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Carrots, sticks and sermons: Policies to unlock community energy finance in the United Kingdom

Matthew Hannon [a,*], Iain Cairns [a], Tim Braunholtz-Speight [b], Jeff Hardy [c], Carly McLachlan [b], Sarah Mander [b], Maria Sharmina [b]

[a] Hunter Centre for Entrepreneurship, Strathclyde Business School, University of Strathclyde, 16 Richmond Street, Glasgow, G1 1XQ, Scotland, United Kingdom
[b] Tyndall Centre for Climate Change Research, School of Engineering, University of Manchester, Oxford Road, Manchester, M13 9PL, United Kingdom
[c] Grantham Institute, Imperial College London, South Kensington Campus, London SW7 2AZ, United Kingdom

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ABSTRACT

Community energy (CE) represents a potentially critical means of accelerating a sustainable and equitable energy transition. However, in many countries, it is experiencing a period of stagnation, typically following the dilution or removal of supportive government policies. In the absence of substantive capital grant funding, attracting capital finance has become increasingly important for the CE sector but remains highly challenging to secure at scale. Policy solutions are therefore needed to unlock finance and catalyse CE sector growth.

To develop policy solutions to accelerate CE business model innovation that can unlock finance, this paper develops a newly synthesized policy instrument, innovation system and business model analytical framework. This is applied to the case of United Kingdom (UK), employing a mixed-methods approach that included a survey of 145 projects, 33 interviews and documentary evidence. To drive business model innovation and unlock CE finance ten policy recommendations are presented that offer an essential balance across three types of policy instrument: 1) financial incentives ('carrots'); 2) regulations and guidance ('sticks'); and 3) initiatives to support the dissemination of information ('sermons'). This recommended policy mix highlights the importance of striking a balance between financial and non-financial policies, and ensuring coverage across all innovation system functions.

1. Introduction

Community energy (CE) is commonly cited as a potentially critical means of delivering on both our net-zero and just transition objectives [1,2]. Community energy projects are initiated through grassroots and local stakeholder action, which are wholly - or partly - owned *and* democratically governed by citizens, and aim to deliver a range of environmental, social and economic benefits for a specific community [3,4]. CE's role in delivering a just, net-zero transition largely revolves around three core contributions: 1) unlocking low-carbon energy projects that may otherwise go unrealised [5]; 2) improving citizen trust and understanding of low-carbon energy [2,5–7]; and 3) empowering marginalised communities to take climate action, by providing them with greater control over energy infrastructure and any financial surplus they generate [2,6,8].

Despite its promise, we find CE continues to represent a niche international market for satisfying our energy needs. In many European countries, the sector has either stagnated or is in decline, with either slow growth or decline identified in the United Kingdom (UK), Denmark and Austria [9]. For example, in the UK, the growth in community owned electricity generation capacity was just 2.4 % between 2020 and 2021, compared with 81 % between 2016 and 2017 [10]. This sluggish growth is set against record-levels of energy investment and expansion across other parts of the low-carbon energy sector [11,12].

Alongside the dilution or removal of supportive CE policies [9,10,13], a common barrier to growth is a combination of the lack of capital grants and poor access to affordable capital finance [1,10,14–16]. This scarcity of finance has been attributed to CE's mismatch with the prevailing socio-economic paradigm [3]. This stems from CE being categorised as a form of 'grassroots innovation' [17], which prioritise democratic ownership, not-for-profit enterprise and a 'triple bottom-line' of economic, social and environmental value [18]. In contrast, the dominant free-market, capitalist paradigm champions investor control, centralised governance, scale and financial returns [3].

* Corresponding author.
E-mail address: matthew.hannon@strath.ac.uk (M. Hannon).

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Considering how damaging recent changes to some governments' energy policy regime have been to CE [9,10], there remains significant potential for new policies to dramatically improve the prospects for CE financing and sectoral growth. This could in turn fuel positive feedbacks that serve to transform the status quo and initiate broader structural changes in the energy system [19]. In this context, this paper adopts a pragmatic approach to unlocking barriers to CE financing in the short-to-medium term, examining policy recommendations that could be reasonably implemented within the existing socio-economic paradigm. Consequently, this paper answers the following question: which barriers are blocking UK community energy finance and how could government policy help to resolve these?

To address this question, this paper examines the case of CE in the UK. Empirically, the paper offers important insights for international policy-makers into strategies to unlock CE finance and wider sectoral growth. Theoretically, the paper makes an important contribution to the energy policy, innovation, finance and business model literature by presenting a newly synthesized analytical framework that supports the identification of policy mixes to unlock niche energy business model finance. This we expect will have utility beyond the case of energy too.

The paper is structured as follows. Section 2 reviews the literature on policies for financing niche, grassroots energy business models, with a specific focus on CE. Section 3 presents the paper's analytical framework. Section 4 outlines the methodology. Section 5 presents the results, outlining key barriers to CE finance and associated policy recommendations to unlock new finance. Section 6 discusses the paper's key findings and Section 7 concludes.

2. Literature review

Section 2.1 reviews the CE finance literature and explores policies for financing niche, grassroots energy business models. Section 2.2 considers the factors influencing the success of securing CE finance and policies that can help to support CE financing.

2.1. Policies for financing niche, grassroots energy business models

A business model represents the rationale of how an organisation creates, delivers, and captures value [20]. At the heart of the business model lies an organisation's value proposition, which is delivered through the content, structure and governance of eight buildings blocks [21], which can be loosely organised across three domains:

- **Operations:** *Key activities, key partners* and *key resources*
- **Customers:** *Customer relationships, customer channels* and *customer segments*
- **Finances:** *Revenue* and *expenditure*

Sustainable innovations are not simply limited to technologies but also include business model innovations [22], which are increasingly considered to be critical to driving and shaping sustainability transitions [23,24]. Business model innovation relates to experimentation with alternative business model architectures that create "superior customer and firm value by addressing societal and environmental needs" [25 p.1498], with an emphasis on a 'triple-bottom line' of environmental, social and economic value [18]. This process typically involves "adding new [business] activities, linking activities in novel ways or changing which party performs an activity" [21 p.41]. In short, business model innovation involves changing *what* a business does (i.e. content), *how* it does it (i.e. structure) and *who* does what (i.e. governance) [21], in a way that creates and/or captures more value for the business [26]. Akin to technological innovation, this may take the form of *incremental* innovation that represents small improvements to the performance of existing business models that are in keeping with the status quo, versus *radical* innovation that is fundamentally novel in character and constitutes a step-change compared to 'business as usual' [27,28].

Unfortunately, the majority of the incumbent energy business models we rely on to satisfy our energy needs typically champion least-cost and secure supply for customers, via the centralised and vertically-integrated governance of a fossil fuel supply chain [24]. Most profitable incumbents may have the capital but not the incentive or capacity to successfully transform their business models [29,30], instead focusing on incremental innovation to improve returns on 'business as usual'. Conversely, a growing number of sustainable energy 'triple-bottom line' business models are emerging but these remain niche, not least those that are civil society led and prioritise democratic ownership; commonly known as *grassroots innovations* [31,32].

Importantly, these sustainable, civil-society led energy business models will require significant financial support before they can achieve mainstream application [3]. Unfortunately, this is not always forthcoming and presents a key barrier to these business models' development and deployment [32,33].

Finance is defined here as the unearned flows of money into companies - typically taking the form of loans, bonds and equity - and are normally subject to repayment over time[1] [34]. Importantly, the prevailing investment criteria of the finance sector has co-evolved with unsustainable energy businesses and is thus at odds with niche, grassroots innovations, such as community energy, stymying their diffusion [3]. As such, "financial actors remain firmly locked into a mandate to maximize risk-adjusted returns and are thereby locked into a pattern of gradual change", and "the inertia of the financial regimes outweighs opportunities to spearhead sustainability transitions" (p.229) [35]. However, as Nykvist and Maltais explain, "when a tipping point in cost and market conditions is reached, and risk reward improves, finance actors are ready to scale finance throughout the transition" (p.230).

This therefore begs the question of what kinds of policy instruments can help to improve the risk-reward profile of emergent sustainable energy business models and see them unlock finance? Policy instruments constitute the tools of governance, designed to address policy problems [36]. They can be broadly categorised into three groups [36–40] (full framework in Appendix B, Table 6):

- **Economic (i.e. *Carrot*):** Pecuniary (dis)incentives that support desirable behaviour;
- **Regulatory (i.e. *Stick*):** A rule or guidance made and maintained by an authority, categorised as either 'soft' (e.g. guidance, voluntary target) or 'hard' (e.g. laws, regulations) rules; and
- **Information (i.e. *Sermon*):** Initiatives that support the dissemination of information that encourage desirable behaviour, such as education, knowledge exchange and foresighting.

These policy instruments sit within a wider policy mix, which accounts for how these different instruments interact, as well as their overall consistency, credibility, coherence and comprehensiveness [36]. The wider strategies and processes by which these policy mixes are implemented is also important [36]. In this context, it is important to consider how the likelihood of different suites of policy instruments gaining traction (see the Overton Window [41]) depends on the wider institutional context they're emerging within [42].

The constituent dimensions of the dominant political, social, economic and technological paradigm self-reinforce one another, serving to preserve or 'lock-in' the status quo, which is commonly referred to by transition scholars as the socio-technical regime [19]. Consequently, this regime typically encourages policy instruments that support or 'lock-in' rather than undermine 'business as usual' and incumbent firms - actors who have co-evolved with the regime - at the expense of niche business

[1] "Equity, which has no final repayment date of a principal, can be seen as an instrument with non-finite maturity" [34]. Finance here relates to repayable debt, excluding non-repayable subsidies such as grants, long-term revenue payments etc.

models [43,44]. As such, some policy solutions to support grassroots innovation finance can be more practicably implemented within some political economies versus others, which may first require a fundamental restructuring of the existing economic and political paradigm, before these solutions gain traction.

Importantly, policy instruments represent an important means of supporting sustainable business innovation [45] and constitute an integral part of any innovation system [46] designed to support their development and deployment. An innovation system is defined here as the: 'determinants of innovation processes; all [the] important economic, social, political, organisational, institutional, and other factors that influence the development, diffusion, and use of innovations' [47 p.182]. The four structural dimensions of these systems are: 1) actors, 2) institutions, 3) networks and 4) technology and infrastructure [48,49], which together support innovation system functions that are critical to the development and deployment of innovations [46,48,50] (see Table 2, Section 3):

- Knowledge development (F1)
- Knowledge exchange (F2)
- Entrepreneurial Experimentation (F3)
- Guidance of the search (F4)
- Resource mobilisation (F5)
- Market formation (F6)
- Legitimation (F7)

Innovation system functions have traditionally been applied as a framework for identifying technology innovation policies (see [51]); commonly known as technology innovation system (TIS) functions. The approach has helped uncover how policies may resolve blocking mechanisms or bolster supporting ones; each connected to different innovation functions [46,48,52]. However, to date there has been very little consideration of how innovation functions directly impact specific business models building blocks, nor how specific policy instruments (i.e. carrot, stick and sermon) could fortify innovation functions to support their development and deployment.

To arrive at policies that can help citizen-led energy business models to thrive, we require new analytical frameworks, which connect existing theory derived from the policy instrument, innovation system, business model and finance literatures. These must illustrate how policy interventions can affect change external and/or internal to sustainable businesses, in a way that can help them to secure finance. Currently, these four literatures largely operate independently from one another and the authors are not aware of any systematic attempt to connect them for the purposes of identifying policy solutions to unlock finance for niche, grassroots energy companies. In this context, this paper presents a newly synthesized framework in Section 3 and applies this to the case of financing community energy in the UK (Section 4), which we now briefly review the extant literature for.

2.2. Financing community energy

Regardless of size, it is not uncommon for CE projects to struggle to secure mainstream finance [5,53]. Section 2.2.1 explores the direct and indirect factors most critical to CE organisations' successful operation and by extension, their ability to secure investment. Section 2.2.2 subsequently reviews the extant literature for policy recommendations to support CE financing.

2.2.1. Factors influencing the scale of CE financing

2.2.1.1. Project scale and investor preferences. Communities tend not to have the unrestricted funds to cover project development and delivery work themselves. Consequently, they must consider high-risk finance; at least initially until they have established their own revenue streams [14,54]. Moreover, their projects are often small-scale, attracting a 'small project premium' from investors, making finance relatively more expensive versus larger schemes [10,14,54]. Scale thus has a direct influence on CE financing, because there is a mismatch between the small scale of CE projects and the large-scale projects that institutional investors typically desire [55]. For example, "*a £1 million deal is likely to have the same transaction costs as a £10 million deal*" [54], making them less attractive. Consequently, securing institutional finance is likely to be very challenging for smaller energy projects, i.e. below £20 m [14,56]; a threshold which almost all CE projects are under. Exacerbating this gap is the lack of state-backed banks that are prepared to provide this funding [5].

Project scale can to some extent be ameliorated by different communities coordinating their activities via intermediaries, which enables them to capture stronger economies of scale, bargaining power etc. [57]. The authors have previously referred to this coordinated approach to financing as a *collective diffusion pathway*, characterised by a confederation of individual CE organisations [3]. This approach has had a direct and positive impact on CE finance raising. Conversely, investors are not intimately familiar with CE [1,58], making its merits hard to assess [58], including its risk profile and potential for a return on investment.

More generally, there is a mismatch in the guiding principles and logic between CE organisations and institutional investors (Section 1). Incumbent investors are also typically unfamiliar with this business logic and therefore struggle "to identify the value-creating potential of social enterprise" [59 p.1630], especially those operating a not-for-profit model. Consequently, the capitalist paradigm has in the UK created a 'glass ceiling' that limits the overall level and type of finance accessible to grassroots CE organisations, thus stymying sectoral growth [3].

2.2.1.2. Resources, capital and skills. For many CE projects, *human capital* remains a significant challenge. Common issues relate to possessing sufficient time, skills and knowledge within the local community, to devote to the development and delivery of investable energy projects [5,53,54,60], as well as the ability to assume the associated liabilities [7]. Naturally, one solution to the lack of human capital is to out-source core business activities. However, this requires funding, and without it, communities are highly reliant on volunteer time [1,5,53,54]. This also relies on *social capital* and organisations' ability to identify and connect with partner organisations to cover any shortfall in internal capabilities [6,61,62].

Conversely, prospective CE partner organisations must also have the necessary capital (human, social etc.) to meaningfully engage as a partner. For instance, Local Authorities (LAs) are often identified as an ideal partner for CE groups but often lack the necessary capacity (e.g. staff time), capabilities (e.g. community energy literacy) or regulatory incentives (e.g. local energy supply procurement rules) to meaningfully engage with communities [2]. Another example here is that whilst CE groups often struggle to present project investment opportunities (e.g. technical, legal, financial and insurance) in a way that resonates with investors [5,54], it is also the investors who lack the relevant knowledge or capital to be able to assess its relative merits (e.g. risk profile, rate of return) [58], potentially restricting their appetite to invest.

A lack of *human capital* – either in-house or externally – also undermines a community group's resilience, whereby the loss of a single staff member or partner organisation can threaten its existence [5]. This in turn heightens their perceived investment risk-profile. Consequently, access to external professional knowledge and experience via intermediary organisations is important, especially the exchange of best-practice between community groups [6,63].

Finally, access to *natural capital*, sparticularly land to site technologies to capture renewable power (e.g. wind turbines, hydropower, solar panels), is also critical to the viability of CE energy projects [53,60].

2.2.1.3. Policy and regulation. Subsidies have played a key role in securing revenue for CE projects [53,60]. In particular, long-term revenue payments per unit of renewable energy generated have been critical to project delivery – most notably feed-in-tariffs (FiTs) - but their subsequent removal has been highly disruptive [2,5,53,60,62]. In the UK, the removal of long-term revenue payments, like the FiT, saw the number of CE projects generating a surplus fall from 90 % to 20 % [64]. These policy changes, alongside the removal of social investment tax breaks [2,58], have made it more difficult for community groups to develop projects that offer an attractive rate of return to investors, potentially making affordable finance harder to secure [64]. At the same time, government CE capital grants are often limited, placing a greater emphasis on communities to secure finance to cover upfront capital costs of energy projects [65]. In short, CE project finance has simultaneously become increasingly important but also to harder to secure [3].

The degree of complexity and volatility surrounding the energy policy landscape also has a critical influence on CE project success [5,53] and communities' ability to develop an investable project. The more complex and fast-changing the policy landscape is, the harder it is for organisations to make sense of, navigate and plan for. It also has a direct bearing on how investable CE is deemed to be as explained by Strachan et al. [15]: "the uncertainties of the RO compounded the unwillingness of UK banks to provide affordable loans to this part of the sector [66,67]" (p.101). In addition, policy coordination and coherence - across different layers of governance - is also essential to ensure that any supportive policies actually deliver a positive impact [62].

A lack of a supportive planning regime is also a major barrier [7,14,53], especially restrictions on certain types of decentralised renewables [68]. These include planning policies that make it extremely difficult and expensive for onshore wind projects to proceed [69], such as England's de facto ban on onshore wind [70].

"Planning requirements [are] disproportionately demanding for small-scale projects, as compared to large-scale developments" [57 p.145]. Interestingly, we find that technological evolution and the "scaling up" in the unit size of technologies (especially wind turbines) has placed pressure on the planning regime to counter adverse aesthetic impacts. This has raised the cost and complexity of obtaining planning permits, giving an advantage to large-scale commercial actors over communities, as they are more likely to possess the skills and capital to overcome these challenges [57].

A major regulatory barrier is the difficulty communities face in selling energy to local consumers [2,6]. Electricity supply licencing for smaller suppliers is regularly identified as the key issue here, but so too are procurement rules, for example those dictating supply to local councils. Associated with this access to market, is the high-cost of grid connection and access charges [5,14,53,71,72].

The type of legal structures community groups can incorporate also has an important bearing on the type and level of finance that can be raised [65]. For example, a cooperative or Community Interest Company (CIC) can raise shares, whereas a Charitable Trust cannot. Legal structures also dictate issues such as the way in which risks are managed (e.g. asset locks), the organisation is governed (e.g. one vote per share or shareholder) and how profits are taxed [65,73].

Finally, scholars have highlighted the importance of presenting a vision for CE in the context of the future of the wider energy system [62]. They are most powerful if they are: a) shared; b) formulated inclusively; and c) reflect multiple spatial scales (national, regional, local etc.) [62]. The authors have previously offered a variety of different co-created visions for the CE in the UK [74], which offer a vision of "a long term future where there is a thriving community energy sector".

2.2.2. Policy instruments to support CE and unlock finance

The academic and grey literature identifies a number of policy solutions that can support CE financing, with a focus on helping projects to overcome the barriers outlined in Section 2.2.1. These include, but are not limited to, those outlined in Table 1.

Table 1
Summary of existing policy recommendations to support CE investment.

Policy type	Examples	Reference
Public finance	• Government backed loans • Loan guarantees • Revolving funds for community energy projects, where repayments fund future projects • Grants • Long-term revenue payments (e.g. feed-in-tariff)	[1,10,14–16]
Non-repayable financial support	• Discounted grid connections • Investment tax relief • Capacity building grants for community organisations (e.g. skills training)	[1,2,10,15,16,53,54,58,62,68,75]
Regulation	• A right to local electricity supply • Mandatory share of community ownership for energy generation projects • Requirement for public bodies to procure a specific share of locally supplied energy for consumption • Simplified planning regime that supports community-owned, decentralised renewables • Legal structures for incorporating CE groups that encapsulate principles of CE but permit finance raising (e.g. shares) • Easy and affordable grid access • Laws that prohibit inefficient and polluting energy supply and consumption	[1,2,7,10,14,16,53,57,65,68,73,75]
Knowledge exchange and network formation	• Intermediary organisations that support access to skills/ knowledge and support sector-wide coordination.	[2,3,6,16,53,54,57,61,62]
Visioning	• Co-creating a shared vision of the role that CE can play in the future energy system	[62,74]

Table 1 outlines a host of existing research-based policy recommendations to support CE, with only some of these explicitly focused on finance. We argue that the research is lacking in four key respects. Firstly, the majority of CE policy recommendations appear in the grey literature of advocacy organisations, think tanks and government departments [54,58,68,76], raising questions about the rigour and/or objectivity of some non-peer-reviewed research. Secondly, many of these publications are outdated, with many published prior to significant policy changes, such as the discontinuation of UK revenue payments (e.g. FiT), new net-zero targets etc. Thirdly, with the odd exception [58], relatively little literature has dealt explicitly with

policies to unlock CE finance. Instead, it deals with policies that support wider CE activity, rather than their influence on finance. Finally, whilst academic research has examined CE policies (Section 2.2.2), as well as related work on innovative CE business models [64,77–79] and financing [3,64,80], little work has attempted to connect these two strands. Consequently, it remains a challenge to accurately assess which policy instruments might cultivate a more innovative environment for CE organisations, and in turn raise business model performance and their likelihood of securing finance. We explain how this paper serves to address these shortcomings in Section 3.

3. Analytical framework

For the purposes of identifying a suite of policy recommendations to explicitly support CE financing, this paper's analytical framework synthesizes three existing frameworks. These include: 1) a policy instrument framework (Appendix B); 2) the technology innovation systems (TIS) functions framework [46,48]; and 3) Osterwalder and Pigneur's business model canvas (BMC) [20] (Section 2.1). The fundamental aim of the framework is to help uncover how different *policy instruments* can bolster one or more *innovation functions* to support the functionality of the fundamental building blocks of innovate energy *business models*. In turn, this can improve business performance and make it more attractive to investors, thus raising the likelihood of it securing *finance*.

Some small but important changes have been made to the underlying frameworks to aid their synthesis and efficacy. First, the description of the TIS functions have been slightly adapted versus those outlined in Section 2.1, to offer a stronger focus on business model versus technology innovation (Table 2).

Second, we adopt the BMC framework outlined in Section 2.1, however we focus our analysis on eight building blocks rather than nine; excluding analysis of how innovation functions impact the Value Proposition (Fig. 1). The rationale is firstly that the other eight building blocks constitute inputs that deliver on a specific Value Proposition (i.e. the output). Our analysis examines how strengthening specific innovation functions can bolster these building blocks and in turn help fulfil the Value Proposition. The second is that, whilst the CE sector is not a homogenous group [64] and "community energy is not reducible to a single entity", the "civil society basis of the sector is fundamental to its character" [82 p.988]. In short, we assume that all CE groups broadly resemble each other in terms of their overarching mission statement of democratic ownership, sustainability, not-for-profit enterprise and local governance [3], which together form the core Value Proposition that is extended by CE organisations (see definition in Section 1). It is also worth noting how we frame finance as a *key resource* and not as *revenue*, given that it is not directly generate via the sale of products or services.

Third, we draw a distinction between *financial* and *non-financial* policies (Step B), as *non-financial* policy can still support TIS functions (e.g. legitimation), and these can still have an important influence on the financial domain and a company's prospects of securing finance. We also draw a distinction between policies that *directly* impact a specific business model sector (see Step C1) or indirectly influence it via changes to its broader environment (see Step C2). Bringing these together, Fig. 1 outlines how the analytical frameworks are connected, offering a step-by-step guide (steps A to F) for its application (Fig. 1).

To help illustrate the framework's functionality, we present a hypothetical worked example for a policy aimed at unlocking CE finance:

- Step A – The **economic (carrot)** policy is a capital grant for small-scale, community-owned renewable power.
- Step B – The policy is explicitly **financial** in nature.
- Step C – It **indirectly influences** power generating CE companies, by reducing the capital cost of all small-scale renewable power generation capacity.
- Step D – It **mobilizes resources (F5)** into CE groups, facilitating **market experimentation (F3)** and **knowledge development (F1)**. Funding from the state also serves to **legitimise (F7)** them.
- Step E - Capital subsidy reduces **expenditure (BB1)**, freeing up **key resources (BB5)** to support core or emergent **key activities (BB4)**.
- Step F – Reduced overheads, allow for a more diverse and/or well-developed portfolio of activities. This is attractive to investors, whilst government support also signals a growth area.

Table 2
Innovation system functions for business models (adapted from [46,48,50]).

Innovation Function	Is the process of strengthening…
Knowledge development (F1)	…the breadth and depth of a knowledge base, relating to improving a business model's performance.
Knowledge exchange (F2)	…the exchange of learning that relates to improving a business model's performance
Entrepreneurial Experimentation (F3)	…market-based experimentation with new business models to generate tacit knowledge (i.e. know-how) via learning by doing and learning by using.
Guidance of the search (F4)	…pressures that encourage actors to enter a particular market and guide the types of activities they undertake.
Resource mobilisation (F5)	…the mobilisation of financial, human and physical resources that support business model functionality.
Market formation (F6)	…the mechanisms that create the market architecture necessary for the business model to function within.
Legitimation (F7)	…the degree to which a new business model is trusted.

4. Methodology

This paper employs a mixed-methods approach to data collection. This includes a UK-wide survey of CE organisations during 2017/18 to examine the level and type of finance flowing into the CE sector against the different characteristics of these organisations (e.g. size, technology, legal structure) [64]. The survey sample cannot be considered truly representative of the entire sector but a significantly large and varied sample was taken. Overall, 280 organisations were contacted, 48 organisations completing the survey, who were involved in 145 projects; yielding a response rate of 17 %.

Data was collected from individuals participating in their capacity as board members or members of staff of community energy companies. They were offered the choice of completing an online questionnaire on their own, or having the questionnaire administered by a researcher over the telephone or video conference. Data collected directly by the authors was augmented with data provided under agreement with Community Energy England from their State of the Sector survey 2017. A more detailed account of the survey methodology is available here [64].

The authors also conducted 33 interviews, which are cross-referenced throughout as "IX, IY, IZ etc." (see Appendix A, Table 5). This included 14 in-depth semi-structured expert interviews focussing on sectoral level developments, as well as 19 interviews with individuals directly involved with establishing and running CE organisations, or those playing a supporting role such as investors, policy makers, and NGOs. A diverse sample of experts were identified for our interviews via purposive sampling (targeted contacting of pre-identified key stakeholders), complemented by snowball sampling (suggested contacts from our survey respondents and interviewees). Thematic analysis [83] of qualitative interview data was carried out using NVIVo software.

Finally, we examined documentary evidence from CE organisations and stakeholders, such as sectoral level reports, company accounts, share offers, presentations, etc. This was identified via three main sampling approaches: 1) directly targeting CE organisations' or other stakeholders websites for information and publications, identified via search engines and social media; 2) requesting non-confidential but non-public information from CE organisation staff, typically those involved in interviews and/or the survey; 3) searching public repositories for relevant reports (e.g. company accounts from Companies House and the Mutuals Public Register).

Integrating three separate strands of data collection provided greater

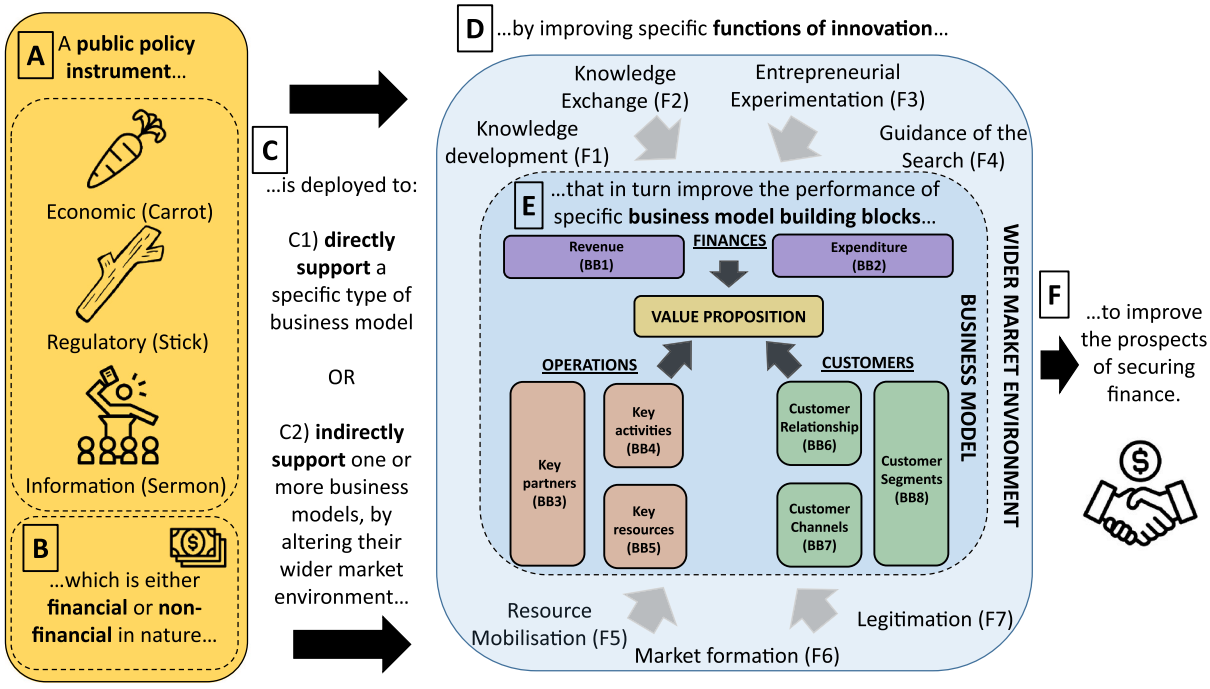

Fig. 1. Policy instruments to support business model financing.

depth and breadth of evidence, as well as offering an important means of triangulation. Synthesizing these data sources, the authors constructed four in-depth case studies of CE business models and finance. The case studies represent an intermediary stage of data analysis, where our different data sources have been synthesized to offer an in-depth and coherent narrative about CE organisations' experience of finance and government policy since their inception. The case study reports were reviewed by leading representatives of the case study organisations, reducing factual errors, lessening misunderstandings and providing additional comment and insights. These include the following:

- Brighton and Hove Energy Services Company (BHESCo) [84];
- Edinburgh Community Solar Cooperative (ECSC) [85];
- Green Energy Mull (GEM) [86]; and
- Gwent Energy CIC [87]

5. Policies to support UK CE financing

Our research points to how the removal of long-term revenue payments – such as the UK's FiT[2] and Renewable Heat Incentive (RHI)[3] has forced communities to experiment with new energy business models, in a bid to secure new revenue streams and unlock finance. Our case studies, survey and interviews (I15) highlight how they have diversified into three area of business model innovation versus the traditional renewable power generation model (Fig. 2):

A. Storage and flexibility;
B. Heat; and
C. Demand-side energy services.

Financing these innovative business models however remains a challenge. This section mobilizes the analytical framework outlined in Section 3 to identify innovation barriers and outlines ten policy recommendations to address these to unlock CE finance in the UK. We take care to connect these policies to their respective innovation functions and business model building blocks. These are summarised in Table 4.

5.1. Economic (carrot)

This section recommends a combination of low-cost state finance (Section 5.1.1), investment tax breaks (Section 5.1.2), sector-specific revenue payments (Section 5.1.3) and market experimentation grants (Section 5.1.4) for CE groups. A common concern that relates to all four policies is that some commercial organisations were posing as community organisations - such as some CICs - who were limited by shares and dominated by a few non-local shareholders (I8, I10). It is therefore essential that there is a robust definition of eligibility to access CE finance support (see Section 1). Any definition must tackle thorny issues such as what kinds of legal entities, voting rights, degree of local membership and scale are consistent with a "*community ethos*" (I9).

5.1.1. Policy 1: Low cost state finance and a joined up finance chain

5.1.1.1. Targeted barriers. State-backed finance, especially from devolved administrations, has proven critical to supporting CE business models. However, where state-finance was available to communities, the interest-rate of these loans was relatively high versus other sources of finance (I5) (Table 3). A good example of this is Scotland's Energy Investment Fund (EIF) (~7 %): "*[whilst] interest rates have dropped massively…EIF is offering you…around about 7-8% over a 10 year period*" (I11). The case of GEM illustrates how the community were able to access a £434,000 fixed-rate loan from Scottish Government at 7 % but were also successful in securing a variable rate loan of £500,000 from the Charity Bank at 5.25 %.[4]

The relatively high cost of state finance was explained as follows.

[2] Paid for between 20 and 25 years, for each kWh of renewable power generated (below a certain installed capacity), plus export tariff for supply to grid.

[3] Generation tariff over seven year term for small-scale renewable heat generation, running from 2014 to 2022.

[4] We acknowledge that fixed rate loans tend to be associated with higher interest rates as they offer less uncertainty.

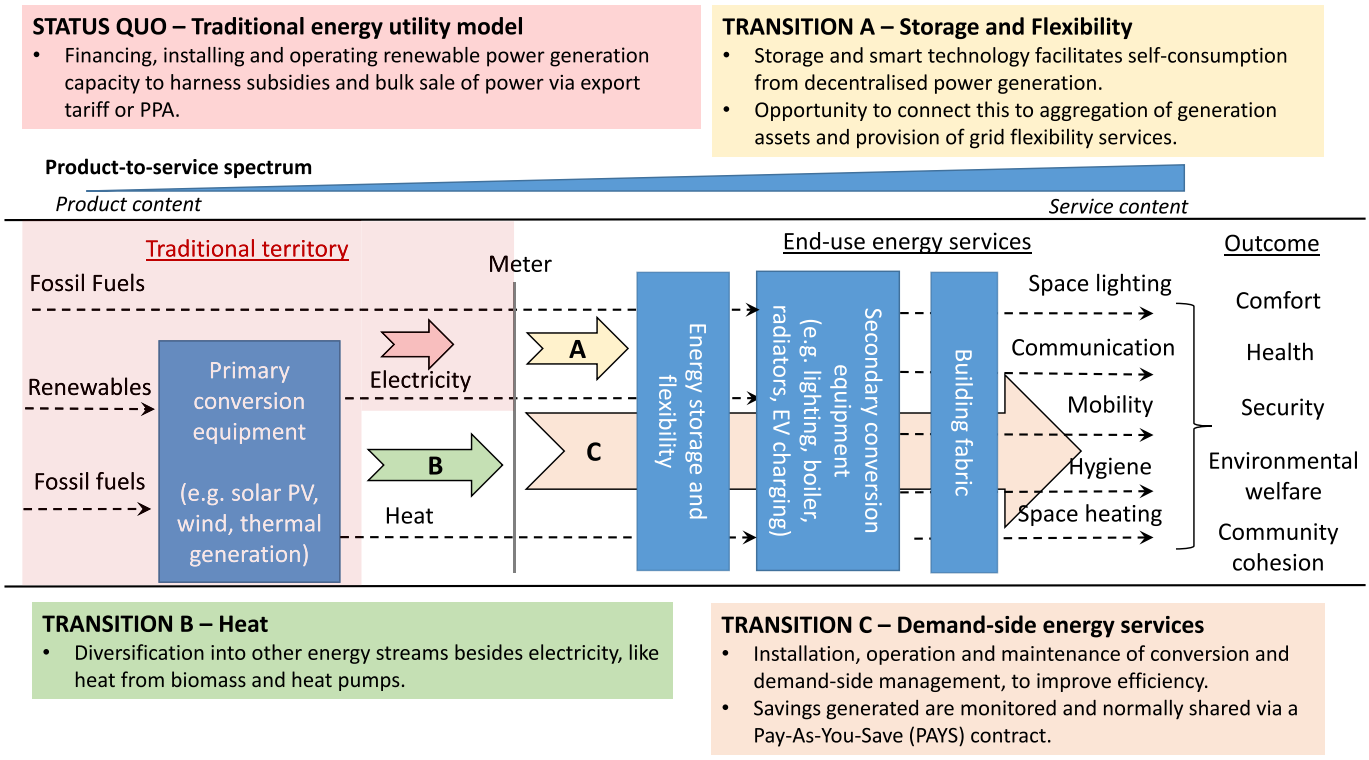

Fig. 2. CE business model experimentation [88,89].

Table 3
CE loans finance by source, size and interest rate (Source: survey and adapted from [3]).

Source of loan	Count	Count (share)	Amount (£)	Amount (share)	Average raised per loan	Mean interest rate per loan (unweighted)	Mean interest rate weighted by size of loan[a]
Public	7	18 %	£4,827,000	23 %	£689,571	7.9 %	7.9 %
Commercial[b]	10	26 %	£14,624,800	69 %	£1,462,480	4.3 %	5.8 %
Third sector[c]	6	16 %	£1,060,000	5 %	£176,666	3.7 %	5.5 %
Citizen	9	24 %	£174,925	1 %	£19,436	4.2 %	5.2 %
Directors	6	16 %	£452,850	2 %	£75,475	0 %	0 %
Total	**38**		**£21,139,575**		**£556,304**	4.2 %	6.1 %

[a] Calculation for weighting: [(size of loan 1 * interest rate of loan 1) + (size of loan 2 * interest rate of loan 2) etc. to loan n] ÷ [sum of sizes of all loans].
[b] Ethical lenders like Triodos, Charity Bank etc. are included in 'commercial'.
[c] The majority of these funds relate to charitable foundations making soft loans (e.g. lending to cover early project development costs, only have to repay if project gets built).

First, it is targeted at de-risking higher risk projects for a private lender (I2), and this risk is reflected in the price of the finance. Second, the state needs to offer finance at commercial rates, in order to avoid being counted as State Aid.[5] Finally, state finance is often provided as a 'soft loan', which can be written off if the project falters, with a higher interest rate designed to off-set some of the risk that some loans will never be fully repaid (I5).

Additionally, due to State Aid rules,[6] government is limited in how much financial support it can provide, especially for larger CE projects. Instead, they act as the minority lender, only "*invest[ing] where there is a demonstrable funding gap in a project's funding package*" [90]. This means that securing state finance is contingent on how much of the project's costs being covered by private finance. However, this is not always forthcoming given the finance sector's lack of familiarity with CE (Section 5.3.2) and appetite for large-scale projects (Section 5.2.1).

Finally, the CE finance chain is much better connected in some parts of the UK versus others, given its devolved governance. Fig. 3 outlines how Scotland and Wales[7] have a much better connected finance chain versus England, given the lack of a coherent funding regime from UK Government.

5.1.1.2. Policy recommendation. In light of these issues, we make several recommendations on state finance that support resource mobilisation (F5), by reducing the cost of finance (BB2). First, we recommend a detailed review of CE related State Aid. With the removal of revenue payments (e.g. FiT, RHI), there is no longer the same risk of 'double subsidy' (I2). This opens up an opportunity for new low or zero-interest finance to be provided, that could be counted as State Aid, particularly

[5] State Aid is defined here as "state resources are used to provide assistance that gives organisations an advantage over others" [134 p.3].
[6] The UK's State Aid rules are changing post-Brexit and the Subsidy Control Bill is moving through parliament, although major changes are not expected to the former EU State Aid regime [135].
[7] The Development Bank of Wales also offers loans up to £5 m (up to 20 years) via its Local Energy Fund, for the construction of small renewable energy projects that have been unable to access commercial funding [136].

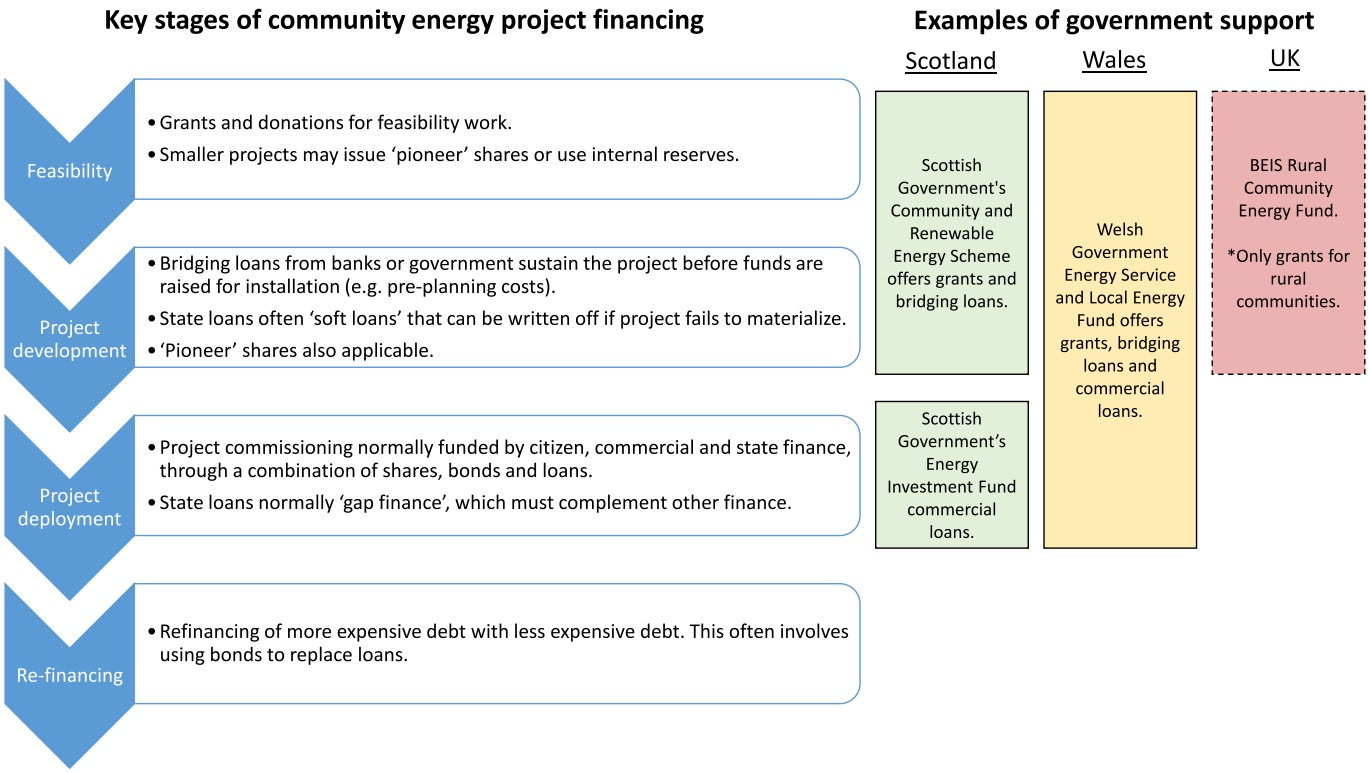

Fig. 3. CE finance chain and associated government support (Source: [3]).

through new bodies such as the UK's Infrastructure Bank and Scotland's National Investment Bank. Furthermore, schemes such as the Public Works Loan Board and Salix, which provide zero or low-interest loans councils to deliver green projects [91], offer an interesting model for community-owned or shared-ownership energy projects. Here, repaid loan finance is recycled to fund future projects [92].

Second, echoing Nolden [14], and as already implemented through Scottish Government's Energy Investment Fund (EIF), the state can assume further risk and draw in additional private investment through the provision of a junior debt facility. Here, the state is considered a lower priority for repayment when recouping any debt owed versus senior private lenders. The state can also provide loan guarantees for CE bodies, where the state effectively "*underwrites a loan, so that it's not expensive for local people*" (I10), essentially making private finance easier to secure for communities.

Third, state finance must be 'joined up' and ensure – alongside citizen and private finance – that finance can be accessed at each stage of the project's lifecycle. As highlighted by Fig. 3, the CE finance chain is much more joined up in Scotland and Wales versus England. A glut of early-stage finance and a lack of later-stage state finance - or vice versa – is of little use unless CE groups can access finance from the private sector or self-fund their own projects. This means a CE project may progress only so far, rendering earlier public investment wasteful. A review of the current CE finance supply chain is needed to identify gaps in the chain. A public-private-civic CE finance taskforce should also be established to deliver targeted solutions to fill these finance gaps, building on and updating the work of the CE Finance Roundtable [54].

Fourth, all four case studies highlight how CE groups were able to raise significant sums of community finance from local citizens but were located in areas with relatively low deprivation indices.[8] This raises questions about whether high-deprivation communities experience difficulty in securing locally sourced citizen finance. It is important that state finance primarily targets community projects in high-deprivation communities, which have fewer obvious opportunities to crowdsource citizen finance from within their own local community. These less affluent communities do not possess the same capacity to self-finance their own projects and thus require targeted support to 'level the playing field'. Furthermore, to support the objectives of a just transition it is critical this finance chain is: a) accessible to less wealthy and well-resourced communities; and b) funded in a progressive manner, ideally via general taxation and not via regressive energy bills levies [93].

5.1.2. Policy 2: Eligibility for investment tax relief

5.1.2.1. Targeted barriers. Prior to 2015, under the Enterprise Investment Scheme (EIS) and Seed Enterprise Investment Scheme (SEIS), CE investors could reduce their tax liability by between 30 % and 50 % of the value of the shares they buy; up to a total investment of £150,000 [94]. However, in April 2015 government announced CE cooperatives would no longer be eligible for these investment tax breaks and in October 2015 announced it would be ineligible for support under its

[8] Gwent CIC is located in Monmouthshire, which contains no areas in the most deprived 10 % [137]. The same was true of the Isle of Mull, home to GEM [138]. The City of Edinburgh (containing ECSC) and Argyll and Bute (containing Mull) and ranked 16th and 17th respectively out of 32 Scottish Local Authorities for share of the most deprived 20 % local areas [139]. Finally, Brighton and Hove (home to BHESCo) arguably rates highest in terms of deprivation, ranking 86 out of 317 English Local Authorities in terms of the number of LSOA areas in the most deprived 10 % [140].

successor, the Social Investment Tax Relief (SITR) [95]. The rationale behind its removal was that CE was already receiving ample subsidy via the FiT (I28) and that "*commercial developers were gaming the system by pretending to be 'community' in order to get the tax relief*" [95 p.2]. This development has dealt a major blow to communities' prospects of securing energy project finance (I15; I31).

5.1.2.2. Policy recommendation. As with low-cost state finance (Section 5.1.1.2), we find that the removal of the FiT and RHI means the argument that investment tax relief for CE constitutes a 'double subsidy' is now outdated (I7, I28). There is clearly an opportunity to support resource mobilisation (F5) by making CE projects once again eligible for investment tax relief via the SITR, which has now been extended to 2023 [96]. This would in turn create headroom for CE companies to lower the rate of return offered to investors and associated costs of raising this finance (BB2), as they will benefit from the tax break.

5.1.3. Policy 3: Revenue payments for CE generation and efficiency

5.1.3.1. Targeted barriers. Revenue payments, such as the FiT and RHI, have been highly lucrative for some community groups. Across our four case studies we find that revenue payments accounted for between 10 % and 79 % of their revenue during the financial year 2017/18, with the total income ranging from £27,625 per annum (see BHESCo [97]) to £191,252 per annum (see GEM [98]).

The withdrawal of revenue payments was considered to have significantly undermined investment into the CE sector (I5, 15, 19). As the Low Carbon Hub explain, the removal of the FiT has "*significantly reduced the number of rooftop projects that we are able to deliver with our operating model*" [99 p.34]. The FiT was replaced by the Smart Export Guarantee (SEG) but it covers only export and not generation, offers "*no minimum export price,*[9] *and no long-term certainty beyond 12-month periods*" [2 p.3].

It has reduced the security of revenue for communities generating renewable heat and/or power, in turn raising the risk profile of these projects, which has translated into higher financing costs and expenditure. As one interviewee explained, with a less secure revenue stream, "*it's obviously going to be harder for them to get good value capital*" (I13). Some CE groups have consequently had to reduce the rate of return they are offering via community share offers to 2–3 % versus the original 4 % or higher (I12). The removal of the FiT has meant that the project payback period has become longer, so the time when the community is "*actually going to really start benefitting from it has gone probably from 12 years to over 30*" (I21).

5.1.3.2. Policy recommendation. Whilst some CE projects have been successful in securing finance without these subsidies, these have tended to be much larger schemes, with stronger economies of scale. For example, the Low Carbon Hub raised £3 m in community shares for a 19 MW ground mount solar park Ray Valley Solar, with the rest funded by loans from Triodos and Oxford City Council [100]. Smaller projects, with poorer economies of scale, still require targeted support that mitigates the relative difference in project costs (BB2) between small-scale and large-scale projects.

Echoing the Environmental Audit Committee [2], an important solution to support resource mobilisation (F5) would be a community energy revenue payment or FiT. It would provide a minimum term and index-linked revenue stream (BB1) per kWh of both low-carbon power and heat for smaller community-owned projects. Continued receipt of community energy revenue payment would be contingent on demonstrable evidence of long-term community benefit and meaningful community ownership. Finally, the scheme should be sensitive to how community groups "*cannot make decisions and invest money at the pace a commercial developer can*", ensuring the scheme gives them ample time and support to make applications (I11).

A similar approach could be taken to support CE demand-side energy services, like BHESCo's Pay As You Save (PAYS) model. This is where the property owner does not bear the upfront capital cost of retrofit measures but pays these back over time, through the energy savings they generate via an energy performance contract [89].

Historically, the relatively low cost of energy and high transaction costs associated with PAYS contracts means it is difficult to generate profit, and so operations are often cross-subsidised via income from surpluses generated by renewables, as is the case with BHESCo. However, energy prices have risen dramatically since Russia's invasion of Ukraine, with the average UK household energy bill reaching £2500 from October 2022 under the Energy Price Guarantee; up from £1277 pre-April 2022 [101]. It remains unclear how long energy prices will remain at record highs but to offer investors certainty about the return on investment of energy demand management projects, an Energy Saving FiT (ESFiT) could be introduced to offer a fixed price subsidy for each unit of energy saved [102,103]. Akin to the strike-price[10] offered by the UK's Contracts for Difference, it would create long-term certainty around the value of energy savings, regardless of short- or medium-term market price fluctuations.

5.1.4. Policy 4: Grants and community benefit payments to support business model experimentation

5.1.4.1. Targeted barriers. Ironically, our case studies highlight how those CE groups already in receipt of long-term revenue payments are in the strongest position to experiment, as they possess the funds and security to experiment (Section 5.1.3). This gives them an advantage over new entrants in terms of entering new energy markets (e.g., grid services, demand reduction etc.).

The alternative to spending unrestricted funds on experimentation, is to secure grant funding. Grants were considered critical to enabling community-level experimentation, allowing communities to "*to explore how they can move forward and explore how they can create value [and] get us to that stage where we can be invested in*" (I13). Furthermore, grants also offered an important foundation for knowledge exchange, by strengthening CE groups' capacity and/or capability to share insights across their network (I13). Unlike in Scotland and Wales, CE grants are very limited in England (I13), where the only flagship scheme is the Rural CE Fund and will end in 2022 (Fig. 3).

Finally, innovation grants have proven an important source of capital funding for CE groups, who are often core partners due to their in-depth understanding of the local area and connections with local stakeholders, allowing for 'in situ' experimentation. This was the case with GEM and their partnership with Scottish Southern Electricity Networks to test the installation of a "repeater" and an "intertrip" at a substation Mull[11] [86]. The aim was to create new sources of flexible electricity demand that could provide 'headroom' for the network link to the mainland grid, thus allowing more decentralised generation – in this case a hydro scheme - to be connected without the need for network upgrades. Whilst the solution has since been replicated "*probably half a dozen or more*" times across Scotland (I24), the smart network was disabled. The grid constraints thus re-emerged, removing GEM's opportunity to channel its hydro-electricity towards supplying heat. This points to how time-

[9] SEG offering tariffs between 1.5-12p per kWh as of 15th February 2022 [141].

[10] The cost of each kWh of energy saved is topped up by the state if it falls below the strike price but the community group pays the state back if the cost of the per unit energy saved rises above the strike price.

[11] These signal if there was a local imbalance in supply and demand, and whether a fault condition was likely, meaning generation assets like Garmony Hydro could be disconnected.

limited innovation funds do not necessarily guarantee long-term benefits for communities.

5.1.4.2. Policy recommendation. Reflecting on these barriers it is essential that grants for CE experimentation are broadened out to other regions and offered UK-wide, with an explicit focus on earlier-stage, feasibility scoping and project development. These should also target the most deprived communities, which are not already in receipt of long-term revenue payments (e.g. FiT) from previous community-led projects, as these are likely to be least able to rely on local citizen crowdfunding to finance new CE projects (Section 5.1.1.2). These would mobilise resources towards communities (F5) with lower levels of capital (e.g. human, social, natural), with an explicit focus on supporting knowledge development (F1) and entrepreneurial experimentation (F3). This would create a much needed revenue stream (BB1) that could help communities secure the necessary key resources (BB5) to develop a business case that is attractive to consumers.

An alternative option to grant funding, is to channel donations from community benefit funds from commercial onshore and offshore wind farms into CE schemes [104]. Here, government guidance is that for onshorew wind an annual payment of £5000 per MW per year be paid into a 'Community Benefit Fund', to support community projects [104,105]. This would mean that a typical 30 MW onshore wind farm would pay £150,000 per year to local projects [106]. Interestingly, very few of these community benefit funds have targeted CE investment [107]. Mandating a specific share of these benefit funds must support CE, would offer much needed early-stage project support.

Finally, it is essential that innovation funding awarded by government, as well as companies via state regulation (e.g. Ofgem's RIIO price control), both insulates vulnerable communities from innovation risk and incorporates succession planning to deliver long-term, direct benefit to the community.

5.2. Regulation (stick)

5.2.1. Policy 5: Minimum net-zero and just transition investment standards

5.2.1.1. Targeted barriers. Our research finds that the ethical finance sector has engaged relatively little with the CE sector to date, typically offering commercially priced investment and favouring larger scale projects (I7, I21). Of the 10 commercial loans our survey identified, five were from ethical lenders like Triodos and Charity Bank (Table 3).

This lack of finance was largely attributed to communities operating at *"a scale that's not interesting to the banks"* (I1). Instead, *"they're interested in low transaction costs - so big returns for big projects. They're not interested in our business model"* (I25). As the former Chief Executive of the (former) Green Investment Bank explained: "*It is very difficult to do that in chunks of £1 million or £2 million for a community project; we have to invest that in chunks of £25 million and above*" [108 p.27]. The issue of scale was also associated with some ethical lenders too: "*we were actually too small for Triodos. They were looking at £2m plus schemes*" (I21).

5.2.1.2. Policy recommendation. CE offers significant potential benefit to both net-zero and a just transition agendas (Section 1): "*you're getting a financial return but you're also getting a social and environmental return as well*" (I7). Investor interest in CE could be significantly increased by regulating the finance sector so that it channels more capital into socially responsible and environmentally sustainable projects. As one respondent explained, "*perhaps government ought to do something to make banks take community organisations more seriously*" (I4). Importantly, UK Government set out some encouraging commitments in late 2020, including a green taxonomy – a common framework for determining the activities that can be defined as environmentally sustainable - alongside mandatory environmental financial disclosures that make transparent the climate impact and risks associated with investments [109].

What is not currently planned however is a requirement for investment portfolios to contain a minimum share of funding for projects that deliver a 'triple bottom line' value proposition (i.e. environmental, social and economic). This is something that would offer a boon to CE organisations, who typically prioritise all three value streams. It could usefully be enforced by the financial regulator (i.e. the Financial Conduct Authority) by imposing minimum portfolio investment share standards on investors applying for market authorisation. Central banks (e.g. Bank of England) and state-owned investment banks (e.g. UK Infrastructure Bank, Scottish National Investment Bank) could also use the same benchmark as a pre-requisite for providing finance. The latter could be modelled on the form of central bank guidance to commercial banks for delivery of 'just transition' projects, akin to China's 'window guidance' approach that "*uses benevolent compulsion to 'guide' financial institutions to extend credit and allocate lending in line with official (government) targets*" [110].

Combined, these policies would not only mobilise financial resources (F5) but also support legitimation (F7), with a view to improve the affordability and availability of finance (BB2). It would also create a new set of key partners (BB3) too, as new investors take interest in CE.

5.2.2. Policy 6: Mandatory partnerships with LAs and non-departmental public bodies

5.2.2.1. Targeted barriers. Given the limited key resources (BB5) some communities have at their disposal (e.g. land, skills, financial capital etc.), establishing new key partnerships (BB3) with local stakeholders represents an important means of filling resource and capability gaps. Our case studies point to a number of examples of successful partnerships with councils, other community groups, non-departmental public bodies (NDPBs), etc. [85,87] that have helped our case study organisations flourish. For example, ECSC entered into a service contract arrangement, to install and manage solar PV across a host of council buildings (e.g. schools). In turn, the council was able to satisfy its political objectives without depleting their already constrained budget, as well as consuming power from the project at below the market rate [111].

CE partnerships with LAs offer tremendous potential, with over 300 LAs having already declared climate emergencies by the beginning of 2023 [112]. However, barriers to partnership are numerous. Firstly, include a lack of internal capacity and funding to build and maintain CE partnerships (I8), largely attributable to a decade of LA cuts reducing English councils' spending power by 18 % between 2010 and 2019 [113]. Secondly, councils lack a clear mandate from central government to deliver on sustainability objectives [114]. This is associated with the removal of LA National Indicators in 2010 to tackle carbon emissions (NI186) and fuel poverty (NI187) [115].

5.2.2.2. Policy recommendation. To support a combination of resource mobilisation (F5), market formation (F6) and legitimation (F7), we recommend four policies to promote new partnerships (BB3), resources (BB5), customers (BB8) and revenue streams (BB1).

First, reinstating LA sustainability funding cuts, as well as the sustainability performance indicators is an obvious first step to bolstering LA-CE partnerships.

Second, a bolder move would be to index-link LA central government funding against a comprehensive and integrated set of environmental (e.g. carbon emissions), economic (e.g. jobs) and social (e.g. fuel poverty) LA performance indicators. A publicly available league table of council performance against these indicators would help evidence councils' progress against their own net-zero targets and create a further 'public relations' incentive to take climate action.

Third, councils would also usefully be mandated to source a minimum share of their electricity supply (e.g. 20 %) via community sources, assuming this meets strict affordability criteria to avoid spiralling costs.

This will of course rely on a supportive regulatory and licencing regime, such as the provision to a 'right to local supply' (Section 5.2.4). It would encourage councils to use their powers (e.g. planning) to facilitate CE projects and also become an important revenue generating customer (BB1, BB8), such as via a long-term Power Purchase Agreement (PPA). A similar 'local content' requirement could be imposed on other non-departmental public bodies like the Forestry Commission and Crown Estate. Procurement rules would need to be adapted in line with these requirements, ensuring that the council weight social and environmental outcomes of energy tenders, alongside the financial costs.

Finally, as in Wales [116], mandating all UK renewable energy projects to have at least some share of local ownership – a critical key resource (BB5) - alongside a minimum target for locally owned renewable energy capacity[12] will stimulate a wide range of local partnerships, not just with LAs.

5.2.3. Policy 7: Support for community land acquisition and project consent

5.2.3.1. Targeted barriers. Community groups often face challenges with regards to access to the key resources (BB5) of land and/or buildings, limiting their scope for key activities (BB4) and revenue generation (BB1) via energy projects [53]. Council owned land is a potentially important source of access for communities. Roughly 8.5 % of land in England is owned by the public sector, and just 4.1 % owned by LAs [117]. However, as one respondent explained, they are not developing these sites "*because it doesn't have any resource itself*" (I8); an issue echoed in Section 5.2.2.

There remains a lack of UK-wide legislation to enable communities to take control of public land to deliver sustainable energy projects by "*level[ling] the playing field, so that communities can compete…you want landowners and asset owners to take communities seriously*" (I17). The UK's Community Right to Bid legislation allows communities to nominate an asset to be registered for 'community value', meaning its sale is paused for a six-month period, whilst they prepare a bid [118]. However, this provision is weak compared to community land access legislation in Scotland. In 2003, Scottish Government brought in its Community Right to Buy,[13] giving communities the right of first refusal to buy private land for sale, providing it pre-registered its interest and has 10 % resident support in a ballot [119]. Subsequent amendments allowed communities to exercise their right to buy the sale of neglected or mismanaged land that is causing the community harm [120], and if the way the land is being managed poses a barrier to sustainable development [121,122].[14] The Scottish Land Fund[15] was also established to help fund community land acquisitions, facilitating some major 'community buy-outs' over the years, such as Langholm Moor [123].

5.2.3.2. Policy recommendation. To ensure equal opportunities across the UK to community land access (BB5), community powers to access under-utilised public land to deliver energy projects should be extended beyond Scotland. However, even in Scotland where these powers do exist, communities must be made aware of them and provided with the relevant technical and administrative support to make use of them.

Access to land should be made as affordable as possible considering that community groups will not be able to compete with institutional landowners on price alone (I8–9; I19). Where communities can evidence that their energy projects will help the LA to meet its policy objectives, the community should be afforded first refusal to buy or lease the land at below market-value or alternatively, offered funding to make it affordable.

Finally, a supportive energy planning regime is essential to make best use of this land once access is granted (Section 2.2.1.3). It is essential planning barriers are removed (I7) – such as England's de facto ban on onshore wind - alongside prioritising community owned energy projects through the planning regime (e.g. mandatory demonstration of community benefit) and supporting communities to navigate the planning approval process.

5.2.4. Policy 8: Regulatory provision for a 'right to local supply'

5.2.4.1. Targeted barriers. CE organisation access to established market channels (BB7) to reach traditional energy customer segments (BB8) is a key barrier and a primarily function of the costs and capabilities associated with becoming a licenced supplier (I4; 23–24). Consequently, this limits their scope for activities (BB4) and revenue generation (BB1). Instead, communities have traditionally engaged in two types of renewable power sales: 1) sale of own-branded energy tariffs via a licenced supplier; and 2) sale of power direct to the customer via a PPA, typically businesses. The former sees the CE group partner with a licenced supplier, as part of a 'white label' arrangement, where the CE group offers a tariff under their own brand but it is the licenced supplier who meets the requirements of metering, balancing and complies with industry codes [124]. However, our case of GEM points to a "*gap … of ten pence a kilowatt*" between the price it sells its electricity to an energy supplier for versus what a typical customer might pay (I22).

Regulation designed to support local electricity supply by reducing the licencing burden – such as Ofgem's Licence Lite - has not translated into new local energy projects and existing licence exemptions still require electricity meters and the meter registrant to be licenced [125].

5.2.4.2. Policy recommendation. As echoed in Section 2.2.2, our research supports the need for regulation that supports market formation (F6) and entrepreneurial experimentation (F3) by creating a 'right to local supply'.[16] Here communities can "*sell their energy to their own community and accommodate local demand*" [2]. It would allow local generators to become licenced suppliers, who would "*face set-up costs and complexity proportionate to the scale of their operations*" [126 p.3]. However, it remains unclear how small-scale and poorly resourced community groups can realistically meet the complex requirements imposed on licenced energy suppliers. Cornwall [125] recommends that the basis for licence-lite regulation is made "*mandatory for eligible suppliers*" to create "*a guaranteed route to customers for local community supplies but without them being required to become licensed suppliers*" (p.13).

5.3. Information (sermon)

5.3.1. Policy 9: UK-wide CE strategy

5.3.1.1. Targeted barriers. Not since the UK Government's updated its UK *Community Energy Strategy* update in 2015 [127] has there been an official strategy for UK CE. A number of respondents lamented the lack of an over-arching strategy for CE development (I1, 8, 15, 30). As one respondent explained, government is quick to "*give it a role but they never quantify it. So you're never really sure how big they want it to be*" (I8). This undermines investor confidence in the long-term growth trajectory of the sector, especially as a lack of certainty negatively impacts upon securing customers (BB8) and partners (BB3).

[12] One gigawatt (GW) of renewable energy capacity in Wales to be locally owned by 2030.

[13] Amended in 2016 to extend to urban areas.

[14] An alternative avenue is a Community Asset Transfer, where public bodies must publish a register of their land and buildings, and communities can apply to buy, lease or manage this property. Reasonable requests are expected to be granted but not guaranteed.

[15] The fund has offered grants up to £1 m, as well as practical support to develop projects [142].

[16] A Local Electricity Supply Bill is in passage and been subject to Second Reading in the House of Commons as of 6th May 2022 [143].

5.3.1.2. Policy recommendation. There is a critical need for a top-down, coordinated UK CE strategy to bolster investor confidence (I8, 10) (F7). This would send a clear signal to local and regional energy stakeholders (e.g. DNOs, LAs) that local and regional climate action will play a key role in the future (F4). Alongside incorporating the policies recommended in this paper, it would outline the specific roles CE will play in a net-zero, just transition and which CE business models are considered most important. Alongside UK Government and Devolved Administrations, it is essential that the regulator Ofgem ensures its price control regulations[17] also complement any wider UK CE strategy, by encouraging network companies to fund projects supportive of CE. For example, see Scottish Power Energy Networks' Zero Carbon Communities Hub [128] and Green Economy Fund [129].

5.3.2. Policy 10: National CE hub for training, knowledge exchange and awareness raising

5.3.2.1. Targeted barriers. Community groups rarely possess the full suite of skills and knowledge (BB5) required to deliver energy projects alone, relying heavily on partnerships (BB3) to make-up for any shortfall in skills, experience and track record [24; I5]. Furthermore, knowledge exchange and skills training is becoming even more critical as communities shift outside their traditional realm of decentralised energy generation and into new areas (e.g. demand management, flexibility services etc.): "*[there] needs to be a lot more work done to support CE in understanding what those business models are, what the risks are within them and what are the best models to use to exploit them*" (I8).

Knowledge exchange is also lacking between the CE sector and investors. Whilst investment funds are increasingly "*badging themselves as impact funders or socially responsible investment funds*" (I7) investor awareness of CE was considered low and "*it takes a lot of work with the loan financer to get them to understand how […] community interest companies and community benefit societies work*" (I12).

5.3.2.2. Policy recommendations. To ensure the UK's CE strategy (Section 5.3.1) is resilient to government and policy change, an 'arm's length', independent delivery body is needed, akin to the Energy Savings Trust. Funded as part of a national CE Strategy, this CE Hub would coordinate delivery of financial and non-financial support, to help communities become 'investment ready' (F6). This would include free or heavily subsidised skills training (F1), especially in relation to finance and legal processes, which were often alien to community groups (I21).[18] It would also manage a UK-wide knowledge exchange (F2) platform, so that community groups can learn from the successes and failures of others. The CE Hub would also connect local-regional-national action by coordinating support delivery, for example through England's five existing Local Energy Hubs [130] and Scotland's proposed Community Climate Action Hubs [131].

There is also an acute need to improve investor knowledge of CE (F1) and the legitimacy of CE (F7). Whilst, some existing initiatives may help to solve this, such as the Green Finance Education Charter [132], designed to educate financial actors in climate-related risks and opportunities, as well as sharing best practice in green finance this is not CE specific. The CE Hub must also provide an outward facing 'guide to CE' for those unfamiliar with the sector and the value it offers (F2), written especially for the finance sector.

[17] Ofgem's most recent price controls for distribution network operators (DNOs) was called RIIO-ED2, and will dictate allowable revenues for DNOs during the period 2023–28.

[18] The UK ran Local Energy Assessment Fund (LEAF) between 2011 and 2012 and was designed to help prepare communities in England and Wales to take action on energy efficiency and renewable energy [144] but it appears to have focused more on project feasibility studies and strategic planning versus community capacity building (e.g. training).

6. Discussion

This section reflects on this paper's results (Section 5) to outline some broader lessons for unlocking finance for CE (Section 6.1), alongside broader reflections on the efficacy of the paper's analytical framework (Section 6.2) and opportunities for future work (Section 6.2.1).

6.1. Policies to unlock CE finance

First, the paper finds that a complementary mix of policies are necessary to stimulate financing of CE business models. The recommended policy mix includes a balance of policies that: a) are explicitly *financial* and *non-financial*; b) *directly* and *indirectly* focus on the CE sector; c) cover all seven TIS functions; and d) offer a blend of *carrot, stick* and *sermon* policies.

In the context of our case of UK CE, we find that:

- ***Incentives (i.e. Carrots)*** were largely *financial* in nature and *directly* targeted at CE businesses, focusing primarily on *resource mobilisation* (F5), alongside *knowledge development* (F1) and *entrepreneurial experimentation* (F3);
- ***Regulations (i.e. Sticks)*** were mostly 'hard' regulation (i.e. legally binding) (Section 2.1), including a blend of *financial* and *non-financial* and tended to have an *indirect* focus on CE, instead targeting the state, institutional investors etc. Targeted functions mostly included *entrepreneurial experimentation* (F3), *resource mobilisation* (F5), *market formation* (F6) and *legitimation* (F7); and
- ***Information (i.e. Sermons)*** policies were *non-financial* in nature but *directly* focused on CE. They mostly targeted *knowledge exchange* (F2), *guidance of the search* (F4), *market formation* (F6) and *legitimation* (F7).

Second, subsidies like long-term revenue payments - most notably the FiT – were critical to unlocking CE finance. They helped de-risk energy projects and bolstering their return on investment, thus making them more attractive to investors. In the future, it is essential that any proposal to remove or reduce such subsidies takes account of their impact on CE organisations' ability to access external finance.

Third, we find that there are many policies that can be implemented that benefit CE indirectly and are not CE-specific in nature. Consequently, the political capital invested in these policies is distributed across other sub-sectors, meaning their implementation may be easier to argue in favour of if the policy benefactors are wide-ranging (Table 4).

Finally, support for CE business model innovation must be mindful of three issues. First, communities in higher deprivation areas are at a natural disadvantage to be able to secure local, citizen finance to fund business model experiment. Second, funding for business model experimentation must not drive CE bodies into territories that generate financial returns but at the expense of their guiding principles, i.e. citizen control and community wealth building. Third, a balance must be struck between support for both mature CE business models today, as well as tomorrow's emergent CE business models. This way, finance support can be immediately channelled to where it is most urgently needed, without waiting for innovative CE business models to become dominant.

6.2. Strategies to support niche energy business model investment

Applying our framework to the case of CE finance presents a number of insights into wider strategies to unlock investment into niche energy business models.

This paper offers the first known synthesis and empirical application (i.e. the case of CE finance in the UK) of three separate analytical frameworks to explicitly connect policy instruments, innovation system functions and business model building blocks, in order to consider how policy interventions might best be targeted to unlock finance for niche

Table 4
Summary of CE policy recommendations to unlock finance.

Policy recommendation				External impact			Internal impact	
Policy type	Policy	Policy details	UK public sector actors responsible	Financial or non-financial	CE-specific or cross-cutting	TIS function targeted	CE business model domains and building blocks impacted	Targeted impact on CE business model barriers to finance
Carrot	1. Low-cost state CE finance and a joined up finance chain	• State provision of low-interest loans, junior debt and loan guarantees • CE finance taskforce to improve coverage and linked-up finance chain • Targeted finance for low-income communities	• HM Treasury • BEIS (formerly) • Devolved administrations • Development agencies • National investment banks	Financial	CE-specific	Resource mobilisation (F5)	*Finances* • Expenditure (BB2)	Project finance more affordable and widely available
	2. Eligibility for investment tax relief	N/A	• HM Treasury	Financial	CE-specific	Resource mobilisation (F5)	*Finances* • Expenditure (BB2)	Project finance more affordable and widely available
	3. Revenue payments for CE generation and efficiency	• Establish a Community Renewable Energy Revenue Payment • Establish an Energy Saving FiT	• BEIS (formerly) • Devolved administrations	Financial	Both	Resource mobilisation (F5)	*Finances* • Revenue (BB1) • Expenditure (BB2)	Greater confidence in the price of energy generated and/or saved
	4. Grants to support business model experimentation in low-income communities	• UK-wide grants for CE business model experimentation • Priority funding for CE groups with no access to FiT/RHI and in deprived areas • Mandate a share of commercial renewable 'community benefit payments' to support CE experimentation • Require innovation funding to insulate communities from risk but deliver long-term benefit	• BEIS (formerly) • Ofgem (price control) • Devolved administrations	Financial	CE-specific	• Knowledge development (F1) • Entrepreneurial experimentation (F3) • Resource mobilisation (F5)	*Finances* • Revenue (BB1) *Operations* • Key resources (BB5)	Funds available to enable experimentation with emergent CE business models – that create lasting benefit - especially for communities struggling to raise finance locally.
	5. Minimum net-zero and just transition investment standards	• Market authorisation and lender eligibility tied to sustainability credentials of portfolio	• HM Treasury • Financial Conduct Authority • Bank of England • National investment banks	Financial	Cross-cutting	• Resource mobilisation (F5) • Legitimation (F7)	*Finances* • Expenditure (BB2) • Key partners (BB3)	Project finance made more affordable and available by institutional investors
Stick	6. Mandatory partnerships with LAs and non-departmental public bodies	• Reinstate LA funding cuts to sustainability teams • Reinstate and expand sustainability performance indicators and index-link LA central government funding. • Public league table of council sustainability performance • LA and NDPB minimum threshold for local electricity supply • Minimum share of local ownership for energy projects • Capacity target for locally owned renewable energy capacity	• Department for Levelling Up, Housing and Communities • Non-departmental public bodies • LAs	Both	Both	• Resource mobilisation (F5) • Market formation (F6) • Legitimation (F7)	*Operations* • Key partners (BB3) • Key resources (BB5) *Custom* • Customer segments (BB8) *Finance* • Revenue (BB1)	Creates a platform for local stakeholders to engage more closely with CE projects; as partner and/or customer

(*continued on next page*)

Table 4 (*continued*)

Policy recommendation				External impact			Internal impact	
Policy type	Policy	Policy details	UK public sector actors responsible	Financial or non-financial	CE-specific or cross-cutting	TIS function targeted	CE business model domains and building blocks impacted	Targeted impact on CE business model barriers to finance
Sermon	7. Support for community land acquisition and project consent	• UK-wide legislation for quick and affordable acquisition of public land • Changes to planning regime to support decentralised energy projects (e.g. onshore wind) and delivery of community benefit	• Department for Levelling Up, Housing and Communities • Devolved administrations • LAs	Both	Cross-cutting	Resource mobilisation (F5)	*Finances* • Revenue (BB1) *Operations* • Key activities (BB4) • Key resources (BB5)	Project revenue generation potential improved, with affordable access to land and a clear planning route to project commissioning
	8. Regulatory provision for a 'right to local supply'	N/A	• BEIS (formerly) • Ofgem	Non-financial	Cross-cutting	• Entrepreneurial experimentation (F3) • Market formation (F6)	*Finances* • Revenue (BB1) *Operations* • Key activities (BB4) *Custom* • Customer channels (BB7) • Customer segments (BB8)	Opportunities to engage in new energy activities, which reach (new) customers via new market channels
	9. UK-wide CE strategy and a stand-alone delivery body	N/A	• BEIS (formerly) • Devolved administrations • Ofgem	Non-financial	CE-specific	• Guidance of the search (F4) • Market formation (F6) • Legitimation (F7)	*Operations* • Key partners (BB3) *Custom* • Customer segments (BB8)	Provides a specific, resilient and quantifiable role for CE, providing it with legitimacy and investors with confidence
	10. National CE Hub for skills training, knowledge exchange and awareness raising	N/A	• BEIS (formerly) • Devolved administrations	Non-financial	CE-specific	• Knowledge development (F1) • Knowledge exchange (F2) • Market formation (F6) • Legitimation (F7)	*Operations* • Key resources (BB5) • Key partners (BB3)	Broadens community group's network and resource base, to bolster their case for investment. Also, informs wider investment community about value of CE

business models. In doing so, it offers a number of wider contributions to both energy and social science research more generally.

From a policy instrument perspective, our framework supports policy makers to consider how both a) financial versus non-financial, and b) direct and indirect policy interventions can raise the likelihood of financing for a specific class of business models. Our framework challenges users to consider how policies that are non-financial and/or have indirect influence on a certain type of business might still elicit improved business performance and a stronger likelihood of investment. By extension, the framework also facilitates analysis of the overall characteristics and associated impacts of a suite of policies, versus individual policy design and impacts. As demonstrated in Table 4, this framework offers a useful means of characterising the type of policy mix being proposed (see [36]) and how these policies connect with both TIS functions and associated BM building blocks. It therefore helps us to consider both obvious gaps and areas of duplication across the policy mix.

From an innovation systems and business model perspective, we have demonstrated how the TIS functions perspective can be applied to a business model as the unit of analysis, rather than a stand-alone technology. This further strengthens currently weak links between TIS functions and BM operations. One insight this has yielded is how our policy recommendations highlight how certain types of policy instruments map more closely onto specific TIS functions and BM domains (see Section 6.1 and Table 4). For example, *economic* policies (i.e. carrots) were typically connected with *resource mobilisation* (F5) and had a direct impact on BM *finances*. In contrast, *regulatory* (i.e. stick) and *information* (i.e. sermon) policies had a broader influence beyond just *resource mobilisation* (F5), also impacting *knowledge exchange* (F2), *guidance of the search* (F4), *market formation* (F6) and *legitimation* (F7), in turn primarily affecting the two BM domains of *operations* and *custom*.

Finally, we acknowledge that whilst CE businesses share some core characteristics and values (e.g. sustainability, citizen-led, non-for-profit), they do not represent a homogenous group. Consequently, some policy recommendations will be of greater benefit to certain types of CE businesses versus others. For example, a 'right to local supply' (Section 5.2.4) is relevant only to CE groups engaged with electricity generation and supply, and much less relevant to those operating 'beyond the meter'.

6.2.1. Towards an improved framework: Priorities for future research

There remain opportunities to further improve the analytical frameworks's generalisability and efficacy. We therefore recommend further work across four areas:

1. Integration of policies within a wider policy mix;
2. Policy and socio-technical regime feedbacks;
3. The type and severity of business model innovation being targeted; and
4. Relationship between business model innovation and investor preferences.

First, whilst our framework supports an assessment of overall characteristics and impacts of a policy mix, it doesn't offer a deeper examination of the policy mix's overall consistency, credibility, coherence and comprehensiveness, nor insight into strategies for how the policy mix could best be implemented (see [36]). The latter raises some important questions about *who* is responsible for designing and implementing these policies, as well as *when* different policies should be implemented and in which sequence. For instance, the TIS functions literature teaches us that some functions are more important than others at earlier (e.g. *Knowledge Development*) versus (e.g. *Market Formation*) later stages of innovation.

Second, as outlined in Section 2.1, the scope for implementing a given policy recommendation will hinge upon the selection environment imposed by the wider socio-technical regime [19]. If the recommended policy and the dominant political paradigm are at odds, the policy is unlikely to be implemented. We acknowledge that the framework could usefully incorporate some 'litmus test' for how realistically the policy recommendations could be applied (see Overton Window [41]), with sensitivity to the wider political economy and socio-technical regime. However, this ignores the positive feedback mechanisms that exist between policies, business models, innovation systems and the wider socio-technical regime [133]. Future work would usefully consider how complementary the policy recommendations are with the dominant socio-technical regime but also how the earlier implementation of less disruptive policies may drive positive feedbacks that alter the regime is such a way that may shift or stretch the Overton Window; creating opportunities for the implementation of more ambitious policies later on.

Third, our framework targets policy recommendations that support business model innovation. However in reality, this process can be further disaggregated into either *incremental* or *radical* business model innovation (Section 2.1). As outlined in Table 4 and Section 2.1, policies may support *incremental* innovation by simply reducing the cost of existing goods or services, or broaden out the customer base for traditional key activities. However, they may also support *radical* innovation, such as by supporting the move into fundamentally new market territory. In the case of CE, this migration may be into a market that is new to most communities (e.g. heat) or into an emerging market that is fundamentally new to the energy sector (e.g. flexibility, storage). Further work should aim to more clearly integrate business model innovation theory into the framework, in a bid to better characterise the severity and type of innovation being targeted (see [21,23]) and the kinds of policy that can facilitate these.

Finally, our framework broadly assumes that new finance will be forthcoming if policy support: a) helps a business model to function more effectively via innovation (Step E) (Fig. 1); and/or b) alters the investment criteria of investors (Step F). This therefore targets policy efforts across both the borrower (i.e. CE organisation) and the lender (i.e. CE investor), in a bid to improve the fitness between the two parties and help unlock finance. Even so, future work would usefully refine our framework by integrating theory that further unpacks investors' decision making processes. The first priority is to characterise who the investor is, as well as what their objectives are and associated investment criteria. The second is to outline exactly how business model innovation influences business model performance and by extension, the associated desirability of a given business model from the perspective of a particular investor.

7. Conclusions

Community energy represents a potentially critical means of accelerating a sustainable and equitable energy transition. However, in some European countries, it is experiencing a prolonged period of stagnation, following the removal or reduction in subsidies. In the absence of substantial capital grant funding, CE project finance has become increasingly important for the sector but remains very challenging to secure at scale. Policy solutions are therefore sorely needed to unlock finance and catalyse CE sector growth, however relatively little work to date has explicitly considered what form these may take.

To help identify these policies, this paper presents a newly synthesized analytical framework that combines policy instrument, innovation system and business model theory, to help identify policies that can facilitate business model innovation and unlock finance. It examines the case of the United Kingdom (UK) and employs a mixed-methods approach, including a survey of 145 projects, 33 interviews and documentary evidence.

Common barriers to CE finance include but are not limited to: 1) poor connectedness and coverage of the UK's CE finance supply chain; 2) limited community access to land and buildings; 3) constrained time, skills and experience within communities; 4) few opportunities to partner with local stakeholders; 5) poor access to wider energy markets

and 6) a finance sector dominated by institutional investors targeting large, replicable and low-risk investments.

In a bid to secure investment, some CE groups have engaged in business model innovation, migrating into new and potentially more promising business territories (e.g. heat, storage, demand-side management). However, this is challenging considering how many communities and investors remain unfamiliar with these new models. Furthermore, it is typically only CE groups already in receipt of lucrative, long-term revenue payments that have the capital to afford experimentation. This could potentially lock-out new entrants, especially from more deprived areas.

A mix of differentiated but complementary policies are therefore needed to drive business model innovation to unlock CE finance, covering a suite of economic (i.e. *carrot*), regulatory (i.e. *stick*) and information (i.e. *sermon*) policies. These include a combination of policies that are *financial* or *non-financial* in nature and *directly* or *indirectly* focused on the CE sector. Finally, these policies offer a balance across the seven core functions of innovation systems, in a bid to support CE operations and present a stronger investment case to investors.

This paper identifies ten policy recommendations to unlock UK community energy finance. Economic (*carrot*) policy recommendations primarily target CE actors, qualified by stricter regulation about what constitutes a CE initiative. These include: 1) low-cost state CE finance and a joined up finance chain; 2) eligible for investment tax relief; 3) revenue payments for CE generation and efficiency; and 4) grants and community benefit payments to support business model experimentation, particularly in deprived areas.

Regulatory (*stick*) recommendations primarily focus on partner organisations, such as state bodies and commercial finance, and include: 5) minimum net-zero and just transition investment standards; 6) mandatory partnerships with LAs and non-departmental public bodies; 7) support for community land access and project consent; and 8) expand market opportunities for local energy supply and grid services.

Information (*sermon*) policies are coordinated and supported financially by state actors, to provide knowledge and technical support to all stakeholders. Recommendations include a: 9) UK-wide CE strategy and a stand-alone delivery body; and 10) a National CE Hub for skills training, knowledge exchange and awareness raising.

To further improve the efficacy of this paper's analytical framework and ensure it offers utility across a range of energy and social science research areas, further work would usefully examine: a) how policy recommendations are integrated into a consistent, credible, coherent and comprehensive policy mix; b) the wider feedback mechanisms between these policies and the prevailing socio-technical regime; c) the type and severity of business model innovation being targeted; and d) the relationship between business model innovation and investor preferences.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Matthew Hannon reports a relationship with British Institute of Energy Economics that includes: board membership. Matthew Hannon reports a relationship with South Seeds that includes: board membership.

Data availability

Selected anonymised data can be made available on request, with consent from participants.

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Appendix A

Table 5
List of interviewees.

Code	Position	Type of org.	Date
I1	Renewables manager	Energy supplier	30.7.18
I2	Manager	Government energy department	30.8.18
I3	Independent consultant	Energy consultancy	26.7.18
I4	Project Officer	CE intermediary	20.7.18
I5	Energy Systems Manager	Delivery body for government funds	2.8.18
I6	Energy Specialist	Non-departmental public body for enterprise	2.8.18
I7	Investment Manager	Social investment organisation	9.8.18
I8	Director	Social investment company	9.8.18
I9	Director	CE association	10.8.18
I10	Political advisor / CE campaigner	Environmental charity	13.8.18
I11	Director	Renewable energy developer	17.8.18
I12	Partner in law firm	Law firm	30.8.18
I13	CE campaigner	Environmental charity	4.9.18
I14	Director	Government energy specialist	18.9.18
I15	Director	CE organisation	7.9.18
I16	Environmental activist	Environmental community organisation	29.9.18
I17	Project Officer	CE intermediary	11.9.18
I18	Board member / former councillor	CE organisation	3.10.18
I19	Board member	CE organisation	23.10.18
I20	Manager	Environmental community organisation	19.11.18
I21	Director	CE organisation	11.10.18
I22	Director	Community organisation	18.10.18
I23	Research and Development Engineer	Distribution Network Operator	1.11.18
I24	Energy Strategy Manager	Distribution Network Operator	1.11.18
I25	Director	CE organisation	12.10.18
I26	Non-executive director	CE organisation	25.10.18
I27	Director	CE intermediary	26.8.18

(*continued on next page*)

Table 5 (*continued*)

Code	Position	Type of org.	Date
I28	Director	Social investment platform	6.11.18
I29	Director	CE organisation	3.9.18
I30	Project Officer	CE organisation	8.10.18
I31	Business Development Manager	Social investment platform	27.9.18
I32	Project manager	CE organisation	8.10.18
I33	Senior law academic	University	17.7.21

Appendix B

Table 6
Choice of policy instruments ([36–39],adapted from [40]).

Type	Aim	Sub-category	Specific demand pull policy
Economic (i.e. Carrot)	Pecuniary (dis)incentives that support desirable behaviour	Incentives	Grants, revenue-payments, loan guarantee, finance (debt, equity etc.), public procurement, public-private partnerships, tax breaks, tradeable certificates, output based incentives
		Disincentives	Taxes, levies, fines, charges, penalties, fees, tariffs, output based disincentives
'Hard' regulatory (i.e. Big Stick)	Legally binding rules that obligate desirable behaviour	–	Laws, regulations, directives, standards, quotas, bans, permits/licence, principles, statutory requirements
'Soft' regulatory (i.e. Little Stick)	Voluntary and non-coercive measures that encourage desirable behaviour	–	Self-regulation, technical standards, certification, voluntary agreements, non-binding rules, coordination, recommendations
Information (i.e. Sermon)	Initiatives that support the dissemination of information that encourage desirable behaviour	Education	Public awareness campaigns, training, best-practice guidelines, toolkits, consultancy/advice, labelling schemes
		Knowledge exchange	Networks, knowledge brokerage, intermediaries
		Foresighting	Strategies, roadmaps, scenarios

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