SONNET – SOCIAL INNOVATION IN ENERGY TRANSITIONS

Co-creating a rich understanding of the diversity, processes, contributions, success and future potentials of social innovation in the energy sector

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Research report on 'Financing and subsidies for renewable energy (solar and wind)' in the United Kingdom

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About SONNET: SONNET is a research project that aims to develop an understanding of diversity, processes, contributions and future potential of social innovation in the energy sector. It is co-funded by the European Commission and runs for three years, from 2019-2022. The SONNET consortium consists of 12 partners across Europe, including academics and city administrations. For more information, please visit our website: https://sonnet-energy.eu

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1 FOREWORD

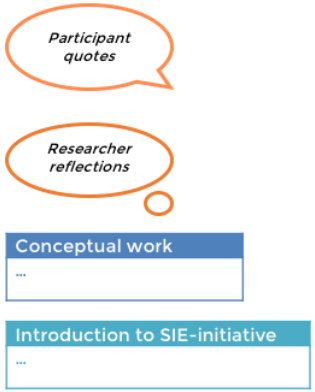
SONNET (Social Innovation in Energy Transitions) brings diverse groups together to make sense of how social innovation can bring about a more sustainable energy sector in Europe. The project aims to co-create a rich understanding of the diversity, processes, contributions, successes and future potentials of social innovation in the energy sector (SIE). We define SIE as a combination of ideas, objects and/ or actions that change social relations and involve new ways of doing, thinking and/ or organising energy. An example is organising under cooperative principles to generate renewable energy. As part of this work, we make use of an embedded case study approach to build a better understanding of the development of diverse SIE-fields (e.g. participatory incubation and experimentation, framings against specific energy pathways, local electricity exchange) and their SIE over time. Our research questions that frame the case study work are:

- How do SIEs and SIE-fields emerge, develop and institutionalise over time?
- How do SIE-field-actors and other field-actors interact with the 'outside' institutional environment and thereby co-shape the SIE-field over time?
- What are the enabling and impeding factors for SIE-field-actors and other field-actors to conduct institutional work and change the 'outside' institutional environment?

A SIE-field is an arena/space that includes a specific SIE as well as SIE-field-actors working on it and other field-actors enabling and/or impeding it. In this arena/ space these actors take one another and their actions into account and have a shared (but not necessarily consensual) understanding of a SIE and of their relationship to other actors. They recognise (but not necessarily follow) shared norms, beliefs and rules. SIE-fields are often not homogenous but are composed of actors with diverse and contradictory aims and interests. An example: The UK cooperative energy field includes SIE-initiatives and SIE-field-actors (e.g. Brighton Energy Co-op, Cooperative UK, Community Energy England, UK Government, City of Brighton), who have a shared understanding of an SIE, which exists as 'organising under cooperative principles to generate renewable energy'.

The structure of this report is as follows. Section 2 provides a summary of the SIE-field relevant for this report and lists some key insights. Section 3 outlines the boundaries of the SIE-field and shows how it has been studied in the country context. Section 4 shows a visual development of the SIE-field. Section 5 tells the historical development of the SIE-field over time, including analytical/ interpretive reflections from the SONNET researchers and quotes from the actors involved in the field developments. Section 6 outlines key research findings, providing answers to the three research questions. Section 7 outlines recommendations for policymakers based on the findings. Finally, Section 9 outlines the methodological approach and includes a more detailed timeline of the SIE-field and its actors.

The following boxes are used within the report:



List of abbreviations

AD - anaerobic digestion

APSE - Association of Public Sector Excellence

BEIS - Department for Business, Energy and Industrial Strategy

BWCE - Bath & West Community Energy

BWEA - British Wind Energy Association

CARES - Community and Renewable Energy Scheme

CCL - Climate Change Levy

CEE – Community Energy England

CES - Community Energy Strategy

CfDs - Contracts for difference

CHP - combined heat and power

CMI - Community Municipal Investment

CPPA - corporate power purchase agreements

CSE - Centre for Sustainable Energy

CSU - Community Shares Unit

DECC - Department for Energy and Climate Change

DEFRA – Department for Environment, Food and Rural Affairs

DNC – Declared net capacity

DNO – Distribution Network Operator

EIS – Enterprise Investment Scheme

EMR – Electricity Market Reform

FCA – Financial Conduct Authorities

FID – Final investment decision

FIT – Feed-in Tariff

FSA – Financial Services Authority

GBBA – Great British Business Account

GEA – Green Energy Account

GIB – Green Investment Bank

GPAM – green power action market

IFISA – Innovative Finance Individual Savings Account

IIGCC – Institutional Investors Group on Climate Change

IPS – Industrial and Provident Society

ISA – Individual savings account

LAs – Local authorities

LCF – Levy Control Framework

LEAF – Local Energy Assessment Fund

LEC – Levy Exemption Certificate

MCS – Microgeneration certification scheme

NETA – New Electricity Trading Arrangements

NFFO – Non-Fossil Fuel Obligation

REA – Renewable Energy Association

RCEF – Rural Community Energy Fund

RHI – Renewable Heat Incentive

RO – Renewable Obligations

ROCs – Renewables Obligation Certificates

SEG – Smart Export Guarantee

SEIS – Seed Enterprise Investment Scheme

SIE – Social innovation in energy

SITR – Social Investment Tax Relief

STA – Solar Trade Association

UCEF - Urban Community Energy Fund

UKFCA – UK Crowd Funding Association

VCT - Venture Capital Trust

2 Financial and subsidy mechanisms for renewable energy in the United Kingdom

In SONNET we investigate the development of social innovations in energy (SIE) and the SIE-field called 'Financial and subsidy mechanisms for renewable energy in the UK'. We look at financial and subsidy mechanisms through which funding and investments are made available to facilitate the activities of novel actor constellations related to the production, distribution and storage of renewable energy in the last 10 years, with a focus on particular types of renewable energy technologies – wind and solar PV. We study this SIE-field in Poland, Netherlands and the United Kingdom (UK). The study of this SIE-field is important for understanding how the use of various financial instruments and mechanisms can affect renewable energy developments, the changing social relations surrounding them, power dynamics and institutionalisation of the SIE-field.

The aims of this report are:
- to trace the development, implementation and/or abolition of financial and subsidy mechanisms in the UK over the last 10 years;
- to explore the diversity of financial mechanisms (including grants, awards, subsidies, crowdfunding, community bonds, ventures, social investment) for renewable energy;
- to show how financial mechanisms change social relations, e.g. by enabling novel actor constellations (including new relations between actors or new roles for actors).

Key insights

For the SONNET project, the financial and subsidy mechanisms for renewable energy as an SIE-field is interesting because through exploring the evolution of particular mechanisms, various discourses and SIE-field actors' activities, it reveals a number of important issues for social innovation in energy transitions. In particular, it illustrates that:

- There are at least two (not mutual exclusive) ways in which financial mechanisms may come with 'changing social relations'. One possibility is that the activity funded involves such change — e.g. when a grant is made to fund a collaborative research project involving a novel form of collaboration. Another possibility is that the changing relations or new roles relate to the financial flows themselves — for example, where community share raises make local people investors in a solar farm or when contractual forms around revenue streams involve new combinations of actors.
- The SIE-field is complex and constituted by a number of sub-fields and institutions concerned with changing social relations in connection to financing of wind and solar that can be part of other fields, i.e. 'municipal energy'; 'community energy'; 'investment-based crowdfunding'; 'institutional investment in green infrastructure';

‘corporate’ and ‘private wire’ Power Purchase Agreements (PPAs). These fields are interconnected and can overlap creating ‘space’ for social innovations around renewable energy.

- There is a diversity of actors, connected with different financial and subsidy mechanisms in the UK. The role of non-traditional actors in renewable energy finance was becoming more prominent at certain stages of the SIE-field development, in response to some policy changes or changes in the outside institutional environment; this includes the increasing role for local authorities in financing renewable energy projects, institutional investors interested in opportunities associated with climate change, and small players e.g. citizens usually investing through share offers or crowdfunding.
- Societal trends can be drivers for some SIE developments: e.g. the fact that increasing number of large companies have decided to make their own commitments in relation to climate and renewable energy resulted in the increasing demand for corporate PPAs (and to some extent private wire PPAs), and has been cited as a major driver of demand for long term PPAs with renewable generators.
- The emergence of crowdfunding platforms (a mechanism for raising capital from large number of small investors) that started providing finance for renewable energy generation projects, was an important development in the SIE-field during the period covered in this report. The adoption and use of crowdfunding platforms were affected by changes in government support which reduced investor confidence, and proved especially challenging to the crowdfunding platforms.
- The financial mechanisms and subsidies for renewable energy in the UK are largely framed by policy and regulation in the field. This means that the actors’ ability to act is limited i.e. power is more constrained and circumscribed.
- The most important policies and policy-making relevant to the SIE-field has been happening at the national level. This manifested, first of all, in subsidy schemes for renewable energy. At launch the subsidies usually played an enabling role; their closure was an impeding factor for the renewable energy sector.
- Over the period covered in this report, the government subsidy policy for renewable energy has changed dramatically. The cuts to support for renewable generation was a ‘shock’ for the actors active in relation to renewable energy.
- During the period 2010-2020 one could see the growing role of local authorities in financing renewable energy projects. This included: ownership of electricity generation assets and investments in renewable energy projects; a support for the community energy sector; the use of novel mechanisms e.g. a crowdfunded Community Municipal Investment for citizen led investments.

3 Introduction to Financial and Subsidy Mechanisms for Renewable Energy in the UK

This case study looks at financial and subsidy mechanisms that come with changing social relations; i.e. novel (in a national context) actor constellations (including new relations between actors or new roles for actors) in relation to renewable energy generation in the UK. 'Financial mechanisms' is not a phrase with a precise and widely understood definition; we suggest that it encompasses both, the ways in which activities are 'financed' through debt, equity, or grants (in the sense of (Braunholtz-Speight et al., 2018)), and the revenue streams that the activities generate, including subsidies, and we look at both of those here.[1] We also included subsidy mechanisms for renewable energy as government support for alternative sources of energy has been crucial for development of the sector. Admittedly, the use of subsidies to renewables is motivated by the need to address market failures, such as to address the price disparity with fossil fuels; they have been credited with increasing innovation, lowering costs and expanding the energy mix. In the UK, subsidies have led to a significant increase in the deployment of renewables, leading to a rapid decrease of the cost of some of these technologies.[2]

The main subsidies and financial mechanisms covered in the case study are:

- Renewable Obligations
- Feed-in Tariff (FIT)
- Contracts for difference (CfDs)
- Smart Export Guarantee
- Rural Community Energy Fund
- Urban Community Energy Fund
- Community & Renewable Energy Scheme (Scotland)
- Ynni'r Fro (Wales)
- Local Energy Assessment Fund
- Community share offers
- Private funds/investments (e.g. institutional investors, Green Investment Bank, Cooperative bank Triodos)
- Crowdfunding, including Community Municipal Investment (CMI) model
- Prudential borrowing
- Power Purchase Agreements (PPAs)
- Surpluses generated through FIT (e.g. for community benefit funds)

[1] It is worth noting that in practice the ability to finance a project through debt or equity is mutually dependant on the future revenue streams; the revenue streams are essential to servicing the interest or dividends on the debt or equity.
[2] https://www.lse.ac.uk/granthaminstitute/explainers/do-renewable-energy-technologies-need-government-subsidies/

The decision was made to restrict the scope of the study by looking at the financial flows which have supported the creation of wind and solar photovoltaic[3] generation over the last 10 years — with some historical background reaching back to privatisation of the UK electricity supply industry in 1989. Both wind and solar PV are relatively new renewables, and during the period covered in this report the field and the institutional context have been through lots of change including social transformations. Choosing the foci of the study allowed us to explore in more detail the evolution of relevant financial and subsidy mechanisms and their effect on social innovation surrounding these technologies over time. We also pick these technologies (wind and solar) because they have a number of technical similarities compared with other sustainable energy sources (which helps keep the story of their financing manageable), but also some notable differences of relevance to social relations involved. Key similarities are:

- they produce no greenhouse gases in operation;
- they are variable energy sources, unlike biofuel or waste burning plants;
- they harness ambient flows of energy in their surroundings at zero marginal cost, which means: they are not directly implicated in markets for biofuels or waste management; much of the ongoing cost associated with an installation is cost of the capital used to finance its construction;
- compared to other systems using ambient energy, the maturation of these technologies has occurred over roughly similar timeframes with notable cost reductions over the last ten years;[4] furthermore, they have all seen substantial growth in the last ten years and now provide a substantial part of the UK's electricity supply.

On the other hand, solar PV, onshore wind, and offshore wind differ markedly in their economies of scale, and this is reflected in the distribution of installation sizes that we see for each technology: while there are many solar farms above 5MW there are also hundreds of thousands of solar PV systems under 10kW capacity, many of which are installed on individual homes and in many cases owned by individual households. There are thousands of onshore wind installations, ranging from individual turbines to the 539 MW Whitelee Wind Farm in Scotland (the largest in the UK). There are tens of offshore wind farms. With the exception of pilot schemes these are above 60MW and the largest to date is 1,200 MW.

In order to introduce the key actors in the SIE-field in the UK concerned with these financial flows, it is useful to review a few general features of the projects they support.

As the 'fuel' is free and maintenance relatively inexpensive, most of the labour and materials used to produce solar or wind power are deployed before the generation asset is commissioned, and a substantial part of the revenue will go towards the cost of the capital (both debt and equity) used to reach that point. Following the UNEP 'Global Trends in Renewable Energy Investment' reports it is useful to divide the creation of a new renewable energy generation asset into two main phases

[3] Developments related to various kinds of (potentially) renewable thermal electricity generation such as waste-to-energy, anaerobic digestion, landfill gas, and biomass are largely ignored. This report also has little to say about marine energy, which is at a much earlier stage of development than wind and solar PV.

[4] In comparison, large scale hydro is much older, while tidal and wave energy are still much less mature.

separated by the 'final investment decision' (FID) at which time the necessary financial commitments have been made for construction to begin (Frankfurt School-UNEP Centre and BNEF, 2019).

Reaching the FID involves (among other things) the identification of a suitable site; establishing the rights required to build and connect the asset from the owner of the site, planning authorities, etc.; finding sources of financing for construction; establishing contracts necessary for the construction, connection, and operation of the asset. This is a risky process. Significant expenditure of resources may come to nought if, for example, planning permission is not granted.

After the FID, construction is generally lower risk; while the risks associated with ownership of the completed asset tend to be lower still. Equity in the project could potentially be issued or change hands in an acquisition at any stage, and while an acquisition does not directly fund new assets, it can play an important role in 'recycling' the capital available to developers to develop more projects. Given the changing type and level of risk over the life of a project, it is also common for projects to be refinanced.

Once the asset has been commissioned, the revenues it receives typically involve the sale of electrical energy which might be done on a transaction basis in a market, but which is often done through a longer term power purchase agreements (PPA).[5] Markets and contractual arrangements also exist for other services that help to keep the electricity grid functioning as a system, such as 'fast frequency response.' In addition, revenue may be supported by a variety of subsidy mechanisms (e.g. a Feed-in Tariff). The revenue streams that will be available are typically of great interest to projects' financial backers, for obvious reasons.

The 'financial mechanisms' scoped out above have pecuniary implications for everyone who pays an electricity bill, but among the actors who have taken a direct interest in shaping them are:

- The UK government, which has created, modified, and destroyed sources of financing, revenue streams, and costs through various subsidy, tax, and market reform policies, and which has intervened in financial markets to stimulate private financing.
- Ofgem — the regulator of the electricity markets (in Great Britain)

[5] Power Purchase Agreements (PPAs) can be complex; without going into much detail, it will be useful to at least distinguish between three main types used in the UK (as the Solar Trade Association has done). Wholesale PPAs are made with a 'licensed supplier or balancing party' who 'in turn then sells the electricity onwards to end consumers or through bilateral or exchange based contracts to other balancing parties.' A Sleeved PPA structure 'enables a consumer to buy electricity direct from a generator whilst being neither physically connected to the project, nor a signatory to the balancing code (i.e. a licensed supplier or balancing party).' Such a signatory is however needed to provide 'a back-to-back or 'Sleeved' PPA' with the consumer in addition to the consumer-generator PPA. In a Private-Wire PPA, electricity is sold to the consumer signed up to the PPA via a direct wire rather than the grid which allows them to avoid "many of the non-commodity costs associated with buying electricity through the grid." 'Corporate PPAs' includes sleeved PPAs, but also include other arrangements which effectively allow a generator to sell electricity to a consumer over the grid (rather than a private wire) such as 'synthetic PPAs.' Most corporate PPAs in the UK are sleeved PPAs.

- The Financial Conduct Authority (FCA) — the regulator of financial markets and services in the UK
- Participants in the electricity markets including:
    - Electricity supply companies (and other traders)
    - Vertically integrated utilities (which combined the above function with generation, and sometimes distribution / transmission)
    - Independent Power Producers (IPPs)
    - Electricity Network Operators (Distribution and Transmission)
    - Signatories to PPAs
- Developers of renewable energy projects (including utilities, independent commercial developers, community groups, local governments)
- Investors in renewable energy projects (both owners and lenders) including developers, banks, utilities, IPPs, individuals, households, businesses, and public sector bodies, local governments, private investors, and institutional investors e.g. insurance companies and pension funds, social impact funds and their intermediaries, government backed programmes, local authorities, retail investors through crowdfunding platforms
- Financial services companies such as crowdfunding platforms
- Trade associations (e.g. the Solar Trade Association) and interest groups (e.g. Centre for Sustainable Energy, Community Energy England)

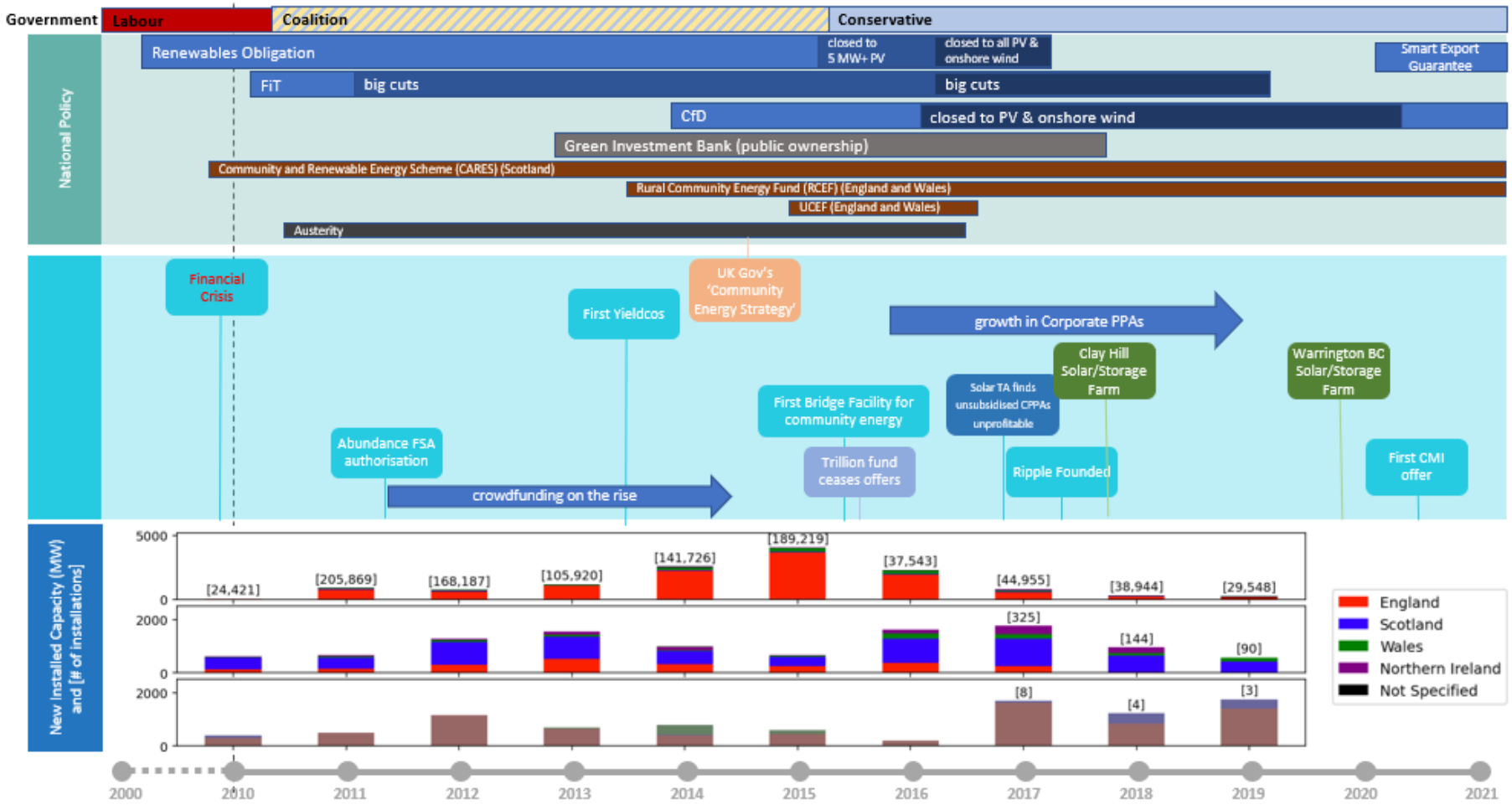
The actors listed above often have diverse and contradictory aims and interests; they can be divided into two categories: SIE-field actors and other field actors. By SIE-field actors we understand individuals, organisations or other collectives who are part of a certain SIE-field and actively work on SIE; other field actors are those who enable and/or impede SIE. These actors take one another and their actions into account and have a shared (but not necessarily consensual) understanding of a SIE and recognise (but not necessarily follow) shared norms, beliefs and rules. (Hielscher et al., 2020) A SIE-field actor seems to be a 'fluid' term, and the same actor can perform as SIE-field actor or other field actor at different stages of SIE-field development and in relation to different SIE/SIE-initiatives (e.g. the government can be SIE-field actor when introducing subsidies or other field actor when creating conditions (through policy and regulations) for implementing particular types of SIE-initiatives).

SIE-initiatives are localised versions/manifestation in time and space of a SIE. Two SIE-initiatives are discussed in this report in more detail – Abundance, a debt-based crowdfunding platform, and Leapfrog Finance, a provider of finance to community energy projects.

‘Outside’ institutional environment shaping the development of the SIE-field
In the SONNET project we are interested in the ‘outside’ institutional environment that ‘surrounds’ and ‘penetrates’ (i.e. shape/influence/interact with) the SIE-field. While the field is constituted by SIE actors and field actors activities, it is also influenced by the outside institutional environment, which can interact, shape, enable or impede the development of the SIE (Hielscher et al. 2020). We want to understand how dominant institutions of the ‘outside’ institutional environment influence the emergence and development of financial mechanisms and subsidies for wind and solar. The SIE-field is nested within an ‘outside’ institutional environment constituted by formal and informal institutions that shape the activities of actors within the SIE-field. Broadly speaking, the outside institutional environment for the SIE-field is constituted by the following: foundational institutions of the market economy in the UK and abroad, such as private property; the regulatory institutions of UK banking and financial markets; the UK political system and regulatory institutions such as Ofgem; the institutions of the UK electricity markets; the EU, whose influence can be seen in state-aid rules and directives on renewable energy targets. Importantly, the evolving SIE-field is influenced by developments in both, the energy system and financial markets; they consist of a wide range of institutionalised rules, norms and beliefs, and have undergone some significant changes over the past decade. For example, the energy system in the UK is characterised by the need to decarbonise the energy system as a result of climate change, the growing deployment of renewable energy technologies (solar and wind), and significant changes in the policy context that often has been framing the changes in the energy sector.

4 Timeline of 'investment and finance mechanisms'

The below timeline does not show all of the events and sites of activities connected to investment and finance mechanisms in the UK over the last ten years. It is supposed to give a 'flavour' of different events, activities and sites.



5 Development of financial mechanisms over time

Historical background: financing renewable generation 1989-2009

In this section we will briefly review some notable developments in the financing of renewable energy generation from the privatisation of the electricity supply industry in 1989 up to the financial crisis of 2008, in order to establish the context for what follows, including a number of significant actors and financial mechanisms.

The first commercial wind farm in the UK was commissioned in Delabole, Cornwall in December 1991. The 4 MW project was developed by the farming family who owned the land, in partnership with generator National Power and supply/distribution company South Western Electricity Board (SWEB) and was supported by the Non-Fossil Fuel Obligation (NFFO) (Edwards and Quilleash, 1994; Freris, 1992). The NFFO was the UK's first price support policy for renewable generation and was introduced by the Electricity Act 1989 which also privatised the electricity supply industry (Mitchell, 2000).

Co-operative ownership of wind power in the UK has existed since the Baywind cooperative used share offers advertised in the local papers to buy two of five turbines at the 2.5 MW Harlock Hill wind farm being developed in Cumbria by a Swedish company which was hoping to establish the cooperative ownership model in the UK. These assets began generating electricity in Jan 1997, with its sale price guaranteed through an NFFO contract (Bolinger, 2001, pp. 36–39; High Winds Community Energy Society, n.d.). Baywind was registered with the Financial Services Authority (FSA)[6] as an Industrial and Provident Society (IPS) — a form long used by cooperative enterprises in the United Kingdom in which shareholders — commonly called 'members' in this context — have one vote regardless of the size of their shareholding. Legislation in 2014 replaced the IPS form with 'co-operative societies' and 'community benefit societies' (FCA, 2015).

To make their share offer more attractive, Baywind took steps to ensure that the investment would qualify for the Enterprise Investment Scheme (EIS) — launched in 1994 — which lets investors claim income tax relief up to a percentage of an eligible investment in a young company, as well as relief from capital gains tax. So, (to repeat Bolinger's example) an investor buying £500 of shares in Baywind would be able to claim 20% of that amount through EIS and thus cut her income tax bill by £100 (Bolinger, 2001). EIS is one of four similar tax relief schemes currently operating in the UK which are designed to incentivise investment in new enterprises — in the case of the EIS, Seed EIS (SEIS), and Venture Capital Trust schemes — or social enterprises in the case of Social Investment Tax Relief (SITR) (HMRC, 2019).

[6] The Financial Conduct Authority (FCA) is an independent public body tasked with regulating UK financial markets to "protect consumers," "protect financial markets," and "promote competition." It operates alongside the Prudential Regulation Authority whose objective is to "promote the safety and soundness" of "banks, building societies, credit unions, insurers and major investment firms." Until April 2013 these functions were the responsibility of the FSA (FCA, 2020)

The Baywind co-op raised funds to buy completed turbines. The construction of Harlock Hill was financed 20% by equity from the developer ('The Wind Company') with the remaining 80% borrowed from the Triodos Bank (Bolinger, 2001), a Dutch ethical bank founded in 1980.

Triodos Bank also established a UK subsidiary in 1994 called 'The Wind Fund plc' which "aimed to enable ordinary people to invest directly into the development of renewable energy projects in the UK." Haverigg II was their first wind farm investment (Thrive Renewables, 2020a). The subsidiary was later renamed as Triodos Renewables, and in 2016 became independent of Triodos in 2016, rebranding as 'Thrive Renewables' (Thrive Renewables, 2020b).

One interviewee from an organisation with a long history of leadership in the sphere of UK renewable energy cooperatives described the organisation's motivation to finance projects by offering equity in cooperatives: "*We are trying to engage with the man on the Clapham Omnibus, the woman in the street, with the climate change agenda by giving them an opportunity to buy a real stake in a renewable energy project. We prefer shares to loans because that offers ownership and voting rights. The European Co-operatives talk about the democratisation of the energy supply, and that is what we are trying to do*." (FM_UK05)

May 1997 saw the election of the first Labour government in 18 years. Under the premiership of Tony Blair, the 'New Labour' government continued the liberalisation of the electricity markets, replacing the existing wholesale market ('the Pool') with the 'New Electricity Trading Arrangements' (NETA) in England and Wales through the Utilities Act 2000. In that year, wind and solar were still marginal sources of electricity in the UK: 947 TWh of electricity were generated from wind — just 0.25% of the total. Solar PV generated a single terawatt-hour in the same year (IEA, 2020). In April 1998 the UK government was among the signatories of the Kyoto Protocol.[7]

The Blair government introduced the Climate Change Levy (CCL) in 2001. The CCL is a specific rate duty tax on the supply of electricity, gas (i.e. natural gas, not gasoline), LPG, and solid fuels to 'business' users including industrial, commercial, and public sector users but excluding use in the public transport and residential sectors. It was offset (in the aggregate) by a cut to the National Insurance contributions paid by employers on employee earnings (Seely, 2009). Electricity generated by sources other than fossil fuels, nuclear, and large hydro was exempt as was that generated by 'good quality' CHP (The Climate Change Levy (General) Regulations 2001, 2001). Eligible generators were issued a Levy Exemption Certificate (LEC) per MWh generated — by acquiring LECs through their own generation or through trade suppliers would be exempt from the CCL on the corresponding quantity of electrical energy (Ashurst, 2015; Ofgem, 2008).

[7] https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-7-a&chapter=27&clang=_en

NETA proved detrimental to wind generators. In a memorandum submitted to the House of Commons environmental audit Committee in Jan 2002, the British Wind Energy Association[8] stated that “NETA is, in its operation, unfair to wind energy, adding an unnecessary additional cost to generation” and noting that “it may be a side-effect of the implementation of NETA that smaller (and in particular, very small, so-called "community schemes") are made unviable because of the additional costs, and therefore reduce competition in the market” (BWEA, 2002).

The NFFO, which was not compatible with the NETA (Mitchell, 2000), was replaced as the primary revenue support for renewable generation by the Renewables Obligation, which began operation in 2002. This scheme required electricity supply (i.e. retail) companies to surrender Renewable Obligation Certificates covering a certain percentage of the energy supplied to customers or pay a penalising buy-out price. This was intended to create a demand, and a market price, for ROCs, which were granted freely to owners of registered renewable generation assets according to the amount of energy these produced, in a similar way to LECs. Sale of ROCs represented an important source of revenue. The percentage of supply for which ROCs were required was increased over time.

By 2001, Baywind had used a second share raise and a loan from the Cooperative Bank, to buy the other three turbines at Harlock Hill. In response to interest from others wishing to set up similar renewable energy coops, in 2002 members of Baywind established Energy4All to support the development of energy cooperatives in the UK (Chapman, 2018, p. 9; Energy4All, n.d.). By 2009, five new cooperatives established by Energy4All had operational generation assets (Energy4All, 2020): the Boyndie Wind Farm Co-operative, the Isle of Skye Renewables Co-operative, the Great Glen Energy Co-op, and the Kilbraur Wind Energy Co-op were set up to offer the public shares in commercial wind farm projects once constructed by Falck Renewables in Scotland, with whom Energy4All had an agreement “to create a local co-op on every one of their Highland wind farm sites” (Great Glen Energy Co-operative, 2020). The Westmill Wind Farm Co-op, on the other hand, is notable for having financed the construction of a 6.5 MW wind farm in Oxfordshire, England at a cost of £7.6m using a share issue (which raised £4.6m from nearly 2,400 members) and a loan from the Co-operative bank (Westmill Wind Farm Co-operative, 2020a, 2020b). Energy4All was itself established as a cooperative, and is owned by the co-ops that it has helped to establish (Energy4All, 2020).

Good Energy (which on founding in 1999 was "the UK's first 100% renewable electricity supplier") took a different approach to sourcing equity from individuals when in 2002 it bought the Delabole wind farm using funds raised through a public share offer which was taken up by 600 of their 5,000 customers (Good Energy, 2016).

[8] The BWEA was established in 1978 and renamed RenewableUK in 2009. It is a trade association representing the wind, wave and tidal energy sectors (Renewable Energy Focus, 2009; RenewableUK, 2010).

Despite the existence of small suppliers like Good Energy, the electricity supply market (i.e. retail) was by the mid-2000s dominated by the 'Big Six' — Centrica, E.On, RWE npower, EDF energy, Scottish Power, and Scottish and Southern Energy. As of Dec 2004, these six together had 99.5% market share for residential electricity and gas supply — a situation which was virtually unchanged by the end of the decade (Ofgem, 2020a).

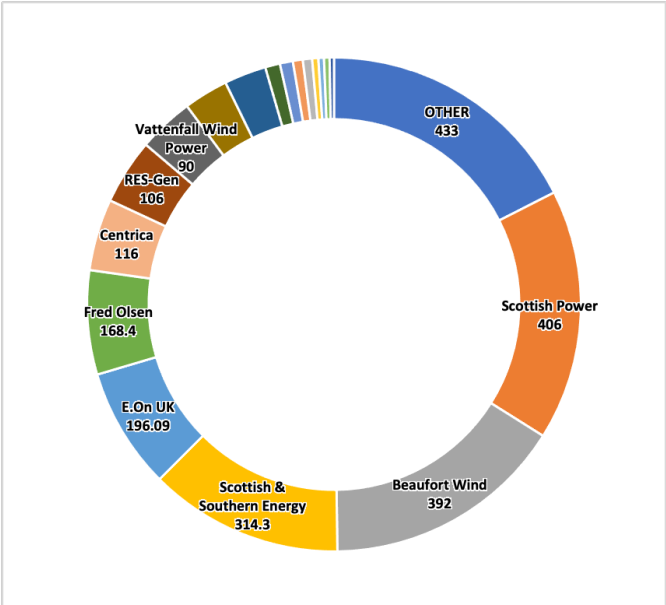


Figure 1: Ownership of operational wind capacity in the United Kingdom as of May 2008 by installed capacity (MW). Note that the data source reports that the amount in the 'OTHER' category is correct as of end of Dec 2007. Authors' plot of data from the Digest of UK Energy Statistics, Table 5.11 (BERR, 2008a, 2008b).

As vertically integrated utilities, the Big Six also owned a considerable amount of generation capacity and this included wind farms — yielding ROCs which helped to fulfil their renewable obligations as suppliers. By May 2008, Scottish Power, Scottish & Southern Energy, E.On, and Centrica all had more than 100MW of the operational wind capacity (onshore and offshore) which was 2,500 MW in total (see **Error! Reference source not found.**) (BERR, 2008a, 2008b). Scottish Power alone had over 400MW. By way of comparison, a ResPublica study four years later would find 60MW of operational renewable capacity in the UK "wholly or partly owned" by local community groups, of which 48MW was wind power (Harnmeijer et al., 2013).

The other companies with more than 100MW wind capacity in May 2008 were Fred Olsen Renewables and a subsidiary ('RES Gen') of RES Group — both major wind developers — and Beaufort Wind, a company formed to transfer the wind power portfolio of 'big six' member RWE to Zephyr Investments for £400m in 2004 (IJGlobal, 2004). While RWE maintained a stake by putting one third of the equity into Zephyr, the other two thirds of the £100m equity were put in by the Bahrain-based First Islamic Investment Bank (now called Arcapita) and private equity company Englefield Capital, while £300m in debt financing was provided by "about a dozen banks" (Taylor, 2004).

The Zephyr deal in 2004 has been cited as "the first time a private equity house had made a significant investment in renewable energy in Britain" (Power, 2007). In contemporary article about the deal, the Times quoted an RWE spokesperson as saying that the government target to obtain 15% of power from renewable sources by 2015 "means that by the end of the decade we would have to carry billions of pounds of investment on our own balance sheet" and stating that the deal "means that in the next few years we can continue to invest in developing wind farms." (Jameson, 2004) The Financial Times credited the deal with "easing government concerns over slow progress in persuading the City to back new projects" (Taylor, 2004).

Of the ~2.5 GW of wind capacity in operation in May 2008, just 404 MW was offshore, consisting of two small pilot projects and five wind farms between 60 and 90 MW which were among those awarded leases in the first round of awards by the Crown Estate (Greenacre et al., 2010, p. 28). The Crown Estate is a statutory corporation which holds the Queen's public estate — including "virtually all the seabed around the UK out to 12 nautical miles" (UK Government, 2020). It manages this estate in much the way that a commercial property manager would, but with its profits flowing to the Government's Treasury. It collects a royalty on the revenues of wind-farms built on its territory and, as Kern and co-authors note, it has been an important "network builder" in the development of offshore-wind (Kern et al., 2014).

The five larger wind farms were each awarded £10m by the Department of Trade and Industry's Offshore Wind Capital Grants scheme (International Energy Agency et al., 2006, p. 256) which, by the time it closed in the mid-2000s, had granted a total of £117m to 12 projects (10m of which was provided by the Big Lottery) (DTI, 2006; IEA, 2014). Kentish Flats was developed and wholly owned by Swedish state-owned utility Vattenfall (Vattenfall, 2009, p. 4); The Burbo Bank project was developed by Seascape which was acquired, prior to construction, by Danish state-owned energy company DONG Energy (Esmerk Denmark News, 2008), prior to construction; while Barrow was a joint venture between DONG Energy, Norwegian state-owned utility Statkraft, and UK 'big 6' supplier Centrica (Centrica, 2014). The other offshore owners were E.On, SSE, and Zephyr (BERR, 2008b), which had acquired the 60 MW North Hoyle wind farm from developer RWE in early 2006 (Modern Power Systems, 2006).

In 2007, both Englefield (Power, Finance & Risk, 2008) and Arcapita made substantial profits selling their stakes in Zephyr with "an unnamed investment group advised by JP Morgan Asset Management" and Infracapital Partners buying in (Private Equity Asia, 2007). Infracapital was the second infrastructure fund of M&G Investment Management, "the European

investment management arm of the Prudential Group" and the (limited partners) investing in the fund were "mostly public and private pensions" (Infrastructure Investor, 2008). Occupational pension funds are one of the main types of 'institutional investor' in the UK according to the Myners Report of 2001, accounting for £800 billion of assets. The others he notes are insurance companies ("with almost £1,000 billion"), pooled investment, and "other financial institutions such as charities, endowments and educational institutions" (Myners, 2001, pp. 5 & 27)[9].

According to the Institutional Investors Group on Climate Change (IIGCC), since privatisation, "the overwhelming majority of the capital invested in UK energy has come from the private sector, primarily through institutional investors" but prior to 2010 this was mainly through the listed debt and equity of utility companies. Investment in the energy sector by institutional investors either directly or through specialised infrastructure funds, such as Infracapital in the Zephyr acquisition, would become increasingly common in the next decade.

While investments by institutional investors in the energy sector have not been exclusively in renewable energy generation or supporting technologies, some such investors were already organising around climate change issues. The IIGCC, for example, "was established in 2001 as a forum for collaboration between pension funds and asset managers to address investment risks and opportunities associated with climate change" (IIGCC, 2007). As of late 2003 it had 18 members including BNP Paribas Asset Management, PRUPRIM (part of the M&G Group) the Co-operative Insurance Society, the Central Finance Board of the Methodist Church, and the pension funds for the BBC, and UK University staff (the USS), and a handful of UK local governments (IIGCC, 2003). Today they have "more than 270 members, mainly pension funds and asset managers, across 16 countries, with over €35 trillion in assets under management" and state that their "mission is to mobilise capital for the low-carbon transition and to ensure resilience to the impacts of a changing climate by collaborating with business, policy makers and fellow investors" (IIGCC, 2020).

In selling electricity, a generator has a number of options. One would be to sell on the wholesale market at market prices. Some more certainty about future prices can be obtained by signing a power purchase agreement (PPA) with one or more 'offtakers.' The offtaker is often a supply company looking to cover the consumption of its retail customers, but not always. The late 2000s saw some of the earliest "corporate PPAs" signed wherein the offtaker is an organisation looking to cover its own consumption via the grid (i.e. not via a separate connection as in a 'private wire' PPA) (Bird & Bird, 2016). In late 2008 it was announced that the supermarket chain Sainsbury's had signed ten year power purchase agreement (PPA) to buy the power generated by an onshore wind farm being developed by A7 Lochhead Ltd (BBC News, 2008; Renewable Energy World, 2008).

[9] Regarding banks, Myners notes that "unlike some continental economies and Japan, banks in the UK tend not to be significant shareholders in their own right" (Myners, 2001, p. 38) — they do however play an important role in financing the energy sector through loans.

In the recession that followed the Global Financial Crisis of 2007-2008, the UK economy shrank 6% between Q1 2008 and Q2 2009. It would take five years for output to recover (ONS, 2018). The UK Government announced a £500m rescue package in Oct 2008, which would partly nationalise the collapsing banks (Guardian, 2008).

As described by interviewees in the UK case study of (Hall et al., 2018) (Supplement 2), there was a "beautiful world" (ibid, p. 1) for project finance of renewables before the crisis in which banks were willing to put in long term debt to finance construction at a high 'gearing' (debt-to-equity) ratio. After the crisis, the banks wanted a significantly lower gearing, necessitating a larger equity input for a given project, and, as we will see, some banks stopped lending to renewables projects entirely. The crisis and bank bailouts also changed attitudes to mainstream finance, with reputational damage compounded by the HSBC money laundering and Libor rigging scandals circa 2011-12 (ibid, p. 6).

Meanwhile, repeated interest rate cuts made by the Bank of England in response to the crisis and ensuing recession took the Bank Rate from a six-year high of 5.75% in July 2007 to a historic low of 0.5% by March 2009, since which time it has not been raised above 0.75% (Bank of England, 2020; Kollewe, 2016). The crisis and the subsequent events mentioned here had wide ranging effects on the financing of renewable electricity generation, which we will discuss in due course.

While we have seen that the new wholesale electricity market under NETA (which was extended to Scotland and renamed the British Electricity Trading Transmission Arrangements in April 2005 (Elexon, 2013)) was seen as disadvantageous for intermittent renewables, by 2010 wind power had seen considerable growth with the support of the RO. During 2010, 10.3 TWh of electricity was generated from wind — 2.7% of the total — (IEA, 2020) and the installed wind capacity as of the end of 2010 was 5,400 MW, with 1,300 MW offshore (BEIS, 2020a). In response to rising costs of offshore wind, revenue support for this technology had increased in 2009, when technology "bands" were introduced to the renewable obligations scheme. This meant that some generation technologies were awarded more or less than one ROC per MWh generated, with the allocation for new offshore wind projects increasing to 1.5, and later to 2, ROCs per MWh (Kern et al., 2014).

In their 2010 manifesto, RenewableUK stated that "the Renewables Obligation (RO) has underpinned development, providing investors with confidence in the market. The RO should be retained as the principle support mechanism for renewables. Any move to replace or undermine it will damage investor confidence and create an investment hiatus that would seriously impair our ability to fulfill [sic] our climate change commitments" (RenewableUK, 2010, p. 12).

Solar PV on the other hand, had yet to take off, with the total installed solar PV capacity at the end of 2009 at just 26.5 MW (BEIS, 2020b). Since around 2007-2008, Renewable Energy Association (REA)[10] and Friends of the Earth had been leading a

[10] According to their website (of Sept 2008) the REA "was established in 2001 to represent British renewable energy producers and promote the use of sustainable energy in the UK" and its "main objective is to secure the best legislative and regulatory framework for expanding renewable energy production in the UK. We undertake policy development and provide input to government departments, agencies, regulators, NGOs and others." By early 2007 it had over 500 members (Renewable Energy Association, 2008).

campaign for the introduction of a Feed-in Tariff “to complement the Renewables Obligation (RO) which, at the time, was proving effective only for landfill gas and large scale onshore wind” (Wolfe, 2016) with a coalition including the Co-operative Bank and the National Farmers Union (Friends of the Earth, 2017). After initially meeting “solid resistance from the main political parties” — according to Philip Wolfe (then head of the REA) — “in a speech at Greenpeace, new Conservative party leader David Cameron proposed the introduction of feed-in tariffs in the UK. Subsequently, a few weeks after his appointment as the first Secretary of State for Energy and Climate Change, Ed Miliband reversed the government's opposition, amending the 2008 Energy Bill to include enabling powers for the creation of feed-in tariffs” (Wolfe, 2016).

The Energy Bill passed into law in November 2008 on the same day as the Climate Change Act 2008, which introduced a statutory emissions target for 2050 at 20% of the 1990 level. In this year the UK also adopted a binding target to source 15% of energy from renewables by 2020 as part of an EU-wide measure. It was expected at the time that this would mean that 30% of electricity would need be generated by renewable sources by 2020 (Lockwood, 2016).

Phase 1 : 2010-2015 — “The greenest government ever”

Following further work on implementation, the Feed-in Tariff (FIT) scheme was launched in April 2010. It supported renewable generation installations of up to 5MW capacity by mandating that electricity suppliers provide an inflation indexed payment per kWh generated (and an additional payment per kWh exported to the grid) for a twenty-five year period following registration with the scheme. By the end of the FIT scheme's first year, 30,201 installations were participating in the FIT, of which 29,556 (77.7 MW) were Solar PV, 1,339 (18.9 MW) Wind, and 203 Hydro (9.9 MW) (Ofgem, 2011).

In May 2010, the Labour government was replaced by a Conservative-Lib Dem coalition headed by David Cameron, who promised "the greenest government ever" in a House of Commons speech (Carter and Clements, 2015; Randerson, 2010). In response to the recession, the coalition introduced a controversial programme of 'austerity' in public finances.

Although supply companies were the ones paying out the FITs and buying the ROCs, these costs are ultimately passed through to consumers as levies on their electricity bills. The new government’s Spending Review of Summer 2010 was significant in introducing a cap on the Department of Energy and Climate Change’s tax and spending through policies which entailed this kind of levy. This would be formalised in spring 2011 as the Levy Control Framework (LCF) (HM Treasury, 2011; Lockwood, 2016). While it would prove significant later, on introduction the LCF “did not attract a lot of attention because forecast spending appeared to fit comfortably under the cap” (Lockwood, 2016, p. 196).

Lockwood argued that the introduction of the LCF represented a significant “relocation of energy policy under budgetary policy […] symbolised by the supervisory role that the Treasury now plays, effectively overseeing the evolution of renewable energy policy” but found “the purpose of the LCF is not wholly clear”(Lockwood, 2016, p. 199). On the basis of the available evidence, he concluded that its primary purpose was to reassure prospective investors in renewable generation that, by

putting in place controls on levies which were portrayed by their opponents as a “green stealth taxes” (ibid., p. 198), the UK would not be forced into retrospectively revoking subsidies in the face of political backlash, as they had been in Spain — for example, by cutting short FIT payments to those already registered. With regard to this purpose however, the LCF would later prove counterproductive.

Solar takes off

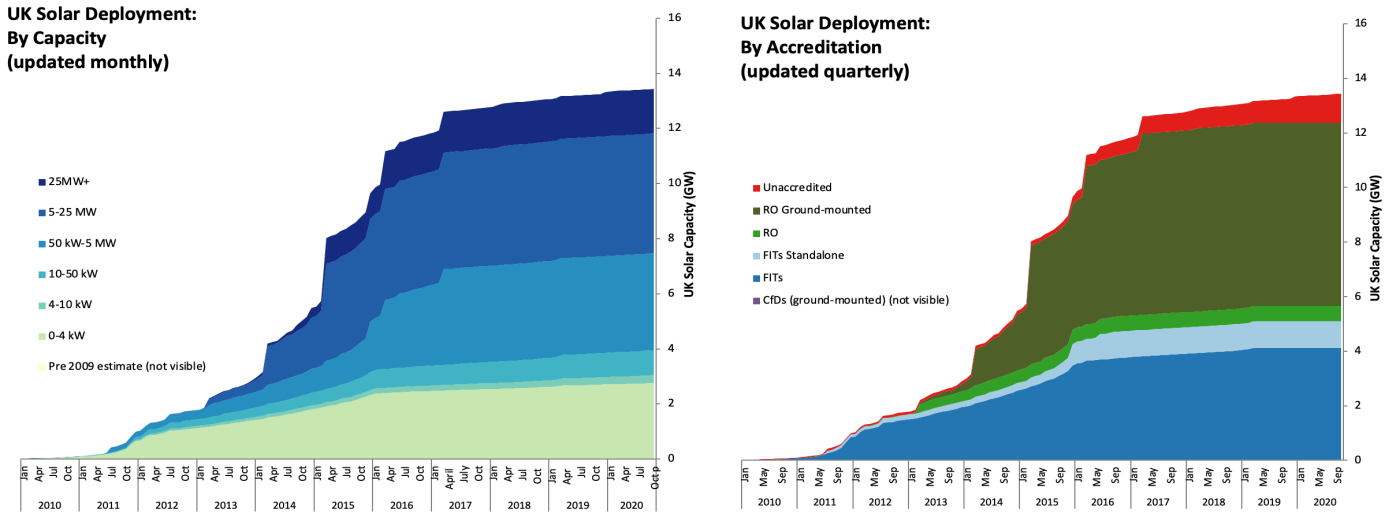


Figure 1: Cumulative Solar PV capacity in the UK by installation size and support mechanism. Taken from (BEIS, 2020c) with the plot formatting adjusted for clarity by the authors.

As Figure 2 shows, until the end of 2013, most solar PV capacity installed was supported by the FIT and consisted of installations under 4kW in size — the scale typical of residential rooftop installations. Indeed, the vast majority of FIT installations by number were domestic Solar PV systems. Hundreds of thousands of households became grid connected electricity generators during the first few years of the scheme, some supported by 'rent-a-roof' schemes offered by private companies such as HomeSun, which had already launched its scheme by July 2010 (Renewable Energy Magazine, 2010). Supported by the high initial level of the FIT, these were schemes in which the company installed roof-top solar panels at no (or very low) cost to the homeowner, retaining ownership of the hardware and receiving the FIT payments. The homeowner meanwhile benefitted from free use of the electricity produced.

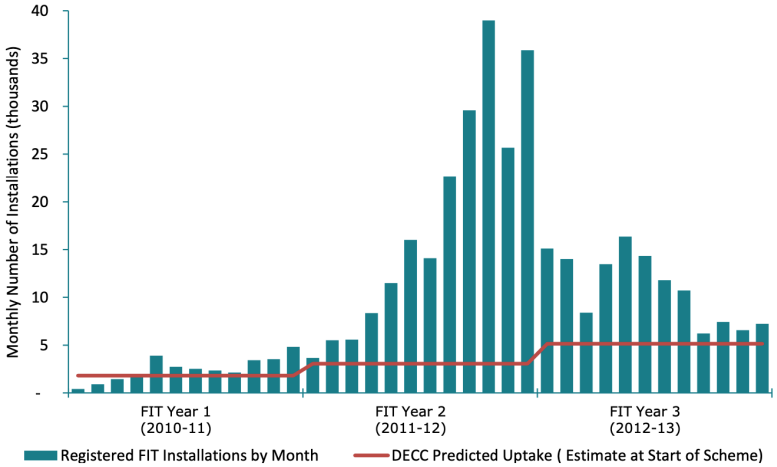


Figure 2: Number of installations registered the first 36 months of the FIT scheme vs DECC's predicted uptake at the start of the scheme. Taken from the 'Feed-in Tariff: Annual Report' (Ofgem, 2013).

In Feb 2011 the Department for Energy and Climate Change (DECC), announced that it would undertake a two-phase 'comprehensive review' of the FIT scheme, as well as a "fast-track review" of FITs for large scale solar PV and "farm-scale" anaerobic digestion. DECC's response to the consultation for this fast-track review, published in June, confirmed that there would be cuts to the generation tariffs for PV installations over 50kW and for "stand alone"[11] PV installations with eligibility dates on or after 1st August 2011 (Ofgem, 2012, pp. 27–28).

The consultation to Phase 1 of the comprehensive review — which dealt exclusively with tariffs for solar PV — was published in October 2011, and proposed unexpectedly early and deep cuts to the FIT rates provided for electricity generated from 1st April 2012 by installations of 250kW or less with an eligibility date after 2nd March 2012. It also proposed a 'multi-installation' tariff for FIT recipients with 25 of more installations, and lower tariffs for installations on buildings which failed to meet an energy efficiency requirement (Carter Jonas, 2011; CMS Law-Now, 2011; Ofgem, 2012, pp. 27–28).

Construction giant Carillion stated that these changes would reduce the solar market significantly. Carillion put 4,500 staff at its Carillion Energy Services division — the sole installer for HomeSun — on notice of redundancy in the first week of December 2011 (Brown, 2011; Cross, 2011). HomeSun, along with another solar company, Solarcentury, and Friends of the Earth successfully applied to the High Court to challenge the cuts (Renewable Energy Magazine, 2011). The planned cuts to

[11] "not attached to a building and not wired to provide electricity to an occupied building" (Ofgem, 2013, p. 44)

the generation tariffs for solar installations below 50 kW (of around 50%) happened later in early March 2012 (Ofgem, 2013). Five solar installers reached an out of court damages settlement with the Government years later (Stoker, 2018).

By the end of 2011 there was 1000 MW of solar PV capacity deployed in the UK — a ten-fold increase in one year. The cuts to the FIT slowed the growth of FIT-supported solar PV capacity, but it still proceeded to double over the next three years. Households weren't the only ones installing FiT supported Solar PV. In August 2012, it was reported that Sainsbury's had become the "largest operator of rooftop-mounted solar PV across the UK after installing 16MW of capacity" across 169 of its stores (Bennett, 2012a). The Feed-in Tariff also created new opportunities for community energy projects.

A consultation on "Solar PV cost control" published in Feb 2012 as part of the second phase of the comprehensive review on FITs proposed that installations with eligibility dates after 31st July 2012 should have further reductions in generation tariffs and that the period for which they received these tariffs be reduced from 25 to 20 years. Moreover, it introduced a tariff 'degression' mechanism (Ofgem, 2012, p. 28) which would automatically reduce the tariffs available to new installations based on actual deployment — so called 'contingent degression.' The degression mechanism decided on in DECCs response to the consultation in May would cut generation tariffs for installations in a given 'degression band' (based on installation capacity) on a fixed quarterly schedule by an amount which depended on the capacity that had been deployed in that band. In addition, a variable 'baseline degression' would mean that the tariffs available would be reduced by a minimum of 3.5% each 9 months regardless of how much capacity was deployed (DECC, 2012a). The first quarterly degression for solar PV generation tariffs happened on 1st November 2012.

A second consultation response for the second phase published in July 2012, which established that a degression mechanism for other technologies would be introduced in April 2014. It also introduced "pre-accreditation" for installations over 50kW capacity (DECC, 2012b, pp. 28–30) which allowed projects with planning consent and a connection agreement to 'lock-in' a guaranteed tariff level before their project was commissioned, provided that commissioning was completed within a specified window of time. "Recognising that community energy projects have longer lead times than commercial projects," DECC decided to "extend tariff guarantees to community energy solar projects on non-domestic buildings with a DNC of less than 50kW" — a version of pre-accreditation known as "pre-registration".

Consultations on the FITs began in the same month. In July they proposed to remove the pre-accreditation system, which allowed projects with planning consent and a connection agreement to 'lock-in' a guaranteed tariff level before their project was commissioned, provided that commissioning was completed within a specified window of time. Since April 2015, this window had been six months longer for community schemes "to reflect the extra time it takes for a community organisation to raise finance." Pre-accreditation was not available for wind and solar PV schemes of 50kW capacity or less, but for community and school installations in this category a version of pre-accreditation called "pre-registration" was available. (Ares, 2016, pp. 7–8) This announcement "prompted a surge of almost 1,500 applications in September 2015" (Ofgem, 2016a).

Community energy 2010-2013

According to one interviewee, the overall trend for community energy was very much influenced by government subsidies i.e. FIT scheme. Before it came in, community groups were doing mainly energy efficiency work, but that "*flipped around a bit with FIT which gave people a business model to do renewables*"; at the same time there was a lack of funding for energy efficiency projects. With the end of FIT that changed again (FM_UK07).

Community energy groups in England and Wales owned 11MW of wind capacity (all onshore) by 2009, according to a research by Community Energy England (CEE). While the projects are not named, the Westmill and Baywind co-ops in the Energy4All family alone would account for 9 MW. In her account of Community Energy in the UK, Chapman notes that "aside from large scale wind projects developed by Energy4All, there were two community owned hydro projects installed before 2010" — Torrs Hydro (near Manchester) and a similar scheme in Settle, North Yorkshire were installed in 2008 and 2009 respectively. Torrs was funded by a share offer, grants and a loan from the Co-op bank and "was viable because the local Co-operative Food store agreed to buy the electricity, via a private wire" (Chapman, 2018, p. 17).

In the case of solar, on the other hand, CEE reports "limited generation capacity identified before 2011, rising to 20 MW by the end of 2011." Given the data in figure 2, it seems reasonable to assume that this was almost all FIT supported. The introduction of FITs made a new business model, with similarities to the commercial rent-a-roof schemes, viable for community energy solar PV projects as Chapman explains: "Throughout 2010 and into 2011 the costs of PV panels were falling and several community organisations saw an opportunity to install solar PV systems on roofs leased from others, with funding from community share offers. The costs were getting to the point where the income from the FIT was sufficient to pay share interest to members and, over time, to pay back their capital while generating a surplus to put into a community benefit fund. It was not always necessary even to charge the building occupants for the electricity generated, making it an attractive proposition for building owners" (Chapman, 2018, p. 22)**.**

Chapman cites Ovesco, an Industrial and Provident Society in East Sussex, England as becoming the first community group to use this approach when they funded the installation of a 100 kW system on the roof of a brewery entirely through a community share offer. She also notes how the government's announcement of first unexpected cut to the FIT for new applicants put them in a race against time to raise the money and build the system while the tariff they had planned for was still available (Chapman, 2018, p. 22). A similar scheme which offered free electricity to schools in Surrey was set up by the Wey Valley Solar Schools Co-operative which initially installed 238 kW on six schools in 2011-12 (Wey Valley Solar, n.d.), raising the money through share offers as part of the Energy4All family (Energy4All, 2020).

Moreover, in Chapman's view, two effects of the financial crisis discussed above were favorable to raising money for projects through community shares — "the financial crash […] led to a decline in trust in the banks and very low interest rates. People were therefore open to the idea of community shares" (Chapman, 2018, p. 14).

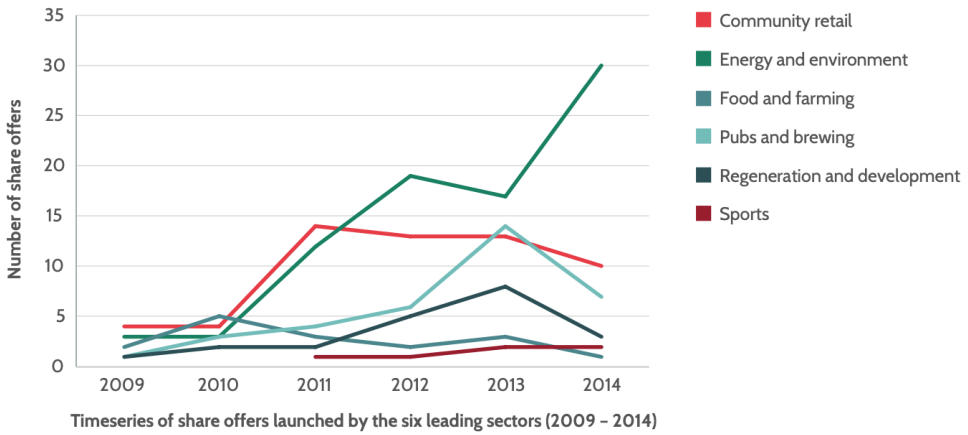


Figure 3: "Community shares by leading sectors, over time" — Graph taken from (Community Shares Unit, 2015, p. 13).

Following an action research programme into community shares running from 2009 to 2011, Co-operatives UK and the Development Trust Association (now called 'Locality') launched The Community Shares Unit in October 2012 with funding from the Department of Communities and Local Government (DCLG) and DECC and an "overriding objective […] to grow a sustainable market and ensure the long-term success of the use of community shares to raise equity finance and participation, with due process and protection for investors, in a range of community and co-operative enterprise" (Community Shares Unit, 2015, p. 6).

Sector	Total Share Capital	Associated loan finance (long-term liabilities	Online	Share interest paid out to members	Sample size (no. of annual returns)	Sample size (as % of total share offers for in the sector)
Community retail	£900,834	£596,579	£3,827,760	£0	27	46%
Energy and Environment	£15,575,007	£12,333,971	£3,592,522	£345,446	29	25%
Food and farming	£542,426	£582,868	£1,384,366	£9,781	8	47%
Pubs and Brewing	£1,321,357	£77,982	£1,226,425	£10,101	11	29%
Regeneration and development	£1,485,681	£1,337,870	£457,197	£25,917	6	29%
Total	£19,825,305	£14,929,270	£10,488,270	£391,245	81	18%

Source: Community Shares Directory, CSU

Table 1: "Society performance indicators using annual return records" for societies which had completed a share offer. Based on 81 annual returns "largely for societies launching share offeres in 2012 and earlier." Taken from (CSU, 2015, pp. 18-19)

As data presented in a 2015 Community Shares Unit report shows (see Figure 3), there was considerable growth in community share offers in the "energy and environment sector" between 2009 and 2014. In terms of share capital raised, the energy sector was dominant circa 2013 (see Table 1). The CSU report states that: "The dominance of renewable energy schemes is not only down to the increased number of share offers for this sector, but due to the growth in the average share offer value. These enterprises are most often focused on solar, wind and hydro installations, all of which have seen communities looking to install larger schemes which require higher capital outlays. The average community energy share offer is now £600,000 – almost double the next largest sector – food and farming" (Community Shares Unit, 2015).

The CSU's definition of "community shares" is quite specific — non-transferrable, withdrawable shares in a society with a voluntary or statutory 'asset lock' (a restriction on the sale of the society's assets). "Withdrawable" means that they can be redeemed from the issuer at face value, normally subject to certain conditions and restrictions — for example, that it is only possible to withdraw a share after a certain period of time. An advantage of offering such shares is that this is exempt from FCA financial promotions regulation (The Community Shares Unit, 2019).

Not all community energy projects have opted to issue this form of share capital. The shares issued by the Baywind Co-op back in 1996 were withdrawable, but also transferable and thus subject to FCA promotions regulation (Co-operatives UK, 2011, p. 49). Energy4All continued to use this approach with other co-ops. As Chapman explains: "Until 2014 Energy4All co-

operatives used a version of the Industrial and Provident Society rules that had been developed for Baywind and did regulated share offers, in which the shares were transferrable (i.e. members could sell their shares to other people). Regulated offers involve considerable cost as they need to be checked by expensive lawyers, so are not suitable for smaller projects. However, Energy4all's use of regulated offers was a deliberate strategy to build confidence. Andrew King, former Chair of Energy4all said: "from day one we worked on the basis that we had to combine co-op ethics and sound business practice/profitability and wherever possible not to rely on grants" (Chapman, 2018, p. 10).

While the FIT made new renewable energy projects viable for community groups, and community shares made equity raises simpler, groups still faced the difficulty of funding the risky pre-FID stage of projects, especially where planning permission was required. While many of these risks would also be faced by utilities and other commercial developers, community groups are generally not in the position to spread these risks across several prospects as a commercial developer might do (FM_UK05).

In 2009-10 the Scottish government introduced its Community and Renewable Energy Scheme (CARES) to support these risky stages of community energy schemes. Initially CARES was purely grant based but moved to a grant and loan scheme in 2011/12 so that it could be combined with the Feed-in Tariff and still comply with EU state aid rules — the regulator having interpreted these as preventing (except in limited circumstances) the receipt of FITs by a generation system whose purchase and installation have been covered in part by state funds (Bainbridge, 2011). The £19.6 million was invested through CARES up to the end of fiscal year 2012/13 (Audit Scotland, 2013).

The Welsh Government introduced a similar scheme — Ynni'r Fro — in 2010, but no equivalent was introduced in England at that time. In 2010, Energy4All tried to address this gap themselves by founding the Energy Prospects Co-op, which raised a pool of capital from members to provide risk money for developing new cooperative energy ventures, in the hope of pooling the associated risks (Energy Prospects Co-operative, n.d.) (FM_UK05).

The new government had, however, made some commitment to support community energy specifically — among the positions listed in the 'Energy and Climate Change' section of the coalition's 'programme for government', published in May 2010, was a commitment to "encourage community-owned renewable energy schemes where local people benefit from the power produced" (Cabinet Office, 2010). In November 2011, it was announced in the Treasury's autumn statement that a £15m Rural Community Energy Fund (RCEF) would be established which, like CARES, would provide grants and loans to help fund the pre-FID development of rural community energy projects. The Centre for Sustainable Energy (CSE)[12] claimed some responsibility for this development, their CEO noting that he had "promoted this sort of initiative to government for several years" according to their website (Centre for Sustainable Energy, 2011).

[12] The CSE is a charity based in Bristol, England, which began as a sister organisation to the Centre for Alternative Technology in 1979 (Centre for Sustainable Energy, 2020a). It states that its "mission is to share our knowledge and practical experience to empower people to change the way they think and act about energy" (Centre for Sustainable Energy, 2020b).

The RCEF would open to applications in June 2013 (DECC and DEFRA, 2013), but funding for the very early stages of projects was made available in December 2011 when the £10m Local Energy Assessment Fund (LEAF) was announced (DECC, 2011). LEAF was a competition for grant funding with the purpose "to help prepare communities in England and Wales to take action on energy efficiency and renewable energy and to take advantage of the opportunities offered by policies such as the Green Deal and Renewable Heat Incentive (RHI), as well as Feed-in Tariffs (FITs)" (DECC, 2014a, p. 3).

LEAF was administered by Energy Saving Trust[13] with several partners including Carbon Leapfrog (which merged with PURE to form Pure Leapfrog), Community Energy Wales, Low Carbon Communities, and the Community Energy Practitioners' Forum. Of 225 groups who completed a monitoring form for the evaluation of their LEAF funded projects, 122 were concerned with renewable energy production (including heat) in some way[14], some "scoping ideas or developing plans for a renewable project" and others "developing more detailed plans and business cases for specific technologies but not site specific."

Also in 2011, the 'Community Energy Coalition' was convened by 'Forum for the Future' with a diverse set of member organisations including Energy4All, Co-operatives UK, the CSE, the National Trust, the Church of England, the National Farmers Union, Friends of the Earth, the Energy Saving Trust, and Carbon Leapfrog.

Institutional Investors, the Green Investment Bank, and Electricity Market Reform

In the years after the crisis, utilities faced tighter constraints on financing new renewables on their balance sheets, as reduced electricity demand during the recession hit the profits which might be retained for such investment, while simultaneously they tried to reduce their debt to keep their credit ratings up and, hence, the costs of future borrowing down (Blyth et al., 2015). Writing in late 2015, the IIGCC stated that "starting in 2010, with utility company balance sheets constrained and institutional investors improving their expertise, an increasing amount of capital has been invested as unlisted debt and equity by pension funds and insurance companies directly or indirectly through specialised infrastructure funds."

The 2007 Infracapital investment in Zephyr was an early example of the indirect approach. A striking example of direct investment occurred in 2012, when the investment management wing of the insurance company Aviva purchased 23 MW of FIT-supported solar PV from HomeSun in the form of 7,000 of their domestic 'rent-a-roof' installations. These assets formed part of its Realm Infrastructure Fund "for mostly pension fund clients" (Bennett, 2012b; Pickard, 2012). HomeSun

[13] Energy Saving Trust is an independent, profit for purpose organisation working to address the climate emergency. They deliver transformative energy and transport programmes working with UK governments; support businesses and households. https://energysavingtrust.org.uk/about-us/

[14] The breakdown by technology is shown in Table 5 of (DECC, 2014a) — 60 projects featured solar PV, 44 wind, 36 biomass, 28 hydropower, 20 anaerobic digestion, and 4 combined heat and power (CHP).)

continued to operate and maintain the systems under the deal. A year later Aviva made a similar acquisition from Ecovision Renewable Energy (Property Funds World, 2013).

While Aviva's acquisition of the HomeSun portfolio might not have been exactly what they had in mind, the government did want to "accelerate private sector investment in the UK's transition to a green economy" (BIS, 2011, p. 5) and they had concerns that the large utility companies alone would not have the capacity deliver the required volume of investment (Bolton et al., 2016, p. 1395). To this end, a public Green Investment Bank (GIB) was launched in 2012. It's 2013 report describes its priority sectors as offshore wind, waste recycling, waste-to-energy, and non-domestic energy efficiency and states that "at least 80% of our investment will be targeted towards" these. The banks initial strategy for offshore wind was "to encourage the development of liquidity in a functional, secondary market for already constructed assets"

Towards this end, the GIB advised the UK Government's Department for Business, Innovation and Skills in buying £50m of the shares issued in the £260m initial public offering of Greencoat UK Wind plc on the London Stock Exchange (Green Investment Bank, 2013, p. 27). As the GIB's annual report explains, "Greencoat was established to attract capital, both institutional and private, into a publicly listed investment vehicle which will be a long-term holder of minority stakes in a mixture of onshore and offshore wind projects." (Green Investment Bank, 2013, p. 27) Greencoat was just one of a handful of 'quoted project funds' or 'YieldCos' to debut on the LSE in 2013, raising 1.9 billion USD in total and acquiring operational wind and solar assets.

According to a BNEF/UNEP report, the low yields on government bonds associated with the low, post-crisis Bank Rates (1.4% for UK 10 year gilts in July 2012 vs. 5.6% in July 2007) were a driver for investors, including institutional investors, to put money into these new funds, which offered "predictable cash flows, often backed by governments, with an element of inflation-proofing and yields nearer to 6%" (Frankfurt School-UNEP Centre, 2014, pp. 61–62).

Along with setting up the GIB, the coalition government had been developing a programme of 'Electricity Market Reform' (EMR) which culminated in December 2013 with the assent of the Energy Act 2013. Along with a carbon price floor and emissions standards this introduced a Capacity Market and 'Contracts for Difference' (CfD). CfDs were intended to replace the Renewables Obligation as the main state support for deployment of large scale renewable and nuclear generation. Attracting new kinds of investor to energy generation infrastructure, including institutional investors, was a key goal in the formulation of this policy (Hall et al., 2018) (Supplement 2), (Bolton et al., 2016; DECC, 2012c).

A CfD (in this context) is a long term contract between a generator and a special counterparty in which the generator regularly receives (or pays) a sum compensating for the difference between the wholesale market price of electricity and a so-called 'strike' price agreed in the contract: assuming the generator was able to sell their electricity at the wholesale price, then with this adjustment it would be as if they had sold it at the strike price instead. The costs (or rewards) of this arrangement are ultimately reflected in electricity bills, in essence shifting the price risk from the renewable investor to the

electricity consumer. CfDs are granted in 'allocation rounds' (Bolton et al., 2016) in which the developers of would-be generation capacity bid on the strike-price.

While the EMR policy was being developed, there were concerns that it would make it more difficult for not just community energy, but "medium-scale projects" more generally. Co-operatives UK commissioned energy market consultancy Cornwall Energy to assess the impact the proposed Energy Bill would have "on community and cooperative energy projects especially in the 5MW-50MW range" (Cornwall Energy, 2012, p. 4). The resulting report of October 2012, noted that "while our terms of reference concern community energy, many of the issues and impacts we discuss apply equally to smaller, independent generators connected to the distribution system more generally" (Cornwall Energy, 2012, p. 9). The report found that benefits of CfDs "do not apply to the same degree for smaller and independent generators, and they are in our opinion more than out-weighed by several real disadvantages. Overall, we believe the CfD FiTs will increase market complexity and therefore costs for smaller players. They also presume a high-level of knowledge of the energy sector, including its centralised trading arrangements" (Cornwall Energy, 2012, p. 18)

The Co-operative Group — a UK consumer cooperative with over 63,000 employees — submitted a memorandum, endorsed by the Community Energy Coalition, to the House of Commons Public Bill Committee on the Energy Bill in early February 2013 proposing that the bill should be amended to: extend the FIT from installations under 5MW to those under 20MW; "place a duty on the Secretary of State to promote new renewable energy generation capacity from community schemes"; and to "establish a market for community energy schemes and independent renewables generators, through the creation of a 'green power action market' [GPAM] or similar mechanism," noting that "this proposal is being developed by a coalition of independent renewables generators, and has the backing of the Renewable Energy Association, Co-operative Bank and other key players."

One of the main issues with the CfD was that payments were based on the difference between the strike price and a wholesale market price. The concern was that since the smaller generation companies, including community schemes, generally sold their electricity not via the wholesale market but through what had become a very thin market for wholesale PPAs, they were generally unable to receive this price (on average) for their electricity, and so the payments though the CfD scheme would effectively mean they achieved a price significantly lower than the strike price. The proposed GPAM would allow CfD holders to sell their power at a price fixed through auctions held every six months, and use the price thus established as their reference price (Greene, 2013).

The Solar Trade Association voiced its support for the GPAM proposal, but noted that "increasing the existing fixed FIT would be preferable to the status quo and is our second choice, compared to GPAM." In March 2013, a letter advocating for the GPAM proposal, as championed by Alan Whitehead MP, was published in the Guardian, with more than thirty signatories — mostly academics — headed by David Toke, a senior lecturer in energy policy at the University of Birmingham. It opened: "The government needs to act urgently to give equivalent terms for renewable energy development to community

renewable companies as are being given to the big electricity companies. Proposals that could do this in a competitive manner have been put forward by Alan Whitehead MP, but have so far been ignored by the government. It is remarkable that the media is full of special pleading from EDF for outrageously bloated subsidies (Report, 15 March) [for its planned nuclear plant at Hinkley], but meanwhile there is silence about the plight of independent renewable generators. Community renewable companies will have access to far lower incentive levels than the Big Six energy companies will get for their renewable schemes" (Toke, 2013).

The Energy Act which passed in Dec 2013, did not create a GPAM but it did in fact give the Secretary of State the power to introduce FITs for schemes up to 10MW in capacity (DECC, 2014b). However, following another consultation, the government in November 2014 decided "not to take forward the proposals to increase the maximum capacity ceiling for community projects under the FITs scheme from 5MW to 10MW" nor "to change its current policy on allowing FITs to be combined with grants." A few measures to support community projects were introduced however, including an increase in the pre-accreditation window (applicable to installations over 50kW) by six months for community energy projects "to reflect the additional time it takes a community to raise finance for renewable electricity projects" (DECC, 2014c). They also "decided to modify the current rules to create an additional exemption to the 'site rule' in the FITs scheme to allow two projects, provided one project is owned by a community organisation, to share one grid connection and receive separate tariffs based on their individual generating capacity. This should encourage communities to either wholly or partly own assets and to overcome a key project development barrier for communities" (DECC, 2014c, p. 25).

In 2014, the Green Investment Bank made major equity investments totalling £461m in two offshore wind projects which were under construction, including purchase made jointly with Marubeni Corporation — a Japanese 'general trading company' — of 50% of the 210 MW Westermost Rough project from DONG, and the acquisition of 10% of 576 MW Gwynt y Môr wind farm from RWE. This brought the GIB's investment in offshore wind up to "well over £600m" according to the UK's Business Secretary (Renewable Energy Focus, 2014). In April 2015, the GIB announced that it had reached first close on its new Offshore Wind Fund — "the world's first fund dedicated to investments in offshore wind power generation" (Scottish Financial News, 2015). Managed by a wholly owned subsidiary of GIB, was set up to attract institutional investors who might not have the skills to otherwise invest in offshore wind with a target of funnelling £1bn into the sector (Green Investment Group, 2020). The £463m raised by first close came from "UK-based pension funds and a major sovereign wealth fund" (Scottish Financial News, 2015) as well as a £200m contribution from the GIB itself (UK Green Investment Bank et al., 2015) p.11).

Community Energy 2013 – 2014 and the government's Community Energy Strategy

In June 2013, shortly after the RCEF opened to applications, the Secretary of State for Energy and Climate Change, Ed Davey, said that he wanted to see a "community energy revolution in the UK" as a call for evidence on community energy was

launched by his department, DECC. In reference to this call for evidence, a report of the House of Commons Select Committee on Energy and Climate Change on 'Local Energy' published in August of 2013 found that "DECC has chosen to focus narrowly on just those projects that are run by community groups [...] and therefore is likely to overlook the contributions that other types of project could make to opening up new sources of finance" noting that "medium-scale projects provide opportunities not only for independent generators and community groups to invest in energy infrastructure, but also for landowners, farmers, local authorities, schools, hospitals, housing associations and businesses (among others). We have not received evidence on how much investment might be accessed through these routes. Given the current reliance on large utilities (in particular the "big six" energy companies) to provide the £110 billion investment in electricity infrastructure that is needed by 2020, it would be helpful to improve understanding of what level of contribution these alternative sources of investment could provide" (Energy and Climate Change Select Committee, 2013, p. 15).

Regarding financing for construction, the Committee Report on Local Energy had found that "projects (especially community-owned)" struggle to secure affordable debt finance for the later phases of projects" and stated that "the Co-operative Bank and Triodos have provided loans to community energy projects, but these organisations are the exception rather than the norm." Back in 2007 the Cooperative had "ring-fenced 400m to fund the [renewables and energy efficiency] sector" and announced in 2011 a target of 1 billion invested by 2013 (Reuters, 2011). In Feb 2012 it was reported that over £700m had been invested to date (Nichols, 2012). According to one interviewee, the bank's renewables desk had a policy of taking on 10% community projects (FM_UK02). However, in August 2013, the Cooperative Bank announced that it was halting new investment in renewable energy: in the words of a contemporary blog post from crowdfunding platform Abundance, "the financial crisis caught up with the Co-op" (Friggens, 2013).

The Government published its 'Community Energy Strategy' (CES) in January 2014 (DECC, 2014d). Among other things it announced a £10m Urban Community Energy Fund (UCEF) which, like the RCEF, offered grants and loans for pre-planning development work (DECC, 2014e). In a blog post responding to the new strategy, a representative of the Centre for Sustainable Energy (CSE) said that "it's not a strategy that's going to scare anyone – nothing radical has emerged, and neither does it seem to contain anything challenging or really transformational in terms of making communities central to both delivery and management of energy resources" (Coxcoon, 2014). The UCEF was launched in November 2014, administered by the CSE.

An assessment conducted to support the Community Energy Strategy found at that community groups active since 2008 had installed at least 49MW of RE capacity in the UK, with a further 81MW in development and 139MW planned (as well as 164MW of RE projects in 'unknown status') (DECC, 2014f, p. 28). An independent study by ResPublica found 58.9 MW of "total operational community energy capacity in the UK" comprising 146 separate installations. Of eight technologies represented in this total, wind and solar PV made up 91% of the total capacity. The ResPublica report found that 62% of this capacity was wholly owned by the community group, with the remaining 38% jointly owned with "an energy developer" (which seems to mean, with a few exceptions, a private entity) (Harnmeijer et al., 2013, pp. 9–10).

A change in the regulation of Cooperatives in 2014 caused disruption and was particularly disturbing to some existing energy cooperatives. Legislation in 2010 and 2014 had introduced Cooperatives and Community Benefit Societies as the successors to Industrial and Provident Societies. In brief, community benefit societies exist for the benefit of the community while cooperatives exist for the benefit of their members. The difficulty arose when the Financial Conduct Authority stopped allowing energy cooperatives to register as Cooperatives in 2014 and questioned the legal status of those which already had. The debate turned on the extent to which an organisation must trade goods or services with its members to be considered a bone fide cooperative — renewable electricity coops generally do not sell electricity to their members for practical reasons (Voinea, 2014).

According to one interviewee, there was a divergence of view within the cooperative movement and the FCA's decision reflected an alignment with one view, although Europe does not have ComBenSocs and uses co-operatives for renewable energy (FM_UK05).

Around 2014-15, Bath & West Community Energy was helping a variety of partner coops with project development "in response to significant and increasing demand from other community groups looking to draw on the experience BWCE has gained to date" and in April 2015 it decided to transfer its development activities to a new coop called Mongoose Energy, part owned by the coops it was assisting. They stated at the time that this would "enable Mongoose Energy to work across the country and so build the scale necessary to draw in the commercial finance required to grow the community energy sector" (BWCE, 2016). One member organisation stated that "Mongoose Energy's ultimate aim is, working with its partners, to generate enough clean energy to be able to set up an energy supply company […] to sell its own electricity directly to its members and the public" (Low Carbon Gordano, 2016). Such a setup would mean that Mongoose would be able to give PPAs to its member community energy projects.

Earlier, in April 2014, electricity supply company OVO — which had a domestic market share of 1.2% at the time (Ofgem, 2020a) — launched an offer called "OVO communities" (Murray, 2014) which would allow organisations to "effectively run their own energy supply business" creating "local energy tariffs that are powered by locally generated heat and power" — the proposition being that by setting up a so-called 'white label' supply brand in this way, a community organisation or public body could establish a flow of money to particular generators (via PPAs with Ovo) from customers who might have a particular interest in buying from them, as Mongoose hoped to do, but leave OVO to do a lot of the work required in running a supply company (Ovo Energy, n.d.). OVO established relationships with at least three groups (Ovo Energy, 2015), but it is not clear whether it ever signed PPAs with generators designated by these groups as a result.

Crowdfunding for sustainable energy

While the government worked to channel new investment into renewable energy with the GIB and EMR, a quite different market for investment in renewables was being developed with the emergence of crowdfunding platforms. Peer-to-peer loan platforms had been operating in the UK since the launch of Zopa in 2005[15] under light-touch regulation from the Office of Fair Trading. In 2011, a crowdfunding start-up, Abundance Generation, became the first platform to receive authorisation from the Financial Services Authority (Abundance, 2011). It was also the first platform in the UK focused on raising capital for renewable generation projects, which it did through crowdfunding debentures — a form of debt capital (Candelise, 2016).

Another renewable generation focused platform, the Trillion Fund, was founded in the same year. This platform was a "hybrid" — allowing crowdfunding of equity, including community shares, as well as debt financing. It launched in 2013, in the same year as Gen Community (a platform focussed on community share raises for renewables) and Ethex, another hybrid platform for organisations with "a clear social mission" which has raised funds for a number of renewable energy projects (Candelise, 2016).

A number of crowdfunding platforms financing other sectors were in operation by this point, and 2013 also saw the founding of the UK Crowd Funding Association (UKCFA) to represent this young industry. Abundance was a founding member of the UKCFA (UKCFA, 2020). The 2013 edition of the UNEP / BNEF "Global Trends in sustainable energy investment" noted that "'Crowd-sourcing,' a recently created mechanism for raising capital from large number of small investors, is starting to be used to fund clean energy projects, particularly small-scale solar in the US and Europe" and mentioned Abundance Generation (Frankfurt School-UNEP Centre, 2013, p. 76).

A qualitative study based on 52 interviews conducted in early 2017 with 'sophisticated investors' in six UK crowdfunding markets, including lending to renewable generation projects, asked investors to reflect "on their decision to move money into crowdfunding." One participant expressed a desire "after the financial crisis, just to give the banks a kicking!" and this was a motive shared by several others. Study participants also "wanted crowdfunding to facilitate more refined choices that would allow for allocating funding to projects or businesses that would realise social and ethical outcomes, as well as financial returns" (Davis et al., 2020, p. 8).

[15] Zopa was the "world's first" peer-to-peer loans platform. It offers personal loans. Lenders' money is split between several borrowers to manage risk (BBC News, 2005). One of the co-founders of Abundance, Bruce Davis, also helped to set up Zopa (Blue and Green Tomorrow, 2013).

Abundance

Abundance is a debt-based crowdfunding platform through which investors can lend as little as five pounds. Work on creating the platform began around 2008. The intention was to create an investment-based crowd funding platform to finance renewable generation projects. The idea was inspired by a perception that the wind industry was struggling against a lack of public understanding — in particular uncertainty over whether it was "*tokenism or a really solid business sector*" — the idea being that engaging more people directly in the business of wind and decarbonisation would build understanding and a greater pool of advocates for the technologies involved. Public concerns about savings "*fuelling destructive practice*" in the aftermath of the financial crisis, quickly suggested that such a platform could also meet demand for opportunities to put money into "*more productive investments — things that were really supporting the long term sustainability of not just their own finances but the world*" (FM_UK01).

The platform, which was originally called 'Abundance Generation', received FSA authorisation in 2011 on the grounds that they "*did not think the average retail investor would be able to understand the risks of lending money to a single company operating a piece of renewable infrastructure*" (FM_UK01). The Royal Bank of Scotland, a listed company, had received the world's biggest banking bailout from the British government during the financial crisis (Agence France Presse, 2015), and the platform's founders countered that "*the guy running RBS hadn't understood the risks in his business and that retail investors were allowed still to invest in that very complicated, multinational, highly diversified corporation*," arguing that wind projects had comparatively straightforward business models (FM_UK01).

It would have been possible to use a different model and avoid the need for obtaining FSA authorisation: "*We went down the regulated route, because all our research showed that, actually, if you want to engage the broad population, being regulated was more attractive to the ordinary investor, and our mission was to bring in ordinary investors into this world, rather than — we could have actually gone down the loan route, but we didn't because we thought this route was — a sort of — a more robust approach in terms of protection for people*" (FM_UK01).

In finding its first borrowers, the company had to "start from scratch" — going to "*lots of conferences and networking sessions and just talked a lot about what we were doing […] renewable energy conferences [...] climate change conferences.*" They found a niche market of small developers seeking long-term project finance which would enable them to retain ownership of their projects "*but raise capital to build them out*" — something that was not easy to find in the years after the crisis: "*If you were trying to raise less than 20 million long-term project finance, it was really difficult. Actually, we were probably the only people in the market, for a period, offering that*" (FM_UK01).

This niche market of borrowers was diverse but characterised by an interest "*building a long-term business in decarbonisation*", a goal which was in line with the founders' aim to build long-term relationships with both its investors

and borrowers: "*That patient long-term mindset in business is not a particularly Anglo-Saxon thing in some respects. We're much more — you know — build and sell and monetise and get out, and that's — that has been the dominant model in renewables over the last decade. It's been people flipping projects up the food-chain. So they aggregate and aggregate and then are flogged to a big pension fund or a big yieldco*." (FM_UK01)

The first project which borrowed through Abundance was 'Great Dunkilns Resilient Energy' — a 500kW, FIT-supported wind turbine developed on a farm in the Forest of Dean in England by a partnership between the land owner and the Resilience Centre, a local social purpose business established by two energy consultants (Burges Salmon, 2016; Resilient Energy, 2015). An offer launched on the platform in July 2012 sought to raise £1.4 million for the project by issuing debentures (Blue & Green Tomorrow, 2012), which are debt instruments similar to bonds (Harwood, 2021). This target was achieved with over 420 investors including a number of people local to the project (Abundance, 2017; Resilient Energy, 2015).

With the exception of one biomass heating project, all investments offered on Abundance prior to 2016 were for solar PV or onshore wind projects, often providing long-term refinancing of assets which were already constructed and operational. Starting in 2016, the projects became more diverse, with further biomass heat and power projects, waste-to-power, geothermal, tidal, electricity storage, and three green social housing projects. Of the 19 projects funded between Nov 2016 and June 2020, there were three wind projects (all refinancing existing installations) and no solar projects (Abundance, 2020a). Most investments offered on the platform have been debentures to finance specific projects, one exception being a bond offer promoted in partnership with Triodos Bank in late 2016, which raised almost £10m to help fund construction of a portfolio of projects Thrive Renewables pipeline (Abundance, 2020b). At the time of writing, over £100m has been invested in over forty projects through the Abundance platform.

Part of the value in having people as financers rather than institutions has been shown when projects experienced problems. "*The first thing a bank or traditional institution would do when a project runs into trouble is think, right, I can grab this asset. […] Our lenders […] don't want to run the asset. They want to see the asset work and deliver its carbon impact, and they want to make sure their capital is looked after. […] There's a balance, because as a project owner you can't take advantage of the retail investor but if we intermediate that as partnership, actually it works really well for both — for both sides. […] What we've found is, is lenders will actually be really active supporters of projects when there's a problem and help the project come through it and keep going*" (FM_UK01).

Support from lenders on the platform has included allowing their borrowers to delay interest payments, or investing more money, where this is urgently needed for a project to succeed. And in at least one instance, investors in a project wrote to their MPs and the energy markets regulator Ofgem ("about 400 emails") to challenge a regulatory decision which threatened its viability.

Abundance also works with Local Authorities helping them and other public sector organisations finance infrastructure projects through citizen and stakeholder investment. In 2016 the first Local Authority Green ISA bond was launched with Swindon Borough Council, which funded two 5MW solar parks with the participation of more than 1,600 investors. Abundance has worked with Bristol and Leeds City Councils as part of the Financing For Society programme,[16] and have developed a new model for citizen led investment in Local Authorities called the Community Municipal Investment (CMI).[17]

Asked about developments in raising equity for community energy projects, an interviewee from the sector responded: "*Ethex and Abundance do try and apply standards, and they can get out to a broader range of people. One issue with Abundance is they cover loan notes and not shares*." (FM_UK05)

While crowdfunding platforms have been used by community energy projects, the two are clearly distinct developments in regard to financing renewable energy. The majority of investments on Abundance (for example) have not been community projects, even if they have community benefits. However, as we have, one finds actors in both fields with a leading interest in using financing relationships (of equity or debt) as a means of engaging the public with a climate / renewable energy agenda.

Austerity and New Opportunities for Municipal Energy for Local Authorities

The government's austerity programme hit Local Authorities hard, with substantial and repeated cuts in spending power over the next five years (Atkins, 2020). At the very start of this period a new potential revenue stream for Local Authorities opened up in July 2010, when a law which had restricted the sale of electricity by Local Authorities to that generated by CHP (or through waste-to-power in Scotland) was amended to also allow them to sell electricity generated by a range of renewable sources including wind, solar, and biofuels. Moreover, they were free to register for the Feed-in Tariff.

Some authorities were quick to use this new power. Among the 55 local authority-led energy initiatives identified by (Rydin et al., 2013) in late 2010, there were already some Local Authorities with FIT-registered Solar PV installations. Plans for Cornwall Council's 5 MW Kernow Solar farm were announced in 2010 (Hughes, 2010). Funded through its Green Cornwall Programme, which was established with a capital budget of £35m in 2009, the Kernow installation became "the first local

[16] Financing for Society: Assessing the Suitability of Crowdfunding for the Public Sector https://baumaninstitute.leeds.ac.uk/research/financing-for-society/
[17] https://issuers.abundanceinvestment.com/local-authorities

authority owned solar farm" (DECC, 2014g, p. 31) when it was commissioned in late 2012, after a period on hold due to the FIT cuts. The Kernow Solar farm sells power over the grid and via a "private wire" PPA to Newquay Airport (BBC News, 2012; Falmouth Packet, 2012; Regen, 2018).

In March 2010, Bristol City Council's cabinet approved the procurement of a wind farm developer to construct two wind turbines at Avonmouth. These were commissioned in October 2013 making Bristol the first Local Authority to own operational wind turbines. The installation, which cost the best part of 10 million, was financed by the Public Works Loan Board[18] via prudential borrowing and was projected to generate annual income of 1 million from the FIT and the sale of electricity and Levy Exemption Certificates (Bristol City Council, n.d.; Local Government Association, 2013). As of 2020, this income "pays for an awful lot of staff" for the Bristol Energy Service (FM_UK04).

Some Local Authorities also supported the burgeoning community energy sector. In 2014, the government's Community Energy Strategy would state that "many of the successful community energy projects […] have had significant backing and support from local government" but would note "a large disparity in the level of support offered to community energy groups between different local authorities. In some places local authorities are perceived as having unintentionally undermined projects" (DECC, 2014g, p. 27). Among the positive examples given were the revolving loan fund for community energy established in late 2012 as part of Cornwall Council's Green Cornwall Programme (Mitchell, 2012), the Lambeth Community Energy Programme started in 2011, and the agreement (also signed 2011) between Bath & West Community Energy (BCWE) and Bath and North East Somerset Council (which saw the Council provide "pump-priming" grants to CE projects) (DECC, 2014g, pp. 28–31).

The publication of the Community Energy Strategy (CES) was accompanied by letter to Local Authorities from the Secretary of State encouraging them to support community energy projects. The main document expanded on this (DECC, 2014g, pp. 27–33), suggesting that they could play a role in financing such projects: "Where the business rate retention scheme exists, government encourages all local authorities to reinvest revenues in information, advice, and support services for community energy projects. But we want them to go further in considering using other resources or prudential borrowing (for example from the Public Works Loan Board) to provide capital loans for community energy projects" (DECC, 2014g, p. 30).

In the view of the Centre for Sustainable Energy (CSE), it was a "real missed opportunity that local authorities, housing associations and local councils" had not themselves been included in the Community Energy Strategy's definition of "community" actors (Coxcoon, 2014). Indeed, it had become increasingly common for Local Authorities (and other local Government bodies) to take an active role in energy investment.

[18] The Public Works Loan Board is a statutory body of the UK Government that provides loans to public bodies from the National Loans Fund.

In June 2014, the 'APSE Energy' service was launched at a House of Commons event. Operating under the Association of Public Sector Excellence umbrella, this collaboration of councils had 32 member authorities at launch (APSE, 2014), and in a response to the Ofgem consultation on 'non-traditional business models' which closed in May 2015 it gave its "mission statement" thus: "to form an effective collaboration of a large number of local authorities to enable and facilitate the municipalisation of energy services. By this we mean the public and community, as well as private, ownership and managerial control of local energy generation, distribution networks and delivery of energy efficiency works. Local authorities working together in this way would have great influence and would be able to deliver economies of scale in green energy to promote economic growth and combat fuel poverty" (APSE Energy, 2015, p. 1)

Researchers from Edinburgh University conducted a systematic survey of sustainable energy plans and projects in all UK Local Authorities in summer 2015, and followed up with 40 detailed case studies later that year (Webb et al., 2017). They found 458 energy projects. The most common type was CHP generation (~130), then building improvements (~125), heat networks (~35), and solar PV (~35). Just under 10 had onshore wind projects. The researchers noted that the eight renewable electricity generation case studies conducted were grouped into two kinds: in one of these the projects "primarily focussed on income generation from feed-in tariffs, utilising council assets (rooftops and land) for solar PV and micro-hydropower and reducing corporate energy costs and carbon through use of electricity generated." The other group were community partnerships, one of these being the Plymouth City Council / Plymouth Energy Community partnership mentioned above.

The report contains an interesting discussion of the "solutions" LA energy teams have devised to pursue their ambitions under the budgetary constraints imposed by the central government's austerity programme. The 'self-financing energy teams' approach is illustrated well by the discussion of Bristol City Council's wind turbines above.

The solution of 'integrating energy services into finance and capital investment programmes' is interesting in that highlights how energy teams were able to position proposed investments in a way that brought finance staff — with a key say in approving the financing — on board: "In these cases the critical innovation was that energy services were constituted as part of 'capital projects' and positioned as a new revenue source. This provided a route to longer term investment appraisal and potential for acceptance of lower rates of return. Involvement of senior finance specialists with energy officers created a more productive working relationship supporting project delivery." (Webb et al., 2017, p. 37)

Warrington Borough Council was given as an example of this 'solution': "In Warrington the value of energy projects was defined in relation to long term revenue streams for essential services like care workers. The council initially used prudential borrowing which provided low interest finance to invest.[19] Financial expertise and commitment from a new Finance Director were critical." The report quotes a Capital Accountant at the Council: "Our ambition as an authority is to be self-funded. And

[19] The prudential borrowing framework enables councils to source capital funding based on what is affordable and prudent, but otherwise free from external restrictions.

using the income from the likes of solar projects, or green energy projects, is a significant part of that vision to become a self-funded authority" (Webb et al., 2017, p. 38).

Given the novelty and complexity of the mechanism, it is notable that when the first CfD allocation round closed in March 2015, Cambridgeshire County Council was one of five developers to receive a CfD for a solar farm. (12MW) Three of the other winning solar projects did not go ahead (Grundy, 2020a; Low Carbon Contracts Company, 2020; MLEI, n.d.).

Power and power relations (power to + power over + power with)

In SONNET we are interested in power dynamics in the SIE-field under study: how SIE-field is enabled and/or impeded by power relations and vice versa; how and to what extent existing power relations are transformed and/or reproduced by the developments in this SIE-field.

The concept of 'power to' relates to actors having different kinds/levels of power/capacity to mobilise SIE-related resources and to achieve goals. 'Power to' can therefore be summed up as people's capacity and resources to take action to be able to change the existing energy system (and social relation within it). The concept of power 'over' relates to actors having power over others in social innovation in energy (SIE) related processes. The concept of 'power with' relates to actors holding and exercising power together with other actors to achieve collective goals, through e.g. strategic collaboration, pooling resources, joining forces, etc.

The financial mechanisms and subsidies for renewable energy in the UK are largely framed by policy and regulation in the field. This means that the actors' ability to act is limited. In other words, power is more constrained and circumscribed.

Under the budgetary constraints imposed by the central government's austerity programme, local authority energy teams devised to pursue their ambitions to be the 'self-financing energy teams'. The integration of energy services into finance and capital investment programmes was an interesting solution, which empowered some local authorities to deliver their energy agenda, including finance for renewables (power to). They were free to register for the Feed-in Tariff, and some authorities were quick to use this new power. In March 2010, Bristol City Council's cabinet approved the procurement of a wind farm developer to construct two wind turbines at Avonmouth. This made Bristol the first local authority to own operational wind turbines. The installation, which cost the best part of 10 million, was financed by the Public Works Loan Board via prudential borrowing and was projected to generate annual income of 1 million from the FIT and the sale of electricity and Levy Exemption Certificates (Bristol City Council, n.d.; Local Government Association, 2013). As of 2020, this income "pays for an awful lot of staff" for the Bristol Energy Service (FM_UK04). Some local authorities also supported the burgeoning community energy sector: the revolving loan fund for community energy established in late 2012 as part of Cornwall Council's Green Cornwall Programme (Mitchell, 2012), the Lambeth Community Energy Programme started in 2011, and the agreement (also signed 2011) between Bath & West

Community Energy (BCWE) and Bath and North East Somerset Council. However, in some places local authorities were perceived as having unintentionally undermined projects.

Power 'over' is well-illustrated by the position of a regulator and the decisions about e.g. subsidy mechanisms and other relevant policies. Another obvious example of power 'over' is the position of investors and lenders who in many cases exercise control over their investments and subsequently over renewable energy generation projects they invested in.

Institutional investors have capacity to mobilise resources. Their role as powerful actors has grown since e.g. an increasing amount of capital has been invested as unlisted debt and equity by pension funds and insurance companies directly or indirectly through specialised infrastructure funds.

The position of investors, especially those less typical, e.g. through crowdfunding, can demonstrate all three types of power (over, to and with), as well as serving as examples of distributed power. For example, small investors collectively can be powerful actors, particularly when seeing it as a form of partnership. It is suggested that part of the value in having people as financiers rather than institutions is that lenders tend to be active supporters of projects. Support from lenders on the platform has included allowing their borrowers to delay interest payments, or investing more money, where this is urgently needed for a project to succeed. In one instance, investors in a project wrote to their MPs and the energy markets regulator Ofgem ("about 400 emails") to challenge a regulatory decision which threatened its viability. (FM_UK01)

The development of SIE-field over time demonstrates how actors collaborate and work together towards common goals (power with). In relation to local authorities, the APSE Energy service was launched in 2014. Operating under the Association of Public Sector Excellence umbrella, this collaboration of councils had 32 member authorities at launch, and in a response to the Ofgem consultation on 'non-traditional business models' which closed in May 2015 it gave its "mission statement" thus: "to form an effective collaboration of a large number of local authorities to enable and facilitate the municipalisation of energy services. Another example of power with is the Local Energy Assessment Fund (LEAF) which was administered by Energy Saving Trust with several partners including Carbon Leapfrog (merged with PURE to form Pure Leapfrog), Community Energy Wales, Low Carbon Communities, and the Community Energy Practitioners' Forum. In the community energy field there are also numerous examples of power with, e.g. the Community Energy Coalition was convened in 2011 by 'Forum for the Future' with a diverse set of member organisations including Energy4All, Co-operatives UK, the CSE, the National Trust, the Church of England, the National Farmers Union, Friends of the Earth, the Energy Saving Trust, and Carbon Leapfrog.

Phase 2: 2015-2019 — Getting "rid of all the green crap"

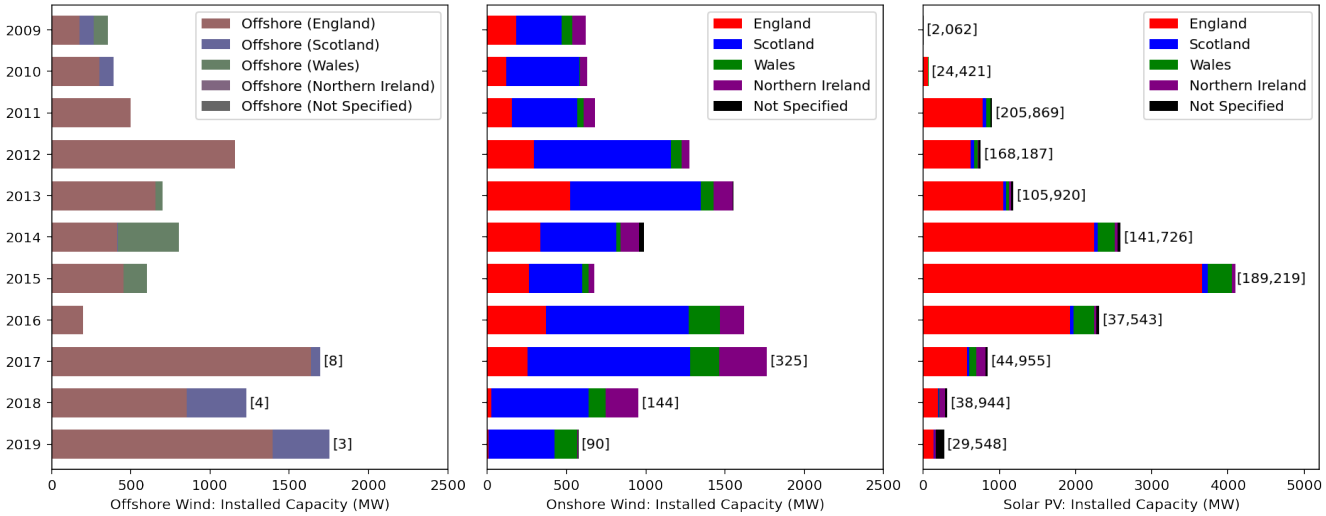


Figure 4: Wind and Solar Capacity by year of commissioning with the number of sites shown in square brackets. Authors' plot of data from (BEIS, 2020a & 2020b).

It was widely reported in Nov 2013 that Cameron had told aides he wanted to "get rid of all the green crap" in reference to the various levies on energy bills which had been introduced to support the greening of the energy sector (Carter and Clements, 2015; Sparrow, 2013). While veracity of the quote was disputed by Downing Street, it does crudely describe the policies the government would actually adopt under Cameron's leadership over the next few years, particularly after the Coalition was replaced by a Conservative government in May 2015. A series of policy changes significantly cut subsidies for the development of new onshore wind and solar PV installations at all scales. While these changes provoked resistance from a wide range of actors, but their efforts had limited impact on policy, and there was a marked drop in the deployment of onshore wind and solar, while offshore wind capacity continued to grow. Demand for Corporate PPAs increased, which helped make the business case for some new onshore developments. Meanwhile, the costs of onshore wind and solar PV continued to fall, as did the cost of battery storage technology leading to the emergence of hybrid solar/storage sites and the first unsubsidised solar PV and wind sites. In this section, we discuss these developments in more detail.

SIE changing social relations
In the context of the SONNET project, social innovation in energy (SIE) is defined as 'a combination of ideas, objects and/ or actions that change social relations and involve new ways of doing, thinking and/or organising energy' (Wittmayer et al. 2020b, p.4). In order to observe the diversity of SIE, the project first developed a typology of contrasting SIE (for more information see https://sonnet-energy.eu/typology/), including one called 'Investment and finance mechanisms' (later renamed to 'Financial and subsidy mechanisms for renewable energy'). Here, social interactions (and changes to social relations) that aim to bring about changes in the energy system are often based on exchange/organising and to some extent on cooperation, rather than conflict or competition. In SONNET we see SIE as multi-actor phenomena. SONNET aims for asking about the interactions and relations between actors, working on a SIE and a broader institutional context in which the SIE is nested (Wittmayer et al. 2020b, p. 7). An empirical focus lies on the development of SIE-fields. Following Fligstein and Adam's field definition (Fligstein and McAdam 2011), an SIE-field within the SONNET project is understood as 'an arena/space that includes a specific SIE as well as SIE-field-actors working on it and other field-actors enabling and/or impeding it. In this space these actors take one another and their actions into account and have a shared (but not necessarily consensual) understanding of a SIE and of their relationship to other actors. They recognise (but not necessarily follow) shared norms, beliefs and rules. SIE-fields are often not homogenous but are composed of actors with diverse and contradictory aims and interests' (Hielscher et al. 2020, p. 17). There are at least two (not mutual exclusive) ways in which financial mechanisms may come with 'changing social relations'. One possibility is that the activity funded involves such change — for example when a grant is made to fund a collaborative research project involving a novel form of collaboration. Another possibility is that the changing relations or new roles relate to the financial flows themselves — for example, where community share raises make local people investors in a solar farm or when contractual forms around revenue streams involve new combinations of actors. It is this type of change that we will focus on in this report, on the basis that accounts of these developments are embedded in a common context of financial and energy markets, policy and regulation, and tend to be described in a common 'language' of finance by those actively working on them, even where their goals and beliefs are might be quite different. The SIE-field 'Financial and subsidy mechanisms for renewable energy' is complex and constituted by a number of sub-fields and institutions concerned with changing social relations in connection to financing of wind and solar, that can be part of other broad institutional fields, i.e. '*municipal energy*' (concerned with local governments taking a greater role in the provision of energy services, including ownership of electricity generation assets); '*community energy*' (which is about direct citizen participation and control of energy activities including investment in electricity generation assets); '*investment-based crowdfunding*' ('alternative' finance for renewable energy projects – online platforms to offer equity and/or debt based investments to the public at large); '*institutional investment in green*

infrastructure' (e.g. pension funds, insurance companies); *'corporate' and 'private wire' PPAs* (contractual arrangements whereby an organisation buys electricity for its own use more or less directly from specific generators).

These fields are interconnected and can overlap creating 'space' for social innovation and changing social relations around energy. For example, while crowdfunding platforms have been used by community energy projects, the two are clearly distinct developments in regard to financing renewable energy. The majority of investments on Abundance (for example) have not been community projects, even if they have community benefits. However, one finds actors in both fields with a leading interest in using financing relationships (of equity or debt) as a means of engaging the public with a climate/renewable energy agenda.

There is a diversity of SIE-field actors and other actors that were entering the renewable energy finance over the period covered in this study, connected with different institutional fields, types of SIE, and different financial and subsidy mechanisms in the UK. It is particularly interesting to see the activities of non-traditional actors whose role in renewable energy finance was becoming more prominent at certain stages of the SIE-field development, in response to some policy changes or changes in the outside institutional environment (e.g. financial markets). For example, after Community Energy strategy 2014 was published, the government encouraging local authorities to support community energy projects, and to be more active in energy provisions more generally. This led to the increasing role for local authorities in financing renewable energy projects. Institutional investors also played a big part after 2014, e.g. UK local authority pension funds, insurance and pension company; by 2018 private institutional investors had started to take substantial shares of projects still under construction. The development of financial mechanisms empowered small players (e.g. citizens) offering investment opportunities and ways to support renewable energy.

Contestations and relations between actors

SONNET is interested in understanding interactions between SIE-field actors and/or other field actors. These relations can be formal or informal, take different forms (e.g. formal alliances, networks, collaborations) and might differ in their quality (e.g. conflicting, competitive, collaborative or exchange-oriented relations; Wittmayer et al. 2020b), as well as in their content (e.g. concentrating on learning, networking, lobbying etc.). Furthermore, field contestations between SIE-field-actors and/or other field-actors are of interest as they can 'unsettle' the existing 'outside' institutional environment (Hielscher et al. 2020, p. 19). Contestations are debates among relevant actors over SIE-field structures and processes such as disagreements about common aims or approaches to lobbying policymakers. Both, contestations and relations can provide an indication of how institutionalised (or not) the SIE-field is (e.g. whether there are formal networks).

Our case study features many examples of interest groups ranging from trade associations like the STA, RenewableUK, and the UK Crowdfunding Association, to organisations like Community Energy England and Co-operatives UK, and

looser coalitions like the Community Energy Coalition. Unsurprisingly, the members of these organisations are not always in agreement. For instance, while UKFCA worked collectively on establishing an IFISA for debt-based crowdfunded investments, it was "a bit of a battle" for the platforms doing bond/debenture-based crowdfunding to keep those included in the design, as the larger loan-based platforms were less interested in pursuing this. Here, the bond-based platforms in the association used the argument that since "*bond-based crowdfunding operates to a higher regulator standard […] it would be illogical to exclude*" it, and were successful in making bond-based investments eligible for inclusion in the IFISA (FM_UK01).

Co-operative renewable electricity generators found themselves on one side of an 'ideological' contest within the wider co-operative movement and, to their frustration, found the FCA aligned with the other side. In response to this, they were able to enlist the support of figures within the broader co-operative movement but, so far, to no avail. This contest was not over the inclusion of electricity generation activities per se, but rather the extent to which a co-op must trade with its members, something which the structure of the electricity market makes difficult for co-operative generators.

The bonfire of the subsidies

In a sign of things to come, the government had announced in May 2014 that the RO would close to solar PV installations over 5MW at the end of March 2015, two years earlier than planned (Nicholls, 2014). This led to a rush of installations in the first quarter of 2015 as developers tried to meet the deadline (Nicholls, 2015) which can be seen in Figure 1.

In the lead up to the May 2015 General Election, The Conservatives, still lead by David Cameron, won an outright majority and the coalition with the Lib Dems was no more (BBC News, 2015). In their election manifesto they had promised to "halt the spread of onshore windfarms" by removing subsidies for new installations and changing planning law (Conservative Party, 2015). In June it was announced that the RO would be closed to new onshore wind projects in April 2016, a year earlier than had been previously stated (Addleshaw Goddard, 2015; Rudd, 2015) and in the same month the government made changes to planning policy in England for onshore wind, which meant that approval would only be possible at sites which had been positively identified proposed sites as suitable for onshore wind projects in local plans (Smith, 2016). These moves drew strong criticism from RenewableUK and the Labour opposition government (Wintour and Vaughan, 2015).

In July 2015 DECC proposed to remove the remaining RO support for sub-5 MW solar PV at the end of March 2016 (one year earlier than planned) (DECC, 2015a), and to remove the "pre-accreditation" of FITs for installations over 50kW as well as the similar "pre-registration" available to smaller community wind and solar PV schemes. The government's budget, also presented in July, stated that the CCL exemption for renewable energy would be removed at the start of August (Bedford, 2015) — removing the sale of LECs as a revenue stream for new projects.

In August 2015, a more overarching consultation on the Feed-in Tariff was published in late August 2015 (DECC, 2015b).

Proposed Generation Tariffs for Jan 2016 (p/kWh, Nominal prices)		Ofgem Tariffs for installations with an eligibility date on or after 1 October 2015 (p/kWh, 2015/16 values)	
Solar PV			
0 -10kW	1.63	<4kW	12.47
		4-50kW	11.30
10 - 50kW	3.69		
50 - 250kW	2.64	50-150kW	9.63
		150-250kW	9.21
250-1000kW	2.28	250-5000kW	5.94
> 1000kW	1.03		
Stand alone	1.03	Stand alone	4.28
Wind			
<50kW	8.61	0-100kW	13.73
50–1500kW	4.52	100–500kW	10.85
		500–1,500kW	5.89
>1500kW	0.00	>1500kW	2.49
Hydro			
<100kW	10.66	<15kW	15.45
		15-100kW	14.43
100-500 kW	9.78	100-500kW	11.40
500-2000kW	6.56	500-2000kW	8.91
>2000kW	2.18	>2000kW	2.43

Tariffs (p/kWh)	Installed capacity	Consultation tariffs	New tariffs (Jan 2016)
PV	<10kW	1.63	**4.39**
	10 - 50kW	3.69	**4.59**
	50 - 250kW	2.64	**2.70**
	250-1000kW	2.28	**2.27**
	> 1000kW	1.03	**0.87**
	Stand alone	1.03	**0.87**
Wind	<50kW	8.61	**8.54**
	50-100kW	4.52	**8.54**
	100–1500kW	4.52	**5.46**
	>1500kW	0.00	**0.86**
Hydro	<100kW	10.66	**8.54**
	100-500 kW	9.78	**6.14**
	500-2000kW	6.56	**6.14**
	>2000kW	2.18	**4.43**

Figure 5: On the left: The tariff changes proposed in the FIT review of Aug 2015 (DECC, 2015b.)
On the right: The tariffs actually applied in February 2016 (Ares, 2016).

While the export tariff would be unchanged under the proposals, the cuts to the generation tariff were between 87% for the smallest PV installations to 76% for the largest, while wind above 1.5MW was to lose the generation tariff completely. Cuts for hydro were more modest. Moreover, it proposed that caps on the capacity which could be registered in each quarter year be introduced for each technology and size band and set to "limit [total] new spending on the scheme to £100m up to the end of 2018/19." In early September, the decision on pre-accreditation was announced: it would be removed it from 1st Oct, with a possible re-introduction once the FIT review was concluded. This announcement "prompted a surge of almost 1,500 applications in September 2015" (Ofgem, 2016a).

A contemporary article in trade publication Business Green described the proposals as “sending shockwaves through the renewables industry” quoting highly critical responses from organisations including the STA, REA, RenewableUK, Greenpeace, Friends of the Earth, Good Energy, the EST, the EEF (a leading representative of the manufacturing sector, now called ‘Make UK’), as well as former Coalition Energy Secretary Ed Davey of the Liberal Democrats (Business Green, 2015).

The Energy Saving Trust's formal response in late October stated that the proposed changes "are having and will have a significant negative effect on the current renewable energy industry in the UK, and on future investment in low carbon in the UK" (Energy Saving Trust, 2015, p. 2). The Solar Trade Association’s response stated that “the very low quarterly PV deployment caps designed to provide an upper limit to spend” are “of even greater concern” to their members than the rate cuts, and warned that if the proposals were introduced, “combined with the curtailment of solar deployment under the Renewables Obligation and uncertainties over CfDs, there won’t be much of a solar industry left” (Solar Trade Association, 2015, p. 3).

The community energy sector also put considerable effort into responding to the proposals. Community Energy England (CEE) is a not-for-profit company established in May 2014 with the objectives of “creating a voice for the sector; supporting sector development; and building cross sector partnerships” (Community Energy England, 2015a). They were cited as playing an important role in representing and/or sharing knowledge in the community energy sector by two interviewees in that sector (FM_UK02), (FM_UK05) and in the municipal energy sector, by Local Authority energy manager who said “*I think we’re in the same space, really*” (FM_UK04).

In August 2015, CEE responded to the pre-accreditation consultation, arguing against its removal (Community Energy England, 2015b). In October 2015, CEE published a report on a sectoral survey which they had commissioned which gave a stark assessment of how the changes proposed in the FIT review would affect community energy: “The majority of respondents have said that they are now putting their projects on hold, or cancelling them, as a result of the recent government policy announcements, consultations and generally negative attitude to renewable energy” (Quantum Strategy & Technology, 2015, p. 5).

Noting that 38 respondents to the survey had collectively received £7.4 in FIT payments to date, the report argued that this represented “very good value for money” given private financing and volunteer time leveraged and the generated revenue to local economies, community benefit funds, energy savings for host organisation, and other less quantifiable effects such as increased activity and awareness around sustainability and increased participation in the voluntary sector (Quantum Strategy & Technology, 2015, p. 5).

“*I would say Community Energy England taking on a lobbying role has been a good thing for the sector. My personal view is that we are not a vital component of the Government’s future plan. We're a 'nice to have' if it doesn't cost too much money*.” (FM_UK05)

Local Energy Scotland's[20] response to the August FIT consultation also pushed for the reintroduction of pre-accreditation, and quoted actors in the financial sector (including representatives of Triodos Bank, the Charity Bank, and Baker Tilly Corporate Finance) which highlighted the importance of pre-accreditation in creating the certainty over income streams needed to make financing community energy projects viable.

The government published its response to the consultation in December, in which it laid out changes it would implement in Feb 2016. The cuts to tariffs for the smallest PV installations were not quite as large as had been proposed, but were actually a little larger for the largest solar schemes (see Figure 5). The quarterly deployment caps went ahead as planned (Ares, 2016). Although wind over 1.5MW wasn't cut to zero, the deployment cap was so small that "it became very difficult to get any subsidy" for onshore wind (Chapman, 2018, p. 30). Jon Halle, one founder of Sharenergy — a spin-off of Energy4All which helps to set up smaller community energy projects — complained that: "The caps for solar have been set at a very low level - 70 medium-scale rooftops across the UK per quarter is a derisory figure. Sharenergy expects these to be snapped up by well-resourced commercial operators leaving little or no opportunity for community-owned solar on schools and public buildings" (Pratt, 2015).

One positive for renewables investors was the decision to re-introduce pre-accreditation (Pratt, 2015). However, the pre-registration scheme for community wind and solar under 50 KW was not reintroduced (Ares, 2016), a decision which CEE would describe in summer 2017 as one of the "most detrimental changes" for the sector made "over the last couple of years."

A report prepared in March 2016 on the House of Commons Select Committee on Energy and Climate Change's investigation into "investor confidence in the UK energy sector" found "that the Government's actions have clearly had an impact on the confidence of many investors. While the effect is not as great as has been experienced in some other countries—where the implementation of retroactive policies has caused investment to collapse—there nevertheless has been a dip in confidence since the election in May 2015. This is most clearly illustrated by the UK's position in the EY Renewable Energy Country Attractiveness Index, which fell from 8th place in June 2015 to 11th place in September 2015".

Institutional investors were among those with concerns about the turn taken by the government's renewable energy policy. In written evidence submitted for Select Committee's investigation in October 2015, the IIGCC stated that "to date, UK energy policy has been successful in attracting institutional capital" citing research showing that "the UK has been a leading European destination for institutional investment into low-carbon technologies over recent years. Financial investors invested nearly EUR 6.4 billion in equity in EU renewable infrastructure in 2014, of which nearly EUR 4.0 billion was invested in the UK" (IIGCC, 2015).

[20] Local Energy Scotland is a consortium comprising the Energy Saving Trust, Changeworks, The Energy Agency, SCARF, and The Wise Group and fully funded by the Scottish Government. It has delivered the CARES scheme since its founding in 2013 (Local Energy Scotland, 2016).

Citing the "early introduction of auctioning to groups of technologies, the freezing of the carbon price floor and the earlier closure of the renewables obligation certificate scheme for new large-scale solar projects" by the previous government, as well as the present government's proposed changes to the FIT, halt on support for onshore wind, early closure of RO, and removal of the CCL exemption for renewables, the IIGCC submission went on to state that "taken together, these changes - and the much faster than historical pace - have placed policy and regulatory risk at the front of investors' minds. While these changes have been prospective, and therefore have yet to affect investment in projects that benefit from the transition, there is a potential that they could result in a substantial decline in UK low carbon investment" (IIGCC, 2015).

In answer to a question about steps DECC could take to increase investor confidence, the IIGCC said that "in the short term, DECC needs to clarify whether it intends to proceed with [a CfD] allocation round for technologies still receiving support this year. This is particularly relevant for IIGCC members, who are currently reviewing their involvement in the UK low-carbon energy sector. Many investors are no longer considering investments in UK energy related assets (across renewable, fossil, nuclear) due to specific UK policy risk" (IIGCC, 2015).

In November 2015, the government stated that a second round of CfDs would go ahead in 2016, but that no CfDs would be offered to the so-called 'Pot 1' of 'established' technologies — this excluded not only onshore wind, as per their manifesto pledge, but also solar PV (Stoker, 2015a). In February 2016, Secretary of State for DECC, Amber Rudd, confirmed that solar would not be included in future rounds either (Stoker, 2016a).

The proposed RO closures for onshore wind and solar PV went ahead on or shortly after the planned dates. Grace periods were available to projects meeting certain criteria, the deadlines for which account for the jumps in RO accredited solar capacity in Figure 2 (BEIS, 2020c; Ofgem, 2016b). Amber Rudd, the then energy minister, justified the end of subsidies for onshore wind as the UK was on track to meet its national targets for renewable electricity.[21]

Lockwood argues that — with the possible exception of the onshore wind decisions — the drastic cuts to subsidies were primarily driven by the Levy Control Framework, after forecasts were presented (first by independent analysts and then the government's Office for Budget Responsibility) in which the already existing pipeline of subsidised renewable generation resulted in the breach of the LCF caps already established by 2019/20. Even in the case of onshore wind, the LCF constraints were a "powerful reinforcing factor" (Lockwood, 2016, p. 196). In September 2015 the then Energy Minister Amber Rudd justified the tariff cuts for solar as the "spectacular" fall in solar costs, the "successful" response to the FIT scheme and the need to protect consumer bills.[22]

"*And also the double whammy is that they took EIS relief away, for communities as well, on the wind and the energy. 'Cause that had been exploited terribly by the investment houses down in London*." (FM_UK02)

[21] Statement on ending subsidies for onshore wind https://www.gov.uk/government/speeches/statement-on-ending-subsidies-for-onshore-wind
[22] Amber Rudd Defends Cuts To UK Feed-in Tariff https://climatechangeactiongroup.blogspot.com/2015/09/amber-rudd-defends-cuts-to-uk-feed-in.html

In November 2015, following a number of steps to "exclude certain energy generation activities from venture capital schemes, including in 2012, 2014, and 2015," the UK Government excluded "subsidised generation of renewable energy by community energy organisations and activities concerning the provision of reserve energy generating capacity" from EIS, SEIS, and VCT, and from the future enlargement of SITR (HMRC, 2015a). A contemporary report stated that "the changes are expected to save the Treasury £485m" (Sukhraj, 2015).

We noted the use of EIS by Baywind earlier, and according to the Solar Trade Association "tax relief structures such as Enterprise Investment Scheme (EIS) and Venture Capital Trust (VCT) have played an important part in building the financial justification for investment in solar projects in the UK to date" (Solar Trade Association, 2016, p. 13).

In response to the removal of these tax credits, Community Energy England and "its counterparts in Wales and Scotland" (Stoker, 2015b) "took legal advice and gave serious consideration to launching a judicial review against the Government but reluctantly decided that its limited financial resources did not extend to launching such an action and taking on large potential liabilities for legal fees if it was not successful" (Community Energy England, 2016).

"Making Solar Pay"

In October 2016, the Solar Trade Association published a report on "the future of the solar PPA market in the UK" entitled "Making Solar Pay" (Solar Trade Association, 2016). The study was a deliverable of the Horizon 2020 "PV Financing Project" which ran from Jan 2015 to June 2017 (PV Financing, n.d.) and which sought to "understand and shape how PV projects are structured and financed in a low or no subsidy world" (Solar Trade Association, 2016, p. 6).

The report opens by saying that "Financing solar PV projects in the UK has changed significantly over the past 10 years. Starting with self-funded pioneers willing to invest in an innovative technology, it has widened to incorporate, amongst others, major banks, financiers, energy consultants, lawyers, risk analysts and energy modellers. As the market has grown, project sizes have also grown from less than 10kW to 50MW or greater." (Solar Trade Association, 2016, p. 4).

It goes on to describe the effects of the recent cuts in rather stark terms: "Over the last 24 months, rather than there being a phased reduction in subsidy levels, the government has embarked on a more significant overhaul of the underpinning policies that formed the basis of the business models over the past 5 years. These changes have made the development of new projects more challenging. The industry as a whole is endeavouring to produce different business models that incorporate these challenges while still allowing sufficient profit to be generated. However, to date, no long-term sustainable replicable business models have emerged" (Solar Trade Association, 2016, p. 4). The report presents financial modelling of

wholesale, sleeved,[23] and private-wire[24] PPA projects in which only the "private wire" structure remains profitable under the contemporary subsidy-free situation for solar projects too large to receive the remaining Feed-in Tariffs (Solar Trade Association, 2016). As the STA noted, private-wire PPAs are only suitable under quite specific circumstances: not does the off-taker need to be based at a physically suitable site, they also need to have a strong enough credit rating for the PPA to be 'bankable' when financing the project.

Corporate PPAs

While noting that "corporate power purchase agreements (PPA)[25] are not a new phenomenon, with the first deals occurring almost ten years ago," an April 2017 article in Project Finance International stated that "the size and frequency of deals - particularly in the United States and United Kingdom – has picked up in recent years" (Norton Rose Fullbright, 2017). One CPPA highlighted by the article was the 15 year deal, announced in June 2016, in which energy from Sanquhar, a greenfield 32.4 MW onshore wind development in Scotland, would be purchased by Nestlé who, as a member of the RE100 group of companies, had committed to moving to 100% renewable power (Community Windpower, 2020; Nestlé, 2016). The FT reported that Nestlé expected "to save a considerable amount over the 15-year lifetime of the agreement" (Clark, 2016).

The Sanquhar wind farm was able to obtain RO accreditation (Ofgem, 2020b), but in discussing why Corporate PPAs had only become "more prominent" in "recent years," a 2019 report by law firm Bird & Bird stated "this is most likely because the availability of fiscal incentives, such as FITs and ROCs, meant that there was little commercial imperative on generators to explore such arrangements. Instead, they would enter into shorter term utility PPAs with a licensed supplier, often on standard forms, for the offtake of all of their power as the support payments were sufficient to demonstrate the long term fixed/floor income stream to lenders" (Reid and Dingenen, 2019, p. 13).

As for the organisations looking to purchase the power, an earlier report by Bird & Bird noted the opportunities to fix power prices (to "hedge against rising energy and fluctuating energy prices in the wholesale market") and to "achieve sustainability targets" as key drivers (Bird & Bird, 2016) — a consideration in choosing a CPPA rather than purchasing Guarantee of Origin certificates from renewable generators can be the question of "additionality" i.e. does the procurement decision result in the construction of new renewable generation capacity (Norton Rose Fullbright, 2017)?

[23] In a sleeved PPA, an intermediary utility company handles the transfer of money and energy to and from a renewable energy (RE) project on behalf of the buyer. The utility takes the energy directly from the RE project and "sleeves" it to the buyer at its point of intake, for a fee.
[24] Electricity generator supplies electricity directly to an end user via a direct, unlicensed 'private' wire rather than over the 'public' electricity grid comprising licensed distribution and transmission networks.
[25] A corporate PPA is any agreement made directly between a generator and a corporate or industrial (C&I) offtaker for the purchase of power.

Describing the summer of 2015 as "a depressing one for the renewable energy industry in the UK, including Community Energy," Chapman recalls that "For community energy groups there was a flurry of activity to pre-register solar PV projects before the end of September which they then had a year to install. So in many ways the impacts of policy changes in 2015 were delayed for a year. This was seen in the dramatic decline in the number of new community energy organisations founded. In 2017 there was only one such organisation founded in England, Wales and Northern Ireland, compared to 13 in 2016 and 33 in both 2014 and 2015" (Chapman, 2018).

Despite the challenges, new build community projects did still go ahead — some larger projects racing to be eligible for the RO, others making the best of the remaining FIT with a stronger incentive to supplement it with a private wire PPA. For one interviewee, the 2015 FIT review was not as significant as the final phase out in 2019: "*You could book your slot, and we would ask, is there lots of room in the cap? Usually there was. So although it sounds as though it should have had an effect, in practice it didn't really affect us all that much*." (FM_UK05) Other community groups opted to buy already operational commercial projects.

In September 2015 construction began on a solar farm which took advantage of the site rule exemption for FITs introduced in November 2014. Braydon Manor Farm near Swindon was "claimed to be the first split-ownership community-commercial solar farm in the UK." It was a collaboration of Public Power Solutions, which (despite being the 'commercial' partner) is a subsidiary of Swindon Borough Council (Public Power Solutions, n.d.), with Mongoose Energy and Wiltshire Wildlife Community Energy. In the same week, Mongoose Energy appointed Ed Davey, the Liberal Democrat MP and former head of DECC, as its chairman (Stoker, 2015c).

Two notable examples of community energy projects using private wire PPAs are the Schools' Energy Co-operative and the Edinburgh Community Solar Co-operative — both members of the Energy4All family. The former — inspired by the Wey Valley Solar Schools Co-op and launched in 2014 — sells electricity to the schools where it sites its installations at lower than retail price with excess sold "to electricity companies through the grid" (The Schools' Energy Co-operative, 2019), but its share offer of 2015 noted that "Co-op's principal source of income is from the Feed-in tariff" (The Schools' Energy Co-operative, 2015, p. 7). The later (which drew inspiration from the Schools' Energy Co-operative) is Edinburgh Community Solar Cooperative. This group has a private wire PPA with Edinburgh City Council on whose buildings their solar projects are installed. In 2018, this PPA accounted for roughly 40% of ECSC's income, with the remaining 60% coming from the FIT generation and export tariffs. Development was funded through the Scottish Government's Climate Challenge Fund, a CARES grant and loan, a loan from Energy Prospects, while construction was covered by community share offers, except for a 10% shortfall which was addressed by "sourcing what was effectively a bridging loan via the Energy4All group" (Cairns et al., 2020).

As noted above, the RO closures came with 'grace' periods and new installations under this scheme continued for some time, with occasional 'rushes' as deadlines approached Figure 1. One community project for which the sub-5 MW RO deadline loomed large was the 4.1MW Ernesettle Solar array which was developed by Plymouth Energy Community in cooperation with a local economic development trust starting in late 2015. With no time to fund construction through a community share raise, after "weeks of negotiation and researching different finance options" they secured a short-term bridging loan from Leapfrog Finance (Plymouth Energy Community, 2020). Once commissioned in March 2016, the project was accredited for 1.3 ROCs per MWh, a long-term (17 year) PPA was signed with Statkraft (Statkraft, n.d.). It was refinanced through a retrospective community share offer of almost £1m which was marketed on Ethex and long-term borrowing from Plymouth City Council (Ethex, n.d.).

Introduction to SIE-initiative

Leapfrog Finance

'PURE, the Clean Planet Trust' was a charity "created to raise the bar in carbon offsetting." With British Airways, they established the BA Carbon Fund in 2011, which uses donations from BA customers to provide grants to community energy projects in the UK and in Africa. In 2012 they launched the Community Energy Fund — "the UK's first dedicated finance facility supporting the development of community energy projects drawing on a £1.5m credit facility from Big Society Capital." In 2012, PURE merged with Carbon Leapfrog, a broker and project manager of professional support to community energy projects, which was launched by a network of professional service firms to form Pure Leapfrog (PURE Leapfrog, 2020a, 2020b).

In early 2014, Pure Leapfrog started work on setting up a revolving bridge finance facility for 'utility scale' community energy projects: "*At the time […] obviously the Feed-in Tariff was still there, and what the community groups didn't have was the ability to build out a project and then refinance it and raise the capital. So we were just a bridge facility, really*." While the established Community Energy Fund was "*a small loan book, which was there to help community groups at preferential rates*" the bridge facility would provide much larger short term loans to fund the construction or acquisition of bigger renewable energy projects, which could then be refinanced through some combination of share issues and long-term debt (Interview FM_UK02). The facility, trading as Leapfrog Finance, was launched in September 2015, having arranged access to a £15m credit facility from Big Society Capital (Guardian, 2016). When they started, "*there was nobody offering the same facilities that we were offering. And, indeed, on the community side, it was starting to go backwards because the feed in tariffs were being removed*." (FM_UK02).

Finding a wholesale lender to finance their loans was a challenge. Searching the market, most potential lenders "*wanted a lesser amounts of risk. And there's nobody in the market, really, to take that. And I can understand — you can understand it. […] One of the risky things with communities is they're not set up like a commercial developer. [When it's] your money*

on the table yourself as a commercial developer, you're going to drive prices down and you're going to make sure it's delivered on time, you're going to keep on top of it." (FM_UK02)

They were able to find a lender in Big Society Capital. A difficulty in coming to an arrangement with BSC was communicating the technical aspects of energy project finance to people with a different background: "*If you'd get on to social impact, it was great, you know, and quite rightly so. […] That's what they like. They understand that. But, if you tell them what the capacity factor is of a bloody wind speed of X, with a turbine of Y with a rotor span of Z — it don't work. So they've got to have — it comes down to confidence in the people*." (FM_UK02).

The "street-cred" of having a manager at Leapfrog Finance who had managed one of the largest renewable energy loan books at a UK bank was therefore crucial in establishing the credit facility at BSC. The professional network this manager brought from the banking sector also proved vital in administering loans: "*So, what we were very fortunate about, with us, and I did this when I was at the bank is we found a solicitors who were very, very good and they could see what we were doing, and they were just — they'd set up from a big company and they said, well, we'll take a punt on you, and we'll do these smaller scale schemes, and we'll get into the market by you. And that got them to dealing with us, and also, it meant that we could pick up the phone and we weren't paid massive rates, […] because legal due diligence can absolutely destroy you. […] So they really.. without them you wouldn't have been able to do what we did*." (FM_UK02).

The particular social impact policies of BSC placed constraints on the projects that Leapfrog Finance could fund: "*Quite a few projects that we couldn't do because they weren't within seven miles of an area of social deprivation — within X percentage of the index. So, we're turning business away. Well, do you want the business or you don't want the business? […] it means you're not making as much money for the charity, and you're wasting even more time, and you can see good deals going by, so it's not very motivational*."

The first project which Leapfrog Finance provided a loan to was the Ernesettle Solar Array mentioned above. After Ernesettle, which "was a model that then was replicated by Community for Renewables down in the southwest," Leapfrog Finance did several similar projects.

One interviewee thought that Leapfrog Finance "*stimulated one or two other organisations to see that there's an opportunity there*." In 2016 Thrive Renewables developed a funding model it calls "The Thrive Community Bridge" to provide bridge finance to help communities acquire renewable projects (Thrive Renewables, 2017). In late 2017, Power to Change — a charitable trust that supports and developers community businesses in England with an endowment from the National Lottery community fund (Power to Change, 2019) — together with Big Society Capital, established CORE Partners with "£40m of liquid funds to acquire operational ground mounted solar farms in England. CORE Partners will typically acquire a target project and over time sell its interest to the local community in partnership with a community energy group" (CORE Partners, 2021; Environmental Finance, 2017). (FM_UK01).

A further blow for community energy specifically came in July 2016 the UCEF was shut down early. In their first 'State of the Sector' report published in June 2017, Community Energy England called its closure "a damaging precedent as no funding stream or support mechanism has been set up in its wake for urban community energy in England" (Community Energy England, 2017, p. 20). Over the programme's truncated lifespan, 123 organisations applied for funding and 75 grants (totalling £1.2 million) were awarded. The contingent loans part of the programme was never launched (Centre for Sustainable Energy, n.d.).

In April 2016, Mongoose Energy — which at this point had 34 MW of capacity under management and a further 40 MW in its development pipeline — announced that it would launch an energy supply business, but it seems that this never reached the point of supplying electricity (Ofgem, 2019).

Community Energy England's State of the Sector Report covering 2017, found "a drop in new community generation capacity of 31% in comparison to 2016. Of this new capacity, three large projects dominated, accounting for 79% of all new generation capacity. These projects were conducted in partnership with commercial entities or collaborative community initiatives to purchase existing renewable generation sites installed prior to 2017" (Community Energy England, 2018, p. 19). These included the acquisition of a 14.7 MW portion of the operational Drayton Solar Farm by Heart of England Community Energy (HECE). This was accomplished using a £6.2m bridge loan from Social and Sustainable Capital (Social and Sustainable Capital, 2017), which was refinanced using a £1m bond issue through Mongoose Crowd (see below) and a share offer by HECE. Another was the 5 MW solar farm at Newton Downs purchased by CORE partners and transferred to Yealm Community Energy. The third was the 6.9 MW Mean Moor Wind Farm, acquired by members of the Energy4All family (Community Energy England, 2018).

Institutional work conducted by SIE-field actors and other field-actors
SONNET investigates how SIE-initiatives, SIE-field-actors and other field-actors 'perform institutional work – meaning they engage in creating, maintaining and transforming institutions to be able to work on, enable and/or impede SIE developments' (Hielscher et al. 2020, p. 20). This analytical focus emphasises that institutional changes are actively influenced by actors within the field (Wittmayer et al. 2020b, p. 31). The term 'institutional work' refers to these activities of creating, maintaining and transforming institutions, and can include diverse types of institutional work, such as material, relational and symbolic work. One of the most important types of institutional work within the field under study are the various forms of advocacy, lobbying, and pressure deployed by SIE-field actors in attempts to shape the positions adopted by national government and regulatory bodies. We saw this in the lobbying for the FIT, and then the efforts to make provision for small and

medium scale independent generators when the electricity market reform policy was being formulated — with the Cooperative group commissioning independent research on the effects of the suggested policies on community energy, on behalf of a wider collective, while the Solar Trade Association voiced its support for similar policies.

Later, when the government's proposed and actual cuts to support for onshore renewables c. 2015 resulted in expressions of concern, objections, and push-back from SIE-field actors we have identified ranging from representatives of institutional investors to representatives of community energy groups, but there were differences in emphasis in the responses of representatives of different groups reflecting their different interests, and differences in the arguments they used to make their case, reflecting their different capacities. While Community Energy England and Local Energy Scotland commissioned research and produced responses to consultations looking in some detail at how specific changes to the Feed-in Tariff would impact community energy projects and appealed to the wider benefits of these projects, the response of the IIGCC does not refer to community energy at all, and appealed foremost to the billions that institutional investors put into UK renewable infrastructure in 2014.

The new financial mechanisms were changing normative and cognitive institutions around renewable energy generation. Creating an investment-based crowdfunding platform to finance renewable generation projects allowed engaging more people directly in the business of wind and decarbonisation that would build understanding and a greater pool of advocates for the technologies involved. Besides, Abundance founders' aim was to build long-term relationships with both its investors and borrowers, which was not seen as "a particularly Anglo-Saxon thing in some respects".

The crowdfunding field also illustrates how wider developments can enable institutional work: Abundance faced a tough time getting FSA authorisation when they were starting up, but a few years later the (successor) FCA was very receptive to the idea of creating an IFISA in which crowdfunded debentures could be included. While the greater maturity of the crowdfunding industry was likely part of the reason for this, it was also noted by a participant that the government and the FCA was keen to diversify the UK's provision of debt financing in the wake of the financial projects — particularly for projects in the 'real' economy.

One striking phenomenon in the case study is SIE-field actors voluntarily, and with considerable extra work, placing themselves under a tighter regulatory regime, because of the public beliefs and expectations attached to that status. We see this in Energy4All's decision to use FSA regulated issues of transferrable shares rather than community shares, and in the work Abundance did to attain FSA regulation.

Establishing new mechanisms, e.g. to provide bridge finance to help communities acquire renewable projects, is an illustrative example of institutional work conducted by SIE-field actors. When the facility, trading as Leapfrog Finance, (launched in 2015) started, there was nobody offering the same facilities; it stimulated other similar organisations to look at this opportunity (e.g. Thrive Renewables, Power to Change).

The government often has performed as an institutional entrepreneur in the SIE-field creating new institutions and changing existing ones. For example, a public Green Investment Bank (GIB) was launched in 2012 (priority sectors were offshore wind, waste recycling, waste-to-energy, and non-domestic energy efficiency with at least 80% of investment targeted towards them). Along with setting up the GIB, the coalition government had been developing a programme of 'Electricity Market Reform' (EMR) which culminated in December 2013 with the assent of the Energy Act 2013. Along with a carbon price floor and emissions standards this introduced a Capacity Market and 'Contracts for Difference' (CfD). CfDs were intended to replace the Renewables Obligation as the main state support for deployment of large scale renewable and nuclear generation. Attracting new kinds of investor to energy generation infrastructure, including institutional investors, was a key goal in the formulation of this policy.

Local Authorities, big solar, and big money

A notable solar farm was completed in March 2016 after intense work to stay within a grace period for ROCs: Wroughton Airfield Solar Park, one of the largest in the UK (Pratt, 2016a). It was initially developed by a partnership between the Science Museum Group which owns the land and Public Power Solutions (PPS), and then by a series of other private investors/developers including Belectric, BSR, and WELink (Buckland, 2015; Thrings, 2016). The 61MW installation was acquired by Rockfire Capital in September 2016 in a deal "funded by a consortium of local authority investors including Warrington, Newham, and Thurrock Borough Councils" (Solar Trade Association, 2017, p. 11), who negotiated a 15 year sleeved PPA with HSBC (British Solar Renewables, 2017; Stoker, 2016b).

Multiple councils together bought £432m of bonds from Rockfire which invested this in 56 solar farm "special purpose vehicles" companies on their behalf. Thurrock Borough Council in particular made significant and controversial investments in renewables through Rockfire and other channels, and was one of a number of Local Authorities which attracted attention for outsized investments in commercial properties and other yield investments. According to a 2020 report by the Financial Times and The Bureau of Investigative Journal, Thurrock borrowed around £1 billion from about 150 other local authorities and council pension schemes and invested £702m in renewable energy deals including "no less than £604m" in solar investments (Davies, 2020).

By way of comparison, the website of Bluefield Solar, one of the leading UK solar yieldcos, advertised its net asset value as £424m on 4 Nov 2020 for an installed capacity of 540 MWp (Bluefield Solar Income Fund, 2020), while Octopus Renewables website (as of 28th Nov 2020) stated that it is the "largest investor of solar power in Europe" with a global portfolio of renewable energy assets (2.8 GW across all technologies) valued at "more than £3 billion" (Octopus Renewables, 2020).

If sudden changes in government support reduced investor confidence across the board, they proved especially challenging to the crowdfunding platforms. Lacking the means to raise cash as quickly as some of the big investors meant that "*the sudden changes that came through on the Feed-in Tariffs, the Renewable Obligations just — you know — impacted us more. We weren't able to sort of turn as quickly, and adjust things as quickly as, say, somebody with a fund. So we'd build up a pipeline and then suddenly find overnight that pipeline had just disappeared […] because all the projects had suddenly become unviable*" (FM_UK01).

The unscheduled cuts to the FIT in 2011 had already proved challenging, the changes c. 2015 meant looking at a broader range of projects to fund: "*then obviously you had Cameron's government — sort of just basically sweeping out all green regulation, which was another sort of massive hiatus in development and actually a platform that started just after us, with a similar sort of focus folded at that point. […] We sort of pivoted and took on a variety of different projects at that point and moved from pure renewables into broader green infrastructure*" (FM_UK01).

In 2015, the Trillion Fund stopped offering debt in renewable energy projects to investors, with the CEO Theresa Burton saying "as a result of the government's surprising decision to suddenly withdraw subsidies from the renewable energy sector in 2015, Trillion Fund was unable to secure sufficient deal flow to support its focus on renewable energy." By March 2017, the platform was up for sale (Shoffman, 2017a). In December 2017, it was reported that "Assetz Capital has paused new investment into its Green Energy Account (GEA) and is replacing its Great British Business Account (GBBA) with a new version, due to a lack of loans. The peer-to-peer business lending platform said the reduction in renewable energy subsidies meant its GEA product was not currently viable as there are no current loans available" (Shoffman, 2017b). Assetz business lending into other markets has continued since then. As noted in the SEI-initiative box above, Abundance diversified away from solar and wind projects around 2016.

The last two solar PV projects funded through Abundance until 2020 are notable for being the first two municipal energy projects to borrow through crowdfunding. Both were developed for Swindon Borough Council by PPS. In Spring 2016, £1.8 million was raised via Abundance which, together with £3 million from the Council, funded construction of the 4.8 MW Common Farm solar farm. The project was "set up as a Community Interest Company, with 65% of the distributable profits from the solar farm funding local community initiatives, while the remaining 35% goes to the Council" (Public Power Solutions, 2021) and was pre-accredited for the FiT before the January 2016 cuts (Pratt, 2016b). In November, £2.46 million were raised for Swindon's Chapel Farm Solar farm. With another £3 million from the Council, this funded construction of a 5MW installation (Pratt, 2017).

For these projects, Abundance "ran a dedicated local marketing campaign including out of home advertising along busy commuter routes, and local digital and press advertising" attracting a total of 800 investors across the two projects

(Abundance, 2021). The Chapel Farm site went live in April of this year and In September Swindon Borough Council signed a PPA with its energy supplier which means that generation from Chapel Farm, which should amount to "nearly 25% of the Council's corporate electricity consumption," is offset against its consumption (Swindon Borough Council, 2020).

The debt-based crowdfunding sector as a whole made an important gain in April 2016 with the introduction of the 'Innovative Finance Individual Savings Account'[26] for UK savers, to supplement the popular cash ISA and stocks and shares ISA (HMRC, 2015b). There is no tax on the interest, income, or capital gains from assets held in an ISA. All UK residents are eligible to open multiple ISAs but there is a limit on the amount which an individual can invest in ISAs each year. Currently set at £20,000 per year (HMRC, 2020), most people's annual saving is well below this threshold, and there are "large pools of capital held within the UK's 10.8m Adult ISAs. In 2017-18, that pool amounted to £69 billion subscribed to Adult ISAs" (Davis and Cartwright, 2019, pp. 19–20). The Chapel Farm debenture[27] was the first crowdfunded debenture to be eligible for inclusion in the new Innovative Finance Individual Savings Account (IFISA) (Swindon Borough Council, 2020).

The UKFCA advocated for the creation of the IFISA and worked closely with the FCA on its implementation. Compared to the struggles of Abundance in attaining authorisation, the FCA was much more open to this 'institutional work' by the crowdfunding sector. The lasting effects of the financial crisis helped to make the argument: Because of the UK economy's heavy reliance on banks to provide debt finance "*the minute the banks fell over, that flow of debt into the economy — you know — just basically dried up, and made our recovery from the crisis slow relative to, say, the US, which has a much more diverse debt market. […] The argument that the Government accepted was that, they needed to build a more resilient debt market, they needed to bring in new players, and opening up the ISA to essentially crowdfunding, peer-to-peer lending, was one way of building that other source of debt. And then there was a — sort of — supporting the real economy argument as well — that this was about, rather than the ISA being a subsidy which effectively — which it is — pulled money into the listed market, which was basically global corporates, opening up the ISA to peer-to-peer lending and crowdfunding would direct it into the real economy and into the SME business, so they would benefit from that subsidy as well*" (FM_UK01).

Interestingly, the fact that crowdfunding was being used to fund renewable generation did not form part of the UKFCA's argument: "*at that point actually green was going out of favour with Government. We were almost told not to mention green. [...] We didn't lever on green at all. It was very much about — you know — the real economy*" (FM_UK01).

[26] An Innovative Finance ISA (IFISA) allows you to make peer-to-peer (P2P) lending investments within a tax-free wrapper. This means that any interest earned within this wrapper will not be taxed and will not count towards your Personal Savings Allowance. https://www.lendingworks.co.uk/finance-guides/isa/what-is-an-innovative-finance-isa

[27] In corporate finance, a debenture is a medium- to long-term debt instrument used by large companies to borrow money, at a fixed rate of interest. The legal term "debenture" originally referred to a document that either creates a debt or acknowledges it, but in some countries the term is now used interchangeably with bond, loan stock or note.

Despite the difficulties reported by some platforms in finding borrowers for RE projects, June 2017 saw the launch of Mongoose Crowd by Mongoose Energy who billed it as the "first dedicated crowdfunding platform for community energy" (Mongoose Energy, 2017) offers the "funding of community energy bonds with tax-free [Innovative Finance] ISA wrappers" (Stoker, 2017a). They first offered up to £1.5m in bonds to refinance "a portfolio of solar projects near Bath and Bristol so community groups can develop other clean projects in the region" at the annual 'Community Energy Fortnight' running June 24 to 8 July 2017 — these included Bristol Energy Cooperative, which sought to use the money to finance a battery storage investment (Powerportal, 2017).

Ripple Energy was also founded in 2017, with an innovative model whereby members of the public could buy community shares in renewable energy cooperatives (thus becoming members of these) and, through switching to a special tariff with Ripple's supply partner Co-op Energy, directly benefit from the electricity these coops produced through reduced electricity bills (Gausden, 2020).

Offshore Wind investment and the increasing role of institutional investors

With the grace periods for the RO and lag between planning permission and commissioning, it took a couple of years for the cuts in support for onshore wind to show up in the amount of new capacity being commissioned, but there was a large drop in 2018 to below the 2012 level. RenewableUK attributed this largely to changes in government policy (Richard, 2019) . Onshore wind capacity installed in 2019 was lower still (see Figure 5). Meanwhile, both 2017 and 2019 saw all-time record highs in the amount of offshore wind installed, with all offshore capacity installed in 2019 accounted for by some phases of three giant wind farms supported by the new "Contracts for Difference" mechanism: the Beatrice extension, Hornsea One, and East Anglia One.

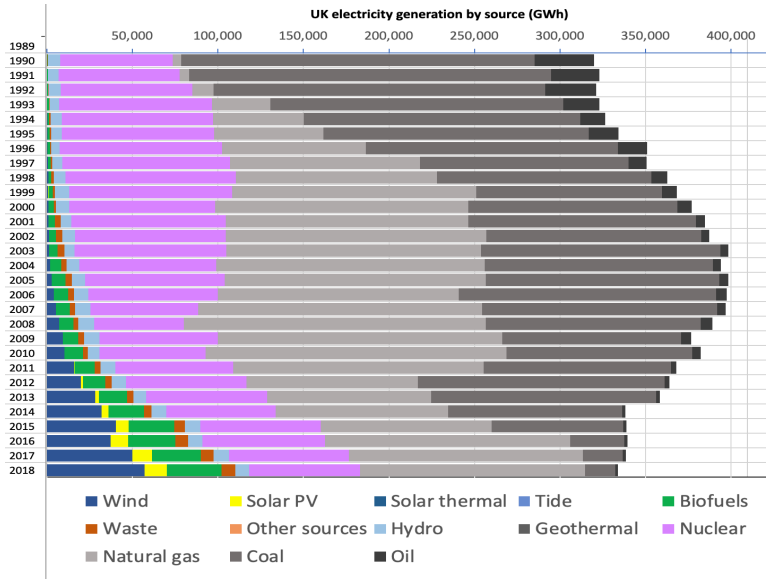


Figure 6: Electricity generated by source 1990-2018. Authors' plot of data from (IEA, 2020).

While some of the UK big six utilities and Scandinavian developers — especially DONG, which rebranded as Ørsted in 2017 — continued to play a leading role in offshore investment, institutional investors also played a big part after 2014. In February 2016, the operational 194 MW Lynn and Inner Dowsing offshore wind farm became the first in the UK to be completely owned by non-utility investors, namely the GIB Offshore Wind Fund and funds managed by BlackRock invest (Green Investment Bank, 2016). With its sixth acquisition in Jan 2017, the GIB Offshore Wind Fund passed its target of £1bn assets under management. By this point, investors in the fund included "five UK local authority pension funds with approximately 700,000 members" and a Swedish life insurance and pension company (Green Investment Bank, 2017). In August 2017, the Green Investment Bank was privatised. It was acquired for £2.3 billion by a consortium consisting of Macquarie Group (an Australian investment bank), the Macquarie European Infrastructure Fund 5, and the Universities Superannuation Scheme and rebranded the 'Green Investment Group' (Russell, 2017)

The GIB Offshore Wind Fund's acquisitions had all been stakes in operational wind farms (Green Investment Bank, 2017), but by 2018 private institutional investors had started to take substantial shares of projects still under construction. For example, Danish Pension funds PKA and PFA each acquired a 25% stake in the 658 MW Walney Extension from Ørsted in

November 2017 (Offshore Wind, 2017). In the September 2018, the month the Walney extension was inaugurated (Ørsted, 2020), Ørsted sold 50% of the partially built 1.2 GW Hornsea One project to infrastructure investment fund Global Infrastructure Partners (GIP), which borrowed from a number of other institutional investors to help finance the deal (Ørsted, 2018) . These included Aviva, which bought bonds for £400m (IPE, 2018).

Phase 3: 2017 – present: Subsidy Free Renewables?

When the Clay Hill solar farm was commissioned in Sept 2017 it was heralded in the national press as the first subsidy free solar farm in the UK. Combining 10 MW installed solar capacity with 6 MW of battery storage, the site was designed to generate revenue from the capacity markets and other services in addition to the sale of electricity (Stoker, 2017b). The second subsidy free solar farm was another hybrid (7.4 MW solar + 4.4 MW battery) project developed by West Sussex County Council at Westhampnett and commissioned in 2018 (Pratt, 2018). The extent to which either of these projects represented the emergence of a viable post-subsidy solar farm business model was disputed (Colville, 2018; Hitchcox, 2018) and it is notable that these were the only subsidy free solar farms commissioned in 2017 and 2018.

May 2018 saw the financial close of what was claimed to be the first subsidy free on-shore wind project, with a long-term corporate PPA had been established with "one of the UK's leading consumer goods brands." This project was 8.2 MW extension of the 18.25 MW Withernwick wind farm in Yorkshire (Richard, 2018).

In July 2018 the government announced that the FIT would be closed from April next year, and launched a consultation "to seek views on the future of support for small-scale, low carbon electricity generation" (BEIS, 2018; Shrestha, 2018).

'*Now, obviously, you've lost the Feed-in Tariff now. So the whole — the whole of the community — um — the community energy sector is — they — they've lost the way really. Because there's no more support mechanisms there for them, but — other than renewable heat and they can't get their head round heat. [...] So you've got a situation which is difficult because you can't enter into long term PPAs anymore other than through Contracts for Difference so, on the generation side, you're most probably not going to see as much built out other than by the big utilities, I would suggest — you're not going to see community stuff done.*' (FM_UK02)'

In connection to subsidy-free projects, an interviewee from an energy cooperative organisation emphasised the increased importance of having a private wire PPA: "*Subsidy-free projects - you need somebody who's going to buy all the electricity that you are generating. And you would be able to offer them, you would hope, a price which is less than the retail price of electricity, but more than wholesale. And that enables everybody to get some benefit from it*." (FM_UK05)

In a 2019 share offer the Schools' Energy Cooperative stated that they had installed their "first 'feed-in tariff free' site – at a school which did not qualify for the feed-in tariff as it already had an existing small solar array – and is in discussions with a number of other schools for such installations. Such installations either need to be particularly suitable or supported by grants. The Co-op has applied to the Greater London Authority for a further grant to support this post-feed-in tariff work and has made a preliminary application for a grant to support such work in Wiltshire and Swindon" (The Schools' Energy Co-operative, 2019, p. 10)

In December 2019, Warrington Borough Council took possession of a large solar farm-storage hybrid at York (34.7 MW solar + 27 MW storage) which had been constructed by Gridserve on their behalf, with plans to acquire another hybrid installation in Hull. Construction was funded by loans from Leapfrog Finance and Investec Bank (Gridserve, 2019; Lux Nova Partners, 2019) which the Council refinanced through PWLB borrowing (Marrs, 2018). According to a case study by the Energy Hub, "While no aspect of the project could be considered truly innovative on its own, it is the first time that this combination of high-production panels with batteries using modern commercial arrangements to sell power and low-cost public money to invest in assets has been seen. […] Warrington Solar is a completely commercial investment by the Council, which has not benefited from any grant funding or subsidies to develop." (Energy Hub, 2020, pp. 2–3). The Hull project is intended to cover all of the Council's own electricity needs through a sleeving arrangement, while a "hybrid power purchase and optimisation" agreement for the York site was signed with UK subsidiary of Statkraft (Grundy, 2020b).

Analysis of the DNO System Wide Resource Register published by Regen in Feb 2020, revealed a 7 GW pipeline of 'accepted-not-yet-connected' solar farm projects with more than half of this prospective capacity due to applications made in 2019 suggesting a growing pipeline of subsidy-free solar farms (Haynes, 2020).

On the 18th February 2020, it was reported that "the UK's first subsidy-free community energy ground-mount solar" farm was connected in Devon, England. This claim might be disputed, as the 7.3MW solar farm consisted of a 4.4MW part which was pre-accredited in the last days of the Feed-in-Tariff plus 2.9MW of subsidy free solar commissioned at a later date. The construction of the farm was financed by CORE renewables, to transfer to Yealm Community Energy and the landowners after commissioning (Lempriere, 2020; Turner, 2020).

From January 2020,[28] the Smart Export Guarantee (SEG) scheme has been brought in to replace the FIT scheme, to encourage investments in renewable technology and reduce carbon emissions for achieving net zero carbon emissions by 2050. The SEG is an obligation set by the government for licensed electricity suppliers to offer a tariff and make payment to small-scale low-carbon generators[29] in Great Britain for electricity exported to the National Grid, providing certain criteria are met. The

[28] The SEG came into force on 1 January 2020.

[29] The SEG is an opportunity for anyone who has installed one of the following technology types up to a capacity of 5MW, or up to 50kW for Micro-CHP: Solar photovoltaic (solar PV); Wind; Micro combined heat and power (CHP); Hydro; Anaerobic digestion (AD). https://www.ofgem.gov.uk/environmental-programmes/smart-export-guarantee-seg/about-smart-export-guarantee-seg

SEG scheme is available to owners of renewable energy generation systems including solar photovoltaic (solar PV) panels, wind, micro combined heat and power (CHP), hydro and anaerobic digestion (AD). The installation must have a meter capable of providing half-hourly export readings (a second-generation smart meter, to be able to provide the required readings) and it must be certified by the MCS or an equivalent scheme.[30]

Policies and policy making

One important cross-cutting theme addressed in SONNET are the socio-political aspects and conditions of social innovation in energy. In SONNET we are interested in identifying enabling or impeding factors and how they influence social innovation processes. This case study therefore aims for identifying important policy events and policy making processes (Wittmayer et al. 2020b, p. 43). This includes asking about broader political debates, the role of different government levels involved in policy making, particular policy strategies and instruments used and how they enable or impede the development of SIEs.

The most important policies and policy-making relevant to the SIE-field has been happening at the national level. This manifested, first of all, in subsidy schemes for renewable energy, e.g. for small-scale renewables. At launch the subsidies usually played an enabling role; their closure was an impeding factor for the renewable energy sector.

The most widely discussed subsidy is the Feed-in Tariff (FIT) scheme, launched in April 2010, which supported renewable generation installations of up to 5MW capacity by mandating that electricity suppliers provide an inflation indexed payment per kWh generated for a certain period (initially 25 years). In 2011/2012 there were unexpectedly early and deep cuts to the FIT rates. By the end of 2011 there was 1000 MW of solar PV capacity deployed in the UK — a ten-fold increase in one year. The cuts to the FIT slowed the growth of FIT-supported solar PV capacity, but it still proceeded to double over the next three years.

In 2010 a new potential revenue stream for Local Authorities opened up, when a law which had restricted the sale of electricity by Local Authorities to that generated by CHP (or through waste-to-power in Scotland) was amended to also allow them to sell electricity generated by a range of renewable sources including wind, solar, and biofuels. Moreover, they were free to register for the Feed-in Tariff.

The FIT created new opportunities for community energy projects, along with the government's 'Community Energy Strategy' 2014 which among other things announced a £10m Urban Community Energy Fund (offered grants and loans for pre-planning development work).

Other important policy changes during the last ten years include: the government's announcement in May 2014 of the closure of RO to solar PV installations over 5MW at the end of March 2015, two years earlier than planned; this led to

[30] This means that both the installer who fits the solar panels and the panels themselves have been approved by the microgeneration certification scheme (MCS) or a recognised equivalent like Flexi-Orb. https://www.solarguide.co.uk/smart-export-vs-feed-in-tariff#/

a rush of installations in the first quarter of 2015 as developers tried to meet the deadline. Further cuts to FIT in 2015 particularly affected community energy: many projects were put on hold or cancelled, as a result of the government policy announcements. A further blow for community energy specifically came in July 2016 the UCEF was shut down early.

The government's actions have clearly had an impact on the confidence of many investors; institutional investors were among those with concerns about the turn taken by the government's renewable energy policy.

The cuts in subsidies affected other types of investors as well. If sudden changes in government support reduced investor confidence across the board, they proved especially challenging to the crowdfunding platforms. The unscheduled cuts to the FIT in 2011 had already proved challenging, the changes c. 2015 meant looking at a broader range of projects to fund (from pure renewables to broader green infrastructure).

From January 2020, the Smart Export Guarantee scheme has been brought in to replace the FIT scheme, to encourage investments in renewable technology and reduce carbon emissions for achieving net zero carbon emissions by 2050, but it is difficult to judge its effect to date.

Another important policy that affected renewable energy generation was about tax relief structures/venture capital schemes and certain energy generation activities: in 2015 the government excluded subsidised generation of renewable energy by community energy organisations and activities from Enterprise Investment Scheme (EIS), Seed EIS (SEIS), and Venture Capital Trust (VCT), and from the future enlargement of Social Investment Tax Relief (SITR). These tax relief structures (EIS, VCT) played an important part in building the financial justification for investment in solar projects in the UK.

Crowdfunding and the Community Municipal Investment structure

In financing a further hybrid solar-storage installation in Cirencester, Warrington became the second UK Council to raise capital through a crowdfunded Community Municipal Investment. This offer (which raised £1 million) was launched in August 2020 (Warrington Borough Council, 2020), shortly after West Berkshire Council's pioneering CMI offer in July (West Berkshire Council, 2020) which funded primarily the installation of rooftop solar on Council-owned sites (Abundance, 2020c). Both of these offers were administered by Abundance, which co-created the CMI structure with researchers at Leeds University and other local authorities through the 'Financing for Society' project which launched in 2018. The CMI is essentially a bond issue in which the capital raised is earmarked for a specific purpose or project, but where the risk to the lender is not project risk,

but rather the risk that the issuing body is unable to pay. For UK Local Authorities, this risk — and hence the interest rates on the CMI — is relatively low (Davis and Cartwright, 2019).

Having seen borrowing for the construction of onshore wind and solar PV projects dry up following the policy changes around 2015, crowdfunding platforms are starting to see this market pick up again: "*Now we are probably looking at point where a lot of these original opportunities are starting to come back around and then — from our perspective — now that so much of the decarbonisation tech is — sort of — outside of regulation — it's subsidy free — it's really exciting because we can just do business without having to worry about the government changing policy overnight*" (FM_UK01).

Key changes in the SIE-field over time
One of the central research questions and empirical foci within the SONNET case studies is to understand the development of the SIE and its SIE-field over time (Hielscher et al. 2020). We therefore take a 'process perspective' and investigate change through focusing on the emergence of the field and the activities of SIE-actors shaping them (Wittmayer et al. 2020b, p. 33). We look at internal field events, key changes in the development of the SIE-field and its relationship with the 'outside' institutional environment, changing narratives and societal trends that enable or impede the development of the SIE and its SIE-field. One example of the role of societal trends can be seen in the increasing demand for corporate PPAs (and to some extent private wire PPAs) — the fact that increasing number of large companies have decided to make their own commitments in relation to climate and renewable energy has been cited as a major driver of demand for long term PPAs with renewable generators. This international trend can be seen in the growth of the RE100 group, founded in 2014, of companies committed to sourcing 100% of their electricity from renewable sources. As of December 2019, the group had 211 members whose collective electricity consumption was a little more than the nation of South Africa (which ranks 21st globally). The importance of having a private wire PPA has recently increased in connection to subsidy-free renewable energy projects. The emergence of crowdfunding platforms, a mechanism for raising capital from large number of small investors, that started providing finance for renewable energy generation projects was another important development in the SIE-field. In 2011, a crowdfunding start-up, Abundance Generation, became the first platform to receive authorisation from the FSA; it was also the first platform in the UK focused on raising capital for renewable generation projects. This was followed by other platforms - the Trillion Fund, Gen Community, Ethex, and the UK Crowd Funding Association (UKCFA) to represent this young industry (founded 2013). Later, sudden changes in government support (FIT, RO) reduced investor confidence across the board, and proved especially challenging to the crowdfunding platforms. Despite the difficulties reported by some platforms in finding borrowers for renewable energy projects, June 2017 saw the launch of Mongoose Crowd by Mongoose Energy who billed it as the "first dedicated crowdfunding platform for community

energy". The debt-based crowdfunding sector as a whole made an important gain in April 2016 with the introduction of the 'Innovative Finance Individual Savings Account' for UK savers, to supplement the popular cash ISA and stocks and shares ISA. Recently crowdfunding platforms have started to see the market picking up again.

Over the period covered in this report, the government subsidy policy for renewable energy has changed dramatically. The cuts to support for renewable generation was a 'shock' — if not a complete surprise — for the actors active in relation to renewable energy. While in the case of onshore wind this was in part the result of the new Conservative party making good on a manifesto promise, which in turn reflected — in part — the objections of a vocal part of their political base to onshore wind — it was also in large part a response to the previously established LCF framework which, ironically, seems to have been designed to maintain confidence among investors in the political sustainability of the subsidy framework. For some crowdfunding platforms this meant diversifying away from wind and solar PV. For community renewables it meant a serious slow-down in the formation of new groups and a move towards buying up existing operational renewable projects over constructing new ones. In the case of corporate and private wire PPAs, it was been cited as a possible reason for increased activity.

Municipal energy finance is concerned with local governments taking a greater role in the provision of energy services, including ownership of electricity generation assets. Such ownership was common in the UK in the early twentieth century, but was essentially eliminated in the post-war nationalisation and centralisation of the electricity supply industry. During the period covered in this study one could see the growing role of LAs in financing renewable energy projects. For example, some LAs supported the community energy sector. They can have an important the role in de-risking renewable energy projects through hosting a project on a council owned land or building. This is no less of importance than a financial contribution as one of the key barriers to any energy developer post-subsidy, who is relying on a corporate PPA model, is having a long-term lease agreement which matches the necessary terms of the PPA i.e. normally 20 years+. This can be seen in areas where community energy is most active e.g. Bristol, Bath, Plymouth, that the council has granted a 20 year sub-lease or an exclusivity agreement with the community groups. LAs also started performing as institutional investors for renewable energy projects. One of the latest mechanisms used by some LAs is a crowdfunded Community Municipal Investment, a new model for citizen led investment in LAs. For Local Authority energy teams, the declaration of a 'climate emergency' made by many UK local authorities in 2019 has helped them in making their case for municipal energy projects.

6 Summary, synthesis and conclusions

6.1 How do SIEs and SIE-fields emerge, develop and institutionalise over time?

In this report we covered the development of the SIE-field 'Financial and subsidy mechanisms for renewable energy' over the last 10 years, with some historical background going back to privatisation of the electricity supply industry in 1989 up to the financial crisis of 2008. The pre-history the SIE-field is interesting as some events and developments relevant to the SIE-field under study happened during that period setting the context in which financial and subsidy mechanisms have been developing during 2010-2020: the NFFO (the UK's first price support policy for renewable generation) replaced by the Renewables Obligation in 2002, the start of co-operative ownership of wind power in the UK, the establishment of Triodos Bank's UK subsidiary in 1994 (aimed to enable ordinary people to invest directly into renewable energy projects), the new government who continued the liberalisation of the electricity markets, the introduction of the Climate Change Levy in 2001, institutional investor interest in opportunities associated with climate change, the emergence of corporate PPAs, the Energy Bill 2008.

At the start of Phase 1 (2010-2015 – 'Greenest government ever') one of the key subsidy mechanisms was launched – the Feed-in Tariff, with the consultations, reviews and subsequent cuts of the scheme in the following years. The trend for community energy was very much influenced by the FIT scheme and the use of community shares to raise equity finance and participation for renewable energy projects (there was considerable growth in community share offers). The coalition government had made some commitment to support community energy (e.g. RCEF; a "community energy revolution in the UK" pledge, followed by Community Energy Strategy 2014 and launching UCEF which, like the RCEF, offered grants and loans for pre-planning development work), although a change in the regulation of Cooperatives in 2014 was particularly disturbing to some existing energy cooperatives. After Community Energy strategy 2014 was published, the government was encouraging local authorities to support community energy projects, and to be more active in energy provisions. This led to the increasing role for LAs in financing renewable energy projects. Institutional investors also played a big part after 2014, e.g. UK local authority pension funds, insurance and pension companies.

There are other examples when the government performed as an institutional entrepreneur in the SIE-field creating new institutions and changing existing ones during Phase 1. For example, a public Green Investment Bank (GIB) was launched in 2012 (priority sectors were offshore wind, waste recycling, waste-to-energy, and non-domestic energy efficiency with at least 80% of investment targeted towards them). In 2014 the GIB made major equity investments totalling £461m in two offshore wind projects under construction; in April 2015 the GIB announced that it had reached first close on its new Offshore Wind Fund dedicated to investments in offshore wind power generation which was set up to attract institutional investors who might not have the skills to otherwise invest in offshore wind.

Along with setting up the GIB, the coalition government had been developing a programme of Electricity Market Reform (EMR) which culminated in December 2013 with the assent of the Energy Act 2013. Along with a carbon price floor and emissions standards this introduced a Capacity Market and Contracts for Difference (CfD). CfDs were intended to replace the Renewables Obligation as the main state support for deployment of large scale renewable and nuclear generation. Attracting new kinds of investors to energy generation infrastructure, including institutional investors, was a key goal in the formulation of this policy.

While the government worked to channel new investment into renewable energy with the GIB and EMR, a quite different market for investment in renewables was being developed with the emergence of crowdfunding platforms – a mechanism for raising capital from large number of small investors. In 2011, a crowdfunding start-up, Abundance Generation, became the first platform to receive authorisation from the FSA; it was also the first platform in the UK focused on raising capital for renewable generation projects. This was followed by other platforms – the Trillion Fund, Gen Community, Ethex; the UK Crowd Funding Association was founded in 2013 to represent this young industry. Later, sudden changes in government support (FIT, RO) reduced investor confidence across the board, and proved especially challenging to the crowdfunding platforms.

Crowdfunding platforms have been used by community energy projects, although the two are clearly distinct developments in regard to financing renewable energy; there are actors in both fields with a leading interest in using financing relationships (of equity or debt) as a means of engaging the public with a climate / renewable energy agenda.

At the very start of Phase 1 a new potential revenue stream for local authorities opened up in 2010, when they were allowed to sell electricity generated by a range of renewable sources including wind, solar, and biofuels; they were free to register for the Feed-in Tariff. Local governments started taking a greater role in the provision of energy services, including ownership of electricity generation assets and in financing renewable energy projects. For example, some LAs supported the community energy sector; they also started performing as institutional investors for renewable energy projects. In 2014 the 'APSE Energy' service was launched as collaboration of councils with a ‘mission’ to enable and facilitate the municipalisation of energy services working together to have great influence and deliver economies of scale in green energy to promote economic growth and combat fuel poverty.

The Phase 2 (2015-2019): Getting “rid of all the green crap” – this does crudely describe the policies the government would adopt under Cameron’s leadership over the next few years, particularly after the Coalition was replaced by a Conservative government in May 2015. A series of policy changes significantly cut subsidies for the development of new onshore wind and solar PV installations at all scales. This resulted in expressions of concern, objections, and push-back from SIE-field actors ranging from institutional investors to community energy groups, but there were differences in emphasis in the responses of representatives of different groups reflecting their different interests, and differences in the arguments they used to make their case, reflecting their different capacities. While the policy changes provoked resistance from a wide range of actors,

their efforts had limited impact on policy, and there was a marked drop in the deployment of onshore wind and solar, while offshore wind capacity continued to grow. Institutional investors were among those with concerns about the turn taken by the government's renewable energy policy. Demand for Corporate PPAs increased, which helped make the business case for some new onshore developments. Meanwhile, the costs of onshore wind and solar PV continued to fall, as did the cost of battery storage technology leading to the emergence of hybrid solar/storage sites and the first unsubsidised solar PV and wind sites.

More institutional work was conducted during this period by SIE-field actors establishing new mechanisms, e.g. to provide bridge finance to help communities acquire renewable projects. When the facility trading as Leapfrog Finance (launched in 2015) started, there was nobody offering the same facilities; it stimulated other similar organisations to look at this opportunity (e.g. Thrive Renewables, Power to Change). Despite the difficulties reported by some platforms in finding borrowers for renewable energy projects, June 2017 saw the launch of Mongoose Crowd by Mongoose Energy who billed it as the 'first dedicated crowdfunding platform for community energy'. The debt-based crowdfunding sector as a whole made an important gain in April 2016 with the introduction of the 'Innovative Finance Individual Savings Account' for UK savers. Another innovative model was suggested by Ripple Energy (founded in 2017) in collaboration with Co-op Energy, whereby members of renewable energy coop would directly benefit from the electricity these coops produced through reduced electricity bills.

During the latest phase of the SIE-field development (Phase 3: 2017 – present: Subsidy Free Renewables?) the projects that were announced as subsidy free started happening (mainly solar). In July 2018 the government announced that the FIT would be closed from April 2019. In connection to subsidy-free projects, the importance of having a private wire PPA increased. From January 2020 the Smart Export Guarantee scheme has been brought in to replace the FIT scheme, to encourage investments in renewable technology and reduce carbon emissions for achieving net zero carbon emissions by 2050. One of the latest mechanisms used by some LAs is a crowdfunded Community Municipal Investment, a new model for citizen led investment in LAs. The declaration of a 'climate emergency' made by many UK local authorities in 2019 has helped Local Authority energy teams in making their case for municipal energy projects.

The overview of the SIE-field development shows that this SIE-field is complex and constituted by a number of sub-fields and institutions. There is a diversity of SIE-field actors and other actors, connected with different institutional sub-fields and different financial and subsidy mechanisms in the UK. The role of non-traditional actors in renewable energy finance was becoming more prominent at certain stages of the SIE-field development, in response to some policy changes or changes in the outside institutional environment; this includes the increasing role for local authorities in financing renewable energy projects, institutional investors interested in opportunities associated with climate change, and small players e.g. citizens usually investing through share offers or crowdfunding.

One of the most important types of institutional work are the various forms of advocacy, lobbying, and pressure deployed by SIE-field actors in attempts to shape the positions adopted by national government and regulatory bodies. We saw this during this period e.g. in the lobbying for the FIT, and then the efforts to make provision for small and medium scale independent generators when the electricity market reform policy was being formulated.

6.2 How do SIE-field-actors and other field-actors interact with the 'outside' institutional environment and thereby co-shape the SIE-field over time?

The SIE-field is nested within an 'outside' institutional environment constituted by formal and informal institutions that shape the activities of actors within the SIE-field. Broadly speaking, the outside institutional environment for the SIE-field is constituted by the following: foundational institutions of the market economy in the UK and abroad, such as private property; the regulatory institutions of UK banking and financial markets; the UK political system and regulatory institutions such as Ofgem; the institutions of the UK electricity markets; the EU, whose influence can be seen in state-aid rules and directives on renewable energy targets. Importantly, the evolving SIE-field is influenced by developments in both, the energy system and financial markets; they consist of a wide range of institutionalised rules, norms and beliefs, and have undergone some significant changes over the past decade. For example, the energy system in the UK is characterised by the need to decarbonise the energy system as a result of climate change, the growing deployment of renewable energy technologies (solar and wind), and significant changes in the policy context that often has been framing the changes in the energy sector.

It is important to note that the SIE-field 'Financial and subsidy mechanisms for renewable energy' is complex and constituted by a number of sub-fields and institutions concerned with changing social relations in connection to financing of wind and solar, that can be part of other broad institutional fields, i.e.:
- 'municipal energy' (concerned with local governments taking a greater role in the provision of energy services, including ownership of electricity generation assets);
- 'community energy' (which is about direct citizen participation and control of energy activities including investment in electricity generation assets);
- 'investment-based crowdfunding' ('alternative' finance for renewable energy projects – online platforms to offer equity and/or debt based investments to the public at large);
- 'institutional investment in green infrastructure' (e.g. pension funds, insurance companies);
- 'corporate' and 'private wire' PPAs (contractual arrangements whereby an organisation buys electricity for its own use more or less directly from specific generators).

These fields are interconnected and can overlap creating 'space' for social innovation and changing social relations around energy. For example, while crowdfunding platforms have been used by community energy projects, the two are clearly distinct developments in regard to financing renewable energy. The majority of investments on Abundance (for example)

have not been community projects, even if they have community benefits. However, one finds actors in both fields with a leading interest in using financing relationships (of equity or debt) as a means of engaging the public with a climate/renewable energy agenda.

The study demonstrates that the financial mechanisms and subsidies for renewable energy in the UK are largely framed by policy and regulation in the field. This means that the actors' ability to act is limited, i.e. power is more constrained and circumscribed. The most important policies and policy-making relevant to the SIE-field has been happening at the national level. This manifested, first of all, in subsidy schemes for renewable energy. At launch the subsidies usually played an enabling role; their closure was an impeding factor for the renewable energy sector.

The societal trends can also perform as enabling or impeding factors. One example of the role of societal trends can be seen in the increasing demand for corporate PPAs (and to some extent private wire PPAs) — the fact that increasing number of large companies have decided to make their own commitments in relation to climate and renewable energy has been cited as a major driver of demand for long term PPAs with renewable generators. This international trend can be seen in the growth of the RE100 group, founded in 2014, of companies committed to sourcing 100% of their electricity from renewable sources. The importance of having a private wire PPA has recently increased in connection to subsidy-free renewable energy projects.

The study illustrates how SIE can influence and shape the outside institutional environment. For example, the new financial mechanisms were changing normative and cognitive institutions around renewable energy generation. Creating an investment-based crowdfunding platform to finance renewable generation projects allowed engaging more people directly in the business of wind and decarbonisation that would build understanding and a greater pool of advocates for the technologies involved. The crowdfunding field also illustrates how wider developments can enable institutional work: e.g. Abundance faced a tough time getting FSA authorisation when they were starting up, but a few years later the (successor) FCA was very receptive to the idea of creating an IFISA in which crowdfunded debentures could be included. While the greater maturity of the crowdfunding industry was likely part of the reason for this, the government and the FCA were keen to diversify the UK's provision of debt financing in the wake of the financial projects — particularly for projects in the 'real' economy.

6.3 What are the enabling and impeding factors for SIE-field-actors and other field-actors to conduct institutional work and change the 'outside' institutional environment?

As mentioned earlier, the policy context can play both enabling and impeding roles, and this case study aimed for identifying important policy events and policy making processes that have had such effect on the SIE-field and its actors. Government

subsidies and some other policy decisions e.g. the announced support for community energy at certain point can be considered as enabling factors for the SIE-field.

The most widely discussed subsidy is the Feed-in Tariff scheme launched in April 2010, which supported renewable generation installations of up to 5MW capacity by mandating that electricity suppliers provide an inflation indexed payment per kWh generated for a certain period (initially 25 years). While the FIT made new renewable energy projects viable for community groups, and community shares made equity raises simpler, groups still faced the difficulty of funding the risky pre-FID stage of projects, especially where planning permission was required. While many of these risks would also be faced by utilities and other commercial developers, community groups were generally not in the position to spread these risks across several prospects as a commercial developer might do. In 2009-10 the Scottish government introduced its Community and Renewable Energy Scheme (CARES) to support these risky stages of community energy schemes. The Welsh Government introduced a similar scheme — Ynni'r Fro — in 2010, but no equivalent was introduced in England at that time. In November 2011, it was announced in the Treasury's autumn statement that a £15m RCEF would be established which, like CARES, would provide grants and loans to help fund the pre-FID development of rural community energy projects.

In 2010 a new potential revenue stream for Local Authorities opened up, when a law which had restricted the sale of electricity by Local Authorities to that generated by CHP (or through waste-to-power in Scotland) was amended to also allow them to sell electricity generated by a range of renewable sources including wind, solar, and biofuels. Moreover, they were free to register for the Feed-in Tariff. The FIT created new opportunities for community energy projects, along with the government's 'Community Energy Strategy' 2014 and UCEF which offered grants and loans for pre-planning development work.

The important changes to the support schemes for renewables that significantly affected the field include: the government's announcement in May 2014 of the closure of RO to solar PV installations over 5MW at the end of March 2015, two years earlier than planned; this led to a rush of installations in the first quarter of 2015 as developers tried to meet the deadline. Further cuts to FIT in 2015 particularly affected community energy: many projects were put on hold or cancelled, as a result of the government policy announcements. A further blow for community energy specifically came in July 2016 the UCEF was shut down early.

As one can see, over the period covered in this report, the government subsidy policy for renewable energy has changed dramatically. The cuts to support for renewable generation was a 'shock' for the actors active in relation to renewable energy. For example, the cuts to the FIT slowed the growth of FIT-supported solar PV capacity, but it still proceeded to double over the next three years. While in the case of onshore wind this was in part the result of the new Conservative party making good on a manifesto promise, which in turn reflected, in part, the objections of a vocal part of their political base to onshore wind — it was also in large part a response to the previously established LCF framework which, ironically, seems to have been designed to maintain confidence among investors in the political sustainability of the subsidy framework. For some

crowdfunding platforms this meant diversifying away from wind and solar PV. For community renewables it meant a serious slow-down in the formation of new groups and a move towards buying up existing operational renewable projects over constructing new ones. In the case of corporate and private wire PPAs, it was been cited as a possible reason for increased activity.

Another important policy that affected renewable energy generation was about tax relief structures/venture capital schemes and certain energy generation activities: in 2015 the government excluded subsidised generation of renewable energy by community energy organisations and activities from Enterprise Investment Scheme (EIS), Seed EIS (SEIS), and Venture Capital Trust (VCT), and from the future enlargement of Social Investment Tax Relief (SITR). These tax relief structures (EIS, VCT) played an important part in building the financial justification for investment in solar projects in the UK.

7 Recommendations for our city partners, national and EU policy makers and SIE practitioners

SONNET city partners /LAs:

- Local authorities should work more actively with other actors investing in renewable energy generation, including community energy projects, particularly at the local level. They should also explore options to develop renewable energy projects in partnership/shared ownership, providing administration support and expert advice.
- Local authorities should explore Power Purchase Agreement options with local renewable energy generators and use PPAs for supporting post-subsidy renewable energy projects.
- The wider use of novel mechanisms e.g. a crowdfunded Community Municipal Investment for citizen led investments could help fund renewable energy projects and other energy-related initiatives developed/delivered by local authorities.

National policy makers:

- The government should consider including renewable energy projects owned and managed by community groups as an eligible activity for Social Investment Tax Relief (SITR), which helps de-risk and encourage social investment. Community energy's eligibility for SITR was removed in 2015. This tax relief would be particularly valuable now, at the time of economic challenge and recovery. (This proposition is supported by the coalition that includes Community Energy England, Community Energy Wales and Community Energy Scotland lobbying for the extension of SITR with a view for it to be expanded for community energy.[31])
- The expansion of Rural Community Energy Fund to include urban areas would be another desired step to support renewable energy projects. The Rural Community Energy Fund exposes the lack of provision for equivalent projects in urban areas where many community energy groups are located (Urban Community Energy Fund which offered grants and loans for pre-planning development work was shut down in 2016).
- The electricity market reform and development of local electricity exchange can create additional opportunities for renewable energy (e.g. through flexibility markets). The government needs to make them accessible for new entrants and community energy groups.

SIE-field-actors:

[31] https://communityenergyengland.org/files/document/334/1563465137_SocialInvestmentTaxRelief_CEECESresponse.pdf

- SIE-field actors should continue experimenting with and adopting novel innovative mechanisms for financing renewable energy projects, as well as continue with lobbying activities providing evidence on social benefits, barriers and opportunities, sharing learning in SIE-field.

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9 Annex 1

Methodology

In the UK the research started with exploring 'Financial mechanisms for renewable energy' as the foci of the case study. After some preliminary research, due to high volume of materials related to financial and subsidy mechanisms for renewable energy in the UK, the decision was made to limit the scope of the study by focusing on the most established renewable

energy technologies, i.e. wind and solar PV. Both wind and solar PV are relatively new renewables, and during the period covered in this report the field and the institutional context have been through lots of change including social transformations. Choosing the foci of the study allowed us to explore in more detail the evolution of relevant financial and subsidy mechanisms and their effect on social innovation surrounding these technologies over time. We also pick these technologies (wind and solar) because they have a number of technical similarities compared with other sustainable energy sources (which helps keep the story of their financing manageable), but also some notable differences of relevance to social relations involved.

As the SIE-field has a relatively long history that goes beyond 10 year period, the historical account of the SIE-field's development started with the 'pre-history' noting developments in the financing of renewable energy generation from the privatisation of the electricity supply industry in 1989 up to the financial crisis of 2008, in order to establish the context for what follows, including a number of significant actors and financial mechanisms.

There are certain limitations to this case study due to a limited number of interviewees and types of actors they represent, documents and online resources that could be accessed and reviewed, and the timeframe for conducting the research. Overall, eight in-depth interviews were conducted during the period October-December 2020. Pre-existing contacts were used to recruit first few interviewees. A snowballing technique allowed to expand the contact base; online search also helped identify relevant organisations/people who presumably represent SIE-field actors. A diverse range of interviewees include representatives of community energy sector, financial institutions and academia. First few interviews were rather exploratory and helped make decisions about the boundaries of the SIE-field and the focus of the study. Two SIE-initiatives are discussed in this report in more detail – Abundance, a debt-based crowdfunding platform, and Leapfrog Finance, a provider of finance to community energy projects.

The opportunities to conduct face-to-face observations were limited due to Covid-19 restrictions. Two online events/webinars organised by intermediary organisations were attended.

The review covered different types of documents: research papers, projects reports, policy documents, companies' reports, press/media, news releases. For the document review, a search was conducted online. Some documents were shared or pointed to by the interviewees. Much of the historical narrative of the SIE-field has derived from studying and analysing the numerous websites. The academic literature search was also conducted online using e.g. GoogleScholar and ScienceDirect. Some of the key documents are listed in the table below.

Documents reviewed

Author name	Document name	Document type	Year	Link to reference
Davis, M. & Cartwright, L.	FINANCING FOR SOCIETY Assessing the Suitability of Crowdfunding for the Public Sector	Local Authority Guide	2019	https://baumaninstitute.leeds.ac.uk/wp-content/uploads/sites/134/2019/04/FinancingForSociety-LocalAuthorityGuide.pdf
Chapman, A.	Community Energy in the UK	Green House Think Tank report	2018	https://gef.eu/wp-content/uploads/2018/11/GEF-community-energy-report-final-low-res.pdf
Ofgem	Feed-in Tariff (FIT): Annual Report 2011-12.	Report	2012	https://www.ofgem.gov.uk/ofgem-publications/58860/fits-annual-report-2011-2012-pdf
DECC	Government Response to Consultation on Comprehensive Review Phase 2B: Tariffs for non-PV technologies and scheme administration issues.	Response to consultation	2012	https://www.gov.uk/government/consultations/tariffs-for-non-pv-technologies-comprehensive-review-phase-2b
BEIS	Feed-In Tariffs Scheme	Policy	2018	https://www.gov.uk/government/consultations/feed-in-tariffs-scheme
Cornwall Energy	The Energy Bill and its impact on Community Energy — A report for Cooperatives UK.	Report	2012	

List of interviewees

Code interview	Empirical description of case	Type of actor according to SONNET	Date of interview	Duration of interview	Interviewer
FM_UK01	Crowd-funding Platform (Abundance)	SIE-field actor	01.12.20	1:00:00	William Matthews
FM_UK02	Provider of Bridge Finance for Community Energy (Leapfrog Finance)	SIE-field actor	18.11.20	1:24:00	William Matthews
FM_UK03	Academic working on alternative finance	SIE-field actor	1.12.20	1:00:00	William Matthews
FM_UK04	Local Authority	SIE-field actor	23.11.20	1:30:00	William Matthews
FM_UK05	Energy Cooperatives Organisation	SIE-field actor	20.11.20	1:23:00	William Matthews
FM_UK06	Energy Finance Strategist	SIE-field actor	7.12.20	1:00:00	William Matthews
FM_UK07	Energy Saving Trust	SIE-field actor	8.12.20	1:27:34	Marfuga Iskandarova
FM_UK08	Community Energy England	Other SIE-field actor	20.10.20	55:00	Marfuga Iskandarova

List of meetings and events attended

Event name	Event organiser (name or description)	Type of event	Date of event	Who attended
Financing climate action with positive social impact: banking a just transition	LSE, University of Leeds	Webinar	21 May 2020	Sabine Hielscher
Sussex Innovation Forum: Finance Innovation for Cross-Sector and Net Zero Projects	University of Sussex	Forum/dialogue session	20.11.20	Marfuga Iskandarova

10 Annex 2

Detailed SIE-field timeline

DATE	TYPE OF EVENT	DESCRIPTION OF EVENT	SOURCE e.g. document, interviewee (D, I)
2002	Policy/subsidy	Renewables Obligation is introduced, with the target proportion of electricity generated by renewable sources rising to 20% by 2020	D

2007-2008	Industry	Financial crisis	D
2008	Policy	Energy Act 2008 made provision in relation to electricity generated from renewable sources; provision relating to electricity transmission; provision about payments to small-scale generators of low-carbon electricity, among others	D
2008	Policy	Climate Change Act 2008 introduces statutory requirement to reduce emissions to 20% of 1990 level by 2050	D
2009	Policy	EU Renewable Energy Directive binds UK to a target that renewable energy sources should account for 15% of final energy consumption by 2020 (around 30% of electricity from renewable sources)	D
2010	Policy	Coalition Government	D
2010	Policy/subsidy	Feed in Tariff (FiT) took effect in April 2010 The FIT scheme was available for installations up to a capacity of 5MW (or 2kW for CHP): Solar photovoltaic (solar PV), Wind, Micro combined heat and power (CHP), Hydro, Anaerobic digestion (AD).	I, D
2011	Policy/subsidy	FiT first big cuts	I, D
2011	Industry	Abundance FSA authorisation Crowdfunding on the rise	I, D
2013	Industry	Green Investment Bank	D
2013	Industry	First 'Yieldcos' in UK	D, I
2013	Policy/funding	Rural Community Energy Fund was launched in June 2013 with funding through the Department for Environment, Food and Rural Affairs (Defra), and the Department of Energy and Climate Change	D
2014	Policy/subsidy	The Contracts for Difference (CfD) scheme is the government's main mechanism for supporting low-carbon electricity generation.	D
2014	Policy/funding	Urban Community Energy Fund was launched in November 2014 with government funding through DECC, and is administered by CSE and Pure Leapfrog; set up to complement RCEF ensuring that every	D

		community in England can access support for renewable energy projects.	
2014	Policy	In 2014, the UK government published the first ever Community Energy Strategy, which presented a decentralised vision of energy transitions in which communities would play a leading role; DECC Community Energy Unit was set up.	I, D
2014	Industry	APSE Energy is launched	D
2015	Policy	Conservative government elected, replacing the Coalition	D
2015	Industry	Trillion funds ceases offers	D
2016	Industry	IFISA introduced	I, D
2016	Industry	Growth in corporate PPAs (more of a trend than an event)	I, D
2016	Policy/subsidy	CfD closed to PV and offshore wind	D
2016	Policy/subsidy	ROCs closed to all PV and onshore wind	D
2016	Policy/subsidy	FiT big cuts	I, D
2017	Industry	Ripple founded	D
2017	Industry	First claims of “subsidy free” solar: Clay Hill Solar/Storage Farm	D
2017	Policy/funding	The BEIS Local Energy programme has been set-up to support the development of local energy projects. The BEIS Local Energy Team was established to support LEPs and local authorities in England to play a leading role in delivering low-carbon economic growth. As part of the Local Energy Programme £1.6 million allocated in 2017 to support LEPs across England to develop an energy strategy for the local area; launched Local Energy Hubs.	D
2019	Policy/subsidy	FiT has seen significant reductions since launch. The scheme was closed to new applicants in April 2019	I, D
2019	Policy	UK becomes first major economy to pass net zero emissions law. New target will require the UK to bring all greenhouse gas emissions to net	D

		zero by 2050. Meeting this target will require significant decarbonisation and an increased demand upon the electricity network.	
2020	Policy	Smart Export Guarantee, a replacement of FiT scheme, started in Jan 2020 to encourage investments in renewable technology and reduce carbon emissions for achieving net zero carbon emissions by 2050.	D
2020	Industry	First Community Municipal Investment offer	D
2020	Policy	Government's Build Back Greener Plan (November 2020)	D