Burneside Community Energy Ltd

Developing a Net Zero Carbon Community Energy Owned System for New Housing

Next Generation Phase 1 External Report

This report has been produced to communicate the findings of the work on this project to help other community organisations develop similar models and learn from our experience. This project – a housing development in a semi-rural area – was by its very nature sensitive and we would ask that all the information and data contained in this report equally sensitively. We hope you can use this report to support your projects.

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October 2021

NEXT GENERATION
COMMUNITY ENERGY EVOLUTION

power to change | business in community hands

Contents

Introduction

This report has been compiled by the Directors of Burneside Community Energy Ltd (BCE) with the responsibility for leading the Next Generation (NG) funded project. The input of the directors has been entirely voluntary throughout the project. This report uses both the technical information supplied by our lead consultants, Quantum Strategy and Technology (Quantum) as well as intuitive, subjective and anecdotal learning and reflection of our own. We would like to thank Quantum, Stephen Scown, the staff at Power to Change for their support on this project.

Reflection on original business plan and objectives

Background to the Project

During 2018 and 2019 Burneside Community Energy Ltd, 'BCE', obtained funding from Electricity NorthWest and Next Generation to assess the feasibility of a community becoming the power supplier to a development of new houses. As a result of this funding, further Next Generation funding was obtained to progress the whole project: Developing a Net Zero Carbon Community Owned Energy System for New Housing. See appendices for detailed delivery plan.

	Timing	**Headline Activities**
Within the scope of the Next Generation funded project:		
Phase 1	February to April 2020	• BCE roles and oversight, risk assessing the project. • Understand the scope of the development proposal and how that affects the energy system proposal. • Train key stakeholders in carbon literacy to fully understand the energy implications of the housing development • Map the contracts needed between BCE and key stakeholders and have in place Heads of Terms /Exclusivity agreements • Specifying the external expertise required to complete phase 2 of the project. Additional funding from ENW supported work to: • Revise the project energy assessment • Define the contractual agreements • Produce the output specification
Phase 2	May to October 2020	• Householder service design • Technologies – designing the system • All aspect of contractual arrangements • Finance & investment models
Phase 3	November 2020 to April 2021	• Submission of planning applications • Finalisation of governance and operational arrangements • Clarify installation requirements, construction requirements • Define installation requirements and providers
Phase 4	May to June 2021	• Dissemination of information and lessons learnt • Handover into Project Implementation phase
Outside the scope of this Project:		
Post Phase 4		Funding and Implementation of the plan

This report is limited to a review of Phase 1 as the decision was made in March 2021 not to progress to Phase 2.

Summary of Phase 1 progress

Summary of Activities Completed Stage 1 Work:

- Developed a high-level model of the energy system to assess the values of different energy flows in the system.
- Carried out a review of the potential governance models, challenges, risks and opportunities for BCE. (see Appendices for governance chart)
- Started to increase the capacity of the BCE Board to manage a project of this scale.
- Developed the project risk register.
- Provided training sessions for stakeholders to make sure the implications of community energy involvement in the housing development were understood.
- Developed a register of potential customer expectations from the perspective of new residents.
- Appointed legal advisers.
- Investigated the contractual arrangements needed between the main stakeholders and secured an initial draft Exclusivity Agreement between BCE and the main landowner.
- Involved BCE in the communications process.
- Developed the specification of work required for the next phase of the project.
- Carried out a scoping study of potential consultants for the next phase of the project.

Milestones not met

- BCE has not been able to reach contractual agreement stage with the developers/ landowners.
- BCE has been able to finalise the business model and financial projections, but it has not been able to confirm the energy performance of the proposed new homes on which the model is based.

Phase 1 Conclusion

The developers and landowners have been unable to commit to the project in the short to medium term which has had terminal implications for the progress of the community energy aspects of the project. The availability of the technical specifications for the new homes with regard to their energy performance and subsequent heat and energy demand is absolutely critical to the modelling, budgeting and financial viability of the project; in effect, the absence of this information represents a 'show stopper'.

The Board of BCE has therefore been unable to reach contractual agreement stage with the developers and landowners. Whilst there has never been any rejection of BCE's proposals and the landowners have remained receptive, BCE has not been able to secure the assurances it needs. As a result the BCE Board decided that it could not take on the risk of initiating Phase 2 of the Next Generation funding offer. In spite of generous levels of understanding from Power to Change staff, BCE felt that it could not deliver in the timescales whilst uncertainty from the developers remained.

This final period of Phase 1 has demonstrated clearly that these projects still hinge on the agreement of landowners and developers over which community energy groups do not hold sway.
It remains a possibility that BCE may still end up investing in a single large ground mounted solar PV array and battery storage in order to supply electricity to a new residential development, but for now the complexities of establishing an entirely new energy services company to supply heat and power remain out of reach.

Insights

We have chosen to break down our *'insights'* section into themes which we believe present the best framework for learning for groups wishing to embark on a similar journey.

Agreeing Energy Performance

In the early stages of this project many ideas were put forward for the development that were far less concrete than they appeared to be. BCE was perhaps naïve to rely on the development proposals and timetable that were presented; BCE should have considered these proposals as more 'fluid,' perhaps, and been ready to both adapt AND to challenge the developers.

The design ideas continued to evolve. It remains difficult to specify an energy system until the design is fully defined, so a model that allows assessment of factors that tip the project into/out of viability is essential. Factors that have been found to be critical are:

- Definition of zero carbon, number, size and energy performance of homes: affecting the technical specification of the energy system
- Phasing of the development: affecting risk of investment advance of need
- Vision for the marketing of the private homes: affecting the boundary of ownership of equipment between the community energy company and private householders e.g. roof-mounted PV, household scale batteries and home EV charging.

A fundamental issue that may not have been fully appreciated by the developer or landowner was how the specification of the energy performance and standard of construction of the homes would directly impact the specification of the renewable energy system if the aim remained to be net zero carbon.

It has so far been impossible to pin the developers/ landowners down to an energy performance standard. We suspect this is because any improvement beyond building regulations is often viewed as "nice to have" so even designers of sustainable homes work on the basis of "as good as we can get" unless the specification is contractually laid down. We had aimed to agree this standard in the development contract but had expected to achieve more clarity earlier on. At the end of phase 1 this had still not been forthcoming. There was some 'push back' from the landowner and developer against our proposal of Passivhaus standard with issues raised about suitability for the climate and durability. However an alternative standard was not specified by the developer and landowner.

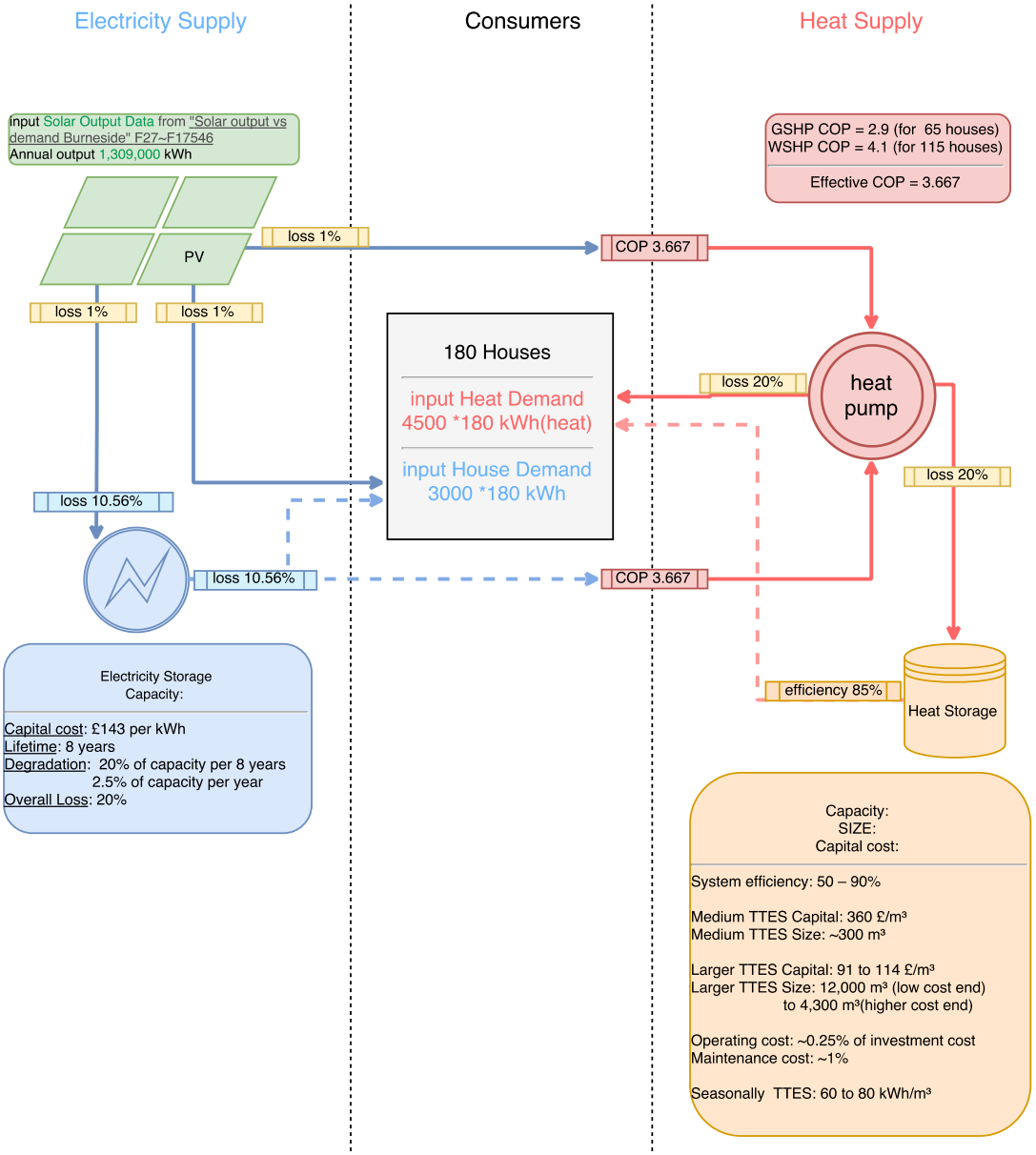
It became clear that although this part of the work programme was expected to be about the design of the site, it was actually about communications and building relationships with the development team. Although discussions with the landowner and developer have been ongoing for over a year, communication was not as forthcoming as we had hoped, despite huge efforts on our part. In part this was due to the delays and complications caused by Covid-19. For much of the year it has not been certain that the development would go ahead, and some stakeholders have not been able to work on the project speculatively without any firm contractual tie to it.

Energy Modelling

The type of integrated energy system that BCE was proposing is not something that can be provided off-the-shelf, so understanding how the energy flows might work was always going to be both critical and highly speculative.

BCE's energy model was developed over time, building on early work carried out under the WRAP funding, which looked at heat supply to the whole village, then developed further with ENW funding.

The model concept is best described using this diagram developed for BCE by Lancaster University:



(Note the costs quoted in this diagram from 2018)

Energy flow priorities from the electricity generated are:

1. Direct electricity to meet demand
2. Direct summer heat demand using electricity via heat pump
3. Electricity to battery storage to meet daily fluctuations
4. Electricity transformed to heat for storage
5. Excess electricity exported
6. Import to meet the direct electricity demand when generation is not sufficient.

The model assumed:

- Renewable on-site electricity is only available from PV
- On-site use of on-site generation is maximised through electricity and heat storage
- Demand is made up of:
    - Electricity for power - 40 kWh/m2/year
    - Hot water - 25 kWh/m2/year
    - Space Heating - 15 kWh/m2/year
    - EV Charging - 360 kWh/year/home
- Daily fluctuations in electricity demand can be met through battery storage (peak storage requirement in mid-summer)
- Seasonal gaps between PV supply and direct electricity demand (power and EV charging) are met through import/export with the grid.
- Summer (May – September) heat demand is supplied directly to homes via the heat pump.
- Winter (October – April) heat demand is met from large scale heat storage.
- Excess electricity in summer transformed into heat via the heat pump and stored, up to the point sufficient heat is available to cover the winter heating season.
- Excess electricity generated in summer beyond that required for all the above demands is exported to the grid.
- Net zero is achieved by matching electricity import/export with the grid. This is a debateable point as it doesn't include energy for non-EV transport.

It is currently built on average monthly demand and supply assumptions, to provide an estimate of:

- How much electricity must be generated to meet the total net demand of the development, including system losses
- What capacity of PV is needed to generate that electricity
- What capacity of battery storage is needed to cover daily demand
- What capacity of heat store is needed to cover winter heat demand.

Data has been sourced from:

- Actual monthly energy demand profiles for a Passivhaus development (kindly supplied by Lancaster Cohousing)
- National average profiles for heat and electricity demand: publicly available from National Grid
- Typical half-hourly PV system output data
- EV charging assumptions supplied by ENW and Charge My Streets
- Equipment costs and other data from online research and discussions with other community energy groups.

Accurate modelling of supply and demand is critical to optimising the specification of the energy supply system. However, the model will always be wrong as people don't behave as predicted. Some assumptions will turn out to be over-optimistic, and others to be conservative. At some point a community group must take a decision on investment which will need to be made on the best available data at the time, but this will always involve a certain element of additional risk, more than BCE's previous projects.

In any case, the BCE business case for investment, as expected early on, would have relied on grant funding for some of the heating network components. This might have been available from the Heat Network Investment Project. An assumption has been made that the developer would provide a contribution, as the project would reduce some of their direct investment costs.

The community-owned element of the project was just about financially viable. It was tight, the return on investment being lower than previous community energy investors have become used to (2.5-3%) but it was reasonable for the current economic position. The acceptability of this would need to be scrutinised if ever developing Phase 2. There is very little headroom for increased costs.

The design would need to be modular to meet both the phases of the build, and future changes in demand such as increased EV charging. This hasn't been modelled by BCE. It is likely that some elements of the scheme would need investment ahead of need (heat storage and the heat distribution system, substation and microgrid capacity), while other elements could be planned for but investment made in stages (PV supply, EV charging, grid extension). This would present additional challenges to the viability of the energy system.

Very little data is currently available on EV charging, and this would be the least "known" element of the demand. This data is slowly emerging as EV car uptake accelerates. ENW has provided some data on their assumptions, but a decision would need to be taken as to how much allowance to make for EV charging in the design of the scheme.

Seasonal heat storage is a critical part of the system, *if the aim is to maximise the on-site use of an energy form that is mainly generated in summer, with demand mainly in the winter*. It is also a critical issue for the UK and other northern climates – and it being tested on a large scale in countries such as Scandinavia, Denmark and Canada. The alternatives would be to:

- Investigate use of wind power to spread the generation profile more evenly across the year – this would require short-term storage but not seasonal storage.
- Use waste heat from James Cropper plc as detailed in the WRAP report – this would require agreement from the company and a heat supply contract. It may not be a long-term solution as the company is aiming to reduce their carbon footprint and stop wasting heat.
- Accept a Net Zero Carbon definition for the site such that the total on-site generation is equivalent to the total on-site demand, effectively using the grid as the store. This is a much cheaper option as it could be based only on the supply of electricity, without any centralised heat supply and storage.

The latter option would need to be explored in the next phase of modelling. It would require much more individualised heating systems, such as an air source heat pump for each home: this cost would need to be covered by the developer rather than the ESCo, but might help address the developer's "marketability" concerns. The ESCo would then only supply electricity from PV, with battery storage to manage daily peaks. The proportion of electricity traded with the grid would be far higher, but we have not investigated the impact of this on the economics of the scheme.

As the energy performance of the fabric of the homes improves, the residual heat demand, for hot water, becomes more significant. This is useful in that daily hot water demand tends not to vary so much over the year, and peak daily demand can be reduced by the use of individual hot water tanks. The developers had not previously considered that space would need to be made in the homes for hot water tanks – so this is a critical design consideration.

Cost data is at present very rough estimates. Some costs (e.g. PV) are well known, for others such as seasonal heat storage, there are so few examples around that the estimates could be wildly out. Operating costs for this type of small scale system are also pretty much guesswork at this stage until the operation itself is designed and quotes obtained.

The development could have been made approximately net zero by installing 800kW of PV. This calculation was based on a baseline energy performance of the homes of 80kWh/m2/year plus 360kWh/home of EV charging. It takes into account assumptions on heat and electricity storage losses.

Based on annual operating costs of around £45,000, the maximum community investment that could give 3% share interest would be around £1 million, or £1.1 million at 2.5% share interest. This may still be considered too risky for investors in future.

Grant funding and developer contribution would need to cover around 1/3 of the cost of the scheme.

These figures will change as assumptions are refined and new data becomes readily available.

Discussions with the owner and developer highlighted a concern around community-ownership of PV on the roofs of private ("market") homes. This can result in issues with potential residents being able to get a mortgage or insure the homes which could impact of the ability to sell the houses. Part of the design was to provide two Car Barns rather than individual garages or driveways, with roof space for community-owned PV and EV charging. There was also some land available for ground-mounted PV. We have modelled for this scenario, but, as it seems a waste of good roof-space not to put PV on the homes, we have also modelled for privately-owned PV which feeds surplus into the community-owned grid. In this scenario the ESCo would need to pay the home-owners for excess electricity exported into the micro-grid. As a result it is a worse scenario for BCE. It would also be potentially more costly for the developer.

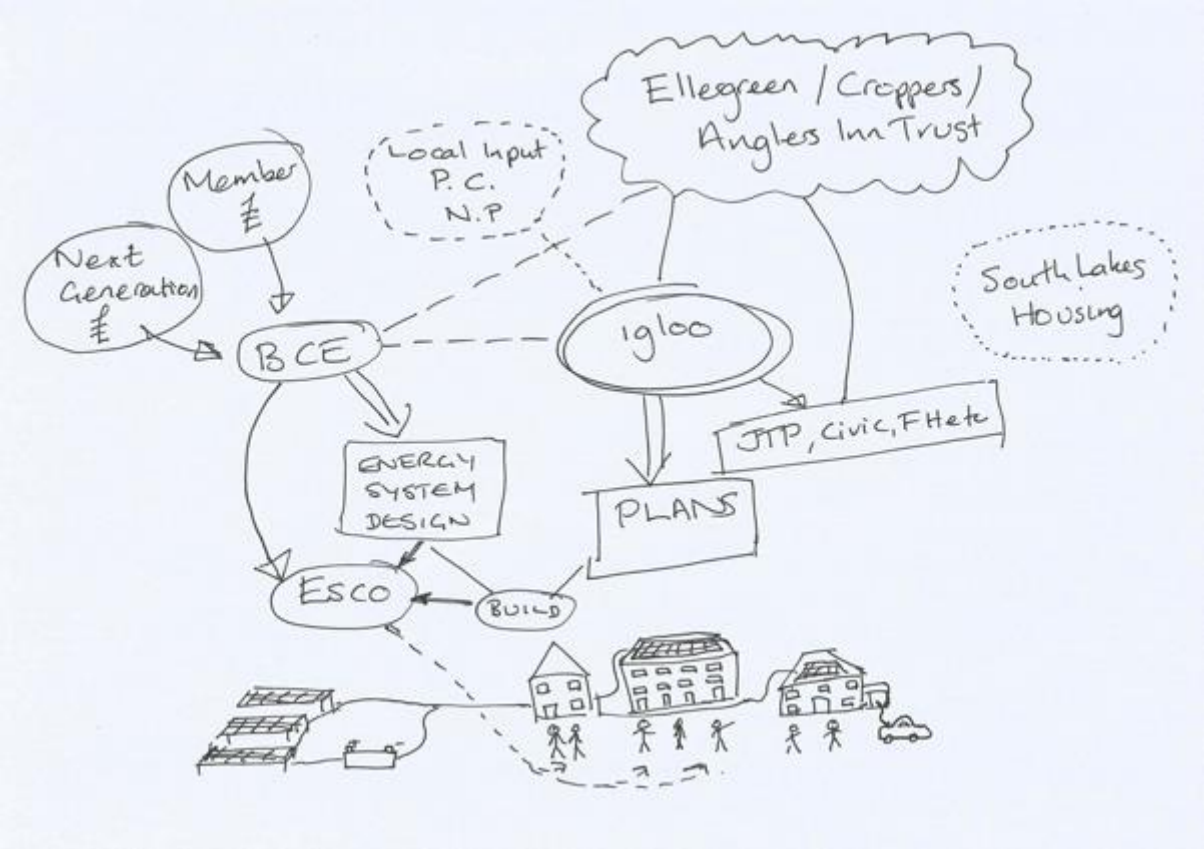
This would need further modelling before making a final decision to progress to investment stage, but the scope/boundary of the community energy system is always a very important early decision, which informs the design of both the energy system and the housing design. It would also be sensible to consider the impact of these home-owners deciding to install their own battery storage to maximise the amount of electricity they "lose" to the communal system. Following on from this, there would need to be a discussion of whether it is better to maximise private or community ownership, and which is considered right for the village, as well as the landowners/developer/investors.

Contractual Arrangements

Community energy is not a traditional mechanism for supplying energy to a new housing development, although there are many instances of district heat supply and a few of local electricity supply via micro-grids. The ESCo needs to be contractually tied into the development alongside the developers and other service/expertise providers. This was not appreciated by either landowner or developer at the start of this process and the BCE work has been carried out in parallel with rather than integrated into the development process.

BCE/ESCo would need contracts to install the energy system and to provide energy services to householders over the long-term before progressing. This long-term involvement changes the dynamics of a typical development contract, and means there must be an emphasis on operability and lifetime costs rather than just focussing on the initial sale value of the homes.

A rough stakeholder map was developed in September 2020 and shared with the landowner and developer, alongside a detailed set of questions for discussion. The aim was to plan how BCE could be contractually integrated into the project. These discussions did not happen due to the issues with the project progressing.



Based on assurances from the landowners and developers that the project would proceed, BCE went ahead with appointing Stephens Scown as their legal representative, and we worked through with them the stages of contract that would be needed.

1. An Exclusivity Agreement setting out the basis on which BCE would work with the developers on the next phase of the project design.
2. A Service/Development agreement between BCE and the developers for provision of BCE's services, specifying at least:
   - what infrastructure BCE will be designing;
   - whether BCE or another party will be responsible for installing the infrastructure;
   - the owner of the designs and infrastructure, and whether ownership is to transfer at any point;
   - the information which BCE will need to receive to produce the designs;
   - which areas of the project BCE will have input on, and how they will give this input e.g. regular meetings, consultations etc.;
   - what rights BCE has to reject any proposals from the developers and the mechanism for resolving any disputes;
   - right of access to the land in order to complete its work;
   - that the development must use renewable sources and not be connected to the gas grid, unless BCE exits the project.
3. A long-term lease with the landowner for specific areas of the site, including some communal roof-space, right of access to the site and for provision of energy services across the land to the homes and other buildings.
4. A Power Purchase Agreement for purchase of excess electricity from privately owned PV systems if appropriate (either householders or other local suppliers).
5. A Heat Purchase Agreement for heat supplied by James Cropper plc if appropriate.

6. An Energy Supply Agreement for the householders supplied by the SPV, and potentially the social housing provider.
7. An agreement to supply electricity for EV charging.
8. Potentially an agreement with funders.
9. Potentially a lease with the social housing provider for use of roof-space for PV.
10. A procurement/construction contract for the construction phase.

A draft of the Exclusivity Agreement was sent to the landowners in 2020 but we were unable to hold the planned discussions with them, as they were not making sufficient progress with the project, as scheduled. This Agreement would be an absolute minimum condition to progress to Phase 2 (and for NG Phase 2 funding).

It seemed to come as a surprise to the landowner and developer that BCE would require a contractual tie into the project and might want to set minimum conditions for this. BCE has done all the work and all the communication on this issue. We had perhaps not appreciated how little thinking either the landowner or developer had done regarding their wish to have a community-owned energy system as part of the development.

Plymouth Energy Co-operative is carrying out a similar housing/low carbon energy supply project, but as both elements are being developed and will be owned by the same organisation, they will not encounter the same issues as BCE in contractually defining the roles and responsibilities of each organisation, and critically, who's responsible if things go wrong.

A potential solution might be for the developers to construct the energy system and sell it on to the ESCo once complete and tested. This would reduce the contractual complexity of the development stage, but BCE/ESCo would need to be happy that the system as built would be viable to operate, so would need to have oversight of the specification, and the option not to take it on. This solution puts all the development risk on the developers, which might not be acceptable to them! It might, however, help to ensure that the homes and energy system are built to a high enough standard.

It is frustrating that we have still not made any firm progress but understand that there is little point in progressing this until it is clear whether the development will actually happen.

We have also investigated lessons on heat supply agreements from district heating operators. This is an area that is not as heavily regulated as the supply of electricity or gas, but regulation is now developing. There have been problems with some heat contracts that have been deemed to be unfair for customers, who have little redress. There are also important issues around heat supply being rolled into rental agreements that social housing providers are starting to address.

As a result we developed the **Customer Expectations Map** (included in Appendices) to inform the development of the energy supply agreements and minimum standards of customer service that the ESCo will need to provide. It could be very helpful for other groups at an early stage of a similar project.

The critical issue for energy supply contracts in a heat network (and micro-grid) is to provide fair treatment to customers, at least as good as they would get with a regulated energy supply. In a small community this requirement is even more essential. The ESCo must as a minimum meet the standards set out by the Heat Trust. This area is one that is likely to grow in visibility and importance so will need to be continually reviewed by the ESCo management. The implications of failing to meet customer expectations on service standards is a significant risk that should be monitored on the risk register.

We have discussed with others their lessons on roof-leases. They have found that:

- There is still a reticence to provide a mortgage on properties with solar roof lease – informed by previous poor practice.
- The legal costs associate with roof leases on private homes made one NG project uneconomic as originally planned, and they have redesigned their project towards private ownership of the PV systems.
- Issues of insurance have been raised. We have no evidence of the impact of insurance industry concerns on roof-leases on private homes – but have direct experience of the problems with the factory-mounted system.

As a result we have been advised against community-owned PV panels on private roofs. There may be a role for the ESCo to own panels on the social housing, but we have also heard from the CE sector that some housing providers are having problems raising capital funding for homes with roof-leases.

One other NG project has encountered problems with insuring EV chargers: the ESCo would have needed to investigate this further in Phase 2.

Planning and Specifications for Phase 2

It was recognised at the start of this process that a more specialist team would be needed to complete the design of the system as well as specifying the service design and making sure contractual arrangements were set up to minimise the risk to BCE.

This final part of Phase 1 was to specify the work to be done in Phase 2 and identify potential people/ organisations able to carry out this work.

The specification has been written in draft (see appendices), building on discussions with a range of other community energy organisations as well as potential contractors. Some of this work was started over a year ago, so the specification is actually very similar to what was proposed in the R&D phase of this project.

A number of other CE organisations have been extremely helpful: particularly South Dartmoor CE, Brighton & Hove ESCo, CREW Energy, Lockleaze Loves Solar, Plymouth Energy Co-op, Nadder Energy.

Alongside the work specification we have interviewed organisations who have or are aiming to carry out similar projects, to understand what they have learnt in the process. We have also interviewed some potential contractors to get their feedback and an idea of how they would approach the work.

We have learned that there are very few people or organisations out there with the capability to deliver this entire project.

One of the key parts of this work is around communicating and testing out new ideas and how to deal with problems without having a ready solution to hand.

Experts tend to have a specific area of expertise or preferred solution that they may want to promote, regardless of whether it's the best solution for you. BCE would need to find someone collaborative and creative who's willing to test new ideas / try to innovate and avoid having discussion or ideas closed down – but at the same time would need to manage a process to slim down the options.

Some consultancies think that their standard approach will work. But they mainly do not understand the nuances of community energy, or the long term operational requirements inherent in the system design. System operability has to be integral to the technical design, and we have seen examples of where this has proved extremely difficult (e.g. different EV charging software that won't talk to each

other). Conversely, few community energy specialists can offer the detailed technical knowledge needed. So a consortium approach is likely to be the best solution – ideally people who are willing to work in an open-source/information sharing way.

Finally, as the experience of BCE and others has shown it is important that any modelling is based on practical and flexible assumptions. Often university models will be focused on producing an academic paper rather than producing a model that can be used for a commercial operation.

Carbon Training

There was a surprising lack of understanding among all the key stakeholders about:

- The housing design and energy technologies that would be needed to make a development zero carbon
- The implications of involving a community energy company as the energy supplier.

This was noted early on in the R&D phase and the proposal had been to run Carbon Literacy Training with all key stakeholders. Carbon Literacy is a formal set of training and assessment run by the Carbon Literacy Trust. It had been proposed that the training would be run by CAfS who have qualified CL trainers, but in the event it was agreed that Quantum would instead run training that was specific to this project, but built on the foundation of carbon literacy.

Two training sessions were run (online) in September 2020, with the Design Team and separately BCE Board and other community representatives.

The issues raised included:

- Trade-offs required between fabric specification and energy system
- Zero carbon definition – whether to include carbon embodied in the buildings
- Passivhaus standard – may not be able to meet the performance standard but useful to follow methodology as it reduces the performance gap between design and as-built
- MVHR might not be a sensible option fort these homes (used to provide air-flow in very airtight buildings)
- User interface will need very careful consideration (customer service)
- Getting skilled builders may be an issue – example from South Lakes Housing work in partnership with Lancaster Cohousing training teams in advance of build
- Mortgage-ability could be an issue: Trent Basin had to show homes were also directly connected to National Grid to remove risk of failure of the ESCo (effectively two supply cables). The National Grid connection remains dormant, but could be used if customers want to change supplier.
- Experience of roof leases in Trent Basin – proved difficult for conveyancing solicitors, especially cheaper online ones.
- Centralised car barn will help with EV charging from community generation – and looking at car clubs.
- Hot water tanks – space will need to be made in homes, but developers are used to designing without them.
- Other schemes have shown massive changes from early to later phases as learning fed into design.
- Is there potential for a wind turbine supply rather than relying on PV?

After the first session a “shopping list” of the energy supply system requirements was shared with the Design Team. This is included in the appendices.

The whole project team and Burneside residents would have needed to work through a very complex journey with this project. There are a huge number of technical, commercial and conceptual difficulties, as well as over-coming some resistance to the construction project itself. Most people involved have some understanding of different bits of this, but no-one really has a complete grasp of all of it.

There's a lot of interest in making this work…. though any solution will be a compromise.

Other Challenges:

The BCE team needed to fully understand the project and all its implications. This is not easy for any group, let alone a group of unpaid volunteers. BCE also needed to have the capacity to oversee the project management. Our consultants at Quantum helped us to develop the project Risk Assessment and held a training/discussion session about it with BCE in August 2020 – which gave the Board much greater clarity.

In mid-2020, BCE were building capacity to manage this project in terms of developing Directors knowledge and experience and also in appointing paid administration support to ensure that the Board communication with Quantum, reporting and links to Next Generation were working. This cost was additional to the original budget. Despite several requests to members and wider, no additional volunteer support was forthcoming and Board capacity would become an issue. In 2021 the BCE board were severely constrained in capacity due to undertaking a 3rd PV installation, becoming involved with community low carbon projects and several board members requiring time out due to personal commitments. It is recommended that other groups undertaking projects of this magnitude appoint a 'project lead' and a 'project administrator' who have the capacity to undertake the roles and have significant project management experience. If they are to be paid then sufficient funding needs to be allocated to the project. These roles were not costed in either time or money in the initial BCE proposal.

Impact of Covid-19

The Next Generation Phase 1 funding was agreed in March 2020 with the first major discussion between BCE and the developers scheduled for 27th March 2020. Prior to that, the UK went into the first period of lockdown. While it was possible to transfer our work and discussions online, the project and all involved were severely affected by the crisis.
Specific aspects included:

- The delays meant that the NG funding was not formally agreed until June 2020.
- There is a concern that investors would be more cautious in these uncertain financial times, which may make funding both the housing and the energy system more difficult.
- On the plus side, the pandemic has brought about a strengthening in local communities and increased support and communications.
- Moving communications online has made participation in meetings easier.

More specifically with Covid-19, in spring 2020, the developers were aiming to submit an outline planning application for all three sites by the end of 2020. However, the impact of the Covid-19 pandemic meant that almost no work was carried out on the development project for the following six months. As a result there was a decision to focus on the site with the most straightforward land ownership which impacted on the potential number of homes.

The choice of site and number of homes affected BCE in two ways:

- It determined the scale and cost of technologies, and potential demand for energy, thus affecting the entire business case
- As an organisation closely linked to the community, there remains a potential reputational risk for BCE in becoming involved in a development that is unpopular, especially if the number of homes proposed is higher than in the Local Plan.

It goes without saying that managing the impact of the pandemic has been stressful for all involved.

Discussions with Stakeholders

This has not always been straightforward and the inability to secure contractual agreements or to learn what energy performance levels the new homes would meet has caused BCE considerable anxiety. The developers proposed to set up three groups of key stakeholders:

- The Design Team – consultants working on the design of the project from different companies to provide input on master planning, civil engineering, landscaping, outline costing etc. and reporting to The Project Board
- The Project Board – representatives of the three landowners and the regeneration team
- A Working Group – representatives of the community, a communications consultant, BCE and representatives of the Design Team, to provide input to and consult on the proposals.

The role of BCE as a development partner was not fully appreciated by other stakeholders at the outset and they had no plans for a formal, contractual role for BCE, despite expecting that BCE would be investing significantly in the project. We have had to push hard to become embedded into the project.

However over the summer and autumn 2020 we were able to have useful discussions with the developers, the master planners and land owners to discuss the proposed design and we received initial proposals on layout, numbers and sizes of homes which we have been able to feed into the energy model. However these plans subsequently changed and this information was not relayed to the BCE Team.

The developers were aiming to make the fabric of the homes highly energy efficient, but a standard has still not yet been agreed. It is likely to be equivalent to or better than AECB Silver, but not Passivhaus. We have collected information on the costs of Passivhaus standard developments in the UK, and examples of a large scale social housing that is being built to this standard for no additional cost in Exeter.

The BCE Team has been involved in Working Group meetings and a couple of site visits (socially distanced, when these were allowed) and continues to be involved in village discussions about the project even though the project has been postponed.

Conclusions and Responses by the BCE Board

The points below reflect what the Board of BCE considers to be the most critical findings of the technical elements of the NG Phase 1 project – i.e. can the project be delivered technically and should we therefore proceed? It suggests how the Board might progress the project technically in the event that sufficient reassurance be forthcoming across other project management / partnership areas.

Key Findings

1. The supply and management of community owned renewable energy to multiple new homes in Burneside is technically feasible and potentially financially feasible too, albeit with very low financial margins and with high risk.
2. A significant proportion of the energy needed to supply multiple 'low carbon' homes in Burneside can be generated and stored at the individual house scale – however, the investment, ownership and management of this is legally and financially very complex and risky.
3. Individual solar PV arrays on individual homes owned by a community energy company are very problematic, legally.
4. The energy modelling for Burneside requires more specific detail than has so far been provided by the developers regarding the level of energy performance of each new house type. Until this is forthcoming, a more robust calculation cannot be made of energy demand and supply. Even with this detail, modelling will always remain hypothetical as humans do not behave according to graphs. A sufficient margin of error would therefore need to be considered before pursuing any particular solution.

Key Implications

1. The financial, technical, legal, managerial risks and costs of pursuing the provision of community owned energy systems on an individual house scale in Burneside (irrespective if it is rolled out across 100+ homes) are too great a burden and threat to the effective management of BCE, which is undertaken by volunteers.
2. Following this, the 'risk to return ratio' / return on investment for BCE in delivering significant benefits to Burneside residents is disproportionately low.….though the Board of BCE recognises that this project has potentially much wider, UK scale implications.
3. BCE and its Partners should continue to consider the opportunities for further development of centralised, aggregated community energy resources to serve the proposed new homes, be this battery or heat storage, solar PV arrays, EV car bank or other. These could all form 'stepping stones' or even 'key stones' in embedding low carbon renewable energy into a future development in the village. These are inevitably much easier to manage than multiple systems across each new home.

We hope that the 'Insight' section of this report has covered the lessons learned comprehensively, both technically and in terms of managing and governing a project like this.

A bullet point summary would therefore include:

- Don't underestimate the complexity of projects like this.
- Have you really considered all of the contractual arrangements that you are likely to encounter and the enormous kaleidoscope of stakeholders involved? Create a great big map / table / chart at the outset and consider carefully how to manage this.
- Energy modelling may be fun and exciting but it is also very complex, dynamic and full of risks. Energy markets can change suddenly (Oct 2021!), new data can come to light, behaviours and incentives can change – so always include a significant margin of error before considering progressing or investing.
- Carbon literacy would be a great first step in any engagement with all stakeholders, including developers. Lots of folk say they want 'carbon neutral' or 'zero carbon'…..but do they know what it means, what it looks like, what it costs? Getting everyone on the same page at the outset is

very important and one can't just assume everyone knows these terms, though they may use them regularly.

- Don't say "Yes, I understand" to consultants or developers if you really don't understand. Ask them to relay the information in simple terms, if must, but don't wander blindly around these projects. (Having said this, we could not have wished for a better consultant leading the study than Quantum Strategy and Technology!).

It's important to push boundaries, to seek and to try out new models of community energy, as BCE has done in this project. If it doesn't work, don't throw the baby out with the bathwater…..as the journey can build invaluable relationships and trust ….and eventually lead to another project, if not in exactly the same guise. BCE is continuing to seek new opportunities within the village and with local landowners and developers

In terms of advice to other community groups – it is essential that the Board / Members set us a separate 'project management / steering group' to administer and lead the project. Ideally, someone with technical experience drawn from the Board or co-opted from the membership would attend these meetings. There is a huge amount of data and information to absorb – and this cannot realistically be communicated to the Board in a normal Board meeting. The level of detail and critical decision making cannot be underestimated – so allow plenty of time. If the current Board cannot commit to this, then reflect carefully on whether or not to embark in the first place.

Before applying, survey the community energy landscape and see what has been done before and what is currently underway. It was enormously helpful talking to other practitioners and reviewing other similar projects across the country.

We did not buddy up with any university academics as we know from experience that frequently such academics have research agendas to fulfil rather than necessarily the drive to support such projects in the practical way a Board might prefer. Nevertheless, groups may wish to investigate with a local college / university whether there is an appropriate department which might be able to lend a hand (e.g. engineering / architecture department with heat and energy modelling expertise).

Appendices