that it is unfair that small companies do not pay these levies since it allows them to undercut the prices of established suppliers, while also a disproportionate amount of fuel poor customers who make use of the WHC are with the established suppliers, which means that the tax burden is not shared fairly (Vaughan, 2017).

[23] The four most important ones pertain to using the distribution grid (Distribution connection and use of system agreement, DCUSA), using the transmission grid (Connection and use of system code, CUSC), rules for a customer transfer system (Master registration agreement, MRA), and near real-time buying and selling of electricity from National Grid (Balancing and settlement code, BSC) (Ofgem, 2019a, 2019e, 2019j, 2019c).

The reason that small companies are exempt appears to be so that they can establish themselves in the highly competitive market first before having to comply with these additional fees, effectively creating a niche in which they can grow their business.

5.2 Licence lite

A second supply licence offered by Ofgem is the licence lite. A licence lite supplier does not have to comply with all industry codes, but instead works with a third-party licensed supplier (TPLS) who will adhere to the MRA, DCUSA, CUSC, BSC and other codes on their behalf (Ofgem, 2015). This supplier licence is therefore meant to reduce entrance barriers for new market entrants and to allow small-scale generators to circumvent the complex wholesale (Ofgem, 2015). Small generators, in practice, almost always constitute of small, decentralised low or zero carbon generators such as small-scale solar or windfarms. It would be disproportionally labour and capital intensive for them to participate in the wholesale electricity market, and the licence lite agreement allows them to pursue further revenue in a cost-effective manner (Ofgem, 2015).

Because of this, and because of the way it removes barriers for new market entrants, the licence lite agreement is well-suited to spur innovation. As an example, the first company to be awarded a licence lite was awarded to Evenergi, a company that works on integrating electric vehicles into the energy system (Boorman, 2017; Evenergi, 2019). However, the success of the licence lite is questionable, since this first license was granted twelve years after the licence became available, suggesting that it either does not meet the requirements of generators and market entrants, or that despite its 'lite' labelling it is still too complex for such companies to obtain it.

5.3 White label supplier

In a white label agreement, an organisation resells a supplier's electricity or gas under their own brand name. This vastly reduces entrance barriers to the market, as the existing senior supplier will already confirm to most relevant market codes. However, it also reduces the organisation's control over energy prices (and retention of profits over them), although this depends on the exact nature of the agreement. A report commissioned by the GLA (Reed *et al.*, 2017) found that setting up a licensed energy supplier costs £2.8m, required a working capital

of around £10m, and would up to a year and a half. Setting up a white label company[24] instead costs around £660,000 and required only three months (Reed *et al.*, 2017). The financial risks associated with a white label supply are much lower since there is no direct involvement in the volatile wholesale market, but this is replaced by an increased institutional risk associated with the ability of the TLPS to meet their contractual requirements under the white label agreement. This pertains in particular to continuation of supply: if the senior supplier were to go bankrupt, this would cause major problems for a white label supplier.

Amongst the local energy companies, there thirteen companies that are white label suppliers with two main licensed suppliers: Robin Hood Energy (see case study below) and OVO Energy, see figure 1.1 and table A.1 (OVO Energy, 2019b; Robin Hood Energy, 2019a). OVO energy is a medium-sized for-profit energy supplier founded in 2009 which aims to provide cheap green energy in a customer-focused manner (OVO Energy, 2019a).

White label agreements provide local authorities with a relatively fast and cheap path to enter the energy market and it offers third party licensed suppliers an opportunity to find new customers. Research has shown that consumers trust their local authorities more than other, big or small, energy companies (OVO Energy, 2014; Local Partnerships and Cornwall Energy, 2016). Thus, a collaboration with a local authority can be a means to bring disengaged customers into the company. In this view, a local authority can be an effective marketing tool for an established energy supplier. However, this risks damaging the reputation of the local authority if consumers are dissatisfied with the service that the local authority and senior supplier provide, which can have political consequences.

5.4 Licence exempt

An organisation does not need an energy supply license if it wants to supply less than 2.5 MW to domestic customers (or 5 MW to businesses) (Ofgem, 2016), which is roughly equivalent to 2,500 homes (Local Partnerships and Cornwall Energy, 2016). This means that the organisation can only supply a small amount of electricity, but this comes with relatively high regulatory liberty. The organisation still needs to cooperate with an external licensed supplier for metering reasons and to be able to use the distribution network, but otherwise provides a simple and easy route to becoming a (very) small-scale supplier. This is because the organisation does not have to participate in the complicated wholesale and retail markets.

[24] They consider a 'white label plus' which is similar to a regular white label agreement but the white label supplier is more invested in customer management (Reed *et al.*, 2017, p. 26).

5.5 Case studies

Below four case studies of the aforementioned types of business structures are given. They were chosen to be representative of their respective type.

5.5.1 Robin Hood Energy

Robin Hood Energy was founded in 2015 and was the first not-for-profit licensed energy company in the United Kingdom. It was established by Nottingham city council to provide cheap energy to its most disadvantaged citizens. In the view of the city council, traditional energy companies failed to provide socially fair, environmentally friendly gas and electricity in a transparent and accessible manner, which is why they choose to enter the market themselves. Since then, it has expanded to supply green electricity and it has stepped into white label agreements with many other local authorities. Furthermore, it took over Energy Deal and Brighter World[25], two 'ethical' energy companies, in 2017 (Ofgem, 2018i).

Setting up the company cost the city council £25.5m[26] (Whitfield, 2019). They did this by buying a dormant licensed energy company which they then turned into Robin Hood Energy. The company is still wholly owned by Nottingham council, and half of its board consist of city councillors (Companies House, 2019; Nottingham City council, 2019; Whitfield, 2019). The company has been profitable since 2018 (Whitfield, 2019).

The company aims to offer transparent and fair tariffs to, predominantly to disadvantaged households in Nottingham who often have pre-paid electricity meters. It relies on growth through public sector endorsement from local authorities and local partnerships, for who they act as a white labelling partner[27]. To achieve its social objectives, it voluntarily participates in the WHD (Robin Hood Energy, 2019b), as do its white label associates (White Rose Energy, 2019b). In recent years, the company has also taken steps to reduce the climate impact of the energy it provides.

In 2016, one year after the company launched, it had one of the cheapest tariffs in the east Midlands. This increased competitive pressure on other suppliers, and the region became the most price competitive in England (Laybourn-langton, 2016). This benefits not just Robin Hood customers, but every consumer in the east Midlands.

[25] Brighter World has stopped trading since, but was not a local supplier and is therefore not considered in this review (Donnelly, no date; Mason, 2018).

[26] Of this, £16.5m were loans and £7.5m was a (controversial) shares purchase (Whitfield, 2019). Whitfield was contacted about the remaining £1.5m, presumably it was for the purchase of the energy company.

[27] This means that they do not pay to be listed on price comparison websites, as many other energy companies do.

Setting up a licensed energy company is very time and capital intensive (Reed *et al.*, 2017), and so far only one other British local authority has followed this path[28]. Robin Hood Energy could only succeed because of the determination of the Nottingham city council. This created a niche space in which Robin Hood Energy could grow and become the nationally operating energy supplier that it is today. It also spurs further experimentation, since Robin Hood is frequently used as a case-study for other local authorities (see for example Platt *et al.*, 2014; Laybourn-langton, 2016; Local Partnerships and Cornwall Energy, 2016).

5.5.2 Greater London Authority

The Greater London Authority (GLA) obtained a licence lite in 2017 (GLA, 2017). After years of planning, the GLA started a year-long pilot whereby they bought electricity from local generators through a power purchase agreement (PPA) which they then supplied to Transport for London (TfL), London's public transport body under control of the GLA. This proof-of-concept was conducted in 2018, during which GLA expected to supply 4 GWh to TfL at a price of £336,000 (GLA, 2017). The third party licensed supplier was npower. This project is part of the Mayor's 'Energy for Londoners' initiative, a broad collection of measures aimed at increasing energy-comfort and low-carbon gneration in the greater London area (Mayor of London, 2019). The initiative is explicitly there to reduce the climate impact of energy provisions, as well as to provide a source of revenue for local low and zero carbon generators in order to spur investment in this sector.

As said previously, the licence lite is unpopular amongst companies in the energy sector, and the GLA is currently the only local authority that has obtained one. It took years of planning to obtain it, and so far, it has only been used to run a pilot which was budgeted to run at a loss[29]. The GLA is a rather unique local authority in the United Kingdom, since it has extensive budgetary and political autonomy, whereas British councils operate under ultra vires principles, which means that they are administratively restricted to those policy areas devolved to them by the central government (Craig, 1998). This together creates a unique niche in which the GLA is able to initiative innovative projects such as acquiring a licence lite. However it also means that it is difficult for smaller or less-established organisations to acquire a licence lite.

[28] Bristol also established an energy company, albeit at a much smaller scale, see Torrens, Johnstone and Schot, 2018.

[29] The cause for this is twofold. Firstly, the pilot was meant to determine viability and was very much an experiment. Secondly, TfL is currently supplied electricity at below-market rates, due to its exceptional bargaining position (GLA, 2017).

In this structure, risk is decreased by circumventing the volatile wholesale market. Furthermore, both supply and demand are relatively predictable. The electricity is generated predominantly by combined heat and power (CHP) plants, and the demand of TfL is fairly predictable too. Furthermore, the GLA works with trusted partners who themselves are established businesses, further reducing risk.

5.5.3 White Rose Energy

White Rose Energy is a not-for-profit white label energy supply company founded by Leeds City council with Robin Hood Energy as senior supplier. Leeds is a city in Yorkshire in the north of England and is the third largest town in the United Kingdom. The white rose is a historic symbol of Yorkshire, just as the Robin Hood legend is associated with Nottingham. They appear to try to associate themselves with these local identities.

From 2010 onwards, the Leeds City council discussed establishing a strategic energy company which would allow the City to bundle its low and zero carbon activities, and to unlock further investment (Bale *et al.*, 2012). However financial and structural barriers meant that no such company was founded (Bale *et al.*, 2012). These barriers were much lower for a white labelling company.

White Rose Energy was established in 2016. It explicitly offers energy services to disadvantaged customers such as those on pay-as-you-go (PAYG) meters and those in fuel poverty (White Rose Energy, 2019a). Through its partnership with Robin Hood Energy, it is able to offer competitive prices. Since 2016, it has expanded to domestic customers in Yorkshire beyond Leeds. As an example, it partnered up with the city of Bradford, a few miles west of Leeds, to provide energy specifically to its fuel poor citizens. In Bradford, 29,095 homes or 14.3% of its population lives in fuel poverty, which is higher than both the Yorkshire and national average (12.1% and 11.1% respectively) (Bradford City Council, 2019b). White Rose Energy is an integral component of Bradford's efforts to alleviate fuel poverty, due to the competitive rates it can offer their citizens.

For its expansion, White Rose has used a fairly conventional combination of advertisements and price offers. However, it also deploys a more unique technique. When a council tenancy within the City of Leeds ends, the new tenants are automatically switched to White Rose Energy (Leeds City Council, 2019). It also does not use inactive customers to offer unsustainably low tariffs to active customers (Bradford City Council, 2019a). There are roughly 58,000 council property in Leeds, 6,500 of which were with White Rose Energy two years after its founding (Stokel-Walker, 2018).

Under its partnership with Robin Hood Energy, customers of White Rose Energy receive similar cheap, transparent tariffs as those of Robin Hood do. Furthermore, since Robin

Hood voluntarily participates in the WHD scheme, White Rose Energy customers are also eligible for one-time payments during winter months to ensure that vulnerable citizens are able to properly heat their houses during cold weather spells.

One thing that becomes clear from this case study of White Rose Energy is just how dependent it is on its senior supplier Robin Hood Energy, which allows it to offer competitive tariffs and focus on disadvantaged customers. This could be a significant weakness in the white label model, since there are, currently, only two suppliers who offer white label arrangements to local authorities. This means that there is limited competition between third party licensed suppliers and choice for new white label suppliers, which might result in reduced efficiency according to market logic.

5.5.4 Aberdeen Heat & Power

A prominent example of a licence exempt supplier is Aberdeen Heat and Power, a not-for-profit company founded in 2002 by the Aberdeen city council after a survey found that 70% of households in council-owned flats lived in fuel poverty in 1999 (Webb, 2015 and Community Power, 2015). Aberdeen Heat and Power owns four combined heat and power (CHP) plants which supply approximately 2,350 flats with electricity and heat through a district heating system (Aberdeen Heat and Power, 2012), reducing fuel bills by up to 50% and greenhouse gas emissions by 56% (Aberdeen City Council, 2019).

This is a good example of a niche innovation. District heating systems and providing energy specifically to disadvantaged households are both not commercially viable. However, the social and environmental concerns of Aberdeen city council created a niche, shielded from market influences, in which Aberdeen Heat & Power could be set up (Webb, 2015). The importance of the involvement of a local council is highlighted by the fact that district heating and electricity technologies have been available for decades, but their uptake has been slow due to market barriers (Webb, 2015). It also reduces risks due to backing by the council and long-term PPAs (Webb, 2015).

Aberdeen Heat & Power is restricted in growth, due to the limitations place by Ofgem on its licence exempt status. There are more fuel poverty citizens in Aberdeen than the 2,350 the City is able to service through this company. This is the main constraint on further growth.

Aberdeen is also a good example of when a local supplier is warranted to address fuel supply. Both the City and the adjacent Aberdeenshire have high levels of fuel poverty, although the problem is more urgent in the latter[30]. Aberdeen City council has established Aberdeen Heat & Power to alleviate fuel poverty, while Aberdeenshire council has not ventured into the energy market. This could cause inequality since disadvantaged consumers in Aberdeenshire

[30] Fuel poverty levels are 21% in Aberdeen city and 37% in Aberdeenshire (Scottish Government, 2018a).

cannot access the same services that some similar consumers in Aberdeen City can. However, their sociotechnical circumstances differ. For instance, fuel poverty in Aberdeenshire is mainly driven by energy inefficiency of the housing stock (Scottish Government, 2018a), something for which a local energy supplier would not make much of a difference.

Chapter six

Discussion

6.1 Local suppliers and regulation

The energy system is very susceptible to sociotechnical lock-in (Van der Vleuten and Raven, 2006). It has a vast physical infrastructure consisting of the grid and power stations that are resistive to change. During the twentieth century, the energy system developed to be centralised, with a grid extending outwards from a few high-capacity fossil fuel and nuclear power stations. This has been detrimental to distributed technologies such as small-scale solar and wind energy, since due to their decentralised nature they do not align to this regime.

Similar lock-in does not appear to arise in the regulatory sphere, which benefits local energy companies since their innovative aspects are predominantly regulatory. This is perhaps because the regulatory framework is relatively young, the physical grid traces its history to the beginning of the previous century. Ofgem actively supports innovation and frequently updates its regulatory structure to facilitate new developments in the energy system. Furthermore, Ofgem is changing its regulatory outlook from one based on rules to one that is more principles-based (Ofgem, 2016). This provides more room for innovation to new market entrants (Bolton and Foxon, 2013). However, the regulatory framework is still rather complicated which creates significant barriers to market entrants, especially for those that want to become a licensed supplier. This means that local authorities with smaller financial resources that want to enter the energy market generally can only choose to either become a white label or licence exempt supplier. The existence of these barriers is partially a vetting process to ensure that new licensed suppliers are able to deal with the complexities of their task. After the increase in market exits in the past two years, some have called for even tougher entrance requirements (Vaughan, 2017).

Littlechild (2017) identified how the regulatory efforts of Ofgem can be detrimental to innovation. He gives the example of green tariffs and lower priced tariffs for senior citizens which were removed from the market after pervasive standardisation efforts were introduced (Littlechild, 2017). In a similar vein, the efforts of Ofgem to improve the market position of inactive customers by introducing price caps was detrimental to suppliers that were already targeting these customers with better tariffs. This was one of the reasons Our Power gave for their bankruptcy, as seen in the case study (BBC News, 2019a). From a market perspective, the tar-

iffs that Our Power offered to inactive, disadvantaged customers were an innovation to increase the efficiency of the retail market, just as Littlechild and others envisioned how retail competition would work. However, it must be noted that Our Power had many other financial issues. Furthermore, their customer base was relatively small at 38,000 and thus the intervention of Ofgem benefitted many more consumers.

When introducing privatisation and liberalisation, Lawson hoped there would be fewer market interventions by the government and that remaining interventions would have to be fully justifiable. However, the previous few years have shown that energy is still a highly active policy area. Policy initiatives such as price caps may have good intentions, but they increase investment risks due to added uncertainty over the future of the energy market. This can lead to underinvestment in the market, which harms consumers in the long time. It is important to note that the choice to have a privatised energy system is a political decision. One of the results of this is that it becomes more difficult to intervene in the system for social or environmental reasons, since interventions are indirect, and that interventions might have unintended consequences. It appears that policy makers would like to have both a privatised market and a direct influence over it, which causes friction.

6.2 Local suppliers and risk

The case studies show that different business models for local companies carry different types of risks. Licensed and licence exempt supply mainly carry financial risk. For the former, this arises predominantly from volatility in the retail market, whereas for the latter it arises from the need to earn back investments in generation capacity. For white label and licence lite suppliers, risk mainly arises from the contracts they have with their senior and third party suppliers. If these licensed suppliers fail to meet their contractual obligations, the white label and licence lite suppliers cannot deliver energy to their customers.

6.3 Local suppliers and fairness

Most local authority-led energy companies focus primarily on fuel poverty issues, which gives them a unique market position. Their intended customers are often disadvantaged household who do not have the financial means to cover their energy needs or who have on poor-value Big-Six tariffs.

Through their business models, local suppliers are putting competitive pressure on Big-Six suppliers to also offer a better service to inactive and disadvantaged customers. Consumers who are not with a local supplier can thus still benefit from such a supplier being active

in their area, if other suppliers reduce their energy prices to remain competitive. This happened in the east Midlands after Robin Hood energy began offering their tariffs. Through these market processes, prices are reduced for all consumers which increases fairness through competition, as argued for by Littlechild (2017). It is important to note that this fairness is not prescribed by a governmental or other regulating entity, as was the case when the energy system was still nationalised and publicly owned.

It remains important to regulate the energy sector to safeguard that companies are acting in the best interest of consumers. A recent example are the price caps on both pay-as-you-go (PAYG) and default tariffs, which Ofgem was mandated to implement. As detailed previously, these price caps (especially the later) diminished the competitive position of Our Power since it reduced the advantage of their innovative tariffs. However, the small total customer base of local suppliers warrants an intervention in the energy market but, as discussed below, it does not have to take the form of a price cap.

As seen in literature, heterogeneous action of local actors is feature of decentralisation that risks exacerbating regional inequalities (Hutchcroft, 2001). This same risk is present in the energy system, due to the small number of local suppliers. This is partly due to the nature of local supplier which need the urban setting, since it is resource intensive to establish and operate a supply company. The sociotechnical regime can also differ between local authorities, as seen in the case study of Aberdeen. It indicated that even though the unequal establishment of local suppliers might create or exacerbate inequalities, they are not a universal solution to fuel poverty.

This inequality could be reduced by enlarging the region in which a supplier with social and environmental values operates. A possible Scottish national, publicly owned energy supply company would provide a case study to test this hypothesis. It would also give insight into the efficiency of a state-run company compared to its privatised competitors in the energy market, and would add context to the debate on whether public institutions are better able to provide public good.

6.4 Local suppliers and fuel poverty

It is well known that as energy prices increase, energy consumption decreases (Grubb, Hourcade and Neuhoff, 2014). As an example, energy prices in Japan are roughly twice as high than in the United States, but so is Japans energy productivity: the amount of energy it uses

per unit GDP[31] (Grubb, Hourcade and Neuhoff, 2014). Therefore, a highly effective way to reduce greenhouse gas emissions stemming from energy usage is to increase energy prices which will lead to greater efficiency and thus lower energy usage.

This creates tension for local suppliers between the twin objectives of alleviating fuel poverty and reducing the environmental impact of their energy since they need to make a trade-off between lowering energy prices while curbing energy usage.[32] In extremis, this shows that fuel poverty cannot be solved through local suppliers alone. It would be environmentally irresponsible to keep reducing energy prices in order to eliminate fuel poverty. The other extreme, to increase energy prices in order to reduce consumption is also not an option since consumers in fuel poverty already have difficulty or are unable to meet their basic energy needs. Therefore, other measures are needed to ensure that all consumers can meet their baseline energy needs. The current government approach appears to be to focus on energy prices, for instance through their price caps, but perhaps redistributive policies including taxes and benefits would be better suited.

6.5 Local suppliers and transitions

As can be seen in the current case studies, there is a stringent issue of scale. Not just any organisation can participate in the energy market since it is both complicated to enter the market and it is capital intensive to do so. The local authorities that have ventured into setting up licensed energy companies—Nottingham City council, the Greater London Authority, and the assembly of Scottish actors—have the financial resources and political conviction to do so, whereas many other, mainly smaller, local authorities have chosen to cooperate with existing suppliers to set up white label agreements, or intervene in the energy market in a different way.

This is consistent with theoretical accounts of urban sociotechnical transitions given in literature. They highlight how the urban dimension, with its concentration of people, resources, and power, allows for cities to become active actors in energy transitions. They can also influence national transitions as appears to be the case for Our Power. Although it failed it seems to have initiated the efforts of the Scottish Government to establish a Scottish national energy supplier with a business model similar to that Our Power, one of the roles theorised by Geels (2013).

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[31] Grubb, Hourcade and Neuhoff (2014) also show that in this case price elasticity is almost 1.

[32] The main approach to sustainability by local suppliers is by supplying green electricity and gas, and offsetting their other emissions. However, these still emit small amounts of greenhouse gasses, and offsetting cannot be sustained on large scales.

Besides their urban setting, the locality of these suppliers is important too. It is conferred to them by the local authorities or other organisations, such as housing associations, that established them. Their locality creates a community to which they are held accountable. This is particularly true for local suppliers connected to local authorities. Their locality creates a niche through which they can justify their social and environmental objectives, for which market conditions do not suffice. Traditional suppliers do not have this accountability, which leads to reduced engagement with disadvantaged households.

Given the three major transition pathways given in literature; central coordination, market rules, and thousand flowers (Foxon, 2013), it becomes clear that local suppliers do not fit neatly into any of the categories. Their community-based, bottom-up approach resembles the logic of the thousand flowers approach. This approach also contains a high degree of decentralisation of both production and governance of energy, which is less present in the case of local suppliers since local authorities act under supervision of the central government. Local suppliers thus appear to present a combination of both government and civil society logics.

As seen in the case studies, there are four major types of local suppliers based on their business structure: licensed suppliers, licence lite suppliers, white label suppliers, and licence exempt suppliers. They each occupy their own place in the planner's triangle (see figure 2.1). A licensed supplier has far-reaching control over environmental protection, through the energy it purchases and sells, and economic development, through its direct participation in the wholesale market. It has lesser control over social equity, since it is required to operate on a national level. This is different for white label suppliers: they are able to restrict their service area to their locality, which gives them the ability to squarely focus on local social equity. However, for environmental protection and economic development they are largely reliant on their senior supplier. Licence lite suppliers occupy a similar location in the triangle, except that they, through local generation, have a more direct influence on environmental protection. Both licence lite and white label suppliers have relatively little influence over economic development because these licensing types are mainly meant to reduce financial barriers to market entrance, which also reduce financial agency. The type that perhaps comes closest to the middle, sustainable development, is licence exempt supply. Through local generation and distribution such a supplier has far-reaching influence over environmental protection and social equity. Furthermore, by not participating in the national wholesale market it also has more control over economic development. Because of this, their operations are much more contained in the locality which facilitates translation between the various vertices. However, this type of supply is impeded by the stringent size restriction.

Even though the foundational reports on the emergence of local suppliers (Platt *et al.*, 2014; Laybourn-langton, 2016; Local Partnerships and Cornwall Energy, 2016) were published recently, their findings are still remarkably accurate. There have only been two major recent

developments. Firstly, the different types of business structures have narrowed to the aforementioned four[33] and recent local suppliers have all been white label suppliers[34]. Secondly, these previous reports addressed the opportunity to use a supply company as an additional source of revenue for cash-strapped local authorities. However, no local suppliers appear to have this objective.

[33] Previous reports gave multiple other structures, such as sleeved supply or private wire supply, which have not been used to date.

[34] Previous reports did not signal which business structure would be adopted most.

Chapter seven

Conclusion

This study aimed to analyse the possible role that local suppliers can have in a transition towards a more sustainable and fairer British energy supply, with a particular focus on regulatory interventions and market dynamics. To study this, I first looked at how they coped in the volatile retail market. Most companies remained viable over the past years, probably due to the stability offered by their relationship with a local authority. Our Power was the only local supplier to go bankrupt, due to financial issues and a changing regulatory landscape. Therefore even though limited regulatory lock-in allows for innovation, Ofgem's interventions might restrict it. The efforts of local suppliers increase competitive pressure on incumbent suppliers to offer better service to disengaged consumers, thus further improving their market position.

The locality of suppliers allows them to set strict environmental and social objectives. Through a typology of the various regulatory frameworks it appears that the licence exempt model allows for the best consolidation of environmental, social and economic factors. However white labelling is generally easier and allows a company to supply energy to more consumers although it does not grant the local authority the same control over economic and environmental issues. However, the twin social and environmental objectives of local suppliers cannot be achieved simultaneously which ultimately means that fuel poverty cannot be addressed through energy prices alone without simultaneously drastically increasing energy consumption.

For now, the impact of local suppliers on the energy transitions remains limited. Their customer base is small and not increasing at a high rate. However, this impact could increase in two ways. First, their presence might change the behaviour of incumbent energy companies through competitive pressure. Second, the establishment of a Scottish public energy company could have a significant impact on the British energy transition.

This dissertation did not determine the efficacy of social interventions by local suppliers. Their environmental objectives are met by the purchase of energy from sustainable sources and carbon offsetting. However, their effect on fuel poverty is less straightforward and requires careful analysis to isolate the effect of local suppliers amongst a variety of other variables. This could perhaps be a topic for a further study.

Chapter eight

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Chapter nine

References[35]

Aberdeen Heat & Power (2012) *Who we are*. Available at: https://www.aberdeenheatandpower.co.uk/ (Accessed: 13 March 2019).

Ambrose, J. (2019) *Cash-strapped Flow Energy sells out to Co-op*, *The Telegraph*. Available at: https://www.telegraph.co.uk/business/2018/04/10/cash-strapped-flow-energy-sells-co-op/ (Accessed: 15 July 2019).

Bale, C. S. E. *et al.* (2012) 'Strategic energy planning within local authorities in the UK: A study of the city of Leeds', *Energy Policy*. Elsevier, 48, pp. 242–251. doi: 10.1016/j.enpol.2012.05.019.

BBC News (2018a) *Extra Energy collapse is the sixth this year*, *BBC News*. Available at: https://www.bbc.com/news/business-46294104 (Accessed: 15 July 2019).

BBC News (2018b) *Tyneside energy supplier Future Energy ceases trading*, *BBC News*. Available at: https://www.bbc.com/news/uk-england-tyne-42817837 (Accessed: 15 July 2019).

BBC News (2019a) *Edinburgh-based energy supplier Our Power folds*, *BBC News*. Available at: https://www.bbc.co.uk/news/uk-scotland-scotland-business-47000453 (Accessed: 15 July 2019).

BBC News (2019b) *Labour unveils National Grid takeover plan*, *BBC News*. Available at: https://www.bbc.co.uk/news/business-48286563 (Accessed: 12 July 2019).

BBC News (2019c) *Spark Energy supply ceases trading*, *BBC News*. Available at: https://www.bbc.com/news/uk-scotland-south-scotland-46316603 (Accessed: 15 July 2019).

Becker, S., Blanchet, T. and Kunze, C. (2016) 'Social movements and urban energy policy: Assessing contexts, agency and outcomes of remunicipalisation processes in Hamburg and Berlin', *Utilities Policy*, 41, pp. 228–236. doi: 10.1016/j.jup.2016.02.001.

Becker, S., Naumann, M. and Moss, T. (2017) 'Between coproduction and commons: understanding initiatives to reclaim urban energy provision in Berlin and Hamburg', *Urban Research and Practice*, 10(1), pp. 63–85. doi: 10.1080/17535069.2016.1156735.

BEIS (2018) *Annual fuel poverty statistics report, 2018 (2016 data) England*. London: Department for Business Energy & Industrial Strategy. Available at: https://www.gov.uk/government/collections/fuel-poverty-statistics.

Boas, T. C. and Gans-Morse, J. (2009) 'Neoliberalism: From new liberal philosophy to anti-liberal

[35] Whenever possible, publicly accessible web links are provided to references. Open-access journal articles are labelled as such, some restricted-access articles can be found online through third party sources.

slogan', *Studies in Comparative International Development*, 44(2), pp. 137–161. doi: 10.1007/s12116-009-9040-5. [open-access]

Bolton, R. and Foxon, T. J. (2013) 'Urban infrastructure dynamics: Market regulation and the shaping of district energy in UK cities', *Environment and Planning A*, 45(9), pp. 2194–2211. doi: 10.1068/a45575.

Bolton, R. and Hannon, M. (2016) 'Governing sustainability transitions through business model innovation: Towards a systems understanding', *Research Policy*. Elsevier B.V., 45, pp. 1731–1742. doi: 10.1016/j.respol.2016.05.003. [open-access]

Boorman, A. (2017) *First ever licence lite grant shows how far the market has come*, *Cornwall Insight*. Available at: https://www.cornwall-insight.com/newsroom/all-news/first-ever-licence-lite-grant-shows-how-far-the-market-has-come (Accessed: 8 July 2019).

Bradford City Council (2019a) *About White Rose Energy*, *Bradford City Council*. Available at: https://www.bradford.gov.uk/environment/climate-change/white-rose-energy/?amp= (Accessed: 5 August 2019).

Bradford City Council (2019b) *Report on the progress of the Home Energy Conversation Act (HECA) 1995 in the Bradford District*. Bradford: City of Bradford Metropolitan District Council. Available at: https://www.bradford.gov.uk/media/3835/heca-report-april-2017.pdf.

De Bruijn, H. and Dicke, W. (2006) 'Strategies for safeguarding public values in liberalized utility sectors', *Public Administration*, 84(3), pp. 717–735. doi: 10.1111/j.1467-9299.2006.00609.x.

Bulkeley, H. *et al.* (eds) (2013a) *Cities and low carbon transitions*. 2nd edn. Abingdon: Routledge.

Bulkeley, H. *et al.* (2013b) 'Introduction', in Bulkeley, H. et al. (eds) *Cities and low carbon transitions*. 2nd edn. Abingdon: Routledge, pp. 1--10.

Bulkeley, H. and Betsill, M. M. (2005) 'Rethinking sustainable cities: Multilevel governance and the "urban" politics of climate change', *Environmental Politics*, 14(1), pp. 42–63. doi: 10.1080/0964401042000310178. [open-access]

Bulkeley, H. and Castán Broto, V. (2013) 'Government by experiment? Global cities and the governing of climate change', *Transactions of the Institute of British Geographers*, 38, pp. 361–375. doi: 10.1111/j.1475-5661.2012.00535.x. [open-access]

Bulkeley, H., Cástan Broto, V. and Maassen, A. (2013) 'Governing urban low carbon transitions', in Bulkeley, H. et al. (eds) *Cities and low carbon transitions*. 2nd edn. Abingdon: Routledge, pp. 13–28.

Campbell, S. (1996) 'Green cities, growing cities, just cities?: Urban planning and the contradictions of sustainable development', *Journal of the American Planning Association*, 62(3), pp. 296–312. doi: 10.1080/01944369608975696. [open-access]

Chick, M. (2007) *Electricity and energy policy in Britain, France and the United States since 1945*. Glos: Edward Elgar Publishing.

Citizens Advice (2019) *Choosing the right energy tariff*, *Citizens Advice*. Available at: https://www.citizensadvice.org.uk/consumer/energy/energy-supply/get-a-better-energy-deal/choosing-energy-tariff/ (Accessed: 4 August 2019).

CMA (2016a) *Energy market investigation*. London: Competition and Markets Authority. Available at: https://www.gov.uk/cma-cases/energy-market-investigation.

CMA (2016b) *Modernising the Energy Market*. London: Competition and Markets Authority. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/531204/overview-modernising-the-energy-market.pdf.

Companies House (2019) *Robin Hood Energy Limited*, *Companies House*. Available at: https://beta.companieshouse.gov.uk/company/08053212 (Accessed: 11 July 2019).

Craig, P. (1998) 'Ultra vires and the foundations of judicial review', *Cambridge Law Jounral*, 57(1), pp. 63–90.

Crisp, T. (2018) *Octopus Energy becomes last resort supplier for GEN4U*, *Cornwall Insight*. Available at: https://www.cornwall-insight.com/publications/energy-spectrum-and-daily-bulletin/energy-spectrum/issue-634/octopus-energy-becomes-last-resort-supplier-for-gen4u (Accessed: 15 July 2019).

Donnelly, S. (no date) *Brighter World Energy: Cheryl Latham*, *Sartups*. Available at: https://startups.co.uk/brighter-world-energy-cheryl-latham/ (Accessed: 16 July 2019).

Ebinger, F., Grohs, S. and Reiter, R. (2011) 'The performance of decentralisation strategies compared: An assessment of decentralisation strategies and their impact on local government performance in Germany, France and England', *Local Government Studies*, 37(5), pp. 553–575. doi: 10.1080/03003930.2011.604557.

Emden, J., Murphy, L. and Lloyd, H. (2018) *Beyond ECO: The future of fuel poverty support*, */PPR*. London: Institute for Public Policy Research. Available at: https://www.ippr.org/files/2018-07/fuel-poverty-june18-final.pdf.

Evenergi (2019) *Evenergi: seize the opportunities from electric vehicles*. Available at: https://www.evenergi.com/ (Accessed: 8 July 2019).

Foxon, T. J. (2013) 'Transition pathways for a UK low carbon electricity future', *Energy Policy*, 52, pp. 10–24. doi: http://dx.doi.org/10.1016/j.enpol.2012.04.001.

Gaus, G., Courtland, S. D. and Schmidtz, D. (2018) *Liberalism*, *Stanford Encyclopedia of Philosophy*. Available at: https://plato.stanford.edu/entries/liberalism/ (Accessed: 14 December 2018).

Geels, F. (2013) 'The role of cities in technological transitions: analytical clarifications and historical examples', in Bulkeley, H. et al. (eds) *Cities and low carbon transitions*. 2nd edn. Abingdon: Routledge, pp. 13–28.

Geels, F. W. (2002) 'Technological transitions as evolutionary reconfiguration processes: A

multi-level perspective and a case-study', *Research Policy*, 31(8–9), pp. 1257–1274. doi: 10.1016/S0048-7333(02)00062-8.

GLA (2017) *Request for Mayoral decision MD2157: Licence lite*. London: Greater London Authority. Available at: https://www.london.gov.uk/decisions/md2157-licence-lite.

Grubb, M., Hourcade, J.-C. and Neuhoff, K. (2014) 'Pricing pollution: of truth and taxes', in *Planetary economics: Energy, climate change and the three domains of sustainable development*. 1st edn. Oxon: Routledge, pp. 207–236.

Hawkey, D. J. C. (2014) 'District heating in the UK: Prospects for a third national programme', *Science and Technology Studies*, 27(3), pp. 68–89. [open-access]

Hawkey, D., Webb, J. and Winskel, M. (2013) 'Organisation and governance of urban energy systems: District heating and cooling in the UK', *Journal of Cleaner Production*, 50, pp. 22–31. doi: 10.1016/j.jclepro.2012.11.018.

Helm, D. (2004) *Energy, the state, and the market: British energy policy since 1979*. 2nd edn. Oxford: Oxford University Press.

Hesse, J. J. and Sharpe, L. J. (1991) 'Local government in international perspective: Some comparative observations', in Hesse, J. J. (ed.) *Local government and urban affairs in international perspective: Analyses of twenty Western industrialised countries*. Baden-Baden: Nomos Verlagsgesellschaft.

Hutchcroft, P. D. (2001) 'Centralization and decentralization in administration and politics: Assessing territorial dimensions of authority and power', *Governance: An International Journal of Policy, Administration, and Institutions*, 14(1), pp. 23–53. doi: 10.1111/0952-1895.00150.

IPCC (2018) *Special report on the impacts of global warming of 1.5°C: Summary for policy makers*. Geneva. Available at: http://www.ipcc.ch/report/sr15/.

Jenkins, K. *et al.* (2016) 'Energy justice: A conceptual review', *Energy Research and Social Science*, 11, pp. 174–182. doi: dx.doi.org/10.1016/j.erss.2015.10.004.

Johnson, V. and Hall, S. (2014) 'Community energy and equity: The distributional implications of a transition to a decentralised electricity system', *People, Place and Policy*, 8(3), pp. 149–167. doi: 10.3351/ppp.0008.0003.0002. [open-access]

Kay, M. and Gooday, G. (2018) 'From hydroelectricity to the National Grid: Harewood House and the history of electrification in Britain, 1900–1940', *History of Retailing and Consumption*, 4(1), pp. 43–63. doi: 10.1080/2373518x.2018.1436222.

Kern, K. and Bulkeley, H. (2006) 'Local government and the governing of climate change in Germany and the UK', *Urban Studies*, 43(12), pp. 2237–2259. doi: 10.1080/00420980600936491.

Köhrsen, J. (2018) 'Exogenous shocks, social skill, and power: Urban energy transitions as social fields', *Energy Policy*, 117(October 2017), pp. 307–315. doi: 10.1016/j.enpol.2018.03.035.

Laybourn-langton, L. (2016) *Community and local energy: Challenges and opportunities*.

London: Institute for Public Policy Research. Available at: https://www.ippr.org/files/publications/pdf/community-energy_June2016.pdf.

Leeds City Council (2019) *Ending your tenancy*, *Leeds City Council*. Available at: https://www.leeds.gov.uk/Pages/PageNotFoundError.aspx?requestUrl=https://www.leeds.gov.uk/residents/housing/council-housing/your-tenancy/ending-your-tenancy (Accessed: 30 July 2019).

Littlechild, S. (2010) *The creation of a market for retail electricity supply*. Florence: EU Working papers: Robert Schuman Centre for Advanced Studies for the Loyola de Palacio Programme on Energy Policy. Available at: http://www.econ.cam.ac.uk/research-files/repec/cam/pdf/cwpe1035.pdf.

Littlechild, S. (2017) 'Competition and price controls in the UK retail energy market', *Network*, (63), pp. 1–11. Available at: https://www.accc.gov.au/system/files/network june 2017 %28D2017-00045379%29.pdf.

Local Partnerships and Cornwall Energy (2016) *Local energy options: A guidance document for local government*. London: Local Partnerships. Available at: http://localpartnerships.org.uk/wp-content/uploads/2016/12/Local-Energy-options-guide-web-version-1.pdf.

Low, R. (2018) *Scoping note on a Scottish publicly owned energy company*. University of Strathclyde: International Public Policy Institute: Centre for Energy Policy. Available at: http://www.parliament.scot/S5_EconomyJobsFairWork/Inquiries/Scoping_note-Publicly_Owned_Energy_Company-Centre_for_Energy_Policy.pdf.

Mason, C. (2018) *Brighter World Energy closes - what it means for customers*, *MoneySavingExpert*. Available at: https://www.moneysavingexpert.com/news/2018/01/brighter-world-energy-has-closed---if-youre-a-customer-heres-what-you-need-to-know/ (Accessed: 16 July 2019).

Mayor of London (2019) *Energy for Londoners*, *Mayor of London*. Available at: https://www.london.gov.uk/what-we-do/environment/energy/energy-londoners (Accessed: 8 July 2019).

Moss, T., Becker, S. and Naumann, M. (2015) 'Whose energy transition is it, anyway? Organisation and ownership of the Energiewende in villages, cities and regions', *Local Environment*, 20(12), pp. 1547–1563. doi: 10.1080/13549839.2014.915799.

Nottingham City council (2019) *Nottingham City council register of payments to elected members*. Nottingham: Nottingham City council. Available at: http://documents.nottinghamcity.gov.uk/download/6982.

O'dwyer, C. and Ziblatt, D. (2006) 'Does decentralisation make government more efficient and effective?', *Commonwealth and Comparative Politics*, 44(3), pp. 326–343. doi: 10.1080/14662040600997064.

Ofgem (2015) *An introduction to licence lite*. London: Office of Gas and Electricity Markets. Available at:

https://www.ofgem.gov.uk/sites/default/files/docs/2015/04/482_an_introduction_to_licence_lite_factsheet_web_0.pdf.

Ofgem (2016) *Entering the retail energy market: A guide*. London: Office of Gas and Electricity Markets. Available at: https://www.ofgem.gov.uk/system/files/docs/2016/07/entering_the_retail_energy_market_-_a_guide.pdf.

Ofgem (2017) *Decision letter on typical domestic consumption values*. London: Office of Gas and Electricity Markets. Available at: https://www.ofgem.gov.uk/system/files/docs/2017/08/tdcvs_2017_decision.pdf.

Ofgem (2018a) *Decision: Default tariff cap - Overview document*. London: Office of Gas and Electricity Markets. Available at: https://www.ofgem.gov.uk/system/files/docs/2018/11/decision_-_default_tariff_cap_-_overview_document_0.pdf.

Ofgem (2018b) *Decision on last resort supply payment claim from Co-operative Energy*. London: Office of Gas and Electricity Markets. Available at: https://www.ofgem.gov.uk/system/files/docs/2018/01/last_resort_supply_payment_claim_from_co-operative_energy_final_decision.pdf.

Ofgem (2018c) *Extra Energy customers: Your questions on new supplier Scottish Power*, *Office of Gas and Electricity Markets*. Available at: https://www.ofgem.gov.uk/publications-and-updates/extra-energy-customers-your-questions-new-supplier-scottish-power (Accessed: 15 July 2019).

Ofgem (2018d) *Insights from running the regulatory sandbox*. London: Office of Gas and Electricity Markets. Available at: https://www.ofgem.gov.uk/system/files/docs/2018/10/insights_from_running_the_regulatory_sandbox.pdf.

Ofgem (2018e) *Ofgem appoints First Utility to take on customers of Usio Energy*, *Office of Gas and Electricity Markets*. Available at: https://www.ofgem.gov.uk/publications-and-updates/ofgem-appoints-first-utility-take-customers-usio-energy (Accessed: 15 July 2019).

Ofgem (2018f) *Ofgem protects customers of failed supplier One Select*, *Office of Gas and Electricity Markets*. Available at: https://www.ofgem.gov.uk/publications-and-updates/ofgem-protects-customers-failed-supplier-one-select (Accessed: 15 July 2019).

Ofgem (2018g) *OneSelect customers: Your questions on new supplier Together Energy*, *Office of Gas and Electricity Markets*. Available at: https://www.ofgem.gov.uk/publications-and-updates/oneselect-customers-your-questions-new-supplier-together-energy (Accessed: 15 July 2019).

Ofgem (2018h) *Spark Energy customers: Your question on new supplier Ovo Energy*, *Office of Gas and Electricity Markets*. Available at: https://www.ofgem.gov.uk/publications-and-updates/spark-energy-customers-your-questions-new-supplier-ovo-energy (Accessed: 15 July 2019).

Ofgem (2018i) *State of the energy market 2018*. London: Office of Gas and Electricity Markets. Available at: https://www.ofgem.gov.uk/system/files/docs/2018/10/state_of_the_energy_market_report_2018.pdf.

Ofgem (2019a) *Balancing and settlement code (BSC)*, *Office of Gas and Electricity Markets*. Available at: https://www.ofgem.gov.uk/licences-industry-codes-and-standards/industry-codes/electricity-codes/balancing-and-settlement-code-bsc (Accessed: 8 July 2019).

Ofgem (2019b) *Brilliant Energy customers: Your questions on new supplier SSE*, *Office of Gas and Electricity Markets*. Available at: https://www.ofgem.gov.uk/publications-and-updates/brilliant-energy-customers-your-questions-new-supplier-sse (Accessed: 15 July 2019).

Ofgem (2019c) *Connection and use of sysyem code (CUSC)*, *Office of Gas and Electricity Markets*. Available at: https://www.ofgem.gov.uk/licences-industry-codes-and-standards/industry-codes/electricity-codes/connection-and-use-system-code-cusc (Accessed: 8 July 2019).

Ofgem (2019d) *Decision on last resort supply payment claim from Octopus Energy limited*. London: Office of Gas and Electricity Markets. Available at: https://www.ofgem.gov.uk/system/files/docs/2019/01/octopus_last_resort_supply_payment_claim_-_final_decison.pdf.

Ofgem (2019e) *Distribution connection and use of system agreement (DCUSA)*, *Office of Gas and Electricity Markets2*. Available at: https://www.ofgem.gov.uk/licences-industry-codes-and-standards/industry-codes/electricity-codes/distribution-connection-and-use-system-agreement (Accessed: 8 July 2019).

Ofgem (2019f) *Economy Energy customers: Your questions on new supplier Ovo Energy*, *Office of Gas and Electricity Markets*. Available at: https://www.ofgem.gov.uk/publications-and-updates/economy-energy-customers-your-questions-new-supplier-ovo-energy (Accessed: 15 July 2019).

Ofgem (2019g) *Electricity supply market shares by company: Domestic (GB)*, *Office of Gas and Electricity Markets*. Available at: https://www.ofgem.gov.uk/data-portal/electricity-supply-market-shares-company-domestic-gb (Accessed: 15 July 2019).

Ofgem (2019h) *Energy company obligation (ECO)*, *Office of Gas and Electricity Markets*. Available at: https://www.ofgem.gov.uk/environmental-programmes/eco (Accessed: 8 July 2019).

Ofgem (2019i) *Energy suppliers*, *Office of Gas and Electricity Markets*. Available at: https://www.ofgem.gov.uk/environmental-programmes/eco/energy-suppliers (Accessed: 8 July 2019).

Ofgem (2019j) *Master registration agreement (MRA)*, *Office of Gas and Electricity Markets*. Available at: https://www.ofgem.gov.uk/licences-industry-codes-and-standards/industry-codes/electricity-codes/distribution-connection-and-use-system-agreement (Accessed: 8 July 2019).

Ofgem (2019k) *Our power customers: Your questions on new supplier Utilita Energy*, *Office of Gas and Electricity Markets*. Available at: https://www.ofgem.gov.uk/publications-and-updates/our-power-customers-your-questions-new-supplier-utilita-energy (Accessed: 15 July 2019).

Ofgem (2019l) *Retail market indicators*, *Office of Gas and Electricity Markets*. Available at: https://www.ofgem.gov.uk/data-portal/retail-market-indicators (Accessed: 12 July 2019).

Ofgem (2019m) *Warm home discount (WHD) scheme*, *Office of Gas and Electricity Markets*. Available at: https://www.ofgem.gov.uk/environmental-programmes/warm-home-discount-whd-scheme (Accessed: 8 July 2019).

Ofgem (2019n) *Wholesale market indicators*, *Office of Gas and Electricity Markets*. Available at: https://www.ofgem.gov.uk/data-portal/wholesale-market-indicators (Accessed: 16 July 2019).

OVO Energy (2014) *Community energy: White paper*. London, Bristol: OVO Energy. Available at: https://www.ovoenergy.com/binaries/content/assets/documents/pdfs/community_energy_whitepaper.pdf.

OVO Energy (2019a) *About OVO*, *OVO Energy*. Available at: https://www.ovoenergy.com/about (Accessed: 8 July 2019).

OVO Energy (2019b) *OVO communities*, *OVO Energy*. Available at: https://www.ovoenergy.com/about/communities (Accessed: 8 July 2019).

Peachey, K. (2019a) *Brilliant Energy becomes tenth energy firm to fail*, *BBC News*. Available at: https://www.bbc.com/news/business-47526126 (Accessed: 15 July 2019).

Peachey, K. (2019b) *Energy firm ceases trading after ban*, *BBC News*. Available at: https://www.bbc.com/news/business-46798461 (Accessed: 15 July 2019).

Pearson, P. (2010) *UK energy policy 1980-2010: A history and lesson to be learnt. A review to mark 30 years of the Parliamentary Group for Energy Studies*. London: The Parliamentary Group for Energy Studies. Available at: http://sro.sussex.ac.uk/id/eprint/38852/1/uk-energy-policy.pdf.

Van der Plas, F. (2019) *Power grid failures: Theory of fluctuating renewables*. Radboud Universiteit Nijmegen. Available at: https://github.com/fonsp/grid-analysis/blob/master/doc/thesis/main.pdf.

Platt, R. *et al.* (2014) *City energy: A new powerhouse for Britain*. London: Institute for Public Policy Research. Available at: https://www.ippr.org/files/publications/pdf/city-energy_Jul2014.pdf.

Reed, E. *et al.* (2017) *Energy for Londoners feasibility study*. Norwich: Cornwall Insight. Available at: https://www.london.gov.uk/sites/default/files/energy_for_londoners_feasibility_study.pdf.

Robin Hood Energy (2019a) *Southend Energy to switch supplier*. Available at: https://robinhoodenergy.co.uk/news/southend-energy-switches-supplier/ (Accessed: 22 May

2019).

Robin Hood Energy (2019b) *What is the Warm Home Discount Scheme?*, *Robin Hood Energy*. Available at: https://robinhoodenergy.co.uk/home-help/warm-home-discount-scheme-work/ (Accessed: 24 July 2019).

Rocholl, N. and Bolton, R. (2016) 'Berlin's electricity distribution grid: an urban energy transition in a national regulatory context', *Technology Analysis and Strategic Management*. doi: 10.1080/09537325.2016.1182629. [open-access]

Rutherford, J. and Coutard, O. (2014) 'Urban energy transitions: Places, processes and politics of socio-technical change', *Urban Studies*, 51(7), pp. 1353–1377. doi: 10.1177/0042098013500090. [open-access]

Rutter, P. and Keirstead, J. (2012) 'A brief history and the possible future of urban energy systems', *Energy Policy*, 50, pp. 72–80. doi: 10.1016/j.enpol.2012.03.072.

Scottish Government (2018a) *Key results from the Scottish house fondition survey (SHCS): Local authority tables 2014-2016*. Edinburgh: Scottish Government, National Statistics, Scottish Housing Conditions Survey Team. Available at: https://www2.gov.scot/Topics/Statistics/SHCS/keyanalyses/LATables1517.

Scottish Government (2018b) *Scottish house condition survey: 2017 key findings*. Edited by A. Clarkson, E. Laird, and D. Lloyd. Edinburgh: Scottish Government, National Statistics, Scottish Housing Conditions Survey Team. Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/statistics/2018/12/scottish-house-condition-survey-2017-key-findings/documents/scottish-house-condition-survey-2017-key-findings/scottish-house-condition-survey-2017-key-findings/govscot.

Scottish Government (2019) *Loans to Our Power Community Benefit Society Ltd update: FOI release*, *Scottisch Government*. Available at: https://www.gov.scot/publications/foi-19-00841/ (Accessed: 16 July 2019).

Scottish Parliament (2016) *Citizens' guide to Scottish devolution*. Edinburgh: Scottish Parliament, Devolution (further powers) committee. Available at: https://www.parliament.scot/EducationandCommunityPartnershipsresources/Your_Guide_Mar_2016.pdf.

Smith, A., Voß, J.-P. and Grin, J. (2010) 'Innovation studies and sustainability transitions: The allure of the multi-level perspective and its challenges', *Research Policy*, 39(4), pp. 435–448. doi: 10.1016/j.respol.2010.01.023.

Steger, M. B. and Roy, R. K. (2013a) 'Neoliberalism in Latin America and Africa', in *Neoliberalism: A very short introduction*. Oxford University Press, pp. 98–118. doi: 10.1093/actrade/9780199560516.001.0001.

Steger, M. B. and Roy, R. K. (2013b) 'What's "neo" about liberalism?', in *Neoliberalism: A very short introduction*. Oxford University Press, pp. 1–20. doi: 10.1093/actrade/9780199560516.001.0001.

Stern, J. (2003) *What the Littlechild report actually said*, *Regulation initiative working paper*. Edited by C. Bolt and M. Cave. Bath: CRI. Available at: http://facultyresearch.london.edu/docs/1_LittlechildJSFINMay03.pdf.

Stern, N. (2006) *Stern review: The economics of climate change*. London.

Stokel-Walker, C. (2018) *The struggle to break the UK's addication to big energy firms*, *Wired*. Available at: https://www.wired.co.uk/article/big-six-energy-bills-local-councils-uk-fuel-poverty (Accessed: 24 July 2019).

Thorp, B. and Marvin, S. (1995) 'Local authorities and energy markets in the 1990s: Getting back into power?', *Local Government Studies*, 21(3), pp. 461–482. doi: 10.1080/03003939508433790.

Torrens, J., Johnstone, P. and Schot, J. (2018) 'Unpacking the formation of favourable environments for urban experimentation: The case of the Bristol energy scene', *Sustainability*, 10. doi: 10.3390/su10030879. [open-access]

Ugaz, C. (2001) 'Workin paper: A public goods approach to regulation of utilities', *EconStor wider discussion paper, the United Nations University World Institute for Development Economics Research*, 9. Available at: https://www.econstor.eu/bitstream/10419/52850/1/333231252.pdf.

UKERC (2014) *UK Energy in a global context: Synthesis report UK*. Edited by P. Ekins and J. Watson. UK Energy Research Centre. Available at: http://www.ukerc.ac.uk/asset/6BD72FAC-0BDC-4182-B69CE9014B7B9BC8/.

Unruh, G. C. (2000) 'Understanding carbon lock-in', *Energy Policy*, 28(12), pp. 817–830. doi: 10.1016/S0301-4215(00)00070-7.

Vaughan, A. (2017) *Co-op energy chief predicts more small suppliers could go bust*, *The Guardian*. Available at: https://www.theguardian.com/business/2017/jul/02/co-op-energy-chief-david-bird-more-small-suppliers-could-go-bust (Accessed: 8 July 2019).

Vaughan, A. (2018a) *Energy supplier Iresa collapses after record number of complaints*, *The Guardian*. Available at: https://www.theguardian.com/business/2018/jul/27/energy-supplier-iresa-collapses-after-record-number-of-complaints (Accessed: 15 July 2019).

Vaughan, A. (2018b) *What is the energy price cap and how does it work?*, *The Guardian*. Available at: https://www.theguardian.com/business/2018/dec/31/what-is-the-price-cap-and-how-does-it-work (Accessed: 13 July 2019).

Van der Vleuten, E. and Raven, R. (2006) 'Lock-in and change: Distributed generation in Denmark in a long-term perspective', *Energy Policy*, 34(18), pp. 3739–3748. doi: 10.1016/j.enpol.2005.08.016.

Webb, J. (2015) 'Improvising innovation in UK urban district heating: The convergence of social and environmental agendas in Aberdeen', *Energy Policy*, 78, pp. 265–272. doi: 10.1016/j.enpol.2014.12.003.

Webb, J., Hawkey, D. and Tingey, M. (2016) 'Governing cities for sustainable energy: The UK case', *Cities*, 54, pp. 28–35. Available at: http://dx.doi.org/10.1016/j.cities.2015.10.014%0Apapers3://publication/doi/10.1016/j.cities.2015.10.014. [open-access]

Webb, J., Tingey, M. and Hawkey, D. (2017) *What we know about local authority engagement in UK energy systems: Ambitions, activities, business structures & ways forward*. UKERC. Available at: http://www.ukerc.ac.uk/asset/CF38B43E-23AA-433B-A3BE79CC11270E20/.

White Rose Energy (2019a) *Serving Yorkshire & 'doing' energy differently*, *White Rose Energy*. Available at: https://www.whiteroseenergy.co.uk/about-us (Accessed: 5 August 2019).

White Rose Energy (2019b) *White Rose Energy is going the extra mile to help alleviate fuel poverty*, *White Rose Energy*. Available at: https://www.whiteroseenergy.co.uk/home-energy/warm-homes-discount (Accessed: 5 August 2019).

Whitfield, D. (2019) 'Robin Hood Energy: How Nottingham City council spent £25m on its own gas and electricity company', *NottinghamshireLive*. Available at: https://www.nottinghampost.com/news/nottingham-news/robin-hood-energy-how-nottingham-2660682.

XR (2019) *Our demands*, *Extinction rebellion*. Available at: https://rebellion.earth/the-truth/demands/ (Accessed: 7 August 2019).

Appendix

Overview of energy companies

Company	*Description*
Angelic Energy	White label supplier for Islington council, working with Robin Hood Energy.
Beam Energy	White label supplier for Barking and Dagenham council, working with Robin Hood Energy.
CitizEN Energy	White label supplier for Southampton City council, working with Robin Hood Energy.
Energy SW	White label supplier in the South West of England, working with OVO Energy.
Fairerpower	White label supplier for Cheshire East council, working with OVO Energy.
Fosse Energy	White label supplier for Leicestershire County and City council, working with Robin Hood Energy.
Great North Energy	White label supplier for Doncaster council, working with Robin Hood Energy.
Greater London Authority	One of the first licence lite suppliers.
Our Power	Former, not-for-profit, licensed energy company in Scotland.
Peterborough Energy	White label supplier for Peterborough City council, working with OVO Energy.
RAM Energy	White label supplier for Derby City council, working with Robin Hood Energy.
Robin Hood Energy	Not-for-profit, licensed energy company from Nottingham that acts as a white label energy partner for other local authorities.
Scottish public energy company	New to create publicly-owned energy company by the Scottish government.

Southend Energy	White label supplier for Southend-on-Sea council, working with OVO Energy.
The Leccy	White label supplier for Liverpool City council, working with Robin Hood energy.
Un Ynni Cymru (One Wales Energy)	Failed initiative to establish a Welsh licensed energy company.
White Rose Energy	White label supplier for Leeds City council, working with Robin Hood Energy.
Your Energy Sussex	White label supplier for West Sussex County council, working with Robin Hood Energy.

Table A.1 Overview of local energy companies considered in this dissertation (Aberdeen Heat & Power, 2012; GLA, 2017; BBC News, 2019a; OVO Energy, 2019b; Robin Hood Energy, 2019a).