

8 Community Energy Subsystem: Findings from Data Analysis

8.1 Factors Affecting Bristol's Community Energy subsystem

Drawing on the interview data analysis, we have formulated the causal model of Bristol's community energy system, as shown in Figure 12¹⁴, and briefly explained below.



Figure 12: Causal model of Bristol's Community Energy Subsystem (factors local and specific to Bristol are presented in purple).

Community Energy groups **are engaged in a wide variety of energy projects**: from wind turbine and solar PV array installations (e.g. Bristol Energy Co-operative, Ambition Laurence Weston) to building and installing home retrofit for energy efficiency (e.g. ReWork, Owen Square Community Group) and offering advice for fuel poverty alleviation (BEN). Consequently, the set of

¹⁴This model can be simulated through this url: https://energysystems.blogs.bristol.ac.uk/2021/03/08/ community-energy/





occupations and skills relevant to the success of these groups is also very broad, in that it ranges from builders and project planners to legal experts and entrepreneurs.

At the same time, there is "quite a lot of knowledge lying around from the renewables boom" and "people that had their own businesses" (P4), who can all join community energy projects. Thus, many of the **skills** needed for such projects can often be **found within the communities themselves** (as in the positive link between Local Skills and Community Energy Projects in Fig 12).

Nevertheless, community energy groups would always have to invest in some skills. When such needs arise, many smaller community groups face skills gaps in their daily activities, despite the skills being available on the market. This is because the **smaller groups do not have the finances available for procuring such skills**. As stated by P19: "we just cannot provide the few thousand pounds that it would cost". Skills noted as available yet expensive within Bristol's context are:

- · Consultancy support (focused on tender/project proposal writing);
- · Legal advice;
- · Neighbourhood planning with architects and city planners;
- · Marketing support.

In Bristol, some of these services are made available to community groups in a limited supply on pro-bono (e.g. legal support) or subsidised (e.g. CSE consultancy) basis. However, these are insufficient to meet the need and therefore, the availability of such services is lacking, and negatively impacting on community energy projects.

Furthermore, community energy projects face **continuous competition from larger, better funded developers** in a variety of areas. For instance, larger developers are able to offer better terms and conditions to landowners for renting land for energy generation installations, where they get better terms for financing from investors and are perceived to be more credible service providers to customers.

Unstable policy directions taken by central government with regards to renewables and community energy sectors have a negative effect on local skills as well as on the success of community energy scheme. For instance, many skilled solar PV and onshore wind turbine installers are currently out of work, as the cut in tariffs has resulted in reduced demand for their skills; wind turbine production businesses have also moved out of the UK. Growth of many community energy projects that focused around the installation of community generation assets for income from the Feed-in Tariffs (FiT) scheme has also stalled.

However, the community energy groups in Bristol are now looking for ways of utilising their skills to develop new local partnerships and **new business models** which, in turn, lead to further skills development within the Bristol community (e.g. the CHEESE project partnering with the city council to deliver energy efficiency audits for local residents and train local unemployed young people to work as energy surveyors for their communities). (This is marked as *Community development loop* in Fig 12.)

Of particular note in the case of Bristol city is the role that the **trusted community intermediary organisations** (such as Bristol Energy Network and Centre for Sustainable Energy) play. They nurture the community energy groups and projects by bringing together like-minded people at various networking events, which sparks collaboration and new project ideas, providing workshops



and training sessions, information sharing, advice and coordination services. In short, they foster the development of the energy communities within the city of Bristol. (This is marked as *Community building loop* in Fig 12.)

Finally, we must note the **impact of local policy**, (as exercised by Bristol City Council and WECA) upon the local community energy scene. The city council (from setting up its dedicated Energy Team in 2010 to having declared a climate emergency in 2018) takes a very supportive stance towards community energy groups (e.g. making land available for community energy such as ALW wind turbine development, entering into long-term PPA agreements with energy community groups, etc.). This support de-risks investment into community energy projects and allows them to develop, as well as leads to more informed and engaged citizens within the city. (This is marked as *Local policy loop* in Fig 12.)

8.2 What skills are needed for the Community Energy Subsystem now and in the future?

The skills deemed relevant by our interviewees to each of the areas of Bristol's Community Energy ecosystem are summarised in Figure 13 and are detailed below, while also being aggregated into generic types.

8.2.1 Engineering Skills for Community Energy subsystem

The majority of community energy (generation) projects have at least one engineer in them. This is not surprising as such groups are set up for energy generation and therefore try to find a suitably skilled technical lead. The engineering skills in the projects vary, including, for example:

- Software engineering;
- · Mechanical engineering;
- Power Systems engineering;
- Network Engineering, etc.;

However, it is also not essential for all of these skills to be always fully integrated into the community energy group. Often these (professionalised) skills would be procured by the community groups as and when needed. Nevertheless, one skill which is often mentioned as desirable for the group to have is that of systems integration, so that the group has a clear idea of how their project would link up with the wider energy system:

• Systems Integration skills are lacking within the systems engineering area: "projects are getting more complex. It's not just one stand-alone technology ...how it all integrates and works together, and then how it integrates with the grid. So you've got a multifaceted, dynamic project. And there's not many people ...with the specialism to cover all of that." (P4).

8.2.2 Energy Domain Skills for Community Energy subsystem

 Energy Audit skills are essential where community undertakes a retrofit project, "we've got surveyors on board, energy surveyors" (P7). It is also noted that many current energy surveyors do not have up-to-date training, e.g. "my kids were saying to the guy doing the EPC,





Figure 13: Skills in the Causal model of Bristol's Community Energy Subsystem.



you've got to look for the draughts. And they were saying, draughts are nothing to do with energy"(P3).

- *Delivering Advice on Energy Efficiency* is one of the key activities of many community energy groups. However, they also need " really serious investment in our skillset" (P19) to be able to deliver better diagnostics (e.g., for thermal efficiency of homes) and advice.
- Understanding of the localisation of Renewable Technologies: knowledge of renewable technology in general can be sufficiently present within community energy groups, although the localisation perspective is not understood very well. As stated by P19: community energy groups "probably have quite a traditional knowledge of you put up a renewable energy project and it just goes to the grid ...and hopefully we're going to move away from that and keep it in local micro grids".

8.2.3 Finance Skills for Community Energy subsystem

- *Financial modelling*, i.e. "taking on a load of investment and then managing, paying that back" (P), ' " there's very poor training on the discounted cash flow analysis and financial assessment of different projects" (P2).
- "Accounting expertise is difficult to find" (P19), though it is not specifically an energy skill, community energy groups cannot operate without it.
- "Understanding and *Putting together a Business Model*, exposure to a completely new level of risk" (P8) is a particularly desirable skill to community groups in the post-fit world.
- Engagement with investors/Fundraising is another critical point of many community energy projects. While it is easier to raise funds for the better established and well-recognised community energy groups (e.g. Bristol Energy Cooperative can issue shares for a new (investable) project), this presents a real challenge to the newer groups. P 17 "communities need to find that early stage money and that's really, really hard to find because it's obviously very risky money." While some community projects generate a return - e.g. through renewable energy generation, others rely on grant funding, volunteers or donations e.g. in giving fuel poverty advice.

8.2.4 Legal Skills for Community Energy subsystem

While the community groups, in their majority, buy in (at least some) legal services, they do need to have an overview of some aspects of the legal domain, including:

- Legal *Registration Process* for groups to get started is scarce, and groups often struggle with "how do we make ourselves official?" (P8). More support in getting started could help with increasing the community group numbers.
- Understanding the Legal Framework in general is another challenge that community groups face, e.g. P19 "there's a lot of different actions involved and a lot of uncertainty around regulations, which are also a big challenge. Understanding the regulatory framework, I find difficult". However, the community groups must also "manage lawyers because ...they'll just keep clocking up the hours" otherwise (P17).



Reading and Interpreting Contracts is necessary for both choosing the right contractors (e.g. P17: "contractors are terrible as well at coming in with a price and finding all sorts of wormy ways out of it and adding extras"), and striking the best agreements, yet "It is quite complex because you're talking about power purchase agreement from the community group to an energy supplier, power, megawatts ..." (P22).

8.2.5 Managerial Skills for Community Energy subsystem

- "*Technical management* skills and also the technical support skills to support the energy infrastructure" (P19) are needed along with *Project planning and implementation* skills.
- Writing Project Proposals and tenders, e.g. community groups do not know "how to stand back and to do an overarching consultancy report" (P4). Yet, nearly all interviewed community energy projects in Bristol that are successful have had some grant funding, which has enabled their progress. As previously noted by P17, "communities need to find that early stage ...very risky money" and grants provide an opportunity for handling such risks.
- *Risk management* requires the community groups to be able to handle "exposure to a completely new level of risk" (P8) as the community energy scene is very dynamic and must continuously adapt to the changing regulations and income/funding opportunities.
- Whole Life cycle Project Management is another relatively unique feature of community energy projects. In these cases, a project manager must get involved in most activities and have a versatile set of skills: from undertaking a feasibility study on identifying a site for potential project development through to commissioning and completion. The project manager must be able to manage lawyers, contractors, as well as having sufficient technical knowledge, and community and customer engagement skills.

8.2.6 Policy Skills for Community Energy subsystem

Policy skills for the community groups:

• *Engaging with policy makers and lobbying* skills are currently scarce within the community energy sector, if compared to what industry/large companies possess. Up until now, it is unsurprising that this has not been the focus of community energy groups. To gain more influence though, the groups must learn to exercise these skills more.

Skills required from (local) authorities for successful community energy projects are:

• Long-term *Consistent Government Policy* which supports community energy activity, would allow for the development and maturation of this sector, as suggested by P4: "there needs to be a clear policy from government, ...there needs to be a roadmap outside of political time-frames. It needs to be a 20, 30-year roadmap, so the commercial sector and local authorities and everybody can actually plan for a longer period". This is relevant for *both national and local levels*. For instance, the BCC policy to discontinue gas boiler installations from 2025 supports the community energy projects focused on energy efficiency in decarbonisation.



Skills to Integrate Community Energy Activities into Local Authority Plans, or, in other words, driving a local authority policy of involvement and support for community energy projects. This can be achieved through a variety of avenues, such as providing council land for lease by community energy groups at low cost and/or signing long-term power purchase agreements with the CE groups to de-risk investments into them (e.g. as per Bristol's ALW wind turbine project). As stated by P17: "City Leap ...in Bristol is ...an example of the council really taking the bull by the horns and wanting to get the whole city carbon neutral by 2030 and that's going to create loads of opportunities for communities"

8.2.7 Soft Skills for Community Energy subsystem

- *Confidence* is needed for community members to initiate an energy group. However, "people that may be unemployed ...don't have the ...confidence" to start up the projects or engage (P8).
- *Leadership* is another key quality necessary to initiate a community energy project. As noted by P4 "I think you need that leadership drive. I think you need that person to build it around."
- Engagement (which includes both informing and motivating participation) is essential, and is carried out widely in Bristol (e.g. One City, Fuel Poverty, Energy Champions programmes). However, the community energy groups are "desperately short of engagement and of skilled engagement" (P19).
- Building Trust and Relationships with people is a key skill present in all community energy groups. Trust needs to be present both between the group members, the wider community which is served by the group, and between the group and the contractors with whom the community energy project works. As noted by P8: "Communities ...are very different but can have a key role to play in terms of trust, in terms of using their own social capital to create a transition". Although this particular skill is not considered to be in short supply, it is flagged as a key ingredient for community energy projects by nearly all of our interviewees, and so is noted here.
- Communication and Negotiation skills are necessary to communicate the message that the community energy group would like to put forward, as well as listening to the community and integrating their views, and negotiating with contractors, authorities and policy makers. As noted by P17, when starting a project, a group may have "...ten different legal contracts to negotiate, you'd have ten different individuals to explain the idea to ...".
- Collaborative Problem Solving and Innovation, which requires flexibility in thinking and "recognising the intelligences in the room" (P3) is a key strength and another required ingredient of successful community energy projects. Given the volunteer-based nature of these projects and the constrained environment in which they must operate, such mutual respect of contributors and the ability to adjust and the "ability to shift models" (P5) are a necessity.

8.2.8 Trades Skills for Community Energy subsystem

Although community groups would not generally be expected to carry out the installations and maintenance work all by themselves, some groups do wish to internalise these skills for their lo-



calities. They consider it an opportunity for training the local workforce and also for improving self-reliance of the group and its projects.

- Operational setting up of energy domain hardware (e.g. of solar or wind farms) is also challenging for community groups, particularly for those in "more deprived areas ...because generally they won't have the engineering skills, they don't have legal skills, they won't have experience of running a business ..." (P8).
- *Maintenance of generation hardware/infrastructure* is required for all community projects, as well as "maintenance operators and ...skilled maintenance managers" (P19).
- *Building retrofit for energy efficiency* is another basic skill that Community energy groups need in order to support ambitions of energy efficiency, both in providing advice to citizens and in undertaking retrofit effectively (which is supported by the CHEESE project in Bristol).

8.3 Training needs for Community Energy Subsystem

The previous subsection details the skills which are in short supply, and so need to have training provision. Next, we highlight some of the key skills training needs.

8.3.1 Areas of Training Needs

When considering the successful set up and operation of a community energy group as a (prosocial) renewables-based (or energy efficiency) business, we observe that the training needed for establishing such groups is not different from that of training for any other business set up, although with a deeper "customer base" engagement. Thus, the essential training would include:

- *Leadership* and confidence, i.e. the ability to communicate, motivate and engage the members of the community with the goals of the community energy group.
- General Business and Financial Literacy, which includes the abilities to make those financial assessments of "do nothing versus use renewable or energy efficiency solutions" (P2) are essential in members of the community in deciding whether to volunteer for - and champion - the community energy causes.
- Understanding of the Smart Local Energy System, including "what the difference is between the old energy system and the new energy system" (P5), which, in turn, will enable innovation for Developing new Business Models.
- Engaging with Investors both through:
 - Fundraising with investors and community;
 - Engaging the local authorities as a contributing party; and
 - Writing grants and project proposals to obtain funding.
- Whole Life cycle Project Management, whereby the daily activities or developing and maintaining the community energy group and its projects are handled from the start to the end, including:





- Procurement;
- Reading and interpreting contracts;
- Risk assessment and management; and
- Technical project management.

8.3.2 Modes of Training

When discussing how training should be delivered, we observe the preference for the more informal, short training opportunities. This is clearly justified, as community energy groups are not considered "professional ventures", yet volunteer ventures instead, with less available time for extensive training. Our respondents noted the following training modes as relevant:

- *Training through sharing* is delivered by local community energy organisations for the benefit of other community energy groups and individuals. This takes the form of:
 - Meeting at local community networking activities, as "the best people to learn from are the people that have done it, so it's that networking amongst community energy groups" (P3) that provides an opportunity to share experiences and identify learning opportunities.
 - Online networking events with geographically separated communities with similar interests;
 - Open Home events (such as Green Doors) whereby, for instance, energy efficiency or retrofit upgrades completed by some houses are shown to all interested households by the homeowners.
 - Questions and Reflection, whereby the interactions and questions between community groups and authorities/other groups lead to "breaking barriers down where oh, you can't do that because we're not allowed ...And just going through that process of getting them to reflect" (P3) builds understanding, mutual learning and provides opportunities for new solutions.
- Teaching Through Demonstration:
 - Informal Demonstration, whereby members of one community see the success of another, and set out to replicate it for their own locality.
 - At Formal Demonstration locations, such as the planned Ambition Lawrence Weston's wind turbine's energy learning zone, the learning zone will serve as a place to show and tell to schools and citizens about what the renewable energy projects are.
- Workshops at Community Centres, where community groups/members could bring ideas for project development, and/or learn from other (invited) group representatives about their solutions to common challenges and successes which could be appropriate to replicate.
- Internships with community energy groups or similar organisations (e.g. Centre for Sustainable Energy) are recognised as valuable training opportunities for engaging with citizens as well as developing local talent for expanding the community energy groups' activities. For instance:





- CHEESE project provides internship opportunities for citizens/young people from disadvantaged communities to learn how to undertake energy efficiency audits, while getting a paid-for placement within the project;
- BEN's Energy Champions programme helps to develop an understanding of home energy efficiency, renewable energy technologies and novel solutions (such as demand-response services) for the volunteer local champions, who, in turn, work with the local communities to educate and engage them with the community energy and retrofit activities.
- Further education colleges are noted as venues where learning about new technologies and practices (such as energy efficiency assessment, operation of community energy generation facilities, etc.) could be taught, particularly to young people. However, it is also noted that some Bristol community groups have "failed in our attempts to talk to ...[colleges about] directing their ...training courses to support our local community in these skills" (P19);
- Apprenticeships, such as a 'Community Energy Specialist' apprenticeship programme, are also suggested as a good opportunity for younger people to acquire skills for community energy, although this is complicated as well. While the local colleges in Bristol are interested in delivering such programmes in general, they " need 12 apprenticeships as a minimum to come through the doors. And obviously each of those apprentices would need an employer to pay for them ..." (P18).
- Learning through Research and Practice with Academia is another relevant avenue as, in collaboration with community energy groups, the universities often support both technical and business innovation development and technical and societal impact evaluation activities.

8.4 Insights and Recommendations for Bristol's Community Energy Subsystem

8.4.1 Risks and Mitigation in Community Energy Projects

Community energy projects are perceived as presenting many risks. We discuss some of these risks (emergent from our interview study) and suggest mitigation options below:

- If the community energy groups are new, they have no track record of successful projects, and so cannot prove their trustworthiness as a borrower. This, to some degree, can be mitigated by the trustworthiness of the group members themselves, making sure to demonstrate their professional track record, *relevance and credibility of their skills* (e.g. "there was someone who'd been in a renewable energy company for 30 years or something. That was very helpful to know [for funding decision]" (P22)). (Necessary skills for CE projects here are: project management, engagement and team building).
- There is little previous evidence of banks successfully funding community energy projects in the UK, which, to the banks, implies higher risk of lending to these groups. Nevertheless, some bank loans have been successful in community energy projects (e.g. "Co-op bank took that risk with the [named] solar project" (P17)). Providing evidence of the successfully funded projects could help to instil more confidence in the prospective funders. (Necessary skills for CE projects here are: research, communication and relationship building).



- Some community energy projects, such as fuel poverty alleviation, are not inherently profitmaking, which makes them unattractive to most funding providers. Although there are some grant funding schemes for such projects, the application is a competitive process which is time consuming and has a low success rate. This issue can be mitigated (to some degree) by setting up a convincing business model, and targeting the funding providers with related interests. For instance, the evidence that retrofit will address fuel poverty concerns could motivate ECO-obliged parties to fund home retrofit projects. Alternatively, combining the fuel poverty alleviation with installation and use of renewable energy generation equipment could pave the way for other business models and funding sources. (Necessary skills for CE projects here are: research and innovation, financial modelling, the ability to develop new business models, as well as communication and relationship building).
- Renewable energy projects tend to have a *long (15 to 20 years) repayment plans*, while *contracts offered within the energy sector are normally assured for much shorter periods* (e.g. National Grid's frequency response contracts are for 3 years). This concern could be mitigated through planning for income from several income streams and stacking the finances (e.g. "the battery project for example, we have five different lines on the business case for income to try and pay off that investment" (P18)). (Necessary skills for CE projects here are: creative thinking, financial modelling, the ability to develop new business models, as well as communication and relationship building).
- The small scale of community projects, which leads to dependence on a single income source, can make their *business models brittle when faced with change*, e.g.:
 - change in feed in tariffs can turn a previously profitable project into a loss maker, if the whole project was designed to receive a specific FiT return;
 - dependence on a single consumer is risky if the behaviour of the consumer changes, e.g. if a project charges battery use to an organisation, which suddenly outsources all of its ICT infrastructure to a cloud service provider and so does not consume the same level of electricity.

To address these "single point of failure" concerns, the projects would need to build partnerships with other companies/organisations both from public and private sector ensuring that they are integrated into a network of mutual support and can diversify their activities, if necessary. (Necessary skills for CE projects here are: partnership building, ability to develop new business models, financial modelling).

 Regulatory uncertainty around renewable energy projects is high in general and even higher for the community energy sector. This uncertainty, to some degree, can be mitigated through working with local governments so that the community energy initiatives are integrated with local government policies and development plans (e.g. as is the case with Devon county at present). The previously noted partnerships and business model diversification activities would also be relevant. (Necessary skills for CE projects here are: partnership building, engagement with policy makers, ability to develop new business models and financial modelling).





8.4.2 Differentiated Support to Community Groups

Community Energy groups are not homogeneous; they represent a mix of:

- very well established (nearly professionalised) groups (e.g. "...someone like Plymouth Energy Community, Totnes Rural Energy Community Company, Freco which is Frome, are pretty competent and they have some very good technical knowledge" (P4));
- some small but able-to-succeed groups which focus on one issue at a time as they "have the ability but not necessarily the time to start getting involved in other projects" (P4),
- "...some very small community groups that have some very big aspirations but really don't have the technical knowledge or the ability" (P4).

All groups start with *using skills already within the community*. As noted by P3: "I didn't know how to build a wind turbine but ...I was able to look at my network and say right, well, [name] is a retired wind engineer. Let's get him involved. And then [name] has just retired, [name] set up the biggest wind turbine company in the world, let's get him involved. ...So yeah, it's recognising the skills that are within people already and how they might be appropriated towards a [community] energy project."

However, they do require some more differentiated support at different levels of their projects thereafter. Thus, the very small and the new groups would benefit most from networking and learning from the opportunities, development processes and requirements that have been faced by more established groups, thus building up their technical know-how, maybe working in "second-ment" with the already successful projects.

The small groups with sufficient technical capacity would need support in acquiring start-up capital and project management of their first project.

Finally, the more established groups would benefit from support with business model diversification and growth.

Thus, we recommend that differentiated support in skills types and training modes should be available for the above target group types.

8.4.3 Skills to be Procured: Challenges and Recommendations

While many skills can - and are - delivered directly by the community group members to the community projects, it is clear that some **skills must be procured from outside**. These are either:

- Professional/highly skilled jobs (such as data-driven management of community energy resources and its integration with the national grid, legal support, etc.), or
- Work requiring specialist equipment use (e.g. cranes for building) and/or qualifications (e.g. electricians).

When community groups go out to procure these skills, they face a number of **Procurement Challenges** which, we suggest could be addressed through the following **recommendations**:

• Assuring Quality of Procured Skills: while skills could be available, the community groups are not always aware of how to differentiate the good vs poor service providers. As noted by P8: " there's always somebody out there. It's how well they can do the task and how much



they cost, and how you find them as well." Thus, a **register of qualified and tested service providers** would prove to be very helpful for community groups, if and when they are able to pay for the services.

- Availability of Checking Service: given that small groups have limited financial resources, they often end up doing all kinds of skilled jobs by themselves. However, at times, this leads to them incurring losses if they miss critical issues in completing such skilled work. For instance, P17 recalls that their "project couldn't afford lawyers so we just had to do it ourselves, and we missed a big one ...there was a clause in the contract that allowed the contractor to charge us another 50,000 quid." Thus, a service that checks over the selfcompleted work produced by community groups could be very beneficial.
- Subcontracting without Post-Delivery Responsibilities is another challenge that community
 groups face when they contract a company and the "companies out there just getting contracts ...and subbing them ...they'll sub it to anybody to get it installed. And the install is poor.
 The operation and maintenance isn't covered within contractual elements at the beginning,
 so nobody will come back and fix it" (P4). This suggests that integrating a requirement for
 post-delivery quality assurance into contracting for community groups could provide a
 measure of assurance for them on the standard of work procured.
- Access to Consultants by Small Groups is becoming even harder, as noted by P4: "we're
 having problems getting the right consultants ...and I think around the country, the procurement issue is becoming a key element for us for delivering the rural community energy fund
 and other bits and bobs, because also a lot of consultants have been snapped up by ...big
 consultancies who are now hoovering up the knowledge that's out there." While, on the one
 hand, it is reassuring to see that the renewable energy skills are in high demand across the
 UK, it would also be useful to ensure that access to qualified services is assured for the
 community groups as well, e.g. by:
 - Stipulating that a consultancy must allocate a proportion of their time to support community groups, if they are to access government contracts;
 - Engaging with local academic institutions who can support the projects through qualified engineering/power systems/marketing and other skills either through dedicated funding (e.g. establishing a community group support fund), or as part of training programmes (e.g. through an established community group training fund), or knowledge transfer activities. We should note that dedicated programmes exist with funded PhD positions (so called CASE studentships [41]) for research to be conducted with eligible companies. However, there is no such mechanism provided to support community groups, which would benefit from this engagement much more than a company does.

