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What is prosumerism for? Exploring the normative dimensions of decentralised energy transitions

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ABSTRACT

Energy systems are in transformation towards increasingly renewable, decentralised, demand responsive and smart configurations. This has led to advocacy of the 'prosumer' phenomenon: characterised by actors who both consume and produce renewable energy. In parallel a range of prosumer business models are emerging, governed by a range of market, municipal and community actors. Through a series of semi-structured interviews, focus groups and documentary analysis - centred on a case study of Bristol in the UK - this paper critically evaluates the normative dimensions of prosumer business models, modes of governance and understandings of value. We discuss how competing 'value logics' are present within imagined futures of prosumer-ism, and through a novel conceptual framework, how these modes of governance may lead to divergent material outcomes in a decentralised energy transition. We argue that a more explicit recognition of competing theories of *value, agency* and *change* is needed in future discussions of prosumer-ism.

1. Introduction

Energy transitions are typically characterised as transformations of physical infrastructures, accompanied by wider social, organisational and political changes [1]. There is a growing consensus that a sustainable energy transition will involve increasingly decentralised sites of energy production and self-consumption [2]. These physical changes will integrate renewable electricity production and consumption close to its point of generation (solar PV, small scale wind and hydro power), low carbon heating systems (heat pumps, heat networks, and biomass) as well as vehicle electrification and storage [3]. Optimising these multi-vector systems and ensuring the reliable and efficient provision of energy services from intermittent renewables, will increasingly necessitate greater demand side flexibility and control at a local and household scale [4,5]. These features of distributed energy systems (DES) are leading to a growing advocacy of the 'prosumer' phenomenon: characterised as actors who both produce and consume renewable energy, and actively modulate their consumption [6,7].

Alongside physical transformations, proponents of prosumersim and DES often emphasise a range of social, institutional and organisational changes that may accompany this transition. Firstly, these include a greater role for civil society in the ownership, governance and direction of energy transitions. The most prevalent example is the profusion of 'community energy' projects, especially in northern Europe [8–12]. These cases are often characterised by their small scale; with community shareholders providing equity finance to develop projects that deliver 'local value', above and beyond the provision of energy services [13]. A parallel development has been the advocacy of municipal involvement in the governance of DES [14]. These include emerging municipal energy suppliers [15], ESCOs [16] and retrofit programs [17]: often aiming to mitigate fuel poverty, health issues and distributional inequalities. A third strand involves an evolution of the current centralised and vertically integrated energy suppliers towards a greater role for technology firms, platform providers and aggregators alongside energy suppliers [18]. In this vision, the market share of the traditional energy utilities is captured by a range of challenger firms who profit from the provision of prosumer energy systems, flexibility services and emerging markets of heat and mobility service provision [19]. These different modes of governance are therefore seen to have divergent social outcomes on the nature and direction of the prosumer energy transition.

To capture these increasingly plural values, a range of new prosumer business models are emerging. Recent studies have attempted to characterise these new business models through typologies [20,21] and quantify the potential *financial value* that they create in future energy systems: i.e. that which has direct monetary exchange value (electricity,

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heat) [22]. However, few studies have specifically interrogated the governance dimensions of these business models or discussed their normative purpose: i.e. *non-financial* social and environmental values (social cohesion, distributional equity, clean air) [15], which do not have a monetary exchange value.

In this paper we explore these competing normative dimensions through the lens of alternative conceptions of value. Developing a conceptual framework for these 'value logics' [23] we explore these ideas through three organisations looking to play a key role in a prosumer led energy transition in Bristol in the UK. We compare the governance of these organisations – each adopting market, municipal and community modes – in terms of the theories of *value, agency* and *change* upon which they are based. We further discuss how the prevailing institutional context of the UK favours business models with market based governance, narrowing the potential scope of economic, social and environmental value that is delivered. Whilst this paper is centred on the UK, we argue these findings have broader relevance for the study of decentralised energy transitions, especially in the European Union (EU).

In the following Section 2 we introduce four key ideas which structure the theoretical development of the paper. Firstly, we introduce the renewable energy *prosumer* concept (Section 2.1). We then situate this within the notion of *business models*, before emphasising alternative market, municipal and *governance* of business models (Section 2.2). Thirdly, we develop a novel framework for the values and *value logics* on which these alternative modes of governance are based (Section 2.3). Section 3 introduces our research design and methodology. In Section 4 we explore these ideas through three case studies of market, municipal and community prosumer governance in the city of Bristol. In Section 5 we discuss these findings in the context of the value logics framework developed in Section 2.3, before providing conclusions and recommendations for further research in Section 6.

2. Business models, governance and value in prosumer energy systems

In this section we explore the relationship between prosumers and three key concepts: *business models, governance* and *value logics*, developing a novel conceptual framework. We first show how the prosumer phenomenon necessitates new business models which deliver value and capture revenue in ways that are radically different for the current centralised energy system [24]. These business models are situated in different types of organisation with different modes of governance [25]. These modes of governance are in turn are motivated by different value logics, informed by divergent philosophical and ideological perspectives [23], as shown in Fig. 1.

2.1. Prosumerism – what is it and what is it for?

The etymology of the 'prosumer' originates with Alvin Toffler's [26] futurist treatise on the new global economy: characterised as the 'third wave'. In the book Toffler presciently foresaw the rise of the information age, renewable energy, bio-technology and an increasingly post-industrial society [27,28]. Of particular emphasis was the 'rise of the prosumer': characterised by a breakdown in the delineation of producer and consumer that arose during the industrial revolution. With the emerging third wave, citizens become active producers of goods and services rather than passive consumers – enabled by the major new resource of the age: information [26]. The prosumer concept has since garnered significant academic attention with the rise of open source software, 3D printing, maker spaces, citizen finance and DES [29,30]. Although there is some debate on the definition [6,31], we characterise renewable energy prosumers as:

Actors who both produce and consume renewable energy and actively modulate their demand.

Building on this definition, and following Brown et al., [24] we develop and use the following 'terms of art'. Firstly 'prosuming' (verb) as the act of production and self-consumption, and secondly 'prosumerism' (noun) describing the phenomenon itself. Thus, prosumers, prosuming and prosumerism describe a material phenomenon which may have associated social, economic and institutional characteristics. Consequently, in Table 1 we delineate centralised, distributed and prosumer electricity systems on the basis of their physical and engineering features, acknowledging ongoing debates surrounding the social, economic and institutional characteristics of these systems [32].

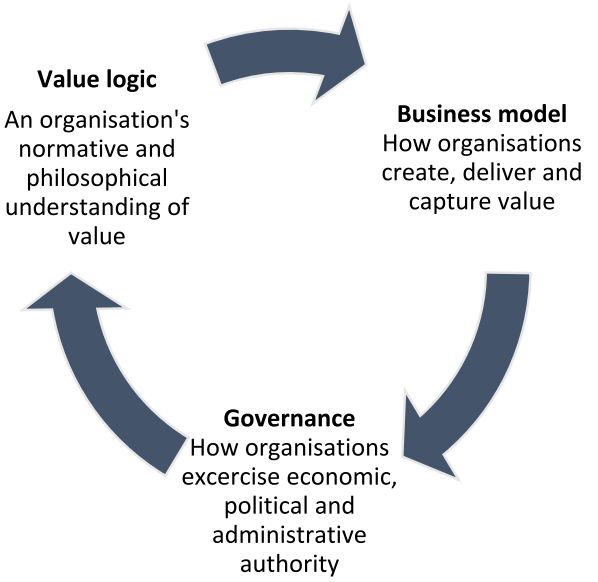


Fig. 1. The relationship between, business models, governance and value logics.

Prosumerism is increasingly seen as a solution to the challenges facing energy systems. In this vision, prosumers drive the adoption of DES, where energy is both produced and consumed locally – reducing greenhouse gas emissions and ensuring local value creation [6,33]. Advocates emphasise the benefits of energy 'autarky' where multiple energy vectors of electricity, heating, transportation and useful work can be sourced locally from solar, wind, geothermal, waste and biogenic sources in increasingly closed-loop, circular systems [34]. These scenarios also envisage demand-side behavioural change through time-of-use (TOU) tariffs, storage and flexibility service provision, helping to balance renewables' intermittency [35–37].

To facilitate the transition towards de-centralised and prosumer led energy systems, various authors have highlighted the importance of new business models [20,38,39]. These models may facilitate increased self-consumption of renewable energy, local trading of electricity, grid stability and a shift to other energy vectors such as heat and transport [24]. However, few have emphasised how such business models might be governed and different types of value that they deliver.

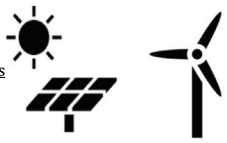
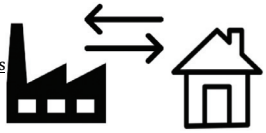
2.2. Prosumer governance and business models

Governance has become a fashionable term describing processes of decision-making, agency and control, across multiple actors and levels in society, and is thus defined by Goldtau [40] as:

> "the institutions, mechanisms and processes through which economic, political and administrative authority is exercised"

Energy research in the social sciences is replete with studies of global [41], multi-level [42] and polycentric energy governance [40]. Studies also explore the relationship between energy system governance and the nature and direction of energy transitions [43,44]. These studies share an emphasis on institutions, incumbency and subsidiarity

Table 1
Three levels of electricity system design.

System type	Network level	Description
Centralised Energy Systems  Thermal power stations, Hydro-dams, Offshore wind farms.	High voltage transmission network 400–50kv. 	Traditional model of large power plants connected to high voltage transmission network. Consumption far from point of generation. Allows for economies of scale in power system design.
Distributed Energy Systems  Solar farms, Wind turbines, Micro-hydro.	Low voltage distribution network 50–1kv. 	Emerging model with smaller scale power plants connected to low voltage distribution network, although still feeding directly into the grid. Consumption close to generation, or within grid supply point. Reduces the use of the transmission network and promotes local consumption.
Prosumer Energy Systems  Building connected solar, CHP, Micro-wind, Pico-hydro.	Ultra-low voltage domestic/ commercial network 400–110v. 	Emerging model with micro scale power plants connected directly to buildings or demand site. Consumption at the point of generation often 'behind the meter'. As above and promotes flexibility on the demand side by actively involving users in demand response and temporal shifting.

in the governance of energy systems, and highlight the challenges of the prevailing neoliberal ideology for achieving sustainable energy transitions [43,45].

Yet, despite assertions that governance transcends the realm of public policy [40,43], the vast majority of these studies emphasise the role of governments, regulation and politics - ignoring governance of organisations that deliver energy services. Several studies do explore how different business models can deliver more plural forms of value in energy transitions [15,20,23,46]. However, few explicitly recognise corporate governance's role as the 'custodian of the business model' [47]. This is despite an emerging seam of literature on different forms of private sector, community and municipal ownership in low carbon energy [9,16], housing [48] and transportation systems [49].

Here, we redress this imbalance, through an explicit focus on modes of governance within emerging prosumer business models. Thus, the emphasis on how business models create, deliver and capture value [50] is supplemented by analysis of the governance of these processes [21]. These features are seen to combine in a variety of ways, however they can be broadly aggregated into three *modes of governance*, that characterise the public, private and third sectors [51]. Thus, the following sections explore three modes in the context of prosumer business models: *market, municipal* and *community governance*.

2.2.1. Market energy governance

Private firms continue to dominate liberalised energy markets. Beginning in the UK in the late 1980s, and expanding to much of the EU, the centralised system of generation, retail, transmission and distribution was sold to large private utilities, which are often vertically integrated and operate in multiple countries. Scholars have since highlighted how accompanying business models are poorly suited to facilitating a low carbon and distributed energy transition [19,20,52] – with an emphasis on selling increasing units of energy to sustain profits [53] and centralised forms of generation and supply [29]. Recently, however, a number of challenger energy start-ups have emerged across Western Europe, seeking to provide improved customer service, alongside the integration of DES.

A key focus of these challenger firms is to offer green and renewable energy tariffs. More recently, companies such as OVO are developing technology-based propositions based around smart meters, renewable heat and electric vehicles [4]. A key rationale is to capture value from the retail and leasing of energy technologies and new revenue streams from prosumer flexibility services to system operators, even at the domestic level [54]. It is noteworthy that several large incumbent utilities are developing capabilities in prosumer business models including Centrica's Local Energy Market [55], with Eon developing TOU and heat pump tariffs. Thus, confounding Richter's [52] assertion, that incumbent utilities would resist developing prosumer-centric business models.

However, the underlying corporate governance of these firms is indistinguishable from the traditional utility model. Although most started in private hands, the majority will have shares traded on the stock market. Such firms are typically operated to maximise shareholder value, profitability and share price. Run by a chief executive(s)/owner(s)/founder(s) these firms are typically beholden to their strategic vision, whilst major investors appoint a board of directors with oversight on the direction and management. Advocates argue that privatisation of the electricity infrastructure has driven down costs for consumers, reduced carbon emissions and facilitated innovation [56].

Thus, under this vision new firms with 'disruptive' business models, can revolutionise the energy sector in a similar manner to other industries such as telecoms and digital technology [57]. Consequently, a market-led prosumer transition involves the integration of multiple self-optimising devices and the partnering between energy suppliers, technology companies and electric vehicle manufacturers – through private sector 'aggregator' business models [58]. Sceptics of this vision highlight issues of opaque pricing and profiteering from vulnerable consumers [59], persistent high levels of fuel poverty [60] and underinvestment in network infrastructure [61], which characterise the energy liberalisation era.

2.2.2. Municipal energy governance

A second trend is a renewed role of local government and municipalities in DES. Despite UK municipalities' early role in power system development, networks were centralised in the early 20th century, nationalised in the 1940s and subsequently privatised in the 1980/90 s [62] .[1] Large centralised private utilities, have since come under

[1] Many EU countries have followed this pattern, starting in the UK

increasing criticism for their high profits, prices and carbon emissions [63], and the unsuitability of their business model for DES [19,52]. Recently, authors have highlighted a potential role for local governments in overcoming the issues of sustainability, affordability and energy security [14]. In the UK a number of municipally owned energy supply companies have emerged, such as Robin Hood in Nottingham and Bristol Energy amongst others [64].

These companies purport to offer better value for customers than private sector competitors, through not-for-profit models or the re-investment of profits in local government projects [15]. Historically, municipalities played a role in developing heat networks, especially for public buildings [45]. Although, the majority of UK examples are focussed on energy supply [14], municipalities in Germany and Denmark are increasingly involved in distribution and generation [65]. Frontrunner cities in the UK such as Nottingham, Bristol and London are now developing prosumer business models including municipal ESCOs [16], net-zero-energy retrofitting programs [21] and battery assisted models on the consumer side of the metre [66].

Municipal energy companies has several distinguishing features from the incumbent private utilities. They are usually owned or created by local governments or city authorities, with a range of arms-length and public-private partnerships typical [16]. These organisations - effectively organs of the state - are answerable to the democratic process that created them: typically, local government councillors and mayors. These processes of representative democracy are therefore seen to provide citizens with oversight in the governance of energy systems [62,67]. Proponents argue that their ability to borrow cheaply, influence local planning and regulations and build on existing trusted relationships within specific geographies – makes municipalities ideally placed to facilitate a prosumer-led transition [14,45,62,68].

Advocacy for municipal energy is typically accompanied by a problematisation of the retreat of the state in the neoliberal era of the last four decades [43,45]. Thus, arguments are often framed around the essential public good nature of energy infrastructure [59] and the wider purview of the state to address related issues such as fuel poverty, social welfare and housing standards [20]. Critics of this re-municipalisation highlight inefficiencies in state provision when compared to markets, past failures of nationalised industries, as well as lack of experience in these more commercially-orientated activities [69]. Indeed, concerns around municipalities capacity to facilitate a decentralised energy transition remain a major obstacle to their increased involvement [14].

2.2.3. Community energy governance

The recent emergence of DES has also been accompanied by a growing interest in 'community energy'. Community energy systems can be broadly understood as those that are owned, used, operated or financed by willing citizens, thus circumventing the traditional organs of the market or the state [70]. Since the introduction of feed-in-tariffs (FITs) there has been an explosion of community energy company registrations; with several hundred in the UK [13] and several thousand in Germany [10]. Although their contribution to overall power production has been relatively modest – largely wind, solar and micro-hydro – community energy schemes have captured significant media and public attention [9]. Several authors have highlighted community energies' role in legitimising discourses on renewable systems [71], such as wind power in Germany [10].

Community energy governance has several important features that shape associated business models, and their logics of value creation and capture. Community energy companies tend to adopt legal forms often grouped as 'cooperative' or 'collective' entities. In the UK this includes a range of Community Benefit Societies (BenComms), Community Interest Companies (CICs), Co-operative societies (Coops), Companies Limited by Guarantee, or other charitable legal models [72]. These legal forms are characterised by internal democracy based on one member, one vote [13]. Although different legal forms may have for-profit or not-for-profit status, a common theme is the reinvestment of revenues in local projects which deliver 'community benefits' [11]. Community energy tends to be financed through investment-based crowdfunding [68], typically with equity owned by multiple shareholders [10]. Historically, community energy models have relied on generous FIT subsidies, although increasingly emphasise the need for new revenue streams [24,73]. Indeed, the phase out of these subsidies across EU member states, has led to a major decline in prosumer projects [7,31]. Therefore, community actors are increasingly interested in new business models such as micro-grids, local energy companies and peer-to-peer trading [58].

Critiques of community energy models highlight several issues relating to their governance and normative aims. Studies emphasise the potentially exclusionary nature of community energy ownership - where only those with the right mix of social, cultural and economic capital [74] tend to be involved, potentially exacerbating existing socio-economic and spatial inequalities [75]. Further, community energy could be argued to create a form of 'energy parochialism', as the business models pursued tend to advocate self-sufficiency, off-grid living and energy autarky [34] often at the expense of the wider electricity network [55]. This has led some authors to question the assumption that 'community' should be conflated with 'benign' [72].

Consequently, the preferred mode of governance is inextricably linked to different understandings of *value* and the wider political and economic *values* which underly them. These normative debates thus go to the heart of what prosumerism *is* and who it is *for*. In the following section we develop a conceptual framework to explore the nature of these 'value logics' and how they are applied to the governance of energy systems.

2.3. Values and value in prosumerism

Advocates of prosumerism not only envisage material changes to infrastructures and practices, but also accompanying visions of social, economic and institutional change. These include hopes for increasing *energy democracy* in the planning, decision-making and operation of DES [76–78]. These democratic goals are purported to deliver more *just* outcomes in the form distributional equity, inclusivity and fairness [79,80]. Further, distributed forms of ownership, financing and revenue sharing may facilitate local value retention, economic development and reduced inequality [20,46,81]. Thus, 'technology optimist' [82] advocates of prosumerism, see these trends towards decentralisation and citizen participation as part of a broader trend of localism, subsidiarity and a breakdown of the old dichotomies of market and state in the provision of public services [6,34,72] – thus echoing Toffler's [26] original vision of a third wave of capitalist development.

Whilst these normative outcomes are evident in many emerging examples of prosumer business models, we wish to caution against the assumption that these outcomes can be assumed *a priori* [72]. We posit that these normative outcomes are contingent on the types of institutions that govern energy transitions [43,83], how their governance implicates the business models adopted, and the logics of value creation and capture that underly them [15]. In this section we make explicit these normative dimensions, through Laasch's [23] conception of 'value logics'. We show how these logics implicitly underlie alternative modes of governance, further exploring their philosophical antecedents to understand how institutions shape, and in turn are shaped by social, political and economic values [43,44].

2.3.1. Market value logic

The *market value logic* draws upon value assumptions from neo-classical economics and marginal utility theory. The philosophical antecedents of this logic lie with Adam Smith's assertion that rational self-interested individuals operating in competitive markets will lead to socially optimal outcomes [84]. Smith's ideas were later formalised into mathematical models and axioms by early economists such as William Stanley Jevons, during the 'marginalist revolution' [85]. Under this

paradigm, agents show their preferences through market mechanisms such that the marginal value/utility of goods or services is revealed by prices. Although tempered by the welfare state and social democratic tendencies of the post-war consensus, these ideas found renewed favour through the neoclassical economics of von Hayek and Friedman from the 1970s onwards [85]. This primacy of market mechanisms and shareholder value [86], led to the predominance of the market logic in the governance of public services, during the energy market liberalisations and privatisations of the 1980s/90 s [56].

Thus, it is this logic of efficient competitive markets, the emphasis of financial and shareholder value and the characterisation of agents as 'consumers' which informs the *market value logic* of prosumerism. In this vision, innovative market entrants, or Schumpeter's 'new men' [87], are seen to disrupt existing energy markets through the introduction of new products, services and business models. Here, prosumers are viewed as adopters of new consumer goods and change only their purchasing activity and consumption behaviour [6,88] in response to price signals and hedonic self-interest [89]. Such a vision implies limited social change and instead presents prosumerism as a technological transition predicated on existing market structures and relationships between consumers, energy markets and the state.

2.3.2. Municipal value logic

By contrast the *municipal value logic* has its roots within democratic socialism and the more recent re-municipalisation movement. The philosophical antecedents of the municipal paradigm are bound up with Marxist critiques of capitalism [90], and its ability to deliver socially-beneficial outcomes [91]. Originating in the labour movement of the later 19th and early 20th centuries, municipal provision of essential public services, emerged in response to the stark inequalities experienced during the *belle epoch* [92]. The provision of water, sanitation and later electricity by municipal authorities was predicated on the 'public good' nature of these services. Thus, through the socialisation of the costs, social value could be maximised through universal provision – regardless of individual means. Influenced by Keynes, these collectivising tendencies led to the aggregation and nationalisation of key industries including energy during the 1940s and post-war period. Recently, the trend towards a re-municipalisation of public infrastructure, is captured in Mazzucato's [93] notion of an 'entrepreneurial state'. Although most prevalent in Germany and France, municipal authorities have sought to take back control of various elements of essential infrastructure, including both energy supply and distribution [91]. Such ideas are mirrored in a resurgent scholarly interest in institutionalist critiques of capitalism and the neoliberal model of public service provision [43,44,94].

Consequently, municipal prosumerism has representative democracy and distributive justice at its core, emphasising the social value and the socialisation of its costs, alongside sovereignty of the citizen. Here, prosumerism facilitates subsidiarity over energy planning and decision-making by absorbing the governance of energy systems within local democratic institutions [67,95]. The emphasis on social value broadens the narrower focus on shareholder value and consumer choice, to deliver wider objectives of public health, poverty alleviation and local economic development [20,96]. The delivery of these outcomes is therefore delegated by citizen prosumers to an elected authority, who manage the transition to a more sustainable energy system on their behalf. Clearly, the success and consent for this transition is contingent both on the capabilities *of*, but also trust *in*, local democratic institutions.

2.3.3. Community value logic

The *community value logic* has its origins both within the cooperative and more recent 'new age' movements which emerged alongside 20th century environmentalism. Early forms of civic participation during the industrial revolution and Victorian cooperative movement were based on the concept of one member one vote and the retention of surplus economic value amongst workers [9]. Therefore, the antecedents of the movement were similar to the origins of state-led socialism. However, vacillations between free market capitalism and authoritarian socialism, alongside a growing environmental awareness, led to a distinct philosophical tradition emerging in the late 20th century. Thinkers such as E.F. Schumacher criticised the centralising and dehumanising tendencies of both corporations and state bureaucracies, and instead advocated smaller units of organisation and decision making in 'Small is Beautiful' [97]. This distrust of governing elites and a desire to adopt smaller and flatter forms of organisation is observed in the experimental communities which characterise the new age movement [34,40]. The work of Elinor Ostrom on common pool resources [98], has further argued that small 'polycentric' forms of governance have for centuries been an efficient means of managing these resources through co-operation and trust-based relationships, breaking down the old dichotomies of market and state.

Such approaches therefore adopt a logic of direct democracy, local and socially-mediated forms of value creation and the characterisation of agents as active stakeholders. Unlike the more collectivising tendencies of state-led systems, communitarian approaches emphasise the sovereignty of small groups of individuals who form advocacy coalitions of the willing [77]. This emphasis on localism and community agency, is contrasted by the individualism of the market-led paradigm, and the homogenising paternalism of the more statist municipal paradigm [99]. When viewing community prosumerism through this lens, we observe a tendency towards autarky [34], with communities seeking to 'island' themselves from wider systems of energy consumption and production, dismantling hierarchical organisation. While these 'social enterprises' hope to democratise energy systems, they often retain a profit-seeking motive in the form of community shareholding and

Table 2
Conceptual framework for three paradigms of prosumerism.

	Market paradigm	Municipal paradigm	Community paradigm
Theory of value	Value is determined by market prices and is translated into shareholder value. Intangible values are expressed in monetary terms or are ignored.	In addition to financial value the state seeks to facilitate intangible social value or 'public goods' such as public health, environmental and economic development. Intangible value may not be monetised, although policymakers develop 'objective' and universal understandings of intangible value.	Value is derived from community benefit. Whilst this includes social value, these intangible values are nested within specific attachments to communities and an emphasis on local context and are therefore treated subjectively.
Theory of agency	Prosumers exercise sovereignty through purchasing decisions and participation in prosumer energy markets.	Through processes of representative democracy, prosumers are able to exercise sovereignty as citizens and voters.	Prosumers exercise sovereignty through direct and participatory democracy. Prosumers are therefore viewed as stakeholders.
Theory of change	Utility maximising prosumers seek to optimise their welfare in competitive markets through price signals. Entrepreneurial firms respond to these signals through new product and service offerings.	Local governments direct change on behalf of prosumers/users through democratic processes and public bureaucracies. Citizens exercise preferences through political parties and regular elections.	Proactive citizens form advocacy coalitions to direct change through grassroots prosumer initiatives. Change occurs locally and is geographically and culturally contingent.

dividends [10]. Therefore, this paradigm typically advocates a variant of capitalism [100], rather than a radically new form of economic organisation [101].

These three overlapping value logics are depicted in Table 2. These paradigms differ in terms of their theory of change, the nature of the value that is emphasised and how prosumers exercise agency within these systems. While real-world examples are unlikely to conform to a pure version of a particular paradigm, in the rest of this paper we explore how these competing normative dimensions are manifested in different forms of governance and in turn business models adopted by market, municipal and community energy actors.

3. Methodology

To understand the relationships between governance, business models and underlying value logics, a comparative case study research design was adopted. The aim was to compare and contrast three types of market, municipal and community energy actor, delineated by their mode of governance. Thus, we categorised these groups *a priori* using Creamer et al's [72] and Avelino and Wittmayer's [25] disaggregation of market, municipal and community governance alongside Brown et al's [24] typology of prosumer business models. Subsequently a qualitative mixed methods approach explored how different business models create, deliver and capture value as well as normative understandings of value, agency and change within these respective organisations. This research design was deemed appropriate given the exploratory and interpretive nature of the paper.

Case study data was centred on the city of Bristol, UK. This included OVO Energy (market governance), Bristol Energy Company (municipal governance) and Bristol Energy Cooperative (community governance). Data included three stakeholder focus groups, eleven semi and unstructured interviews as well as documentary analysis.

The semi-structured and unstructured interviews were conducted from the winter of 2018 to the summer of 2019. Interviews were concentrated on prosumer organisations across the UK, between market, municipal and community sectors. Interview questions were designed to interrogate the nature of the business models adopted, how value is created delivered and how revenue was captured. Particular emphasis was placed on the three modes of governance outlined above, and how this influenced: the type of *value* that was created, how prosumers could exercise *agency* within the system and theories of how this *change* might occur. A further three unstructured interviews were undertaken with the OVO Energy, Bristol Energy Company and Bristol Energy Cooperative. These interviews were designed unpack these normative aims of the organisation, with particular reference to a new prosumer business model each was developing. A full interview protocol and interviewee list is provided in Appendices A and B.

The first in a series of three focus groups (June 11th, 2019), explored the challenges and opportunities facing prosumerism in Bristol in a post-subsidy landscape (32 attendees). These focus groups form part of a series of 'Living Lab' interventions in the PROsumers in the Energy Union (PROSEU) project. The events brought together a diversity of stakeholders including local government, community energy organisations, businesses, citizens, academia and the third sector including Bristol Energy Company, Bristol Energy Cooperative and OVO Energy. Results of the first workshop were then captured in a report and disseminated to workshop participants [102]. A second roundtable (November 21st, 2019) was centred on Bristol Energy Cooperative and the challenges of developing business and financing models for a private wire micro-hydro project in the city (7 attendees). A third workshop (December 6th, 2019) was delivered jointly with Bristol Energy Company and focussed on the challenges of developing domestic energy service business models (25 attendees). Full details of these focus groups is provided in Appendix A.

Subsequently, interviews were coded using the NVivo 12 qualitative analysis software. Primary data analysis was complemented by a number of academic and grey literature sources which helped both in the conceptual development of the paper [6,13,14,103–105], as well as providing further detail on the empirical case studies of the three Bristol organisations [4,15,106,107].

4. Prosumer business models– exploring three modes of governance

The following section sets out the findings from the three case studies within the Bristol energy scene. We first describe the nature and history of the organisation, before providing an account of the novel prosumer business model the organisation is pursuing. We focus specifically on how the governance of the organisation influenced the preferred business model, alongside the prospects for the business model within current institutional and market arrangements.

4.1. Market governance – OVO energy

Headquartered in Bristol, OVO energy were amongst the first and are now the largest of the 15 or so 'challenger energy' companies in the UK. Founded by CEO Stephen Fitzpatrick in 2009, OVO now has approximately 1.5 m customers and is valued at ~£1bn (although its stock is not traded publicly). OVO's *modus operandi* has been to increase its market share through improved customer service and lower prices via a range of transparent and flexible tariffs. OVO are also heavily active in the energy transition having acquired a number of energy technology start-ups and are involved in public-funded trials surrounding smart grids, electric vehicles and low carbon heat systems. Most saliently, OVO also acquired VCharge – a flexibility aggregator and platform developer - in 2017. Now rebranded as 'Kaluza', this arm of OVO is developing prosumer business models around the aggregation of flexible demand and generation assets (PV panels, heat pumps, home batteries, EVs) or a 'virtual power plant' - delivering balancing and flexibility services to the electricity system, alongside technology retail offerings. OVO recently received £200 m in investment from the technology giant Mitsubishi, and as of September 2019 purchased Scottish and Southern Electric's (SSE) retail arm – making them the second largest energy supplier in the UK.

4.1.1. Business model: domestic aggregator

Domestic aggregator business models involve the direct load control of flexible demand and storage assets, complemented by local forms of electricity generation, such as PV panels. Through network effects and control algorithms, aggregator platforms – such as Kaluza's – optimise and control prosumers energy assets in real time. This is seen as a major growth market for the firm in a distributed energy future:

> *"due to … increasing amounts of renewables on the grid we … saw [this] huge opportunity in developing an aggregator in-house [with] this functionality."* (Flexibility Service Provider #1).

> *"If we do crack this and do become… the first player in this then there are huge advantages to that"* (Flexibility Service Provider #2)

These business models deliver significant engineering value to the electricity system by avoiding expensive and carbon intensive reserve generation. Creating value for the wholesale, balancing and ancillary markets, these models may therefore access significant sources of new revenue:

> *"all the opportunities and all the value that's created comes from value available in the wholesale markets, inter-day spreads and the balance markets… driven by… renewable output."* (Flexibility Service Provider #2)

Key to accessing these value streams are network effects, where a large number of flexible assets can be controlled and dispatched in real time – often referred to as the virtual power plant concept. Therefore, in

a similar manner to traditional energy retail models, these business models necessitate aggregating a large number of customers, and an emphasis on scale and market share:

> *"you have to build the scale … before you start to look at network value, you can't do it the other way around. So [with]… more EV's… more batteries… more connected heat propositions… you will start to see the value unit go up because you can start to produce something meaningful"* (Flexibility Service Provider #2)

OVO intend to grow this customer base through *"an integrated offering… [involving] some hardware and a proposition around some other benefits and the value [from] the optimisation of their energy consumption."* Therefore, these models retain the traditional relationships between energy supplier and consumer and are largely consistent with the current retail market design.

> *"a supplier [has] a customer relationship which allows us to try and sell the devices that we want to connect through… those customer relationships… act as almost a kind of a sales channel for us to acquire more load."* (Flexibility Service Provider #2)

This market-led prosumerism therefore seeks to maximise financial value, primarily through the provision of services to the electricity system as well as reduced costs and improved experience of customers. Such value is easily capitalised in the share price and can lead to significant inward investment, such as a recent £200 m equity stake from Mitsubishi [108]. The firm's strategy is therefore consistent with similar high-growth firms in the technology sector:

> *"We have basically acquired a start-up kind of system, but we had the money of a big company behind us."* (Flexibility Service Provider #1)

The long term goal is likely to be an initial public offering (IPO) and the continued maximisation of shareholder value. Despite their successes and increasing scale, the interviewees conceded that the firm was unlikely to invest in wider forms of social value, such as fuel poverty alleviation, unless a clear business case could be made:

> *"Being a profitable company has massive advantages in terms of our… development but… it also limits you to do things that need to be profitable… going forward."* (Flexibility Service Provider #1)

Although certain aspects of the UK's current electricity market regulation are hindering the development of the business model, OVOs corporate governance and profit orientation are well supported by the existing regulatory and institutional environment. This is likely to lead to continued growth and increasing market share through a prosumer-led offering, operating within the bounds of the existing electricity market structure. Consequently, the existing selection environment was seen as largely favourable to the market governance of prosumerism.

4.2. Municipal governance – Bristol Energy Company

Bristol Energy are one of the UK's emerging municipally-owned energy companies, alongside Robin Hood energy in Nottingham, Cheshire East Council and several niche municipal ESCOs [14]. Like OVO, Bristol Energy seek to challenge the UK's 'big six' energy companies, although with an explicit focus on the city as its core customer base. Indeed, as of August 2019 they have 100,000 customers – with the majority based in a city of only 463,000 – a significant market share. Although localism has been core to the organisation's brand, their stated aim is to address issues of fuel poverty and deprivation through a focus on affordability, home insulation programs and supporting vulnerable consumers. Although operating a for-profit model, Bristol Energy will recycle any profits into the wider council's budget and must also repay their initial £27 million start-up funding.

Bristol Energy have also been heavily involved in the cities' low carbon transition: offering favourable power purchase agreements (PPAs) to small renewable generators alongside a route for the councils investment in low carbon infrastructure through Bristol's £1bn 'City Leap' programme [106]: "so we are going to invest in [small scale hydro scheme] because it's the right thing to do… using our… additionality fund which comes from our green tariff customers" (Municipal Energy Company). Alongside these activities, Bristol Energy have been involved in an innovative trial with the UK's Energy Systems Catapult to develop an 'energy-as-a-service' business model. It is hoped than in time this business model will develop into a full prosumer offering, with low carbon heating systems and solar panels offered to customers on long-term energy performance contracts. However, the current energy system regulation and wider institutional norms are presenting challenges in moving beyond the trial stage.

4.2.1. Business model: energy-as-a-service

Energy service business models are predicated on selling customers energy services (temperature/comfort, hot water, electricity) rather than units of primary energy and conversion hardware (kWh of gas, biomass and boilers, heat pumps and PV panels). These business models instead transfer the responsibility for system efficiency onto energy service companies (ESCOs). This creates economic incentives for maximum system efficiency, and the installation of insulation measures and energy conversion systems with a low marginal cost of generation, such as heat pumps and PV panels. These business models are often partnered with long-term financing of measures and equipment and may thus be offered at no upfront cost to the customer.

Bristol Energy have expressed interest in this business model, specifically for its potential in overcoming the dual challenges of high energy bills and climate change. During the current trial of the 'heat-as-a-service' model, homeowners are offered a flat rate tariff based on the internal temperature of their home. Through a series of energy monitoring devices, the trial aims to generate data on occupant behaviour and heating system operation, for future refinement of the offering.

The long-term objective is to reduce household expenditure through the energy efficiency retrofit of homes and the introduction of low carbon heat sources and PV panels. Here the municipal ESCO offers a single tariff based on agreed comfort levels and volumes of electricity and hot water. This business model is already being trailed by another municipal housing authority in Nottingham, as part of the Energiesprong initiative. Here the focus has been on social housing, with an improvement in occupant health and wellbeing having an equal footing with energy savings:

> *"people living in cold draughty homes and with… high energy costs, there being no* [current] *credible… solution to hit where we need to be in terms of an 80% or greater* CO_2 *reduction… I think as personal ambition that keeps us kind of straight."* (ESCO Intermediary)

Therefore, these business models place greater emphasis on social value, and the distributional benefits of energy transitions. This is in no small part due to the objectives of local authorities to facilitate social value and public good objectives. Hence, Bristol Energy introduce 'public sector values' into an energy sector dominated by shareholder owned multinationals. Additionally, a business model predicated on improved comfort, health and wellbeing for vulnerable customers alongside the adoption of DES through redistributive means, demonstrates a distinct normative vision. Thus, municipal prosumerism is a means of socialising the costs and benefits of energy transitions to deliver more equitable and socially-just outcomes. Both the Energiesprong and Bristol Energy examples have focussed on the social housing sector, where social value can be maximised through business models which involve the most vulnerable members of society – citizens who would otherwise be excluded from becoming prosumers.

However, these municipal variants of prosumerism face significant challenges; both in terms of existing electricity market regulations and the wider institutional context. Current UK electricity market regulations give consumers the right to switch energy supplier within 28 days. This requirement is significant risk for business models predicated on a

long-term energy service offering, where the costs of measures and fabric improvements are paid off gradually. Further, current state aid requirements actually prevent Bristol Energy from acting as the preferred energy supplier for municipally-owned buildings and energy assets in the city. Equally, unlike other EU states and the USA, municipal authorities in the UK face significant restrictions on their ability to borrow for infrastructure projects, hampering their entrepreneurial ambitions.

Consequently, much of the existing energy market regulation and wider institutional conditions present challenges for municipally-driven variants of prosumerism. Alongside these structural issues, a range of cultural factors also present challenges. Several of the workshop participants, cited the £27 m funding for Bristol Energy as 'a waste of public money', and used common tropes of the 'inherent inefficiency and wastefulness' of the public sector. Although many other energy start-ups remain unprofitable, the entrepreneurial and speculative actions of the city council were viewed by some as an inappropriate use of council tax funds, despite the company exceeding its targets for customer base in its first few years:

> "'wasting the council's money… people have that opinion, it's not something I hear a lot but… any time it's to do with 'my taxes' then yeah everyone has an opinion… we are… very aware of where our money comes from and we are all committed to making good on that investment"
>
> (Municipal Energy Company)

4.3. Community governance – Bristol Energy Coop

Bristol Energy Coop (BEC) are one of the larger actors that emerged during the UK's community energy boom of the early-mid 2010s. Formed in 2011, BEC have delivered almost £10.3 million of investment in community-owned solar schemes, including rooftop arrays on community buildings in the city as well as some larger solar farms. Governance of the Coop is based on a membership who make key decisions and on the basis of 'one member, one vote'. Historically, BECs business model has been based on power purchase agreements (PPAs) with the host site (often originally receiving the power for free), alongside generous subsidy payments through the UK's FIT scheme. BEC have raised funds through a series of community share offerings, where multiple small community investors can purchase shares through the crowdfunding platform Ethex, with returns of 4–5% typical.

However, In April 2019 the UK government ended its FIT scheme and also closed the export tariff which guaranteed prices for exported power. These policy changes have presented a major challenge to the business model of community energy groups. Although the capital cost of renewable energy has come down significantly since the FITs were introduced, long payback periods combined with uncertainties surrounding the level of self-consumption has rendered many projects uneconomic. In response, community energy actors such as BEC have been exploring new business models, which allow for greater self-consumption of renewable generation 'behind the meter'. Two related models that are gaining increased interest are private wire and microgrid arrangements.

4.4. Business model: private wire/microgrid

Private wire/microgrid business models share generation and subsequent consumption behind the metre – effectively limiting the use of the public network. Private wire arrangements typically involve a single generation asset, while microgrids involve multiple small nodes of generation and consumption. What these models share is a privately-owned distribution network and an emphasis on 'islanding off' prosumers from the wider grid as far as possible.

BEC now have planning permission for a small micro-hydro scheme at Netham Weir in the city, involving a 360 kW 'Archimedes screw' design and a private wire arrangement with a food storage warehouse. Many other community energy actors are also expressing an interest in developing microgrids on community housing schemes:

> *"We [were] just struggling to find a model… because they've got 20 [electricty] meters and the housing Coop pays all the bills, so we don't have to worry about billing. It's great because that's a big source of risk if we were individually billing. That's where we want to do the microgrid"* (Community Energy Company #1)

The core value proposition of these business models is local value retention, maximising revenues for the parties involved including the community shareholders. Alongside financial value, many community energy companies have sought to redistribute surpluses to 'worthy local causes' including fuel poverty programs and other community projects:

> *"I would say the motivation is different. I think there's still a big focus on getting renewable energy generation installed and combatting fuel poverty. And then there's also the sustainable economy aspect"* (Community Energy Company #2)

Central to this understanding of value is the communities' *agency* in the decision-making process and an emphasis on building a grassroots movement:

> *"I think a lot of the value in community energy is the social aspect of it, whether that be increasing awareness of renewable energy or the educational aspect of having solar panels there for people to be able to see first-hand."* (Community Energy Company #2)

However, several interviewees highlighted the challenges of measuring and therefore justifying these more intangible and speculative forms of value:

> *"Yeah so this is really a discussion that is ongoing in the world of community energy, how do you measure the performance of a community energy group?... I think especially in terms of how policy's supporting community energy there's a big mismatch in terms of valuing it socially rather than purely based on the financial incentives."* (Community Energy Company #2)

Thus, traditional metrics used in policy analysis often fall short of capturing the value that participants place on their agency in being involved:

> *"everyone said something about democratising energy. Could they condense it into an outcome? They all said something about diversifying ownership and… enabling people to participate in a transition. It was a shame because what I couldn't then do was say, 'Okay, well crystallise that into something measurable for me please'."* (Community Energy Company #1)

Community energy actors therefore place strong emphasis on direct democracy, despite the challenges this brings in decision-making:

> *"they've got very good governance, but I think the problem is because it's voluntary… meetings and stuff take a long time to happen and it's almost like, not by majority, but 100% sort of have got to sort of say, 'Yeah, we're up for it'."* (Microgrid Developer)

A key issue for these business models with their emphasis on self-sufficiency, is the extent to which they rely on, and therefore pay for, the wider electricity system. Much of the microgrid concept is based on avoiding use of system charges (UoS) which are currently charged volumetrically, contributing a significant portion of energy bills:

> *"that's great because that then means that they can start to use storage and generation to actually try to mitigate some of those charges"* (Microgrid Developer)

However, the UK's energy regulator Ofgem is currently reviewing this and are minded to adopt fixed UoS charges. Such moves relate to concerns that as numbers of behind-the-metre prosumers increase,

fewer and fewer non-prosumers will be paying for a larger and larger share of these charges – the so called 'death spiral effect'. This highlights a wider philosophical debate on the extent to which prosumerism represents a benefit to a privileged few, with the social and financial capital to invest, at the expense of the wider energy bill paying public.

5. Discussion

This paper has outlined how three contrasting forms of market, municipal and community governance, lead to different outcomes for a prosumer led energy transition. In turn, these competing visions of prosumerism emphasise divergent forms of value, which are inherent in the normative orientation of these modes of governance. Drawing on our case study of Bristol, we now discuss these findings in the context of the wider value logics upon which these alternative visions are based. We further describe how the existing selection environment may favour certain modes of governance foregrounding alternative theories of *value, agency* and *change*. Our findings suggest that these competing normative visions represent a 'contested space' for the future direction of prosumerism, which has been under appreciated in the largely technocratic scholarship of the phenomenon to date [7,37,109–112].

5.1. Theory of value

By applying a normative lens, this paper highlights what Laasch [23] describes as plurality of 'value logics' which inform the market, municipal and community paradigms of prosumerism. The case of OVO and Kaluza highlights how the market paradigm views prosumerism essentially as an extension of consumerism, with an emphasis on price signals, consumer choice and shareholder value. Skeggs [113] outlines how this primacy of capital and economic value has subsumed most aspects of contemporary life. Sociologists and political economists thus argue this logic intervenes in our intimate social relations [114,115], controls our sense of time [116,117], and shapes our imagined futures through complex relations of credit and debt [118–120]. In energy transitions, this implies that responses to climate change, such as prosumerism can be understood as a form of 'market transition' [121]. Framed in this way, prosumerism is a mechanism for energy suppliers to offer new products and services and an opportunity for investors to increase profits – perhaps with an intangible sense of having somehow also done something 'good'.

Our findings suggest that this conception of value remains dominant in discussions of energy systems and extends to discourses on prosumer futures. Thus, the market *values* of prosumerism are increasingly reflected through the *value* that financial markets place on actors such as OVO – at a time when most energy suppliers have shrinking balance sheets [122]. In this view, value is derived through the immaterial activities of financial markets, their platforms and instruments of exchange and circulation – what Davis [123] refers to as 'speculative value'. This speculative value privileges the intangibility of 'the new' and the excitement of 'imagined futures' over the material reality of production and consumption [118,124] meaning that new and unproven companies are suddenly worth billions on global stock markets [123,125,126]. As we argue above, the focus of market governance on maximising shareholder value, and the anticipated future yield of market opportunities, appears better for investors and increasing market share than it does for achieving wider normative aims.

By contrast both Bristol Energy and BEC emphasise broader and more intangible forms of *social value*, which are inherently subjective and difficult to quantify [127]. When reviewing these forms of municipal and community governance, our findings also suggest that conceptions of social value are themselves contested [72]. Bristol Energy espouse traditional public sector understandings of social value, surrounding a 'socialised' and democratically-mediated response to issues such as inequality, deprivation and climate change. Following Hall and Foxon [46], municipal approaches therefore view social value as something that can be defined and addressed primarily thorough a delegated authority, who emphasise the universal provision of essential services and prioritise those most at need. These tendencies are subsequently reflected in the selection of energy service business models which 'de-responsibilise' the individual and instead seek to deliver comfort, health and wellbeing instead of consumer products and energy commodities [91,95].

Community energy actors also espouse social value objectives, although tend to pursue value embedded within discrete geographical locales or specific communities of interest. Thus, the adoption of microgrids and behind-the-metre forms of prosumerism reflects a more independent, anti-bureaucratic and libertarian set of values [34]. These understandings thus giving primacy to locally-derived solutions and local value creation and distribution. As outlined by Lent and Studdert [99] this community value paradigm thus emerges from a distrust of the amoral tendencies of markets and the homogenising and paternalistic tendencies of the state. Critics of this position argue that this understanding of value tends towards parochialism and an exclusionary and regressive means of governing energy transitions [75]. Thus, profits and control accrue to a new class of 'prosumer capitalists' who come from a narrow demographic, age and ethnic groups.

5.2. Theory of agency

Market prosumerism sees prosumers exercise agency through their purchasing power in liquid and competitive energy markets. Here, domestic aggregators such as OVO/Kaluza develop novel product and service offerings, retaining the traditional supplier-consumer relationship. This perspective characterises humans as profit-maximising economic agents, who express their preferences through purchasing decisions – 'voting with their feet'. Following marginal utility theory [85], this concept of agency posits that prosumers improve their welfare through competitive markets and product choice. However, evidence from the energy liberalisation era challenges these assumptions, with few consumers switching suppliers [128], resulting in oligopolistic trading practices [56]. Whether these trends will continue a prosumer transition remains to be seen. Notwithstanding, our findings suggest markets are already placing a significant speculative value on market prosumer actors such as OVO.

Municipal variants of prosumerism, instead view prosumers as 'citizens' and foreground processes of representative democracy. Thus the re-municipalisation movement, facilitates 'energy democracy' [76–78] at the ballot box and Bergman and Eyre's [129] collectivised ideas of 'energy citizenship'. Here, energy planning and the provision of energy services is delegated to locally-accountable democratic institutions. This leads to business models which place less emphasis on individual choice and instead collectivise responsibility for delivering essential energy services – through standardised offerings with pre-determined levels of comfort under long-term contracts [67]. Such models contradict existing electricity market regulation, designed to promote switching between suppliers [20] and represent a wider philosophical departure from the logic of 'markets know best' which has characterised the energy liberalisation era [94].

By contrast, community energy models emphasise direct democracy and the sovereignty of individual communities of place and interest [77]. This understanding of agency abandons centralised, hierarchical governance, in favour of 'polycentric' forms. Drawing on these ideas, Goldtau [40] argues that distributed and prosumer energy systems, share many of the features of Ostrom's [98] 'common pool resources'. In this view prosumerism is best governed though locally-constituted and independent networks of community participation. Here, local context and subjective values can be best accommodated by small groups often acting independently of each other [40]. This view, places self-sufficiency and community values ahead of more holistic and uniform 'societal solutions' to social problems [72]. Such understandings of agency manifest in the pursuit of business models such as off-grid, private wire

and microgrid solutions, which pursue autarky, even at the expense of wider energy system function.

5.3. Theory of change

The nascent prosumer transition represents an unprecedented change to the material character of energy systems. Proponents hope this will be accompanied by complementary social and institutional changes. In this paper we argue that these changes cannot be implicitly assumed to occur without concerted structural and political action. Hence, the existing regulatory landscape and wider selection environment lead to 'institutional isomorphism' [130]; where energy regulation, financial institutions, state aid rules, cultural norms and industry narratives act as a homogenising force; tending towards existing modes of governance and understandings of value. Consequently, by combining our discussions of value and agency we discuss these alternative theories of change, and the extent to which they are likely to be successful in the current institutional context of the UK.

Market led variants of prosumerism view change as occurring largely within the confines of existing energy market structures. Although policymakers may facilitate this transition by fixing 'market failures'; this vision of prosumerism is associated with limited social and political upheaval in liberalised market economies. Transition is therefore largely delivered through Schumpeterian 'creative destruction' with 'disruptive' firms, replacing incumbents through 'Darwinian' competition [131]. Such understandings are also present in contemporary literature surrounding socio-technical transitions [76]. Here, social and institutional changes surrounding distributed and prosumer energy transitions are often characterised as facilitating technological innovation, rather than something worth pursuing in their own right [132]. The findings of this paper tentatively suggest that market-led variants of prosumerism are likely to be most successful in the existing selection environment.

Advocates of municipal prosumerism, instead foresee a transition towards locally-governed and publicly-owned energy service provision; requiring major structural and institutional changes to be realised. These include a new role for municipal ESCOs [62], radical reform of energy markets [45], and greater financial and fiscal authority for local authorities to overturn dominant neoliberal cultural norms [68]. As argued by Mazzucato [93], tropes of the state as inefficient, cumbersome and un-innovative are perhaps the most pervasive impediment to this 'municipal socialism'. Thus, actors such as Bristol Energy are forced to emulate the practices of conventional energy suppliers, despite their social value objectives [20]. In time advocates hope that concepts such as energy service models can begin to challenge the dominance of the market paradigm. However, UK municipalities face significant structural challenges in developing prosumer business models against an ongoing backdrop of austerity and privatisation [45].

The community energy paradigm is perhaps the purest embodiment of the 'third wave' of capitalist development as originally conceived in Toffler's concept of the 'prosumer' [26]. Here, prosumers not only take responsibility for the physical provision of energy services, but also become central actors in the governance of energy transitions. Thus, locally-contingent understandings of value and the sovereignty of small groups of active stakeholders shape the nature and direction of such transitions [40]. However, unlike the municipal paradigm which utilises the existing organs of representative democracy, community energy initiatives are symptomatic of a wider mistrust in the effectiveness and transparency of public institutions [133]. Thus, as Creamer et al. [72] argues, the value of community energy is predicated on the 'community' having the best interests of its polity at heart – despite the lack of checks, balances and accountability which characterise the traditional public sector. Sud et al. [133] critique this emerging reliance on community-led solutions and 'social enterprises' as a means of solving social and environmental issues. They argue that the isomorphism inherent in capitalist systems leads to tensions between espoused social values and the demands of market forces, profitability and shareholders value. Indeed, our findings have outlined that the prosumer business models being pursued by community stakeholders, may in fact destroy value for the wider energy system, and disenfranchise vulnerable non-prosumers [75].

6. Conclusion and recommendations for future research

This paper aimed to shed new light on the future role of prosumers, highlighting how alternative forms of governance may lead to radically different outcomes for the nature and direction of energy transitions. In doing so we develop a novel conceptual framework, linking the concepts of value logics, governance and business models. Through a focus on three alternative forms of governance, we highlight how market, municipal and community variants of prosumerism exhibit different conceptions of value, understandings of agency and theories of change. We argue that these normative dimensions – often ignored in contemporary scholarship on prosumerism – will play a significant role in determining the shape and character of future energy systems.

While the case of Bristol - a frontrunner city in the UK's energy transition – is instructive, future studies should look to map these trends across different national or institutional contexts. Thus, the representativeness of arguments made here should be qualified by the relatively small sample size, and narrow empirical focus. Equally, the transferability of these findings for other national contexts, is dependant not only on their electricity market characteristics, but also their prevailing political economy. The UK as first mover in electricity market liberalisation has perhaps gone further than most in the 'marketisation' of its energy sector. Other countries with a more interventionist state, or stronger communitarian traditions may follow a different trajectory to that being observed in this study. Either way, the contemporary context presents an interesting moment to study of this directionality [134] of an increasingly decentralised energy transition.

We subsequently posit a number of concluding arguments and recommendations for future research, which aim to stimulate further research and debate in the emerging field of energy prosumerism:

- Prosumers are likely to play a crucial and enabling role as energy systems become increasingly renewable and decentralised. These trends will be accentuated by the increased adoption of smart home technologies, EVs and flexible demand side assets.
- The nature of these prosumer futures are, however, likely to be heavily shaped by the dominant mode of governance through which this transition is delivered.
- Current UK energy market regulations, cultural norms and the wider institutional context is likely to favour the dominant market governance paradigm – where prosumerism essentially becomes an extension of consumer choice.
- Market-led variants of prosumerism are therefore likely to focus on value that can be easily monetised, while municipal and community governance may foreground broader forms of social value and associated political and social change.
- A prosumer transition in which municipal and community actors are to play a significant role, will instead require wide-reaching cultural and structural changes. However, these normative visions of prosumerism are contested.
- These contested norms are reflected in the choice of different business models which market, municipal and community actors choose to adopt. Further these business models are likely to foreground alternative understandings of value, agency and processes of change.
- Therefore, broader forms of social value and institutional change are unlikely to occur without political and economic reforms that extend well beyond the purview of energy markets.
- Future scholarship should acknowledge these divergent value systems within the prosumer concept and place greater emphasis on the

how these relate to the governance of energy transitions more broadly.

Declaration of Competing Interest

Conflict of interest: the authors declare that they have no conflict of interest

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.erss.2020.101475.

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