WPI ECONOMICS

The future of community energy

A WPI Economics report for SP Energy Networks

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Contents

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About WPI Economics

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About this report

This report explores the future of the community energy sector in the UK. We consider the potential for growth in community led renewable energy, energy demand reduction and energy supply projects, and the economic, social and environmental benefits that such growth would deliver for the country. We find that despite significant progress over the last decade the sector has substantial untapped potential. Community energy could allow people across the country to take action on climate change but current Government policy risks squandering the potential of the sector and there is a pressing need for a new Community Energy Strategy.

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Executive Summary

Decarbonisation needs communities, but the future of the sector is unclear

Community energy has grown significantly in the United Kingdom over the last decade but it now stands at a crossroads. Over 350 groups across the country are now responsible for at least 250 megawatts (MW) of renewable energy generation capacity, generating enough electricity to supply the needs of around 100,000 homes.[1] The primary activity of the sector to date has been electricity generation but the sector also undertakes a wide range of related activity that reduces fuel bills, provides funds for community initiatives and helps communities across the country to decarbonise.

2019 saw an increased focused on the urgency of the challenge of decarbonisation, both through public debate and Government action. The United Kingdom became the first major economy in the world to pass laws to end its contribution to global warming by 2050 and Scotland has an earlier target of 2045. These dates, which seem to indicate a fairly long-time horizon for action, should not obscure the thinking of policy makers – radical action must take place over the next ten years for the decarbonisation agenda to be successful. The eyes of the international community will be on the UK at the end of 2020 when Glasgow hosts COP26, the major United Nations conference on climate change.

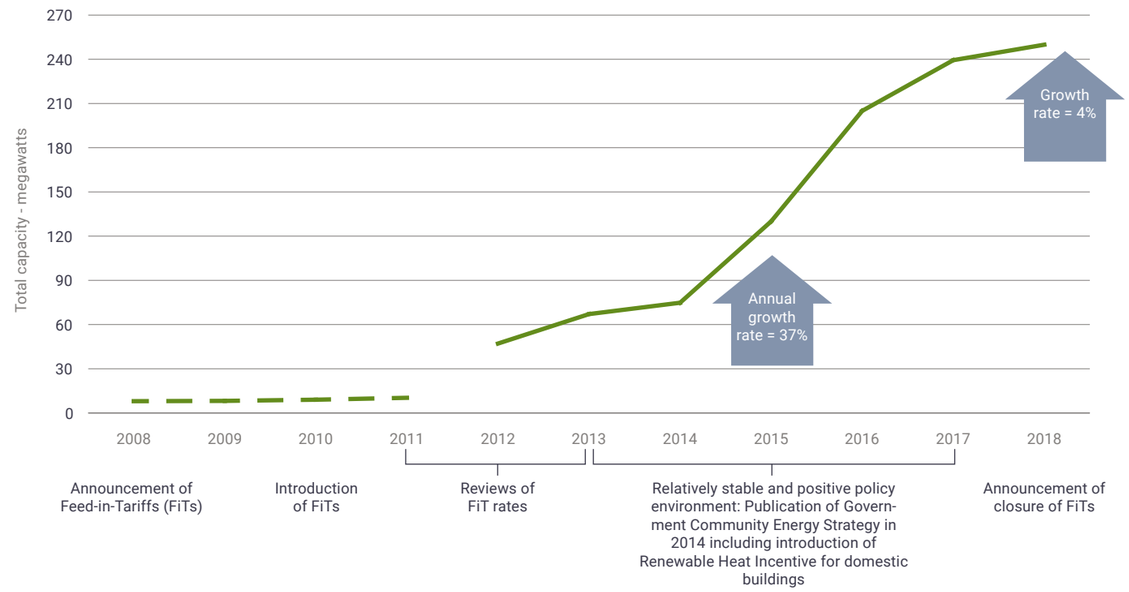
Decarbonisation is about every area of the country and every part of the economy, including business, transport, energy and households. Community involvement will be needed to engage people in the far-reaching changes that will be required and to harness their energy and skills. Community energy allows people across the country to take action on climate change, and at the same time can help the energy system to meet its goals. However, the future for the community energy sector in the UK is unclear:

- **Government support at a national level has been unstable, and the recent closure of the Feed-in Tariff has significantly reduced the financial viability of future schemes.** Whilst there is a more supportive policy environment in devolved administrations the impacts of national regulations and policies have affected the outlook for schemes across the UK;
- **More positively, the next phase of decarbonisation is likely to need more support from communities.** The energy sector is undergoing a multi-faceted transformation to a decarbonised and less-centralised energy system and changes will be required to individual homes (energy efficiency and heat generation), cars (electric vehicles) and types of household appliance (demand response). People will need to be engaged with this change at a local level.

The focus of community energy groups is changing in response, but the sector needs a clear strategy and support from Government, regulators and the industry. Figure 1 presents the available data (which may not be comprehensive) on the growth of community energy generation capacity.

The impact of the closure of the Feed-in Tariff scheme can already be seen in a much lower growth rate, but the true picture of post Feed-in Tariff growth is likely to be even lower as the closure has been tapered.

Figure 1: Growth of community energy electricity and heat generation capacity in the UK (Scotland included from 2012 onwards)



Sources: Community Energy England, Energy Saving Trust and WPI Economics calculations. Data for 2008-2011 is for England, Wales and Northern Ireland only.

Community energy's substantial untapped potential

In order to understand the potential of the sector, we have generated three scenarios for future growth. We find that previous modelling of the sector suggested that it could grow significantly from its current size. International comparators, such as Germany and Denmark, also suggest that substantial growth is possible.

Given the right policy support we think that the community energy sector could grow to between **12-20 times larger than today by 2030**. Such growth would have a range of beneficial impacts which we have estimated by extrapolating evidence from a range of other sources. Table 1 summarises our findings.

Table 1: Summary of scenario results: size of the sector and impacts by 2030

	Moderate Scenario	High Scenario
Number of organisations	2,300	4,000
Installed generation capacity	3,000MW	5,270MW
Estimated homes powered	1,300,000	2,200,000
Associated jobs	3,800-4,970 Total (generation and energy efficiency)	6,670-8,720
Gross Value Added	£1,060m	£1,860m
Carbon emissions saved from energy generation, per year (tonnes CO2e)	1,000,000	1,800,000
Households visited for energy efficiency, 2020-2030	830,000	1,400,000
Heating and hot water efficiency savings, per year	500,000 Carbon emissions (tonnes CO2e)	700,000
	£90m Consumer bills	£150m

Source: WPI calculations

We estimate that 1.5 million tonnes of carbon could be saved per year in our moderate scenario, which is the equivalent of the emissions for all domestic flights in the UK.[2] Our high scenario suggests the savings could be as much as 2.5 million tonnes.

Community benefit funds have also been a feature of community energy during the last decade, supported by Feed-in Tariffs and the potential for new schemes to create such funds will depend on Government decisions about support programmes. If a level of support similar to that seen before 2018 was restored then £11-19million could be being spent annually to support a range of socio-economic activity in the localities of schemes.

The sector would also facilitate the move towards distributed energy of various types. The community energy landscape is changing fast – based upon our research and input from experts in the sector we believe it is likely the sector will play some part in the following types of decarbonisation activity by 2030:

- Helping achieve the decarbonisation of residential heating in 4.4-5.6 million homes;
- Facilitating the change to around 25% of smart appliances in homes by 2030 that can reduce energy costs through flexible energy use;

- Ensuring that a wide range of locations and people are able to benefit from the estimated 10 million purely electric vehicles on the road by 2030;
- Installing around 2.7GW of local energy storage capacity that allows renewable technology to be used more intensively, further reducing emissions.

Creating a thriving community energy sector

However, current policy will not achieve anything like this scale and could even see a decline from today squandering the significant potential of community energy groups. What is needed to achieve a thriving community energy sector?

Firstly, there is a need for **the Government to speedily set a new strategy for community energy** that:

- Sets a level of ambition for the future;
- Identifies the areas of decarbonisation where community groups can have the most impact in the push towards net zero emissions;
- Commits to the policies needed to make this happen, with associated targets for the sector;
- Is based on independent research and analysis, with performance monitored by an independent body.

We have identified four key areas that this strategy should tackle:

1. **Introduce new funding streams:** The aim for the sector should be one that is financially sustainable without continued grant support, and below we identify the importance of changes to our centralised system of energy regulation that would allow this. However, until this reform has happened, new funding streams are needed:

- Government should design specific funding routes to support the type of activity where community energy can have the most impact;
- Government together with Ofgem should identify how this funding can be flexible to the needs of different local areas, considering if it should be allocated on a regional basis.

2. **Provide clarity on effective local energy planning:** Community energy groups need to play a strong role in shaping the future energy system in their areas, and then focus their activity on what the energy system in their area needs. To make this a reality:

- Government together with Ofgem need to identify and fully resource an approach to energy planning at local levels that sets out a core role for community energy groups.

3. **Reduce regulatory barriers and increase institutional support:** Community groups are likely to have lower resources than other energy providers. To help them get off the ground and thrive:

- Ofgem should be tasked to conduct a review of regulatory barriers for community energy schemes and set out how these could be addressed;
- Central government should ensure strong coordination across departments and actively encourage and support local authorities to adopt planning practices that promote local support of renewable energy projects;
- Local and regional government should ensure the role of community energy is articulated in their plans for the energy system in their area;

4. **Identify how broader energy regulatory reform should place the needs of communities at its core:** Fundamental reform of our centralised system of energy regulation could also allow community energy to thrive and become financially sustainable. Ofgem need to make progress on allowing the local sale of energy in ways that does not exacerbate inequality in energy bills, and the Government should provide a strategic steer to Ofgem on the promotion of investment that anticipates demand so that energy network companies can proactively work alongside community schemes that seek to change behaviour.

    - A specific training and skills fund for community groups should be considered, with the aims developed by community energy groups and the energy industry in partnership.

The picture that emerges is one of decisions made at a less centralised level than in the past, and the need for regional and local engagement. Distribution Network/System Operators (DNOs/DSOs) are ideally placed to deal with the more localised nature of the future energy system and to provide the bridge between local communities and that system. As part of addressing the regulatory barriers, Ofgem should review whether DNOs/DSOs have sufficient funding to fully play this role and all DNOs/DSOs should consider the following with respect to community energy:

- Establishing a community energy strategy, with a community energy fund;
- Providing high quality briefings and resources to support community energy schemes in getting off the ground and scaling up their activities;
- Transparency around opportunities, grid constraints and future projections.

These policies would help ensure that the substantial untapped potential of the community energy sector can be realised and communities across the UK can play their full part in the fight against climate change. However, time is not on our side – the UK needs to move quickly to achieve decarbonisation of the scale required. Policy change is required speedily in order to create this thriving sector over the next crucial decade.

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Orkeny Surf n Turf community project: Project partners and suppliers with hydrogen fuel cell, mobile storage units and local ferry, Kirkwall Pier. Courtesy of Community Energy Scotland.

CHAPTER 1

Introduction

The way we produce, store and use energy is changing. This scenario is not unique to the 21st century – the history of the energy system in the UK is one of change and flux. For much of our industrialisation, energy was produced and stored locally for the use and benefit of those living in that (usually municipal) area. Physical evidence of this can be found in the historic gas storage towers in many of our towns and cities. The 20th century however was a time of much greater centralisation, with most of the storage and production of energy concentrated among a handful of large institutions and distributed to households and businesses countrywide.[3]

The energy sector is undergoing a multi-faceted transformation due to the combined impact of decarbonisation, digitisation and advances in energy storage technology

However, today the energy sector is undergoing a multi-faceted transformation due to the combined impact of decarbonisation, digitisation and advances in energy storage technology, with electricity becoming an increasingly dominant form of energy[4]. Many of these changes suggest the future of energy is likely to move away from its centralised model, which will be fundamentally unsuited to the new methods required of generating, storing, using, and consuming energy.

This means decentralisation towards regional and community-scale energy production and consumption. During the past decade local groups have set up a wide variety of community schemes to carry out a range of energy related activities, such as community owned renewable energy generation schemes (i.e. wind turbines, solar panels or hydroelectricity turbines), power charging points for electric vehicles, and awareness raising schemes to encourage energy efficiency.[5] This activity has become known as community energy, or the related concept of local energy.

Until 2017 there was a steady growth in the community energy sector. However, with changes to UK Government policy, most notably the reduction and ending of the UK-wide Feed-in Tariff support for small and medium scale renewable energy generation, the sector is facing uncertainty and challenge. The level of challenge differs in the constituent parts of the country as the devolved Governments each have their own approach to the sector, but there are also common difficulties. An expert from one of the community energy organisations we spoke to summed up the situation as “community energy is expected to play in the same market as large companies and compete on efficiency, whilst in addition delivering wider social impacts”.

Despite the more challenging policy environment currently, community energy groups are developing new business models and exploring innovative new technologies and approaches to low carbon development[6]. A recent report by the UK Energy Research Centre highlights that there are new opportunities, in particular the recent creation of the Innovative Finance ISA may unlock finance on a greater scale and the Clean Growth Strategy offers an opportunity to engage with policy.[7] In Scotland, communities have also trialled 'local energy economy models' to create value through engagement in national grid's frequency response schemes or maximising local renewable generation and reducing local energy costs through matching with locally-specific demand (for example by establishing power-purchase agreements with local fish farms or distilleries).

2019 has also seen an increased focused on the urgency of the challenge of decarbonisation, both through public debate and Government action. The United Kingdom became the first major economy in the world to pass laws to end its contribution to global warming by 2050[8] and the Scottish Government has set an even more ambitious target of 2045. These dates, which seem to indicate a fairly long-time horizon for

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action, should not obscure the thinking of policy makers – radical action must take place over the next 10 years for the decarbonisation agenda to be successful. Over half of councils in the UK have now declared a climate emergency[9]. And the eyes of the international community will be on the UK, and in particular Scotland, at the end of 2020 when Glasgow hosts COP26, the major United Nations conference on climate change.

The next phase of decarbonisation needs communities – people from across all communities and all backgrounds need to get involved and drive this forward. Increasing focus on heat generation, building energy efficiency, low carbon vehicles and energy storage are all needed, and all require greater involvement from individuals than electricity generation. Evidence from other countries suggests that increased engagement of communities increases acceptance and support for large low-carbon infrastructure.[10] Community energy should have a significant role to play, but this will require policy makers, industry and communities themselves to take action.

This report examines the latent potential of the sector, and the economic, social and environmental benefits that a thriving sector could provide, by:

- Summarising the evidence on the economic, social and environmental impacts of the sector;
- Assessing the potential for the sector in the UK, developing realistic scenarios for future growth and the associated benefits to the country;
- Identifies barriers to the growth of the sector and the interventions that could allow the sector to fulfil its potential.

Our definition of community energy

Community energy has been defined in several ways by various interested parties; we have included a range of definitions in Annex A. For this report we primarily focus on one such definition from Community Energy England that focuses on ownership and/or control by communities.

It is important to recognise that the term "local energy" is also widely used. This can be used synonymously with the term "community energy", but local energy can also include schemes owned by other organisations such as local businesses or local authorities. Our focus is on schemes owned by community organisations, but we also discuss local energy schemes where relevant.

“Community energy refers to the delivery of community led renewable energy, energy demand reduction and energy supply projects, whether wholly owned and/or controlled by communities or through partnership with commercial or public sector partners.”[11]

Box 1: Types of scheme included in this report

Electricity generation: Community-owned renewable electricity installations such as solar photovoltaic (PV) panels, wind turbines or hydroelectric generation.

Heat generation: For example, the installation and use of a renewable heat source such as a heat pump or biomass boiler.

Energy storage: Battery or heat storage of energy, often of electricity generated by a community owned electricity or heat generation source.

Low Carbon Transport: For example, provision of electric vehicles or hydrogen-based transport alongside associated car clubs.

Energy efficiency: Including a wide range of activities, from direct services such as energy audits and insulation upgrades, to wider low carbon awareness raising and education initiatives.

CHAPTER 2

Community energy policy and the energy transition

The energy sector is undergoing a transformation, and any analysis of community energy must be set in the context of the structural changes the sector is undergoing, and the policy landscape it currently operates in.

The energy transition and community energy

The growth of community energy over the last decade sits within a much broader context of the energy system transition that is required to address climate change and being driven by technological developments. Some of the constituent parts of this transition are examined below:

1. **Decarbonisation:** The need to radically alter the way our energy is generated is a key driver of community energy. The 195 signatories of the Paris Climate Agreement have set a goal of keeping the increase in global average temperature to well below 2°C above pre-industrial levels[12]. Almost all community energy schemes have a focus on reducing carbon emissions, with 95% of community energy groups in England mentioning climate change as being an important motivator for their projects, (with other key drivers being further environmental concerns such as air quality and biodiversity);[13]

95% of community energy groups in England mentioned climate change as being an important motivator for their projects

2. **Energy storage:** Improved energy storage is both an enabler of community energy through allowing a greater use of renewable energy (at all scales), and an area where community energy could play a major role in providing storage infrastructure. Community energy storage has been framed as a 'socio-technical' innovation that unites the twin objectives of enabling a transition towards a low carbon energy environment with engaging local communities in the energy system;[14]

3. **Distributed electricity generation:** The energy industry is moving away from the traditional model of large fossil-fuel power stations that send electricity through central transmission networks, to one that is dominated by smaller-scale, often renewable, plants[15]. Distributed generation has doubled over the last 5 years and now represents over a quarter of total GB capacity.[16] These are the type of generation schemes that community energy has been focused on;

4. **Digitisation:** Digitisation is an enabler of renewable energy because it helps to tackle a key issue of energy system flexibility that arises with the shift to low carbon sources of generation. Renewable energy cannot be brought on and offline as easily as fossil fuel power stations, which means that the energy system needs a broader range of flexibility elsewhere in the system.[17] Digitisation can create flexibility through allowing a range of technologies to actively manage energy demand and supply. For example, digitisation can enable electric vehicles or smart appliances to vary their demand for energy in response to the network's needs. This activity, known as Demand-Side Response, is a core part of creating a distributed, decarbonised energy system;

5. **Electric Vehicles:** In 2018, transport accounted for a third of all carbon dioxide emissions in the UK, with road transport contributing the overwhelming majority of this. [18] Consequently, increasing take up of Electric Vehicles (EVs) has been identified by policy makers as a key component of any strategy of reaching net zero carbon emissions by 2050. Community energy has the potential to play a supporting role in terms of providing the infrastructure necessary for the expansion of EVs, although its involvement in this area is fairly nascent to date;

6. **Heat:** Transforming the way that we heat our buildings is often considered one of the thorniest elements of the energy transition, moving away from well understood fossil fuel-based heating systems such as gas boilers. Heat pumps have gained traction as one means of rolling out low carbon heating for homes, alongside the consideration of hydrogen-based solutions and biomass fuels among others.[19] Heat generation is another area in which community energy schemes have an emerging involvement, but have run up against a range of barriers around complexity and cost of installation, economic barriers when competing with low cost fossil fuel providers, and a lack of institutional knowledge within the broader community energy sector.[20]

The role of all the actors in the energy system is likely to change as a result of these trends. For example, energy networks will be at the heart of the energy transition and will need to adapt to the demands of a more distributed system with many smaller generators. The flexibility introduced by storage, digitisation and smart devices (including electric vehicles in particular) will enable substantial change. ScottishPower and SP Energy Networks' recent Zero Carbon Communities report[21] explores what this will practically mean in their communities, identifying the adaptions (e.g. electric vehicle charging points, the number of heat pumps replacing gas boilers) that will be required across eight areas they serve. The development of the "Distribution System Operator" concept recognises the key role that the network companies will have in facilitating regional and local decarbonisation objectives, although this is taking many years to implement.

There is also now broad political consensus around the scale of the threat posed by climate change. Last year saw an increase in concern about climate change. According to YouGov data, the proportion of Britons ranking the environment as a priority issue for the country doubled from 2018 to 2019.[22] Differences in the approach of the main parties tend to be over the speed and breadth attached to their decarbonisation plans rather than on any point of principle. Getting the transformation of the energy system right will be a vital element of meeting any politically determined targets around carbon reduction.

Community energy could harness this increased concern. The sector can motivate people through the local demonstration of benefits and help to engage the local community, particularly for those instances where people need to change their behaviour, such as installing energy efficiency measures in a home or changing consumption patterns. A successful energy transition will need to engage with people in every cross-section of society and research has suggested that engaging individuals as members of a community, rather than only as consumers of energy, is an important strategy for changing behaviour.[23]

The proportion of Britons ranking the environment as a priority issue for the country doubled from 2018 to 2019

The policy landscape

The energy sector is a creature of regulation and Government policy, and the same is true of community energy. There have been several recent changes to policies that affect community energy, either across the United Kingdom or in its constituent parts. Some of the key elements of the current landscape are:

- **Closure of Feed-in Tariffs:** After a period of reductions in rates, the Feed-in Tariff (FiT) scheme, which provided support for small to medium scale renewable energy generation was closed to new applications from 31st March 2019. The FiT involves quarterly payments based on the amount of energy generated and exported. Community Energy England warns that this will impact the viability of many community renewable energy schemes.[24] From the 1st January 2020 the Smart Export Guarantee opened in the place of FiTs but it is unlikely that owners will make as much money from this scheme because it pays only for excess electricity put into the grid, rather than all the electricity that's generated;[25]
- **Renewable Heat Incentive:** Heat is an area that continues to be actively supported by Government subsidy in the form of the Renewable Heat Incentive (RHI), but this has been criticised for its low levels of take up[26] and is scheduled to close in its current form in 2021.[27] The involvement of community energy schemes in heat generation remains relatively small, although there are indications that this could grow in advance of the RHI closure;[28]
- **Local Energy Hubs:** BEIS finance five Local Energy Hubs across England. These teams will provide practical support and expertise to Local Enterprise Partnerships and local authorities to help them undertake the initial stages of development for priority energy projects;[29]
- **Rural Community Energy Fund (RCEF):** This £10 million programme was set up in 2019 and supports rural communities in England to develop renewable energy projects, which provide economic and social benefits to the community. It is run by the five Local Energy Hubs.[30] This helps with the costs of setting up a scheme, but it only covers rural areas and does not provide assistance towards ongoing financial viability. Many schemes could be financially viable without support if they could sell energy locally, but such opportunities are very limited in the UK's centralised regulatory system;
- **Community and Renewable Energy Scheme (CARES):** As part of the Scottish Government's strategy of achieving 1GW of community and locally owned renewable energy generation by 2020 and 2GW by 2030, this programme offers grants for starting, growing and innovating small renewable schemes. CARES has existed since 2009, and £5 million will be made available in the latest round between 2019 and 2020.[31] This has a broader focus than the Rural Community Energy Fund, supporting both urban schemes as well as rural and for a wider range of purposes including grant funding elements of projects. However, it also cannot provide ongoing financial assistance;
- **Welsh Government Energy Service:** The Welsh Government launched the new Welsh Government Energy Service in 2018 which provides a single point of contact for those seeking to develop energy efficiency or renewable energy schemes.[32]

The UK's departure from the European Union may also affect funding opportunities as access to future programmes similar to the European Union's Horizon 2020 initiative is likely to come to an end. Table 2 maps the policy landscape for community energy in England, Wales and Scotland (the landscape in Northern Ireland is different due to the single electricity market, and the sector is currently relatively small with only one organisation responding to the Community Energy England survey).

Table 2: Policy landscape for community energy in Great Britain

		England	Wales	Scotland
Financial	Feed-in-Tariffs	National scheme, closed to new applications in 2019		
	Smart Export Guarantee	Opening in 2020, pays generators for energy exported to the grid		
	Renewable Heat Incentive	National scheme, future uncertain after 2021		
	Grant support to develop schemes	Rural Community Energy Fund (£10 million)	Loans/grants from Local Energy Service	Community and Renewable Energy Scheme (£5m)
		Range of other organisations offering grants: Big Lottery Climate Action Fund, Players of the People's Postcode Trust, Naturesave Trust		
Regulation/ support and advice	Government strategy / target	Local energy strategies set by Local Enterprise Partnerships	Target for Local Energy capacity of 1GW by 2030[38]	Target for Local Energy capacity of 1GW by 2020 and 2GW by 2030[39] and consulting on a Local Energy Policy Statement[40]
	Energy system regulation	Set nationally by Ofgem. Key part of the regulations is that suppliers are the regulated interface between energy consumer and the energy system. This severely constrains the ability for local energy in the UK, as local generators cannot easily sell to local people or businesses. Ofgem have said that there is a strong case for considering fundamental reforms to this "supplier-hub" model		
	Government support/advice	Local Energy Hubs	Welsh Government Local Energy Service	Local Energy Scotland
	Non-government support/advice	Community Energy England / Hub	Community Energy Wales Renew Wales	Community Energy Scotland

What helps community energy schemes succeed?

We have also reviewed evidence on what can lead to success or failure of community energy schemes; our findings are summarised in Box 2.

Box 2: Evaluation evidence from the Local Energy Assessment Fund

The 2014 evaluation of the Local Energy Assessment Fund (LEAF) is the most recent comprehensive source of evidence on what contributes to the success of community energy projects. The review of 236 community projects revealed that there are a few common factors that make them more likely to succeed. Key success criteria were:

- **Expertise and experience:** Projects are much more likely to be successful if they have realistic goals and timescales and are led by people with project management experience. "Community" does not equate to "amateurish", and the projects that succeed are those that can make the best use of the skills and experience of their members.
- **External support:** successful projects typically employ outside expertise in the form of consultants and contractors. Those leading schemes should recognise when others are better equipped to deliver aspects of the project.
- **Relationships and the community:** Pre-existing relationships with key experts, decision makers (e.g. Local Authorities) and the community more widely make it much more likely that community energy schemes succeed.

Source: Department for Energy and Climate Change (2014) LEAF Evaluation

The importance of external support has been recognised for a number of years and is often provided by third sector organisations. For example, Community Energy Scotland provides detailed, independent and ongoing support for all aspects of community energy project development and Community Energy England and Community Energy Wales supports and provides advice to community energy organisations.

There is further evidence from schemes in Wales that extensive engagement with the public is vital in taking forward community energy projects, with public support being cited as a key determinant of success for schemes in Awel, Swansea and Carmarthenshire.[33]

Economic incentives are an important driver for participation in community energy schemes, particularly for those who invest their own money in such projects. A survey of over 4000 members of two community energy cooperatives in Flanders found that return on investment had a higher correlation with participation in these schemes than any other factor.[34]

Analysis by the UK Energy Research Centre[35] has also found that innovative approaches to start up funding have been key to the success of many community energy groups. For example, rather than relying on Government grants, groups began to issue community shares in their schemes in order to fund initial projects. Another key area of innovation has been in community groups providing development services which specialise in growing and scaling other community energy schemes, such as the establishment of Energy4All by the Baywind initiative.

This evidence shows that funding, access to expertise and strong links between experts and the community are all important to the success of community energy schemes. In our recommendations we discuss approaches to local energy planning to ensure strong links to the energy system, and also look at funding and advice. Energy Local Bethesda (see Box 3) is a good example of the combination of community passion and skill with support from Government and the energy industry.

Box 3: Energy Local Bethesda

The success of Energy Local Bethesda has been driven by a core group of highly engaged and well-equipped citizens who are motivated by the need to tackle climate change and a desire to see their community prosper. The scheme was set up in 2016 with the objective of demonstrating a successful blueprint for a community owned hydro scheme, with an ambition for this model to also be applied to other areas across the UK.

In the first instance, the group formed a club of 100 people who purchase low cost energy from a local National Trust owned Hydro scheme. Each member has a smart meter installed in their home to match their own energy use to that which is generated by the hydro installation.

Through this model, the scheme is able to provide energy for the local community at a lower overall price than if they were to purchase from a large energy company, while also providing a better price for the hydro scheme than if it sold energy directly to the Grid. The installation of smart meters is key to the scheme achieving this, as are the new relationships the energy club has established with the big energy companies.

As a result, each household can expect to ultimately benefit from savings **of between 10% and 30% on their electricity bills**, plus the community also has surplus revenue to invest in local renewable projects of their choosing. In the context of an area with higher levels of overall deprivation and fuel poverty these are significant positive impacts.

This scheme has benefitted from financial support from a range of sources including the Welsh Government and the Department of Business, Energy and Industrial Strategy. It has also received contributions from SP Energy Networks to help them host events in the community for current and potential members of the energy club.

Benefits: *Carbon reduction, Education and awareness raising, Reduction in energy bills through provision of low-cost energy and energy efficiency, Economic resilience, Energy system resilience, Community cohesion.*

Sources: Energy Local Bethesda, Kelly (2016), and BBC (2016)[36]

Table 2 shows that there is a range of funding and advice available across the constituent parts of Great Britain aimed at ensuring community schemes can get off the ground and get access to support and expertise. This is welcome, however it may not be sufficient. In a recent survey of community energy organisations in the East and South-East of England (including London), 52% of respondents stated that a barrier to their work is often a lack of organisational capacity, either due to low volunteer numbers or a lack of specific expertise.[37]

Explicit targets for local energy in Scotland and Wales appear to be driving continued focus and support in these areas; targets such as these are most valuable in the context of a strategy designed to achieve them. However, later in the report we review the barriers to community energy growing further and find that key barriers (e.g. the lack of a wide range of viable business models and the centralised nature of energy regulation in the UK) arise from national Government decisions and are the same across the country.

CHAPTER 3

The potential for community energy

How large is the sector today, and to what extent could it grow given a supportive policy environment? This chapter reviews the evidence on the current extent of the sector and then goes on to describe how we have built realistic scenarios of potential future growth.

Extent of the sector today

No comprehensive database exists of community energy schemes and their activities. For information on the size of the sector there are a range of sources:

- In Scotland contemporary data collection is carried out by the Energy Saving Trust and the Welsh Government has also recently reported on the size of the sector.[41] Community Energy Scotland also own data for their projects. These data sources are focused on collecting information about installed capacity so do not include wider indicators (such as number of staff employed);
- In England, Northern Ireland and Wales, the not-for-profit organization Community Energy England conducts an annual survey and publishes an annual "State of the Sector" report[42]. This survey collects a more comprehensive range of information, but only for those organisations that have been identified so may understate the size of the sector.

The contemporary datasets suggest that there are at least:

- 275 community energy groups in England, Wales, and Northern Ireland;
- 540 community owned renewable installations (e.g. wind turbine) in Scotland (although one community energy group may own more than one installation).

These groups undertake a range of types of activity; below we look at the data that shows the predominant activity is electricity generation but there is a move towards energy efficiency, heat generation, energy storage and low carbon transport activity.

Community energy may be significantly bigger than this. In 2014 the then Department for Energy and Climate Change (DECC) commissioned the most extensive attempt to gather data on the size of the sector.[43] This review found evidence that at least 5,000 groups had considered, commenced and/or completed energy projects between 2008 and 2014. Many of these groups were likely to be small groups undertaking energy efficiency activity and the report notes that it is difficult to provide a comprehensive account of community energy activity.

In terms of energy generation, one way to measure the size of the sector is by how much capacity community energy groups have installed (or own). Table 3 breaks this down across the country.

Table 3: Known generation/storage capacity (MW) of community energy schemes as of 2018

Nation(s)	Electricity generation	Heat generation	Solar PV	Wind	Hydroelectric	Battery storage
England, Wales and NI	**168**	**2**	137	28	2	0.5
Scotland	**68**	**12**	2	60[44]	6	0.8

Source: Adapted from Community Energy England State of the Sector 2019 and Energy Saving Trust Community and locally owned renewable energy report 2018

The relative focus on solar capacity in England, Wales and Northern Ireland is likely to be explained by changes made to planning policy for onshore wind generation in England in 2015, introducing new considerations to be applied to proposed developments.[45] These changes led to a 94% drop off in the number of onshore wind applications made in England in 2015-17 when compared to 2013-15.[46] Community groups are more likely to be involved in onshore as opposed to offshore wind.

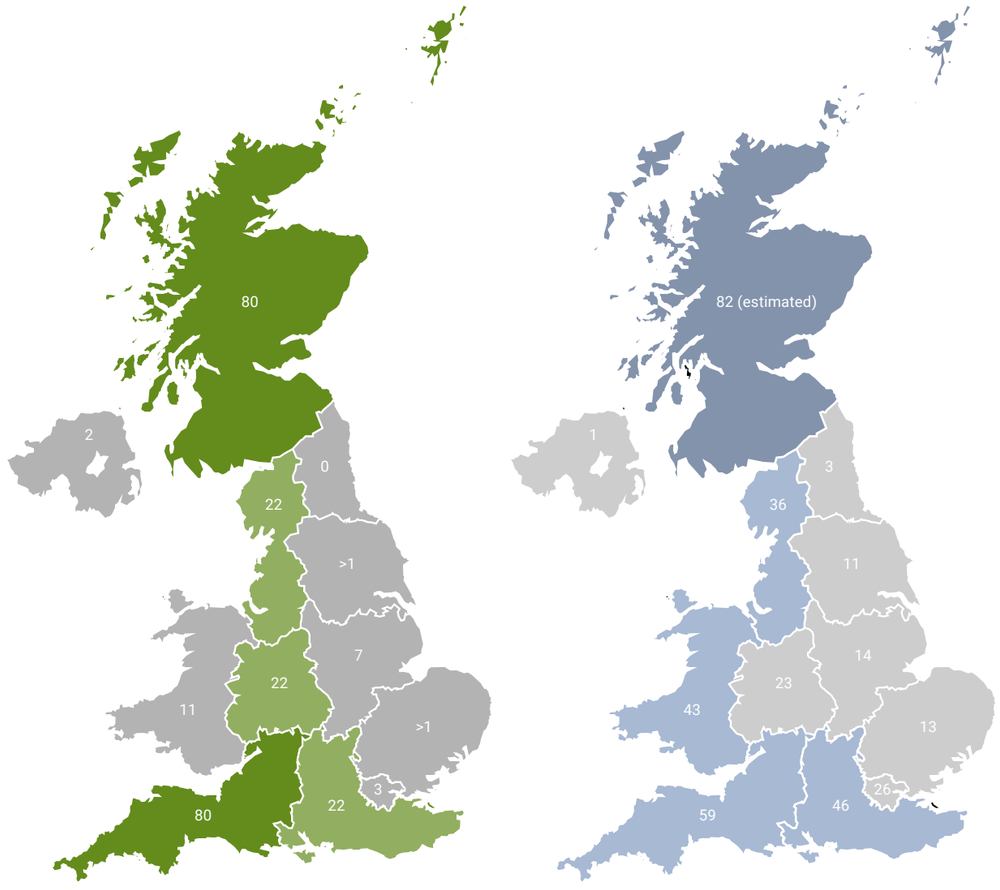
Total energy generation by the sector in 2018 was estimated at 398 gigawatt hours[47], which accounted for 0.12% of total energy generation in the UK and 0.36% of renewables generation[48]. However, the evidence we review later in this chapter leads us to think there is very significant latent potential for the sector to grow much larger than its current size – perhaps producing 20 times as much energy as today.

Local electrician installs new, smart, electric heating to be used as remotely-controllable demand for the Mull ACCESS Project. Photo courtesy of Community Energy Scotland via Euan Robertson

Distribution of the sector

Community energy is not uniformly distributed across the country, with a particular focus in the South-West and Scotland (southern and western areas are better placed for wind and solar opportunities compared to the rest of England[49] and Scotland has had consistent policy support for Local Energy). Figure 2 shows the distribution of known installed capacity across the country and the distribution of organisations in the country.

Figure 2: Community energy generation capacity and the number of organisations in the UK



Installed Electricity and Heat generation capacity (MW)

Community energy organisations

Source: Community Energy England and Local Energy Scotland. We have not identified a published estimate of the number of organisations in Scotland, so have included the number of individual community organisations listed on Local Energy Scotland's local energy projects map.[50] This is likely to be an underestimated figure.

There has also been some analysis of where community energy groups have been set up. DECC (2014)[51] found that:

- **Community energy groups are more prevalent per person in rural areas relative to urban areas:** Whilst the majority of community groups are found in urban areas, the prevalence of community groups planning/undertaking energy projects in rural areas (41%) is high when compared to the distribution of the UK resident population. For example, approximately 18% of the resident population in England reside in rural areas;
- **Community energy groups were not focused on either the most or least deprived areas of the country:** Further analysis of the geographical distribution of projects in England suggests that the scale of community energy activity, in terms of number of groups, is similar from the most deprived areas of the country to the least deprived.

We have also analysed data kindly provided to us by Community Energy England to explore the current distribution of the sector. This data suggests that as a proportion of activity in England, Wales and Northern Ireland in 2018:

- 84% of energy efficiency events held were in London, South East England and South West England;
- 85% of all community members engaged as part of energy efficiency/demand projects were in the South West of England;
- Half of all full-time staff employed are in Wales and the South-West of England.

Whilst renewable electricity generation is suited to some parts of the countries more than others[52], it is not clear that future activity will follow this pattern. Other types of community energy activity are needed nationwide, so we would expect the changing face of community energy to be spread more evenly across the country.

The changing face of community energy

Community schemes must find ways of funding the activities which they have identified as delivering their stated aims around benefitting the community. This gives rise to the need to develop a business model which generates a reliable source of revenue. There are a very broad range of models employed by community schemes, but in Table 4 we identify three high level categories which many of the schemes fit in to. These categories are not exclusive; in particular, schemes using Feed-in-Tariffs have often also undertaken efficiency or innovation focused activity as well.

Table 4: Categorisation of community energy business models

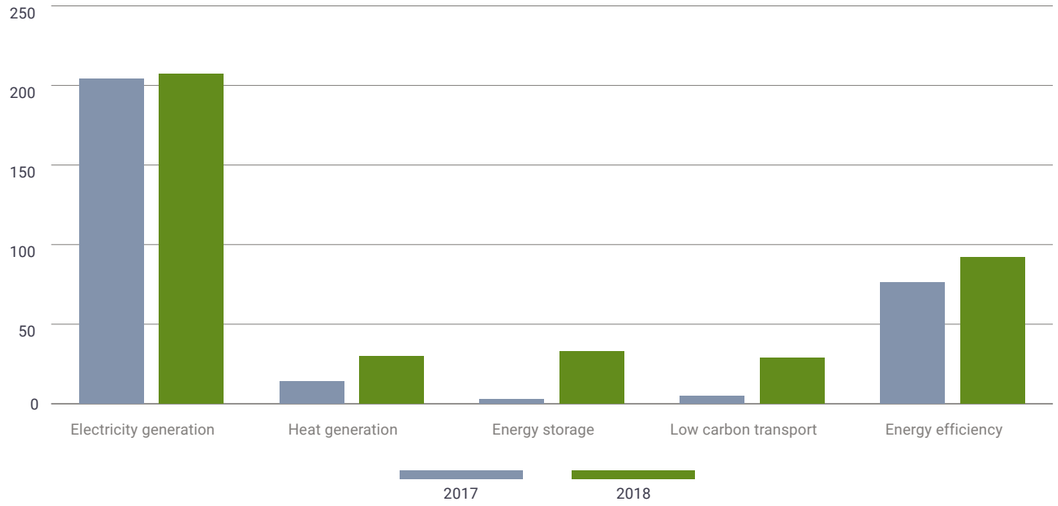
Model	Description
The Feed-in Tariff (FiT) model	About three quarters of schemes in England, Wales and NI have a business model that to some degree relies on FiTs as a subsidy for renewable energy generation, although in many cases this won't be their only activity. The profit from this activity is transformed into some kind of benefit for the scheme members or wider community, usually either financial support for community resources or reduced energy bills. The cutting and ultimate abolition of FiTs to new entrants has had a large and detrimental impact on take up of schemes which have a mainly energy generation focussed model.
Efficiency focused model	There is a less clear model for drawing income from work on energy efficiency, and so these activities are often subsidised by revenue from renewable generation. Community Energy England suggests that schemes may wish to consider working with a range of partners, potentially including commercial operations. Most efficiency schemes are relatively small scale and low cost and include the provision of free advice or signposting. Some higher impact and cost options can include installing measures such as LED lighting, double glazing, or draught exclusion in homes. At least one scheme provides these options on a 'pay as you save' basis where the householder has the measures installed for zero upfront cost and pays the scheme back gradually from their savings on their energy bills.
Innovators	Some schemes have a focus on pushing the boundaries of how the energy transition can be delivered through innovation, often with the assistance of a grant from Government or working with an energy company. Energise Barnsley (Box 4) are an example of an innovator, testing a new approach to decarbonising the heat system through Demand Side Response (DSR). There are also a range of innovations taking place in other areas. Examples of community-led innovation include battery and hydrogen energy storage, levelling out peak and off-peak demands and exploring ways to use locally generated energy to heat essential community facilities.

Sources: Community Energy England State of the Sector 2019, Energise Barnsley, and Brighton and Hove Energy Services Co-operative[53]

In Scotland, Community Energy Scotland have led the development of the concept of Local Energy Economies. This idea describes a system where energy is generated, distributed and used locally, with the cost of energy infrastructure supported through local finance, such as community shares. Opportunities for local sale of energy are limited by current UK legislation but this concept has explored what could be possible from such models, and encouraged innovative approaches to energy system flexibility and resilience.

Figure 3 shows how 2018 saw a shift in the focus of community energy groups. The data from Community Energy England suggests that the predominant activity is energy generation, followed by energy efficiency with other types of activity much less prevalent. However, whilst electricity generation was still the predominant activity in 2018, there was a substantial increase in the number of organisations reporting that they were active in heat generation, energy storage, electric vehicles and energy efficiency.

Figure 3: Number of community energy organisations in England, Wales and Northern Ireland reporting that they undertake given types of activity



Source: Adapted from Community Energy England State of the sector reports 2018 and 2019

Although the timing of this change may have been driven by the reduction in support for electricity generation activity, there is a much more important story underlying the change; the next phase of decarbonisation will move the focus from energy generation to many other types of "distributed energy resources". For example, the Energy Systems Catapult have said that there will be a heavy focus on the challenges of heat and the energy performance of buildings, with costs measured in hundreds of billions of pounds by 2050[54] and the Green Alliance summarise a range of different types of distributed energy resources in their report Community Energy 2.0, including battery storage, demand response (changing energy demand in response to energy system requirements) and electric vehicles.[55] A potential source of income to community energy groups is selling flexibility to the energy system. Distribution System Operators publicise their flexibility needs on an online platform called Piclo[56] where organisations can upload details of their energy assets and take part in competitions to provide flexibility.

This next phase of decarbonisation is likely to need more support from individuals and communities because many of the measures require changes to individual homes (energy efficiency), cars (electric vehicles) or types of household appliance (demand response). People living in shared buildings will need to decarbonise with their neighbours, making community involvement even more important. Community energy schemes should therefore be very well placed to play a key role in this phase, and harness the change in popular opinion that we have seen recently towards more active involvement.

It has long been the case that community energy schemes have undertaken a range of types of activity, but electricity generation is what many people think of first. It is likely that the typical community energy scheme will change fast; Box 4 looks at Energise Barnsley which is likely to be more indicative of future schemes.

Box 4: Case study – Energise Barnsley, England

This social enterprise began as a collaboration between the local council and three other organisations committed to delivering lasting social impact through community owned energy schemes across Barnsley. The scheme aims to create an impact by tackling fuel poverty through reduced energy bills, engaging local people in the scheme, and supporting community initiatives through the Scheme's community benefit fund.

Energise Barnsley's projects span a range of domains including installing solar panels, battery storage and smart technology that allows energy demand to be shifted away from peak times – known as Demand Side Response (DSR). As part of one initiative, 321 council owned homes have received free solar PV installations, of which 75% are bungalows housing elderly tenants. These tenants saved over £40,000 in reduced energy bills in the first year of this initiative. All surplus profits from renewable generation are directed to a community benefit fund which supports good local causes, such as energy related support and advice for elderly people delivered by Age UK and Citizen's Advice.

Energise Barnsley also plays an important role in helping to develop solutions to major challenges facing the energy system. For example, following an award from BEIS in 2019, Energise Barnsley is currently exploring an innovative approach to DSR for domestic tenanted housing, as part of identifying how best to achieve the Government's objective of decarbonising the heat system.

Benefits: *Carbon reduction, education and awareness raising reduction in energy bills through provision of low-cost energy and energy efficiency, supporting community initiatives through generating funds, job creation in local areas, local fuel poverty reduction, economic resilience, energy system resilience, provision of community assets (e.g. electric vehicles).*

Sources: Energise Barnsley, Barnsley Metropolitan Borough Council and Community Energy England[57]

Growth of the sector tomorrow: developing scenarios

How much could the sector grow? This section presents a range of evidence-based scenarios on the future potential for community energy in the United Kingdom and assesses the impacts of the sector under these scenarios. These are not forecasts, because significant policy change would be required to reach the higher scenarios. Instead we aim to identify an ambitious but achievable level of growth for the sector to illustrate what effective policy in this area could achieve. In the final chapter we discuss what type of policies would be required to reach these levels of growth.

We have focused on electricity generation in the first instance as this is where there is most evidence from both UK history and international evidence. We then use these scenarios to consider the other types of activity community energy may move in to.

We have combined three approaches to building a realistic set of scenarios:

- **Trend-based forecasting:** Using previous trends to project forward. This approach can get a sense of realistic growth rates but cannot account for a range of reasons why those trends may not continue;
- **Detailed sector modelling:** Reviewing previous reports that have modelled the potential growth in the sector in detail. This type of approach is most likely to produce the most accurate forecasts but will not necessarily account for the potential for significant policy change;
- **International evidence review:** Conducting a review of the scale of community energy in other countries as potential real-world comparators for the UK.

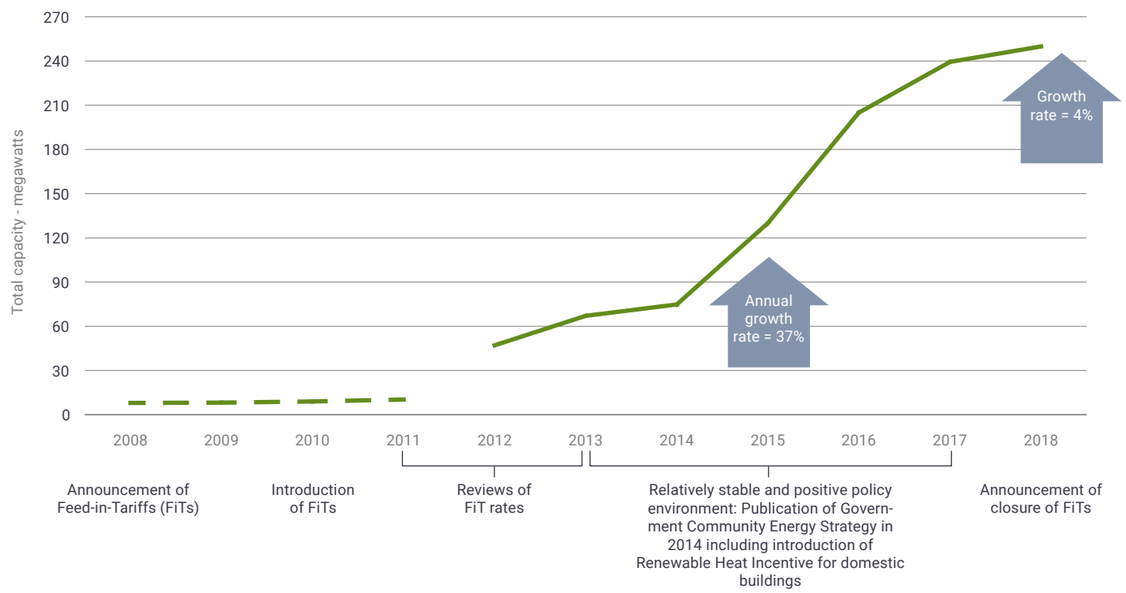
Much of the evidence we review pre-dates the UK government commitment to net zero emission by 2050 and also pre-dates the announcement of reductions and eventual closure of the Feed-in-Tarrif scheme. However, the evidence is still relevant because both the international examples and sector modelling suggest what could be achieved with more supportive policy.

We model growth to 2030 to both allow time for significant policy change while keeping our focus on the near-term policy change that is required if the country is to achieve its 2050 decarbonisation targets.

Trend based forecasting

Figure 4 presents the available data on the growth of community energy generation capacity in the UK (including Scotland from 2012), and plots changes to some of the key policies that supported the growth of the sector. We are grateful to Community Energy England for supplying us with their latest data on the estimated growth in capacity in England, Wales and Northern Ireland. This data may differ slightly from earlier published sources as the Community Energy England team constantly updates their data to capture a realistic view of the sector.

Figure 4: Growth of community energy electricity and heat generation capacity in the UK (Scotland included from 2012 onwards)



Sources: Community Energy England, Energy Saving Trust and WPI Economics calculations[58]. Data for 2008-2011 is for England, Wales and Northern Ireland only.

We find that there was a period of growth in identified capacity of **37% per year** from 2013-2017 but that following the announcement of the closure of the Feed-in Tariff scheme there was only **4% growth** in 2018.

If these growth rates were to be seen over the period 2019-2030 then we would see generation capacity grow from the 2018 estimated capacity of 250MW to:

- **Current trend growth:** 420MW
- **Trend based on 2013-2017 relatively stable and positive policy environment:** 11,300MW (11.3GW)

This analysis simply shows the substantial difference between what would occur if the previous rate of growth were to be sustained compared to the much lower rate of growth seen in 2018. However, this analysis cannot tell us if a potential of several gigawatts (GW) of generation capacity is realistic. For that we turn to our other approaches.

Detailed sector modelling

We have identified three previous attempts to model the potential of community energy in detail, summarised in Table 5.

Table 5: Summary of previous modelling of the potential for the sector

Model	Energy generation potential, United Kingdom (MW)	Suggested timescale given in report	Approach
Camco and Baker Tilly (2011)	3,500	Unknown	Survey of community activity in one part of England scaled up to the UK as a way of testing whether a figure of 10% of total renewables capacity was viable.
ResPublica (2013)	5,270	Report mentions both 2020 and 2027	Takes Camco and Baker Tilly report as starting point, and scales up to reflect the potential for greater split ownership or Joint Venture schemes
Capener (2014)	Range of scenarios: High: 3,000 Medium (stop-start policy support): 650 Low: 475	By 2020	Modelled the financial viability of community energy organisations' delivering varying proportions of forecast renewables generation

Camco and Baker Tilly (2011)[59] extrapolated what had been achieved in one area of England to the whole country, and ResPublica (2013)[60] built on this to include the potential for greater shared ownership. The later report by Capener (2014)[61] carried out a more detailed modelling exercise that included assessment of the financial viability of community energy organisations' building capacity.

Capener found that with a positive and stable policy environment community energy could have the potential to deliver 3GW of capacity by 2020. The study also modelled two other scenarios, including a medium (stop-start) scenario characterised by intermittent support for community energy action and an unstable policy and regulatory framework. These scenarios showed that instability has a significant impact on community and investor confidence by undermining the rate of sector growth, funds raised and projects installed as a result.

These assessments did not come to pass, with the low scenario from Capener being closest to the outcome we are likely to see. However, our review of international evidence suggests that community energy does have the potential to be significantly larger.

International evidence

We reviewed the evidence on community energy in other countries and have found that alternative approaches can encourage significantly larger community energy sectors than the UK. Two key examples are Germany and Denmark:

- **Germany:** Trend Research estimate that 31.5% of renewable energy in Germany was owned by households under the category of "Citizen Energy" in 2016[62]. With a total installed renewable capacity of 100.3GW in 2016[63] we can calculate that households owned 31.6GW of renewable capacity in 2016. This trend has continued; Deloitte report that over two-fifths of renewable energy installed in 2017 was also cooperative-owned.[64] The German approach to community energy shows the scope for a radically different sector; a 2014 Respublica report found that there were 1,100 electricity suppliers in Germany[65] compared to just 64 as of June 2019 in the UK;[66]
- **Denmark:** Favourable policies led to a peak of community energy projects around the year 2000 in Denmark when around 80% of the country's wind turbines were in the hands of individual owners or cooperatives[67]. In 2013, 70-80% of wind turbines in the country were considered to be under community ownership.[68] Beyond high Feed-in tariffs, there appear to be two key reasons for the success of the sector in Denmark:
  - ***Governance:*** Ruggiero et al. (2019)[69] report that the country has always had a governance system that supported decentralised energy production with a strong role for municipal government. Municipalities are the main actor when it comes to energy planning and they often work closely together with local citizen groups and companies.
  - ***Requiring local share in wind projects:*** Denmark strongly supports energy cooperatives, requiring a 20 percent local community share in all wind projects.[70]

Transferring figures from the international context to the United Kingdom needs to be done with caution. The success of community schemes may be influenced by a range of hard to replicate factors such as different regional and local political structures and cultural histories of community organisation. There has also been a challenge in Germany over preferential treatment offered to citizen's energy that may have resulted in some companies gaming the system, but not delivering the full range of benefits of true community schemes.[71]

However, what these examples give us is a way to check that significant growth from today is feasible, at least at a broad order of magnitude. It is clear from both the German and Danish examples that a much larger community energy sector is possible, and that it could be responsible for multiple gigawatts of generation capacity given the right policy environment.

Box 5: The German energy market and community energy

Despite there being no specific strategy in place for growing community energy in Germany, the sector is substantially more mature than in the UK. Key reasons for this include:

The historic local nature of energy in Germany – municipal authorities in Germany have always played a major role in providing for the energy needs of that area, primarily in the form of the Stadtwerke (municipal utility monopolies). As a result of this legacy, the energy market in Germany has not become highly concentrated;

High levels of historic support for renewables – support has existed in some form since the 1980s, and Feed-in Tariffs have existed since 2000. Support for renewables became even more pronounced following the Fukushima nuclear incident as a means of encouraging a shift away from nuclear power;

Access to finance – if partnering with local authorities, community groups can access low cost financing through the German state bank KfW to help fund their projects.

Sources: ResPublica and European Committee of the Regions[72]

Future community energy scenarios

This evidence suggests that a capacity of several gigawatts may be achievable for community energy, given the right policy environment. Virtually all of our expert interviewees agreed that this scale was feasible. We think that the best basis for future scenarios is to use the current rate of growth (4%) as our baseline and compare this to scenarios in which the potential identified by Respublica (2013) and the high scenario from Capener (2014) are met by 2030. In summary:

Baseline (low growth): 420MW energy generation capacity by 2030

Moderate scenario: 3GW energy generation capacity by 2030

High scenario: 5.3GW energy generation capacity by 2030

These would require significant policy change, but we can use them to understand the impacts a thriving community energy sector could have.

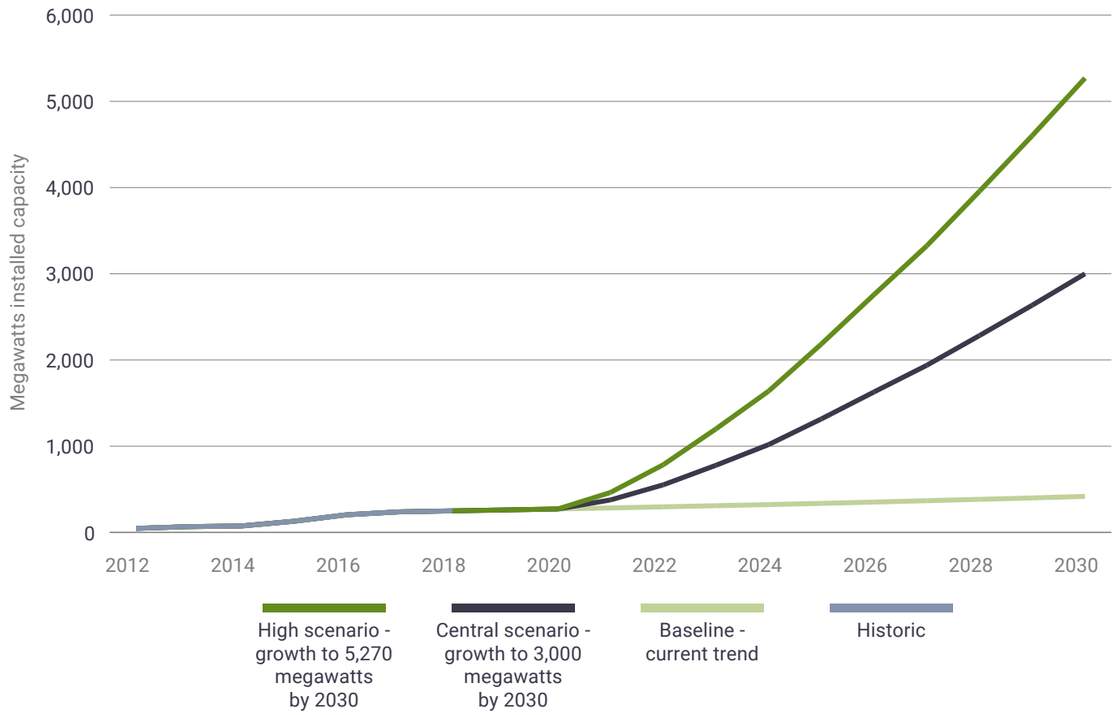
We need to make assumptions about the path that growth might follow in the moderate and high scenarios. We assume the following:

- 2019 and 2020: Given that the current policy environment would take time to change we assume only 4% growth for these two years;
- 2021 to 2030: We use the Future Energy Scenarios developed by the National Grid Electricity System Operator (ESO)[73] to build a realistic path for growth. The National Grid ESO publishes Future Energy Scenarios each year, with the latest version in 2019 including a scenario called "Community Renewables" which features a high degree of decentralisation. We use the path that solar, wind, hydro and biomass energy is projected to follow under this scenario to model the path that our scenarios should follow.

Finally, we make an assumption that the levels of capacity reached in 2030 do not represent maturity of the sector. The German and Danish examples suggest even further growth could be plausible and renewable energy is expected to continue growing beyond 2030[74]. Our scenarios do exhibit a declining growth rate towards 2030 but maturity would not be reached until beyond the forecast period.

Figure 5 shows how our scenarios would grow from today to 2030.

Figure 5: Community energy growth scenarios



Source: WPI calculations

To reach the moderate scenario a 27% average annual growth rate would be required during the next decade, which is lower than the growth rate seen during the relatively positive policy environment seen during 2013-2017. We think this is reasonable because although the policy environment was relatively positive, many of the actions in the 2014 Community Energy Strategy[75] were not fully carried out. The high scenario implies a higher average annual growth rate of 34%.

In order to clearly assess the implications of these scenarios we will summarise the results for 2030 and also for 2024; the end of the next Parliament if it runs its full course of five years. Table 6 shows the installed generation capacity in those years.

Table 6: WPI scenarios – installed generation capacity (MW)

Scenario	2024	2030
BASELINE	320	418
MODERATE	1,020	3,000
HIGH	1,640	5,720

Source: WPI calculations

To give a sense of scale, 3GW of capacity could be expected to generate around 4.8GWh of energy at current rates of generation, which is enough to supply the annual electricity needs of around 1.3 million homes at current average electricity consumption. 5.3GW could supply as many as 2.2 million homes.[76]

We can also estimate the number of community energy organisations that would likely need to be in existence to install this capacity, shown in Table 7, in the following way:

- For our baseline scenario we simply grow the number of organisations by 4% a year, in line with our assumption of how capacity grows;
- For the moderate and high scenarios, we use the findings from Capener (2014) which estimated that a capacity of 3 gigawatts would require 2,300 organisations. We use this to scale up the number of organisations for the high scenario in 2030;
- For the intermediate years we grow the number of organisations towards the 2030 level in proportion to the capacity increase.

Table 7: WPI scenarios – estimated number of community energy organisations

Scenario	2024	2030
BASELINE	430	600
MODERATE	900	2,300
HIGH	1,400	4,000

Source: WPI calculations

The next chapter looks at the impacts that a community energy sector of this size could have on the country. These organisations are likely to undertake a much wider range of activity than electricity generation, and the next page looks at the areas of heat generation, energy demand and storage.

Heat generation, energy demand and storage

Beyond energy generation, it is challenging to generate realistic scenarios for other areas such as energy storage, electric vehicles and energy efficiency. This is because the historical involvement of community energy groups has been more limited, and the energy transition is about to lead to significant growth across these areas which does not have historical or international precedent to draw from.

To get a handle on the scale of the opportunity across these areas, we have looked at a range of sources. In particular the National Grid Electricity System Operator has produced a series of "Future Energy Scenarios" (FES)[77] which present different plausible visions of how energy production, distribution and consumption will evolve depending on different regulatory environments. The FES propose two routes which achieve a reduction of 80% of emissions by 2050 (the analysis for this year's FES predated the Government's net zero commitment):

- **Community renewables:** In this scenario local energy schemes flourish, consumers are engaged and improving energy efficiency is a priority;
- **Two degrees:** In this scenario large-scale solutions are delivered and consumers are supported to choose alternative heat and transport options to meet the 2050 target. Although this scenario looks at a more centralised route to decarbonisation it still opens up significant opportunities for community energy.

We can get some indication of the scale of opportunity in this area using these scenarios and other sources:

Heating: Our scenario development above included heat generation alongside electricity generation but there is the potential for community group involvement in heat generation to grow at a faster rate. Getting to net zero emissions will mean the end of gas heating as we know it, and the mass conversion of existing homes to electric-powered heat pump technology[78]. The FES shows that between 4.4 and 5.6 million homes need to change to lower carbon sources by 2030. District heating alone will connect around three times as many homes in 2030 than today; in Demark 60% of domestic housing and 45% of total heat requirement was already met by district heating by 2013;[79]

Appliances: The Future Energy Scenarios work suggests up to 25% of homes could have "cold" smart appliances (fridges and freezers) and up to 26% "wet" smart appliances (dishwashers and washing machines) by 2030. Community energy could have a signficiant role to play in encouraging adoption and helping households with the behavioural change needed to make the most of these new technologies;

Electric vehicles: The UK currently has 160,000 electric vehicles and is expected to reach a million by 2022 with up to 1GW of vehicle to grid capacity by 2030.[80] WPI Economics projections[81] show that there might be more than 10 million purely electric vehicles on the road by 2030. FES envisions the vast majority of EV charging being conducted at people's homes and 15% at public charge points. Community energy could help facilitate both of these, but especially public facilities in local areas;

Storage: The UK already has 3GW of installed battery capacity, equivalent to powering 300,000 electric vehicles[82], and FES estimates that the installed storage capacity will increase by over 300% between now and 2030 to around 12GW. Western Power Distribution[83] have predicted that up to 23% of storage capacity will need to be distributed to the household or community level, implying around 2.7GW of capacity that community energy may be able to play a part in delivering. Community Energy England found that 33 groups are involved in energy storage schemes[84] however academic research suggests that the potential is much greater, with some analysis finding that community energy storage is an overall more efficient option than household energy storage.[85]

CHAPTER 4

Estimating the impacts of community energy

Community energy has a wide range of impacts. The sector consists of a variety of types of scheme; although many schemes have electricity generation at their heart there are many other types of activity including energy efficiency, electric vehicles and energy storage. Combined with this a community scheme has more complex impacts than a commercial scheme, as the schemes often have a broader social and environmental purpose and many distribute money through a community benefit fund to local educational, community retail and recreational activities, which in turn can generate further local economic activity.

For example, Community Energy England found that the sector employed 205 full-time equivalent (FTE) staff across England, Wales and Northern Ireland in 2018 and £978,000 was allocated by community benefit funds[86]. See figure 6 for key statistics provided by the Community Energy England survey.

Figure 6: Key facts on community energy schemes in England, Wales and Northern Ireland, 2018

29 communities involved in low carbon transport, with the majority in electric vehicles	£978,000 in community benefit fund spending	205 FTE staff taking part in community energy schemes	128,000 local people engaged in energy efficiency projects

Adapted from Community Energy England State of the Sector 2019

However, the range of impacts is much wider than this. To illustrate the breadth of impacts Table 8 maps out the primary types of impact that are likely to arise from different types of activity that community energy groups might undertake, based on our research and discussions with experts in the sector.

Table 8: Benefits map for community energy schemes – primary types of benefit for types of community energy scheme activity

Scenario	Type of benefit	Energy generation (electricity or heat)	Energy storage	Low Carbon Transport	Energy efficiency
Environmental	Carbon reduction	✓	✓	✓	✓
	Education and awareness raising	✓	✓	✓	✓
Economic	Reduction in energy bills through provision of low-cost energy and energy efficiency	✓	✓		✓
	Supporting community initiatives through generating funds	✓			
	Job creation in local areas	✓	✓		✓
	Skills development through training initiatives	✓			
	Local fuel poverty reduction through energy efficiency	✓	✓	✓	✓
	Reduced transport costs through electric vehicle charging infrastructure			✓	
Resilience	Economic resilience	✓	✓		✓
	Energy system resilience	✓	✓	✓	
Social benefits	Community cohesion	✓	✓	✓	✓
	Provision of community assets (e.g. electric vehicles)			✓	
	Improved health and wellbeing	✓	✓	✓	✓
Innovation	Piloting new approaches to energy generation	✓			
	Increased R&D spending	✓	✓	✓	✓

Source: WPI Economics assessment

Box 6 discusses a case study which shows how money generated from a community energy scheme can support broader social goals.

Box 6: Hoprigshiels Community Windfarm, Scotland

Berwickshire Housing Association identified the generation and sale of renewable energy as a potential means of funding a vital need for local people – new homes for social rent. Through a partnership with Community Energy Scotland it created a groundbreaking new community wind farm called the "Fisherman Three" at Hoprigshiels in the Scottish Borders. This initiative received financial backing by the Scottish Investment Bank through its Renewable Energy Investment Fund (REIF) as well as Triodos bank.

All of the electricity from the wind farm is sold directly to the grid – facilitated by 18 kilometres of cable laid by SP Energy Networks. The total revenue generated by the project is forecast to amount to £24 million over the next 25 years, and BHA's share will fund investment in existing and new homes over the same period.

Hoprigshiels wind farm was the first ever example of a Housing Association using a wind farm to fund the development of homes for social rent, with a second similar scheme announced not long after its completion by Fyne Homes in Argyll and Bute. The Hoprigshiels project was warmly welcomed by the Scottish Government and was nominated for a renewable energy award.

Benefits: *Carbon reduction, Reduction in energy bills through provision of low-cost energy and energy efficiency, Supporting community initiatives through generating funds, Economic resilience, Energy system resilience, Provision of community assets cohesion.*

Source: Berwickshire Housing Association and Scottish Housing News[87]

Estimating the impacts of community energy can be challenging due to their relatively small size and the lack of systematic data collection. However, there are a number of studies that report results relevant to the impact of community energy. We have reviewed this evidence in order to allow us to estimate the benefits that a thriving sector would have under our growth scenarios in the following areas:

- Local economic impacts;
- Environmental impacts;
- Social impacts including education and skills.

We calculate these impacts for the three scenarios we develop in Chapter 3 to show the potential of the community energy sector were it to be given the right support. To recap, these three scenarios are:

- **A baseline scenario:** This scenario exhibits a relatively low rate of 4% annual growth, resulting in 600 community energy organisations supplying around 420MW energy generation capacity across the UK by 2030;
- **Moderate scenario:** This scenario would fulfil the high scenario forecast modelled by Capener (2014) by 2030, resulting in 2,300 community organisations supplying around 3GW energy generation capacity, enough to supply the annual electricity needs of around 1.3 million homes;
- **High scenario:** This scenario would fulfil the forecast potential from ResPublica (2013) by 2030, resulting in around 4,000 community energy organisations supplying around 5.27GW energy generation capacity enough to supply the annual electricity needs of around 2.2 million homes.

We now consider what the impacts of these scenarios would be.

Local economic impacts

Community energy schemes can impact the local economy in a variety of ways including:

- Jobs associated with the construction and maintenance of the schemes;
- Boosting economic activity in the area through "multiplier effects", when increased income to an area is re-spent within that area.

It is important to note analysis of these impacts seeks to understand the effect on the local areas where the schemes are based. The impacts on the UK economy overall will be different as they would be influenced by other effects such as displacement. However, given that community energy schemes are more prevalent in rural areas and the economic activity will be in the green economy it is valuable to understand these impacts at a local level.

A recent study by the Institute of Welsh Affairs (IWA) (2018)[88] calculates the potential for the regional economic impact of radical decarbonisation of electricity generation, including renewable energy generation. Table 9 below shows selected results along with our calculations of the impacts (jobs created and Gross Value Added) per MW.

Table 9: Estimated impacts of modelled renewable energy transition in Wales

	Installed capacity (MW)	Cost/MW (£m)	Jobs created in Wales over 15 year period (plus construction)	GVA (£m)	Jobs created/MW	GVA/MW (£m)
Solar	2,670	1.5	1,800	1,310	0.7	0.5
Onshore wind	2,545	0.7	2,000	520	0.8	0.2
In stream hydropower	55	4.8	50	30	0.9	0.5
Total	**5,270**	**1.2**	**3,850**	**1,860**	**0.7**	**0.4**

Source: Institute of Welsh Affairs (2018) and WPI calculations

Whilst the study is not focused on community energy, another study on renewable energy (The Economic Impact of the Development of Marine Energy in Wales by Regeneris Consulting[89]) shows that smaller scale installations have a greater local economic impact per megawatt of capacity installed. We can therefore tentatively assume that estimates of economic impact made for larger schemes can be applied to smaller community energy schemes.

Jobs

Community energy has the potential to create green jobs in local areas, with many of them being skilled jobs such as plumbers, electricians and engineers. We currently know that there are 205 full-time equivalent jobs in Community Energy groups in England, Wales and Northern Ireland[90]. Using data from Community Energy England from 2016-2018[91] we calculate that there are on average 1.1 FTE jobs per MW of installed capacity. This is close to the figures in Table 9 above that show a slightly lower estimate of 0.7 jobs per MW of installed capacity.

We therefore use the range 0.7-1.1 jobs per MW of installed capacity to estimate the jobs created in local areas in our scenarios, shown in Table 10.

Table 10: Estimated jobs associated with community energy generation in each scenario

Scenario	2024 (low)	2024 (high)	2030 (low)	2030 (high)
Baseline	240	360	310	470
Moderate	740	1,140	2,190	3,360
High	1,200	1,840	3,850	5,900

Source: WPI calculations

Gross Value Added

Community energy will also add value to the economies of the areas that host the schemes, changing the pattern of economic activity towards those areas where schemes are located and towards the renewable energy sector.

Gross Value Added (GVA) is a measure of the value of goods and services produced in an area, industry or sector of an economy. For these purposes it can give us an indication of the level of economic activity that will be focused in the community energy sector and the areas where it is active.

The evidence from the IWA[92] is our key source here. Based on figures from that report, Table 9 shows our calculations of Gross Value Added per megawatt of capacity installed. Looking just at solar, onshore wind and hydro technologies the IWA report suggests that each megawatt of installed capacity can produce £0.35m of Gross Value Added to the area in which the scheme takes place. Using this figure we can calculate the impact of our scenarios, shown in table 11 below. Gross Value Added can produce very large figures out of context, so we also provide the figures on a per organisation basis.

These calculations assume that the local economic impact would be similar across the UK as in Wales. This may not be true for several reasons such as differing densities and make-up of economic activity. However, this gives us a broad order of magnitude of the impact that a larger sector could have.

Table 11: Estimated gross value added in each scenario

	Gross Value Added (£m)		Gross Value Added per organisation (£m)	
Scenario	**2024**	**2030**	**2024**	**2030**
Baseline	110	150	0.26	0.25
Moderate	360	1,060	0.41	0.46
High	580	1,860	0.41	0.47

Source: WPI calculations

Our estimates above have used evidence that did not focus on community energy schemes. A report which did so was by Entwistle, Roberts and Xu for Community Energy Scotland (2014)[93], which shows the routes by which schemes could be expected to have an impact on the local economy. The report identified five ways that community income can arise from community schemes, shown in figure 7, and quantified these for Scottish community-owned onshore wind developments.

Figure 7: Sources for community income from a sample of Scottish community-owned onshore wind developments

Source: Adapted from Entwistle, Roberts and Xu (2014)

The focus of Entwistle et al. (2014) was on a single island scheme so we cannot use these figures as indicative of the impact of other schemes. In order to use this approach for other schemes, expenditure figures from three "rounds" of spending associated with projects are required (see Annex B for a description of the types of data needed). This data is not collected for the majority of schemes in the UK and hence it is not possible to estimate the multiplier effects of the schemes at a national level currently. Entwistle et al. note that such data collection is likely to be time consuming so the sector would need to be supported in order to collect this data consistently in the future.

Entwistle et al. also find evidence that the impact of a scheme can be improved by either accessing finance via the local community or selling electricity locally (where this is possible). Accessing financing via the local community can increase the local economic impact significantly through reducing the cost of finance, as can selling electricity locally mostly through higher earnings. Selling electricity locally also opens up the opportunity of tackling fuel poverty directly. However, there are a number of regulatory and logistical issues to this approach, which means it will only be applicable to those schemes that have significant consumers of electricity in close proximity to their renewable energy generator.

In addition to the local economic benefits discussed above, community energy can also increase the energy resilience of communities. This is particularly the case in isolated and rural areas, where a local resource may be able to provide energy during a network power cut.

Environmental impacts including reduced energy costs

Environmental reasons are a key motivator for almost all community energy groups. Academic researchers have confirmed that an individual's commitment towards environmental goals and the extent to which they identify as being ecologically conscious are key determinants of the extent to which they involve themselves in community energy schemes.[94]

Community Energy England reported that in England, Wales and Northern Ireland in 2018, 56,711 tonnes CO2 equivalent were saved from the 170MW of installed electricity and heat generation capacity that year[95], which works out at 334 tonnes CO2 equivalent per MW of installed capacity. As we do not have a forecast of emissions factors in 2030 we cannot forecast emissions saved in our scenarios directly. However, we can calculate what a larger sector in the UK could have achieved were it to have come to fruition in the past few years, that gives a sense of magnitude.

Table 12: Carbon emissions saved by 2030 with a larger sector

Scenario	Tonnes CO2 equivalent saved per year
Baseline	140,000
Moderate	1,000,000
High	1,760,000

Source: WPI calculations

Many community energy groups are also involved in energy efficiency activity, seeking to engage with the local community both at community events to provide advice and raise awareness and directly through visits to households. Community Energy England report that in 2018, 92 of the organisations in their survey (representing 33%) provided direct services and upgrades to 17,600 local homes, schools and businesses[96]. This is 191 properties per organisation.

Assuming that a third of community energy organisations continue to be involved in this activity in our growth scenarios, we are then able to scale up this activity to calculate how many households would be visited as a result.

Table 13: Number of households visited for activity related to energy efficiency

Scenario	2024	2030	Total 2020-2030
Baseline	27,500	35,500	318,000
Moderate	56,400	147,200	832,000
High	86,900	258,600	1,355,000

Source: WPI calculations

To estimate the savings in carbon emissions and fuel bills we use the annual progress reports from the Committee for Climate Change (CCC). They report annually on a target for buildings emissions to fall by around 20% between 2016 and 2030 through a combination of measures to reduce energy demand for heating and hot water and the supply of low carbon heat. We cover low carbon heat elsewhere in this report, so the relevant figure for our current purpose is that the CCC propose that a 14% reduction in energy demand for heating and hot water is achievable by 2030.[97] We can use this figure to estimate the impact on carbon emissions and fuel costs using the following evidence and assumptions:

- We assume that visits will be to existing dwellings and not new houses and flats, as new buildings are likely to have a range of energy efficiency measures already installed,
- The most recent data on average CO2 emissions per household for existing dwellings is 3.87 tonnes per annum, and the average heating and hot water costs per annum for existing dwellings in England and Wales is currently £795.[98]

Using this information, we can calculate the average carbon emissions and fuel cost savings from energy efficiency measures, shown in Table 14. We consider the average savings for years following 2030 as each household that has efficiency measures installed would continue to benefit each following year.

Table 14: CO2 emissions and heating/hot water costs saved per year following 2030

Scenario	Average carbon emissions saved per year (tonnes CO2e), all properties improved by 2030	Average savings per year, all properties improved by 2030
Average savings per household	0.54	£111
Baseline	172,000	£35,000,000
Moderate	451,000	£93,000,000
High	734,000	£151,000,000

Source: WPI calculations

These savings are one of the main ways that community energy schemes could help to alleviate fuel poverty, as effort could be focused on those who are most struggling with energy costs.

This energy efficiency activity can also create jobs in the local areas where the schemes are active. Evidence on this is also available from the Institute of Welsh Affairs report[99] which estimated the economic impacts of a large-scale programme of domestic energy efficiency measures targeting 870,000 households across Wales to deliver 20% efficiency savings. The report comments that much of the £5bn spend that would be required has the potential to be local and hence it finds that it could support 9,500 jobs over a 15 year programme. This implies 1 local job for each 92 houses visited, and we assume this stays constant.

Scaling this up to the UK level allows us to calculate further jobs associated with community energy organisations in our scenarios.

Table 15: Jobs associated with energy efficiency activity for each scenario

Scenario	2024	2030
Baseline	300	390
Moderate	620	1,610
High	950	2,820

Source: WPI calculations

Education and skills

A significant benefit of community energy schemes is the added value they provide around education and skills. We have not identified any systematic collection of information on this subject. However, there are several schemes which illustrate how community energy can engage with schools (increasing both environmental awareness and an understanding of the technical skills needed by the renewable energy sector), directly invest in youth training programmes and provide paid work experience in the renewables sector. For example:

- The Schools Energy Cooperative installs community funded solar panels on schools – at no cost to the schools – and to date maintains a network of 62 schools across the country. The majority of the energy from the panels is used by the schools themselves.[100] To differing extents, pupils in the schools are engaged in the project, such as Ashlyns School in Berkhamsted where business studies students learn about the progress of the cooperative;[101]
- Other community energy groups have also embarked on specific projects to build solar panels on schools and engage them in environmental issues, such as Bath and West Community Energy[102] and Brighton and Hove Energy Services Co-operative;[103]
- Repowering, which works with a number of community energy groups in London, has developed a model of addressing fuel poverty not just through low cost energy generation, but also addressing the life and employment prospects in local communities.[104] They use profits from their installations to run paid youth training programmes, which are AQA accredited, teaching participants skills needed to thrive in the green economy. They also provide paid work experience in the renewables sector, as well as solar panel making workshops for children and adults.[105]

Much of this engagement helps to nurture skills in the STEM subjects, particularly where it centres around building understanding of the science of climate change or renewables. This is an important added value of the community energy sector more broadly given the growing skills gap faced by UK STEM businesses, which now reportedly costs the sector £1.5 billion a year.[106]

Social impacts

Community energy leverages the power of social influence. Climate Outreach at Cardiff University point out that there are few influences more powerful than an individual's social network and the social norms that people are surrounded by[107] and research has suggested that engaging individuals as members of a community, rather than only as consumers of energy, is an important strategy for changing energy-related behaviours.[108] This suggests the potential for substantial growth in community energy participation once the extent of involvement across the population reaches a certain point.

Many community energy schemes also deliver significant benefit through establishing a community benefit fund. Community Energy England report that[109]:

- In 2016, 52 organisations generated a total of £620,000 for their community benefit funds, an average of £12,000 per organisation with a fund;
- In 2017, 83 organisations (36% of organisations that responded to the survey) were reported to have spent a total of £1.1m in their local area, an average of £13,300;
- The total value spent by organisations fell to £978,000 in 2018, despite an increase in the number of respondents.

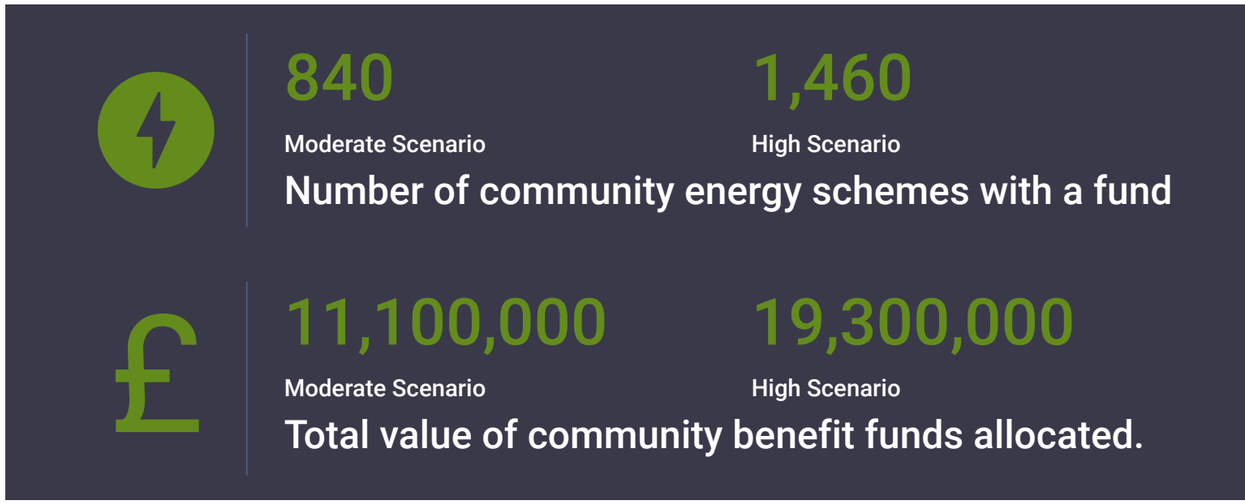
These funds tend to come from energy generation and have been built up during a period in which Feed-in-Tariffs were open to new registrations, which is no longer the case. The future ability of new community energy activities to generate community benefit funds will depend on Government decisions about support programmes for various types of activity. In this context, we are only able to estimate the level of community benefit funds that could be built up in our scenarios were a similar level of support to be restored.

Table 16 shows the potential community benefit funds if 36% of organisations in our scenarios were able to build up similar sized community benefit funds to that seen in 2017.

Table 16: Potential community benefit funds if funding support for schemes were to be restored to pre-2018 levels

Scenario	2024		2030	
	Number of organisations with a fund	Total community benefit funds allocated	Number of organisations with a fund	Total community benefit funds allocated
Baseline	160	£2,100,000	220	£2,900,000
Moderate	320	£4,200,000	840	£11,100,000
High	510	£6,800,000	1,460	£19,300,000

Source: WPI calculations



Community benefit funds are used for a wide variety of activity including both activity focused on environmental objectives (such as grants for energy efficiency upgrades) and wider social objectives such as support of local services and groups (e.g. befriending and youth groups). These grants mean that income is retained in a local area and may also encourage further investment as other funders may provide matched funding for schemes. In a report on community hydro power in Wales, respondents suggested that "a mix of educational, community retail and recreational activities were most likely to be supported by community funds, along with a good proportion of physical refurbishment and 'pump priming' for further, low carbon investment."[110]

Some community energy schemes particularly focus on tackling fuel poverty. For example:

- Plymouth Energy Community provide users of their services a multi-dimensional approach to tackling fuel poverty, this includes access to grants to clear energy debt, free and assisted insulation and tariff switching advice;
- Brighton & Hove Energy Services Co-operative have helped 180 households in fuel poverty through the Warmth for Wellbeing project by switching residents to a more appropriate energy tariff, helping residents by stopping draughts and replacing older-style light bulbs with LEDs.[111]

Entwistle, Roberts and Xu (2014)[112] also found evidence that community benefit funds can be a key part of the overall impact of a scheme. If a project raises finances from grants or bank loans, the vast majority of the economic impact will be due to surplus generated for community benefit funds.

The above discussion shows how the impacts of community energy schemes can be very important for local areas, and also have knock-on effects from one type of activity to another. Box 7 sets out how a different model for small scale renewable energy generation can lead to a range of economic, social and environmental benefits through multiple routes. Whilst this scheme is an example of the broader concept of local energy, community energy schemes will share many of the same characteristics.

Box 7: Standhill Farm case study

From its beginnings in 1951, Standhill Farm has historically been focussed on dairy production, and indeed still produces and sells milk to this day. However, it has broadened its focus from these beginnings, and in recent years the farm has emerged as a well-known hub for innovative sustainable practices. The innovative approach employed by the farm has helped it to grow to be a major supplier of Scottish tomatoes, growing the overall business and providing more jobs locally.

This farm makes use of an "anaerobic digester" to help power the glasshouse in which its tomatoes are grown. This works by combining bacteria with livestock slurry in a compressed container, emitting a biogas which is a clean and sustainable form of fuel. Any leftover electricity is then sold back to the network, with waste CO2 created during the fermentation process then being fed to tomatoes grown in the farms greenhouses where it boosts photosynthesis, resulting in stronger, healthier plants and increased yields.

Anaerobic digestion is used commonly in Germany and Denmark – however it is not well established in the UK. The scheme was made possible as a result of a grant from the Scottish Government under its Rural Priorities Scheme, with a view to encouraging take up of similar schemes elsewhere across the UK.

Benefits: *Carbon reduction, education and awareness raising through local and national media, Job creation in local areas, Improved health and wellbeing, Piloting new approaches to energy generation.*

Various sources[113]

Summary results

We summarise the results from our scenario modelling in Table 17, showing the potential scale and impacts of the sector by 2030 under the different scenarios.

Table 17: Summary of scenario results: size of the sector and impacts by 2030

		Scenarios		
		Baseline	**Moderate**	**High**
Installed generation capacity		418MW	3,000MW	5,270MW
Jobs	Total	700-860	3,800-4,970	6,670-8,720
	Generation	310 - 470	2,190 - 3,360	3,850 - 5,900
	Energy efficiency	390	1,610	2,820
Number of Organisations		600	2,300	4,000
Gross Value Added	Total	£150m	£1,060m	£1,860m
	Per organisation	£0.25m	£0.46m	£0.47m
Carbon emissions saved from energy generation, per year (tonnes CO2e)		140,000	1,000,000	1,760,000
Households visited for energy efficiency, per year		35,500	147,000	259,000
Heating and hot water efficiency savings, per annum	Carbon emissions (tonnes CO2e)	172,000	451,000	734,000
	Consumer bills	£35m	£90m	£150m
Community benefit funds	Potential value of funds (if previous level of subsidy were restored)	£2.9m	£11.1m	£19.3m

Source: WPI calculations

CHAPTER 5

Creating a thriving community energy sector

The last chapter illustrated the scale of potential benefits that could arise from a thriving community energy sector; now we turn to how this could be achieved. There is no time to waste - radical action must take place over the next ten years for the decarbonisation agenda to be successful. As one of the representatives of a community energy organisation told us: "Government is currently missing a huge opportunity not only for increasing carbon reduction, but also for giving people a substantial way to join the fight on climate change".

The good news is that community energy offers a way to harness people's concern about climate change into substantive action in communities across the UK. Through our literature review (including the success factors we discuss in Box 2) and interviewing nine experts in the field we have identified a number of current barriers to growth and potential options to tackle these.

To provide a strong, coherent policy direction there is a need for the Government to set a new strategy for community energy, building on work already done by the devolved Governments, Ofgem and community organisations. The next phase of decarbonisation needs increased changes at a household and community level, and current policy risks squandering the significant potential of community energy groups.

This new community energy strategy should:

- Set a level of ambition for the future;
- Identify the areas of decarbonisation where community groups can have the most impact in the push towards net zero emissions;
- Commit to the policies needed to make this happen, with associated targets for the sector;
- Be based on independent research and analysis.

This last point is crucial. The strategy must be robust to political change, and hence should be produced in a way that commands political consensus and developed together with the community energy sector. A body such as the Committee on Climate Change or the National Audit Office should be tasked with monitoring and publicly reporting on performance against the strategy. In addition, the sector should be supported to continue and improve the collection of evidence on the sector. In particular, evidence on the local economic benefits and impacts on behaviour change need a systematic and well-resourced approach.

We have identified four key areas that this strategy should tackle:

i. **Introduce new funding streams:** Opportunities to sell energy locally in the UK are currently limited; we discuss below reform to the UK's centralised regulatory model that would allow community energy to be self-sustaining in the future. Until this reform has happened there is a good case for financial subsidy to support the wide range of social, environmental and other benefits that the sector achieves. Whilst there are a number of sources of grant funding available to get projects off the ground (although even this funding has typically been limited to physical equipment which does not cover the costs of local people's time for project management), longer term support for projects has been much reduced. For example, the recently launched Smart Export Guarantee will only support larger scale community projects[114].

As a key part of the next phase of decarbonisation, broader funding support of community energy in the right way is likely to be value for money. We recommend that:

- Government should design specific funding routes to support the type of activity where community energy can have the most impact. Community Energy England have identified a range of potential options worthy of consideration, including the reinstatement of social investment tax relief, an Urban Community Energy Fund (as a counterpart to the Rural Community Energy Fund) and improved versions of the Smart Export Guarantee, Feed-in Tariff, or Renewable Heat Incentive targeted specifically at community groups.[115]
- Government together with Ofgem should identify how this funding can be flexible to the needs of different local areas, considering if it should be allocated on a regional basis in line with local energy planning that we discuss below.

ii. **Provide clarity on effective local energy planning:** The Energy Systems Catapult find that no single approach to decarbonising the energy system can be applied nationwide, with each local area requiring a unique mix of technologies and networks.[116] Community energy groups could play an essential role in shaping the future energy system in their areas, and then focus their activity on what the energy system in their area needs. Currently there are a plethora of ways that energy planning at a local level is happening and new approaches being developed (e.g. LEP Local Energy Strategies[117], Local Area Energy Planning led by Local Authorities[118] and community-led Local Energy Plans[119]) and one of the experts we interviewed said that there is currently a "missing layer of interaction between local energy planning and community energy". The strategy should therefore set a clear direction on local energy planning:

- Government together with Ofgem need to identify and fully resource an approach to energy planning at local levels that sets out a core role for community energy groups. We think that Local Authorities may be best placed to coordinate the full range of stakeholders, provided they are given the resources to carry out the job.

iii. **Reduce regulatory barriers and increase institutional support:** The Institute of Welsh Affairs[120] summarises a range of research on the reasons for the lack of community energy ownership which include a series of regulatory hurdles such as planning and licensing. Community developments often lack the capacity to overcome and the land use planning and other regulatory mechanisms do not explicitly favour community/social developments. To tackle these barriers:

- Ofgem should be tasked to conduct a review of regulatory barriers for community energy schemes, identify those that are hindering the sector most and set out how these could be addressed. This would recognise the changing face of the types of organisations that will be involved in the energy system of the future. This should benefit from research already undertaken on specific areas, such as Regen considering the barriers to community organisations providing energy flexibility services;[121]
- Central Government should ensure strong coordination across departments and actively encourage and support local authorities to adopt planning practices that promote local support of renewable energy projects;
- Local and regional government should ensure the role of community energy is articulated in their plans for the energy system in their area;

- As discussed in Box 2, access to specialist skills and advice has been found to be important to the success of community energy schemes. A specific training and skills fund for community groups should be considered; similar to the training allowance that Distribution Network Operators currently get to ensure their staff have the skills to deliver connections for local schemes. The aims of such an initiative could be developed by community energy groups and the energy industry in partnership and delivered through a competitive tender process. Apprenticeships focused on community energy could be considered as part of this process.

iv. **Identify how broader energy regulatory reform should place the needs of communities at its core:** One reason why community energy schemes in other countries are more viable is that they exist within a more decentralised system, and a new community energy strategy needs to work with the grain of broader reform of energy regulation that is underway. Such reform is the way to create a sector that can be financially sustainable in the long-run without continued grant support. One of our expert interviewees pointed out that the "energy market is a creature of policy and governance, but the current system is inappropriate for the scale of the climate challenge and technological innovation".

The Green Alliance recommend that community projects should be allowed to participate in emerging local energy markets.[122] More widespread reform would allow community energy to thrive, but this would require BEIS and Ofgem to provide overarching regulatory change to the "supplier-hub" model. Broader governance reform is complex, but projects such as IGov at the University of Exeter have carried out substantial research on how this could be done and their proposals should be considered.[123]

- Ofgem have acknowledged that the supplier-hub model is not going to be fit for purpose for energy consumers over the longer term[124] but need to make progress on allowing the local sale of energy in ways that does not exacerbate inequality in energy bills.

As noted in Chapter 2, network operators will play a key role in facilitating regional and local decarbonisation objectives in this more decentralised system and the shift to the Distribution System Operator concept is an important reform. However, this could be progressing faster. We agree with the recommendation in ScottishPower and SP Energy Networks' recent Zero Carbon Communities report[125] that identifies the importance of Ofgem working with network companies to accelerate the development of the Distribution System Operator concept.

This final point is important; Distribution Network/System Operators (DNOs/DSOs) should play a core role in creating the conditions for community energy to thrive. These organisations are ideally placed to deal with the more localised nature of the future energy system and to provide the bridge between local communities and that system. There are a number of examples of good practice; for example publicising a specific contact person/team who is responsible for liaising with community energy schemes and support to ensure speedy and reasonably priced connections to the network. Further to this all DNOs/DSOs should consider the following with respect to community energy:

- Establishing a community energy strategy;
- Providing high quality briefings and resources. These should be designed to support community energy schemes in both getting off the ground and scaling up their activities, should be based on engagement with community energy schemes and should be clearly linked to local energy plans;
- Transparency around opportunities, grid constraints and future projections so that community energy can develop optimal projects, and ensuring there are active discussions to stimulate projects that meet both parties' needs;
- A community energy fund.

As part of addressing the regulatory barriers, Ofgem should review whether DNOs/DSOs have sufficient funding to fully play this role.

These policies would help ensure that the substantial untapped potential of the community energy sector can be realised and communities across the UK can play their full part in the fight against climate change. However, time is not on our side – the UK needs to move quickly to achieve decarbonisation of the scale required. Policy change is required speedily in order to create this thriving sector over the next crucial decade.

SP Energy Networks increasing local knowledge and awareness at an agricultural show.

Annex A: Definition of community energy

Source	Definition	Notes
Community Energy England	Community energy refers to the delivery of community led renewable energy, energy demand reduction and energy supply projects, whether wholly owned and/or controlled by communities or through partnership with commercial or public sector partners.	This definition explicitly refers to renewable as opposed to other forms of generation.
Good Energy (a renewable electricity company)	In simple terms, community energy is a group of people coming together to generate, own, manage, or reduce consumption of energy. Community energy projects are predominantly renewable using power from the wind, sun and rain.	This definition emphasises renewable generation.
HM Government	Community energy covers aspects of collective action to reduce, purchase, manage and generate energy. Community energy projects have an emphasis on local engagement, local leadership and control and the local community benefiting collectively from the outcomes. Community-led action can often tackle challenging issues around energy, with community groups well placed to understand their local areas and to bring people together with common purpose. There are many examples of community energy projects across the UK, with at least 5,000 community groups undertaking energy initiatives in the last five years. Examples of community energy projects include: • Community-owned renewable electricity installations such as solar photovoltaic (PV) panels, wind turbines or hydroelectric generation. • Members of the community jointly switching to a renewable heat source such as a heat pump or biomass boiler. • A community group supporting energy saving measures such as the installation of cavity wall or solid wall insulation, which can be funded wholly or partly by the Green Deal. • Working in partnership with the local Distribution Network Operator (DNO) to pilot smart technologies. • Collective purchasing of heating oil for off gas-grid communities • Collective switching of electricity or gas suppliers.	Explicitly makes reference to activities that are non-renewable focussed, as well as some activities that are typically commercial in nature (collective purchasing).
UK Energy Research Council (UKERC)	1. Any energy project that is wholly or partly owned or controlled by a community group; or 2. Any energy project where two or more of these conditions apply: a. a community group acts as “technology host” (Walker and Cass 2007: 465) i.e. the energy technology is installed on a site they own; b. community members have some formal democratic control of the project (e.g. through ‘one member one vote’ community shares); or c. there is an active role for community members in the project – perhaps taking part in collective energy-saving actions or producing energy (e.g. through domestic solar PV) that is shared among other community members through some kind of local supply arrangement.	This definition is based on a deconstruction of a range of definitions used by (primarily academic) researchers.
Green Alliance	Any energy project that is wholly or partly owned or controlled by a community group, including energy co-operatives; or Any energy project where two or more of the following conditions apply: • a community group that hosts a project on a site they own or manage; • community benefit societies, including non-localised schemes, where profits are directed towards the community and members share democratic control; • there is an active role for community members in the project, perhaps taking part in collective energy saving actions, active load management or producing energy (e.g. through domestic solar PV) shared among other community members through some kind of local supply arrangement.	This definition is adapted from the UKERC definition above. This definition covers energy service companies which are emerging in response to changes in the energy market, access to finance and consumer needs.

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Annex B: Merits of economic modelling approaches for assessing the impact of community energy schemes

Entwistle, Roberts and Xu (2014)[126] identify three type of models that could be used to estimate the local economic impacts of community energy schemes and compare their advantages and disadvantages. All three models focus on identifying the "multiplier effects" associated with a scheme; these arise from an investment because local businesses, households, and government agencies purchase goods and services from one another. The approaches are summarised in box 8.

Box 8: Advantages and disadvantages of economic modelling approaches for assessing the local impact of community energy schemes

- **Input-output models:** This approach is good for highlighting the impact of an investment on particular industry sectors. However, they are usually used at national or regional level and are not good for community renewables projects as these projects tend to have limited input and labour requirements after being commissioned;
- **Regional Keynesian multipliers:** These draw a picture of regional macro-economic characteristics, providing useful results and guidance for regional policies. However, they require significant data and are best suited to the regional picture;
- **Local Multiplier 3 model:** This model, developed by the New Economics Foundation, is suitable for analysis below local authority level and the process of its calculation can highlight ways to increase local economic impact. The necessary surveys still require detailed expenditure figures but this approach is easiest to apply and most applicable.

Source: Adapted from Entwistle, Roberts and Xu (2014)

The Local Multiplier 3 model was identified as the most suitable as it is relatively simple and quick to complete and it can be adopted at local community level. However, in order to calculate the impacts, expenditure figures from three "rounds" of spending associated with projects are required and these may be time consuming to obtain.

To apply the approach requires the following data collection:

- Initial income to local businesses of schemes from construction and operation phases;
- Initial income to local citizens through e.g. salaries, land rental income and the use of the financial surplus generated for community grants;
- Business spending surveys to gather data on how much spending is retained at a local level;
- Personal spending surveys to gather data on the pattern of local expenditure.

The total spending in the local economy across three "rounds" is aggregated to estimate the overall impact (hence why the model is called the Local Multiplier 3). This data is not collected for the majority of schemes in the UK and hence it is not possible to estimate the local economic impact of the sector currently. Entwistle et al. note that such data collection is likely to be time consuming so the sector would need to be supported in order to collect this data consistently in the future.

Endnotes

1 Elsewhere in the report we collate figures that estimate there was 398GWh of energy generated by 250MW installed capacity in 2018 (see chapter 3). We calculate the numbers of houses electricity needs that are supplied by a given capacity using the average annual household electricity consumption of 3,800kWh from BEIS (2018): UK Energy Statistics, 2018 & Q4 2018. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/791297/Press_Notice_March_2019.pdf

2 Latest figures for domestic aviation from 2016 show 1.5 million tonnes carbon dioxide equivalent from this mode. Source: Department for Transport - Energy and environment: data tables - Greenhouse gas emissions (ENV02) table. Available at: https://www.gov.uk/government/statistical-data-sets/energy-and-environment-data-tables-env#greenhouse-gas-emissions-env02

3 Institute for Public Policy Research (2018) A distributed energy future for the UK: An essay collection. Available at: https://www.ippr.org/research/publications/a-distributed-energy-future

4 Dieter Helm (2017) Cost of Energy Review. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/654902/Cost_of_Energy_Review.pdf

5 Community Energy England (2019). State of the Sector Report 2019. Available at: https://communityenergyengland.org/pages/state-of-the-sector-report-2019

6 Community Energy England (2019). State of the Sector Report 2019. Available at: https://communityenergyengland.org/pages/state-of-the-sector-report-2019

7 UKERC (2018) Community energy has grown across the UK in recent decades. Available at: http://www.ukerc.ac.uk/news/community-energy-has-grown.html

8 Department for Business, Energy & Industrial Strategy (2019). "UK becomes first major economy to pass net zero emissions law". Available at: https://www.gov.uk/government/news/uk-becomes-first-major-economy-to-pass-net-zero-emissions-law

9 Green World (2019) Over half of UK councils declare climate emergency. Available at: https://greenworld.org.uk/article/over-half-uk-councils-declare-climate-emergency

10 DECC (2014) Community Energy Strategy Full Report. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/275163/20140126Community_Energy_Strategy.pdf

11 https://communityenergyengland.org/pages/what-is-community-energy

12 https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

13 Community Energy England (2019). State of the Sector Report 2019. Available at: https://communityenergyengland.org/pages/state-of-the-sector-report-2019

14 Koirala, van Oost and van der Windt (2018). Community energy storage: A responsible innovation towards a sustainable energy system? Available at: https://www.sciencedirect.com/science/article/pii/S0306261918314740

15 Financial Times (May 27th 2018) "Community energy projects bring power to the people". Available (subscription required) at: https://www.ft.com/content/c283a8a0-5f5e-11e8-9334-2218e7146b04

16 UKERC (2018) Unlocking Local Energy Markets. Available at: http://www.ukerc.ac.uk/network/network-news/unlocking-local-energy-markets.html

17 Energy UK (2018) Defining Flexibility – 2018 Available here: https://www.energy-uk.org.uk/publication.html?task=file.download&id=6625

18 BEIS (2018) 2018 UK greenhouse gas emissions, provisional figures. Available here: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/790626/2018-provisional-emissions-statistics-report.pdf

19 The Energyst (2018) Electrifying heat: Too expensive, or too little ambition? Available here: https://theenergyst.com/electrifying-heat-too-expensive-or-too-little-ambition/

20 Community Energy England (2019). State of the Sector Report 2019. Available at: https://communityenergyengland.org/pages/state-of-the-sector-report-2019

21 ScottishPower and SP Energy Networks (2019). Zero Carbon Communities. Available at: https://www.spenergynetworks.co.uk/userfiles/file/Zero_Carbon_Communities_Report.pdf

22 WPI calculations from YouGov tracker on "Top Issues Facing the Country". Calculations carried out on 7th November 2019. Data available from: https://yougov.co.uk/topics/politics/articles-reports/2019/11/03/political-trackers-31-oct-1-nov-update

23 Behavioural Insight Team, Department of Energy and Climate Change and Department of Communities and Local Government (2011), Behaviour Change and Energy Use Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48123/2135-behaviour-change-and-energy-use.pdf

24 Community Energy England (2019). State of the Sector Report 2019. Available at: https://communityenergyengland.org/pages/state-of-the-sector-report-2019

25 Which? (2019) Smart Export Guarantee explained. Available at: https://www.which.co.uk/reviews/solar-panels/article/smart-export-guarantee-explained

26 National Audit Office (2018) Low-carbon heating of homes and businesses and the Renewable Heat Incentive. Available at: https://www.nao.org.uk/wp-content/uploads/2018/02/Low-carbon-heating-of-homes-and-businesses-and-the-Renewable-Heat-Incentive.pdf

27 House of Commons Committee of Public Accounts (2018) Renewable Heat Incentive in Great Britain. Available at: https://publications.parliament.uk/pa/cm201719/cmselect/cmpubacc/696/696.pdf

28 Community Energy England (2019). State of the Sector Report 2019. Available at: https://communityenergyengland.org/pages/state-of-the-sector-report-2019

29 BEIS Local Energy Team. Available at: https://hub.communityenergyengland.org/resources/BEIS-Local-Energy-Team

30 Department for Business, Energy & Industrial Strategy and Department for Environment, Food & Rural Affairs (2019) Rural Community Energy Fund. Available at: https://www.gov.uk/guidance/rural-community-energy-fund

31 Local Energy Scotland: Funding. Available at: https://www.localenergy.scot/funding/

32 Welsh Government (2018) Written Statement - Launch of the Welsh Government Energy Service Available at: https://gov.wales/written-statement-launch-welsh-government-energy-service

33 Welsh Government Community Energy Toolkit. Availabe at: https://gov.wales/community-energy-toolkit. Accessed on 6th November 2019.

34 Bauwens (2019) Analyzing the determinants of the size of investments by community renewable energy members: Findings and policy implications from Flanders. Available here: https://www.researchgate.net/publication/331645920_Analyzing_the_determinants_of_the_size_of_investments_by_community_renewable_energy_members_Findings_and_policy_implications_from_Flanders

35 UKERC (2018) Evolution of Community Energy in the UK. Available at: http://www.ukerc.ac.uk/publications/evolution-of-community-energy-in-the-uk.html

36 Sources:

- Energy Local: http://www.energylocal.co.uk/cyd-ynni/ ;
- BBC (2016) 'Bethesda energy club shares hydro power in UK first' Available from: https://www.bbc.co.uk/news/uk-wales-38236414
- Kelly (2016) Investigating a New Way of Delivery Energy to Tackle Fuel Poverty using Case Studies in Wales and Scotland Available here https://www.eagacharitabletrust.org/app/uploads/2017/03/Jane-Kelly-final-dissertation.pdf

37 UK Power Networks (2018) Community Energy Research – South East, East and London. Available at: https://www.ukpowernetworks.co.uk/electricity/distribution-energy-resources/community-energy

38 Llywodraeth Cymru / Welsh Government (2018) Energy Generation in Wales. Available at: https://gov.wales/sites/default/files/publications/2019-10/energy-generation-in-wales-2018.pdf

39 Scottish Government. Renewable and low carbon energy. Available at: https://www.gov.scot/policies/renewable-and-low-carbon-energy/local-and-small-scale-renewables/ (accessed on 11/10/19)

40 Scottish Government (2019) Local energy policy statement: consultation. Available at: https://www.gov.scot/publications/scottish-governments-local-energy-policy-statement-consultation/

41 Energy generation in Wales (2017) Available at: https://www.regen.co.uk/wp-content/uploads/Energy-Generation-in-Wales-2017.pdf

42 Community Energy England (2017, 2018 and 2019). State of the Sector Reports. Available at: https://communityenergyengland.org/pages/cee-publications

43 DECC (2014) Community Energy in the UK: Part 2. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/274571/Community_Energy_in_the_UK_part_2_.pdf

44 This figure may include a proportion of Wind to Heat generation

45 Communities and Local Government written statements Thursday 18th June 2015. Available at: https://publications.parliament.uk/pa/cm201516/cmhansrd/cm150618/wmstext/150618m0001.htm#15061882000002

46 10:10 Climate Action (2018) Unlocking UK onshore wind for affordable bills and clean growth Available here: http://files.1010global.org/blownaway/Unlocking_UK_onshore_wind_Feb2018.pdf

47 Community Energy England (2019). State of the Sector Report 2019. Available at: https://communityenergyengland.org/pages/state-of-the-sector-report-2019; and Energy Saving Trust (2018). Community and locally owned renewable energy in Scotland https://www.energysavingtrust.org.uk/sites/default/files/Community%20and%20locally%20owned%20renewable%20energy%20report%202018.PDF

48 Total electricity generation in the UK was 333 Terawatt Hours in 2018 taken from BEIS (2019) Energy in Brief 2019. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/819511/UK_Energy_in_Brief_2019.pdf

49 Green Alliance and Localis (2019) The Route to Clean Growth. Available at: https://www.green-alliance.org.uk/The_route_to_clean_growth.php

50 Local Energy Scotland. Search for Community and Locally Owned Projects. Available at: https://www.localenergy.scot/projects-and-case-studies/searchable-map-of-local-energy-projects/

51 DECC (2014) Community Energy in the UK: Part 2. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/274571/Community_Energy_in_the_UK_part_2_.pdf

52 Green Alliance and Localis (2019) The Route to Clean Growth. Available at: https://www.green-alliance.org.uk/The_route_to_clean_growth.php

53 Sources:

- Community Energy England (2019). State of the Sector Report 2019. Available at: https://communityenergyengland.org/pages/state-of-the-sector-report-2019
- Community Energy Efficiency Toolkit. Available here: https://s3.eu-west-2.amazonaws.com/prod-wl-cee/resources/files/Getting_started_with_community_energy_efficiency-_Hub_v1.2.pdf
- https://www.barnsley.gov.uk/news/a-successful-start-to-2019-for-energise-barnsley
- https://bhesco.co.uk/

54 Energy Systems Catapult (2018) Local Area Energy Planning: Supporting clean growth and low carbon transition. Available at: https://es.catapult.org.uk/wp-content/uploads/2018/12/Local-Area-Energy-Planning-Supporting-clean-growth-and-low-carbon-transition.pdf

55 Green Alliance (2019) Community energy 2.0: The future role of local energy ownership in the UK. Available at : https://www.green-alliance.org.uk/resources/Community_Energy_2.0.pdf.

56 www.piclo.energy

57 Sources:

- https://communityenergyengland.org/pages/energise-barnsley-2018-collaboration-award-winner-case-study
- https://www.barnsley.gov.uk/news/a-successful-start-to-2019-for-energise-barnsley/
- http://www.energisebarnsley.co.uk/wp-content/uploads/2019/01/2018-EBL-Social-Impact-Report-AH-1.pdf

58 Community Energy England (2017, 2018 and 2019). State of the Sector Reports. Available at: https://communityenergyengland.org/pages/cee-publications; and Energy Saving Trust (2012-2018). Community Energy Reports https://www.energysavingtrust.org.uk/scotland/communities/community-renewables/community-energy-reports

59 Camco and Baker Tilly (2011) The potential for the GIB to support community renewables For the Cooperative Group

60 ResPublica (2013). The Community Renewables Economy: Starting up, scaling up and spinning out. Available at: https://www.respublica.org.uk/our-work/publications/community-renewables-economy-starting-scaling-spinning/

61 Capener (2014). Community Renewable Electricity Generation: Potential Sector Growth to 2020. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/274746/20140108_Community_Energy_Modelling_FinalReportJan.pdf

62 Reported by Energy Transition (https://energytransition.org/2018/02/share-of-german-citizen-renewable-energy-shrinking/) and Clean Energy Wire (https://www.cleanenergywire.org/factsheets/citizens-participation-energiewende)

63 Clean Energy Wire (2018). Citizens' participation in the Energiewende. Available at: (https://www.cleanenergywire.org/factsheets/citizens-participation-energiewende)

64 Deloitte (2018) Global renewable energy trends. Available at: https://www2.deloitte.com/us/en/insights/industry/power-and-utilities/global-renewable-energy-trends.html

65 ResPublica (2014) Creating Local Energy Economies: Lessons from Germany. Available at: https://www.respublica.org.uk/our-work/publications/creating-local-energy-economies-lessons-germany/

66 Ofgem (2019) Number of active domestic suppliers by fuel type (GB). Available at: https://www.ofgem.gov.uk/data-portal/number-active-domestic-suppliers-fuel-type-gb (data correct as of 29/11/19)

67 Mey and Diesendorf (2018) and Bauwens et al. (2016) quoted in Ruggiero, Isakovic, Busch, Auvinen and Faller (2019) Co2mmunity WORKING PAPER No. 2.3. Available at: http://co2mmunity.eu/wp-content/uploads/2019/03/Co2mmunity-working-paper-2.3.pdf

68 Roberts, J, Bodman, F and Rybski,R (2014). Community Power: Model Legal Frameworks for Citizen-owned Renewable Energy. (ClientEarth: London). Available at: https://ec.europa.eu/energy/intelligent/projects/sites/iee-projects/files/projects/documents/model_legal_frameworks_2014.pdf

69 Ruggiero, Isakovic, Busch, Auvinen and Faller (2019) Co2mmunity WORKING PAPER No. 2.3. Available at: http://co2mmunity.eu/wp-content/uploads/2019/03/Co2mmunity-working-paper-2.3.pdf

70 Deloitte (2018) Solar and wind move from mainstream to preferred. Available at: https://www2.deloitte.com/us/en/insights/industry/power-and-utilities/global-renewable-energy-trends.html?id=us:2sm:3fb:4di_gl:5eng:6di#endnote-sup-69

71 Energy Transition (2017). Wind power hit record low price in German auctions. Few are happy. Available at: https://energytransition.org/2017/08/wind-power-hit-record-low-price-in-german-auctions-few-are-happy/

72 Sources:

- European Committee of the Regions (2018) Models of Local Energy Ownership and the Role of Local Energy Communities in Energy Transition in Europe. Availabe at: https://cor.europa.eu/en/engage/studies/Documents/local-energy-ownership.pdf
- ResPublica (2014) Creating Local Energy Economies: Lessons from Germany. Availabe at: https://www.respublica.org.uk/our-work/publications/creating-local-energy-economies-lessons-germany/

73 National Grid Electricity System Operator (2019) Future Energy Scenarios 2019. Available at: http://fes.nationalgrid.com/

74 Department for Business, Energy and Industrial Strategy (2019) Updated Energy and Emissions Projections 2018. Figure 5.1: Electricity generation by fuel source Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/794590/updated-energy-and-emissions-projections-2018.pdf

75 DECC (2014) Community Energy Strategy Full Report. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/275163/20140126Community_Energy_Strategy.pdf

76 Elsewhere in the report we collate figures that estimate there was 398GWh of energy generated by 250MW installed capacity in 2018 (see chapter 3). We calculate the numbers of houses electricity needs that are supplied by a given capacity using the average annual household electricity consumption of 3,800kWh from BEIS (2018): UK Energy Statistics, 2018 & Q4 2018. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/791297/Press_Notice_March_2019.pdf

77 National Grid Electricity System Operator (2019) Future Energy Scenarios 2019. Available at: http://fes.nationalgrid.com/

78 ScottishPower and SP Energy Networks (2019). Zero Carbon Communities. Available at: https://www.spenergynetworks.co.uk/userfiles/file/Zero_Carbon_Communities_Report.pdf

79 Roberts, J, Bodman, F and Rybski,R (2014). Community Power: Model Legal Frameworks for Citizen-owned Renewable Energy. (ClientEarth: London). Available at: https://ec.europa.eu/energy/intelligent/projects/sites/iee-projects/files/projects/documents/model_legal_frameworks_2014.pdf

80 Green Alliance (2019) Community energy 2.0: The future role of local energy ownership in the UK. Available at : https://www.green-alliance.org.uk/resources/Community_Energy_2.0.pdf.

81 WPI Economics (2018) Helping people and business move towards cleaner forms of transport. Available at: http://wpieconomics.com/publications/helping-people-business-move-towards-cleaner-forms-transport/

82 Green Alliance (2019) Community energy 2.0. The future role of local energy ownership in the UK https://www.green-alliance.org.uk/resources/Community_Energy_2.0.pdf

83 Regen (2018) Distribution Future Energy Scenarios: A generation and demand study. Availabe at: https://www.westernpower.co.uk/downloads/6710. Western Power Distribution's "Two Degrees" Future Energy Scenario includes 180 MW out of 775 MW (23%) of battery storage capacity in 2032 in their region being delivered by Domestic/Community actors.

84 Community Energy England (2019). State of the Sector Report 2019. Available at: https://communityenergyengland.org/pages/state-of-the-sector-report-2019

85 Barbour, Parra, Awwad, González (2018). Community energy storage: A smart choice for the smart grid? Available at: https://www.sciencedirect.com/science/article/pii/S0306261917317713?via%3Dihub

86 Community Energy England (2019). State of the Sector Report 2019. Available at: https://communityenergyengland.org/pages/state-of-the-sector-report-2019

87 https://www.berwickshirehousing.org.uk/our-community/our-community-windfarm/; https://www.scottishhousingnews.com/article/second-scottish-housing-association-build-wind-turbines-community-benefit

88 Institute of Welsh Affairs (2018) The Economic Costs and Benefits of Renewable Energy Transition in Wales. Available at: https://www.iwa.wales/wp-content/uploads/2018/11/IWA_WP3.2_EconomicCostsandBenefits-4.pdf

89 Regeneris Consulting Ltd for the Welsh Government (2013) The Economic Impact of the Development of Marine Energy in Wales. Available at: https://gov.wales/sites/default/files/publications/2019-06/economic-impact-of-the-development-of-marine-energy-final-report.pdf

90 Community Energy England (2019). State of the Sector Report 2019. Available at: https://communityenergyengland.org/pages/state-of-the-sector-report-2019

91 Community Energy England (2017, 2018 and 2019). State of the Sector Reports. Available at: https://communityenergyengland.org/pages/cee-publications

92 Institute of Welsh Affairs (2018) The Economic Costs and Benefits of Renewable Energy Transition in Wales. Available at: https://www.iwa.wales/wp-content/uploads/2018/11/IWA_WP3.2_EconomicCostsandBenefits-4.pdf

93 Entwistle, G., Roberts, D., and Xu, Y commissioned by Community Energy Scotland (2014) Measuring the Local Economic Impact of Community-Owned Energy Projects (Scotland). Available from: https://www.communityenergyscotland.org.uk/userfiles/file/stevens_uploaded_documents/Measuring-the-Local-Economic-Impact-of-Community-Owned-Energy-Projects-2014-pdf.pdf

94 Sources:

- Radtke (2014) A closer look inside collaborative action: civic engagement and participation in community energy initiatives. Available at: https://extra.shu.ac.uk/ppp-online/wp-content/uploads/2014/12/closer-look-collaborative-action.pdf;
- Reinsberger and Posch (2014) Bottom-up Initiatives for Photovoltaic: Incentives and Barriers. Available here: https://www.researchgate.net/publication/265179908_Bottom-up_Initiatives_for_Photovoltaic_Incentives_and_Barriers ;
- Doci and Vasileiadou (2015) “Let□s do it ourselves” Individual motivations for investing in renewables at community level. Available here: https://www.sciencedirect.com/science/article/pii/S1364032115003214

95 Community Energy England (2019). State of the Sector Report 2019. Available at: https://communityenergyengland.org/pages/state-of-the-sector-report-2019

96 Community Energy England (2019). State of the Sector Report 2019. Available at: https://communityenergyengland.org/pages/state-of-the-sector-report-2019

97 Committee on Climate Change (2018) Reducing UK emissions. 2018 Progress Report to Parliament (page 92). Available at: https://www.theccc.org.uk/publication/reducing-uk-emissions-2018-progress-report-to-parliament/. Although this figure is for the total housing stock it is reasonable to use it as an average household saving estimate because it involves tailored measures to most of the houses in the country (for example, including insulating all practicable lofts by 2022). It is also similar to figures from elsewhere for what could be achieved by individual household energy efficiency measures, such as Adan and Fuerst (2015) Do energy efficiency measures really reduce household energy consumption? A difference-in-difference analysis.

98 MHCLG (2019) Energy Performance of Buildings Certificates Statistical Release: Q3 2019 – England and Wales. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/843215/EPB_Cert_Statistics_Release_Q3_2019.pdf

We have assumed that average carbon emissions and fuel costs are similar in Scotland and Northern Ireland

99 Institute of Welsh Affairs (2018) The Economic Costs and Benefits of Renewable Energy Transition in Wales. Available at: https://www.iwa.wales/wp-content/uploads/2018/11/IWA_WP3.2_EconomicCostsandBenefits-4.pdf

100 The Schools’ Energy Cooperative (https://schools-energy-coop.co.uk/)

101 The Schools’ Energy Cooperative (https://schools-energy-coop.co.uk/projects)

102 Bath & West Community Energy - School Buildings Solar PV. Available at: https://www.bwce.coop/project-categories/schools-roof-mounted-solar-pv/

103 Brighton and Hove Energy Services Cooperative (https://bhesco.co.uk/schools)

104 Repowering (https://www.repowering.org.uk/)

105 Repowering (https://www.repowering.org.uk/education/)

106 Stem learning (2018) Skills shortage costing STEM sector £1.5 billion a year Available here: https://www.stem.org.uk/news-and-views/news/skills-shortage-costing-stem-sector-15bn

107 Climate Outreach/Cardiff University (2019) Mainstreaming low-carbon lifestyles. Available at: https://talk.eco/wp-content/uploads/Climate-Outreach-CASPI-Mainstreaming-low-carbon-lifestyles.pdf

108 Behavioural Insight Team, Department of Energy and Climate Change and Department of Communities and Local Government (2011), Behaviour Change and Energy Use Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48123/2135-behaviour-change-and-energy-use.pdf

109 Community Energy England (2017, 2018 and 2019). State of the Sector Reports. Available at: https://communityenergyengland.org/pages/cee-publications

110 http://www.regenwales.org/upload/pdf/071015091201Impact%20of%20Small%20and%20Community%20Hydro%20in%20Wales.pdf

111 Community Energy England. Fuel poverty and what the Community Energy Sector is doing about it. Available at: https://communityenergyengland.org/files/document/37/1494515616_Fuel_poverty_and_what_the_Community_Energy_Sector_is_doing_about_it.pdf

112 Entwistle, G., Roberts, D., and Xu, Y commissioned by Community Energy Scotland (2014) Measuring the Local Economic Impact of Community-Owned Energy Projects (Scotland). Available from: https://www.communityenergyscotland.org.uk/userfiles/file/stevens_uploaded_documents/Measuring-the-Local-Economic-Impact-of-Community-Owned-Energy-Projects-2014-pdf.pdf

113 The Scotsman (2008) ‘Pigs produce crackling of electricity’ Available here: https://www.scotsman.com/news-2-15012/pigs-produce-crackling-of-electricity-1-1362092, Standhill Farm website. Available at: http://www.standhillfarm.co.uk/about/biogas/

114 Local Energy Scotland. CARES Project Viability Modelling. Available at: https://www.localenergy.scot/media/110533/local-energy-scotland-guide-post-fit-viability-modelling.pdf

115 Community Energy England (2019). What policies are CEE asking for?. Available at: https://communityenergyengland.org/pages/what-policies-are-cee-asking-for (accessed on 29/11/19)

116 Energy Systems Catapult (2018) Local Area Energy Planning key to minimising decarbonisation costs. Available at: https://es.catapult.org.uk/news/local-area-energy-planning-key-to-minimising-decarbonisation-costs/

117 For example York, North Yorkshire & East Riding’s Local Energy Strategy (2019). Available at: https://www.southeastlep.com/app/uploads/2019/03/Local-Energy-Strategy-FINAL.pdf

118 Energy Systems Catapult (2018) Local Area Energy Planning: Supporting clean growth and low carbon transition. Available at: https://es.catapult.org.uk/wp-content/uploads/2018/12/Local-Area-Energy-Planning-Supporting-clean-growth-and-low-carbon-transition.pdf

119 Local Energy Scotland. Local Energy Plans. Available at: https://www.localenergy.scot/what-is-local-energy/local-energy-plans/

120 IWA (2018) The Economic Impact of Energy Transition in Wales. Available at: https://www.iwa.wales/wp-content/uploads/2018/09/EconomicImpactofEnergyTransition-2.pdf

121 Regen (2019) Power to participate: a specification for community energy to participate in a flexible energy system. Available at: https://www.regen.co.uk/wp-content/uploads/P2P-Specification-for-community-energy_Sept19.pdf

122 Green Alliance (2019) Community energy 2.0. The future role of local energy ownership in the UK https://www.green-alliance.org.uk/resources/Community_Energy_2.0.pdf

123 IGov (2019) Getting energy governance right: Lessons from IGov. Available at: http://projects.exeter.ac.uk/igov/getting-energy-governance-right-lessons-from-igov/

124 Ofgem (2018) Future supply market arrangements – response to our call for evidence. Available at: https://www.ofgem.gov.uk/publications-and-updates/future-supply-market-arrangements-response-our-call-evidence

125 ScottishPower and SP Energy Networks (2019). Zero Carbon Communities. Available at: https://www.spenergynetworks.co.uk/userfiles/file/Zero_Carbon_Communities_Report.pdf

126 Entwistle, G., Roberts, D., and Xu, Y commissioned by Community Energy Scotland (2014) Measuring the Local Economic Impact of Community-Owned Energy Projects (Scotland). Available from: https://www.communityenergyscotland.org.uk/userfiles/file/stevens_uploaded_documents/Measuring-the-Local-Economic-Impact-of-Community-Owned-Energy-Projects-2014-pdf.pdf

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