Net Zero Community (NZCom)

Work Package 5

D10 – A Guide for Communities

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V4	TJ	1/12	Additions to Chapters 5 & 7
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For more information about the NZCom project including details of the research completed and the reports produced visit: https://www.wren.uk.com/nzcom

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1 Foreword

National Grid as a distribution network operator has approximately eight million customers across its four licence areas and those customers are essential to net zero and the UK's aspirations to a decarbonised economy. As part of our responsibilities to those customers we have an obligation to not only deliver a safe and reliable electricity system, but also to innovate to make it fit for purpose for future generations.

In 2021 we launched Project Vulnerability and Energy Networks, Identification and Consumption Evaluation (VENICE) our first innovation project focussed wholly on customers and in particular those with vulnerabilities. VENICE has three work packages, the first looked at the effect of the pandemic and working from home, the second looked at using data to predict changes in consumer behaviour that could indicate a new vulnerability, and finally, the Net Zero Community (NZCom) work package, which leveraged a community energy group to investigate new business models to engage the fuel poor in net zero.

National Grid is delighted to have worked on NZCom with Wadebridge Renewable Energy Network (WREN) and their project partners, namely University of Exeter, Planet A Solutions and Community Energy Plus (CEP). This community guide comes reflects all the work completed in their work package and is intended to allow all communities to have access to the research and tools developed that can help with the transition to net zero. It is National Grid's role to help facilitate net zero as far as we can and this guide, we think, will be a really helpful resource alongside the Future Energy Tool.

We hope that all communities will find real value in the outputs of VENICE.

Stuart Fowler

Innovation Engineer

National Grid Electricity Distribution

2 Setting the scene

During the delivery of the Net Zero Community (NZCom) project, Western Power Distribution (WPD) was bought by National Grid and rebranded National Grid Electricity Distribution (NGED). Therefore, where reference is made to WPD, it should be noted that future development of the ideas and proposals in this guide will be carried out under National Grid programmes.

The Government, Cornwall Council and many Cornish town and parish councils have declared 'climate emergencies', setting targets to achieve net zero carbon at various points between 2030 and 2050. What does this really mean? What are 'net zero' carbon targets and how do we all play our part?

Broadly, net zero means being as energy efficient at possible at home, work, school and when we are travelling, whilst maximising our use of renewable energy sources and off-setting or balancing any unavoidable emissions by measures that remove carbon (CO_2) from the atmosphere.

However, when you try to get into the detail, all sorts of questions and concerns arise, such as the potential costs of switching to low carbon heating and energy efficiency upgrades to your home, as well as challenges of societal shifts towards the use of low carbon transport and waste reduction behaviours. Currently, as a community, we do not have all the answers, but through the NZCom project we are working through these challenges together.

2.1 Project Background

2.1.1 The Problem

The Government has set ambitious targets for the UK to reach net zero carbon by 2050. Cornwall Council has declared a Climate Emergency and set a target for the Council to become carbon neutral by 2030. It is inevitable that to meet these targets, there will be a significant increase in electricity consumption within the community and across the UK. However, moving away from carbon intensive energy sources such as coal, oil, and gas, has the potential to push more people into fuel poverty and negatively impact energy consumers who are already vulnerable.

Demand for electricity is likely to at least double by 2050. The Climate Change Committee has recommended that all homes need to achieve an energy performance rating of level C by 2035; the energy efficiency of a property is shown on its Energy Performance Certificate (EPC), and it is an important guide to the actions needed to improve its thermal qualities and as a result reduce its CO_2 emissions. The Committee have set out a plan in the 6th Carbon budget to achieve this by increasing insulation levels, improving energy efficiency, and phasing out domestic gas supplies and other carbon intensive heating fuels. In addition, the Government plans to phase out the purchase of new diesel and petrol cars and encourage car owners to switch to electric vehicles. Potentially, this will have a massive impact on rural communities with poor public transport links.

At the start of the project in 2021, Government data showed that 12.6% of Cornwall's households were currently in or at risk of fuel poverty, that is, more than 30,000 WPD customers. The cost-of-living crisis and the escalating cost of energy that has impacted households during 2021–22, has further increased the numbers of households struggling to afford to keep warm.

In addition, 67% of Cornish homes are estimated to have an EPC rating of D or lower. Affordability and availability of capital to invest in home improvements is a real concern for many people and it may mean that individuals may not be able to make the most energy efficient options to reduce their carbon consumption.

2.2 The purpose of this guide

This guide has been written to assist community energy, climate action and other groups interested in defining a journey to net zero for the communities that they represent, answering the questions:

- How do we help our community make the transition to a low carbon future?
- What do we need to know and understand about our community?
- Where are the most vulnerable members of our community and what help do they need?

Each chapter in the guide covers the main workstreams of the project and tries to reflect the discussions and research the NZCom team have produced in the context of the Wadebridge and Padstow Community Network area and our lessons learnt. We recognise that many communities are starting the journey of a transition, and so there are lots of questions, which will have different solutions in different communities. We hope this guide will prompt local discourse amongst the groups and key stakeholders in your community.

We have provided links to the detail behind our research and other useful guidance that we have come across along the way. There is no easy answer or one size that fits all, so we are always keen to receive feedback and understand where we can improve this guide or discuss other methodologies that can be considered. Please feel free to email the WREN team at nzcom@wren.uk.com

3 Leaving No-one Behind

3.1 Vulnerabilities and barriers to action

During the delivery of the NZCom project, the rapid rise in the cost of energy has been an issue that every household and business has had to face. It has bought into sharp focus the numbers of households that are struggling to afford to heat their homes properly, and equally, many small businesses, particularly in the hospitality sector, have started to question their viability. The rise in costs of grid supplied energy has prompted many people to look again at domestic energy efficiency improvements and options for renewable energy generation.

However, it is important in considering the transition to a net zero energy system and the take up of low carbon technologies to distinguish between vulnerability to energy costs, (typically termed fuel poverty), and wider vulnerabilities that may prevent households and businesses making the transition to a net zero. While the numbers of households in, or at risk of fuel poverty is rising sharply and, potentially, will have an impact on overall carbon emissions (as lower income households tend to have smaller carbon footprints than more affluent households), financial concerns are not the only barrier to acting on the net zero challenge.

During the delivery of NZCom, in various engagement activities we have used the imagery of a hurdle race as a metaphor, to reflect the language used by PM Boris Johnson when he launched the 2020 Energy White Paper, and he talked of the 'Race to net zero'. We must not assume that every participant starts in the same place, nor that they are equally ready or equipped to join the race. Some will hit barriers (hurdles) early on and may quickly give up; others will look at the challenge and not know where to start. The analogy of an athletics event is helpful because it allows us to compare what is needed for a short sprint or a marathon, which is a closer match to the challenges we are facing.

If as a community, we are starting to make the transition to net zero, some people will be able to move quickly and independently, but can we really make sure no-one is left behind? Are we clear that everyone is running the same race? For those who can take early actions and make appropriate investments, does this create energy inequalities that give them advantages over those people who are unable to act at the same time? For instance, it has been recognised that people who are privately renting are less able to act to improve the energy efficiency of their home. As a rural area that has a sizeable proportion of properties that are not connected to the mains gas grid, the Wadebridge and Padstow Community Network area provides many good examples of older properties that are harder to heat and potentially more expensive to retrofit low carbon technologies.

3.2 Energy Industry definitions

In the context of the work that the Network Operators are licensed to deliver, they are regulated by Ofgem, and as part of their licence conditions, they must have regard to Ofgem's definition of vulnerable consumers.

Ofgem defines vulnerability as

> 'When a consumer's personal circumstances and characteristics combine with aspects of the market to create **situations** where he or she is:

> • significantly less able than a typical consumer to protect or represent his or her interests in the energy market and / or
> • significantly more likely than a typical consumer to suffer detriment, or that detriment is likely to be more substantial'

This definition includes consumers that may experience vulnerability over a prolonged period, or it may only occur in a particular instance, and may include consumers who are:

- struggling to afford bills
- living in a cold, energy inefficient home
- in or at risk of fuel poverty
- facing pressure sales tactics
- struggling to understand and act upon information or choices (such as getting the best deal) or
- lacking the confidence or ability to pursue a query or complaint

Note that this definition relates to the domestic energy consumer. As explained in our briefing note, *A working definition of vulnerability of non-domestic consumers*, (see link in 3.4), amendments have been proposed by Ofgem to the supplier licence conditions as they relate to non-domestic consumers, and with this will come a recognition of vulnerability with small and medium sized businesses.

3.3 A just transition?

Throughout the delivery of the NZCom project, at focus groups and community engagement events it has been very apparent that there is a widespread lack of knowledge of the technology options to get to net zero. Participants are familiar with the 'normal' means of heating their properties – gas or oil boilers, electric storage heaters – but they are less familiar with what heat pumps are, or how they work. Concerns about running costs and maintenance issues were regularly raised in group discussions.

This lack of knowledge leads to uncertainty, and a lack of confidence that the appropriate actions are understood and can be taken safely without undue cost if something goes wrong. We met questions about where to get reliable advice, as there was some wariness about taking advice from installers and those with vested interests in specific products.

Concern was expressed about the prohibitive costs of actions, especially when thinking about decarbonised heat and the need for financial support. Looking for grants to fund partially or fully upgrade the energy efficiency of homes, still appears to be a trigger to find out what action could be taken. Comments were made in the focus groups on the recent Green Homes Grant scheme, indicating that there was interest but also frustration at how that scheme failed.

It still appears that the key point to act (and where access to advice and information is essential) is when existing equipment needs to be upgraded, or when a notable change is being contemplated, for example when moving into a new home or planning major home improvements. Lack of advanced planning for future investments can mean that decisions are based on the urgency to get systems working.

3.4 Where to find out more

- Vulnerability of domestic consumers
  https://www.wren.uk.com/images/documents/NZCom/NZCom_8_Vulnerability_in_the_Energy_Sector_-_domestic_consumers.pdf

- Working definition of vulnerability of non-domestic consumers

  https://www.wren.uk.com/images/documents/NZCom/NZCom_Report_D19_Vulnerability_in_the_Energy_Sector_-_Non-Domestic_Consumers_v560275.pdf

3.4.1 Identifying vulnerable households in your community

There are numerous online resources that will help you to create a profile of the vulnerable members of your community.

For those communities within what was WPD's network area, the Social Indicator Mapping tool developed by the Centre for Sustainable Energy is a useful starting point to map your area. This provides data either at Local Authority level or at Lower Super Output Area (LSOA), which is a commonly used geography for statistical reporting (used by the Census).

- https://www.nationalgrid.co.uk/customers-and-community/priority-services/social-indicator-mapping

The UK Government publishes annual data on rates of fuel poverty (note that the annual release reports on the situation two years ago).

- https://www.gov.uk/government/collections/fuel-poverty-statistics

Included in the Social Indicator Mapping tool are data showing different markers of deprivation; again, the Government releases regular updates on these statistics.

- https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019

Finally, the Census has a lot of useful data about your community that will help you build the picture of your community. At the point of writing, December 2022, not all the datasets from the 2021 Census had been released, so periodic visits to the Census 2022 website are worthwhile to check on the latest releases.

- https://www.ons.gov.uk/census

4 Future energy scenarios for net zero

4.1 Overview

Scenarios are tools for exploring possible outcomes in the future. The purpose of establishing scenarios is to develop a set of plausible perspectives of a wide range of future possibilities, aiding discussion, and guiding decision-making in the context of complex and uncertain societal changes.

Scenarios can usefully be contrasted with forecasts. While forecasts tend to provide narrow, simplistic, and often optimistic perspectives on how systems might change, the role of scenarios is often to highlight a range of contrasting futures, and therefore they can help expand and challenge existing worldviews.

Scenarios are valuable tools to aid decision-making, but they are not value free. Top-down, national, and international scale scenarios have been criticised for being overly complex, focusing on technical and physical infrastructure, but insufficiently addressing:

a) social infrastructure – such as the engagement necessary to support the transformations needed
b) equality and inclusion of transformations and how they affect different sectors of the population
c) the interactions that are needed between actors responsible for promoting changes at the local and national scale.

As part of the NZCom project, three scenarios were developed specifically for the Wadebridge & Padstow Community Network Area, two of which reach net zero, and one of which falls short (Figure 1). The framework in which these scenarios sit is based on National Grid's Future Energy Scenarios 2021, but with a new emphasis on societal engagement rather than societal change. (See section 4.5 for where to find this document.)

The work undertaken to produce these scenarios aimed to depict credible energy futures for the Wadebridge & Padstow Community Network Area, which are relevant and detailed enough to be of use for decision-makers in the local area. Therefore, consideration was given to the rural nature of this community, and attention was given to the local context in terms of resources, infrastructure, and demographics, to be able to inform local practices and strategies. Replicating this approach in other communities should note these assumptions.

Achieving net zero by 2050 is not inevitable. The Falling short scenario represents a baseline scenario in which low levels of ambition at national, regional, and local scales translate to poor progress towards decarbonisation, as well as a persistence of negative impacts on the most vulnerable members of the community.

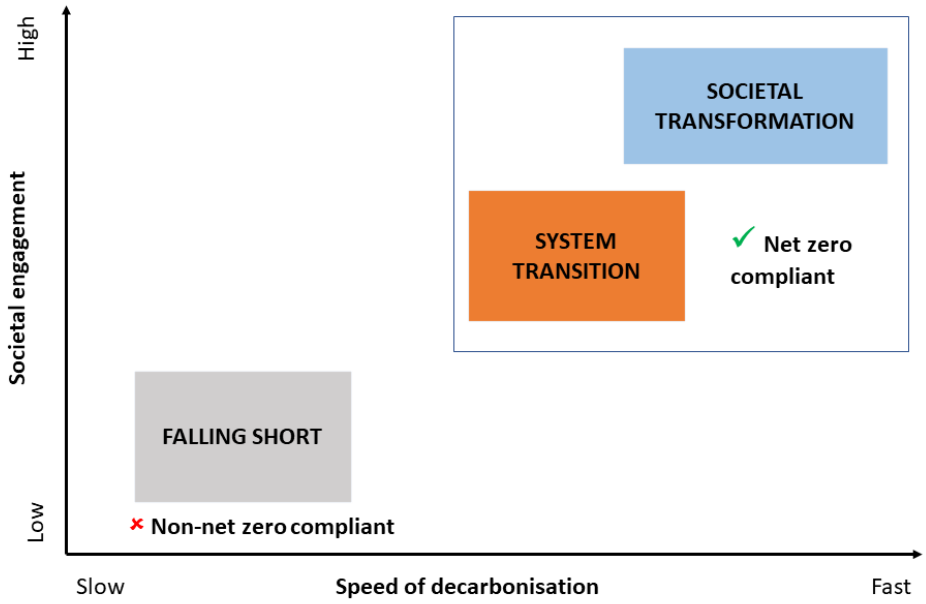


Figure 1: Net Zero Community Scenarios framework

The two net zero compliant scenarios, **System Transition** and **Societal Transformation**, can be distinguished by the degree to which developments on the pathways to net zero are utilised and built upon.

- **System Transition** represents a path to net zero which emphasises the deployment of large-scale interventions in the energy system, achievable by conventional supply-side approaches to energy policy and infrastructure.
- **Societal Transformation** meanwhile emphasises a role for household and community-scale interventions as well as behavioural changes in energy consumption, requiring a major change in societal engagement and participation in the process.

While net zero is theoretically possible through System Transition, it is likely to a) take longer, and b) will exacerbate vulnerabilities compared to the Societal Transformation scenario.

4.2 The No-regrets options

While there are multiple, plausible pathways to net zero for the community, there are several options that are consistent across net zero pathways. These represent no-regrets options.

Accelerated society-wide domestic energy efficiency retrofit is critical to achieving net zero. Whilst retrofitting homes is central to the Societal Transformation scenario, System Transition also implies a step change in retrofitting energy efficiency measures to homes, compared to the Falling Short scenario. Decarbonising all homes requires an integrated, holistic, and long-term approach, underpinned by national policy frameworks and regulations. This also requires new forms of governance and business models.

Societal engagement is an important aspect of reaching net zero. While comprehensive public engagement is central to Societal Transformation, engagement is still needed for the System Transition pathway. Societal Transformation implies coordination of engagement practices, such as working with residents to make multiple technology decisions, opting to use flexible energy tariff options, and sequencing interventions to gain the most benefit. Social learning, efficiencies and

additionality are more likely to be achieved through coordinated engagement when compared to the ad-hoc and uncoordinated engagement implied within System Transition.

4.3 Using NZCom's scenarios as a proxy for other communities

This section outlines some of the ways in which the methods developed to establish the three scenarios for the Wadebridge and Padstow area can be applied in full or in part by other communities. Many of the issues encountered in the NZCom project will be like those experienced in other communities. Considering what one or more future energy scenario might look like for your community can help active members of a community to:

- **Support calls for action** and approaches that assist the transition to net zero and address vulnerabilities, for example, by sharing the examples developed for the Wadebridge & Padstow area.
- **Challenge 'business as usual':** The scenarios developed by the NZCom project, and indeed all net zero scenarios developed at regional and national scales, make a poor case for continuing to do the same as we have thus far, that is, 'business as usual.' For the NZCom scenarios, this is especially the case for the **Falling Short** scenario, which fails to achieve our net zero targets. Greater shifts away from business as usual will be necessary to unlock the many benefits of addressing net zero.
- **Make the link between social infrastructure and net zero**: Our Societal Transformation scenario reflects the levels and forms of societal engagement necessary to reach net zero whilst addressing vulnerabilities. Again, this will not be unique to the Wadebridge and Padstow area. Understanding how local decarbonisation and wider societal objectives are aligned could help decision making concerning the resources, capacities and training needed for a range of engagement proposals in your locality.

4.3.1 Adopting general principles from the NZCom scenarios

Our scenarios echoed key findings from analyses at national and regional scales. For example:

- Multiple, plausible energy system futures exist, as does the possibility of not reaching net zero at all.
- Change is systemic, and which pathways are realised will be influenced by a large number of interconnected technological, economic, behavioural, and political factors. These factors can align to support decarbonisation, but they can also align to frustrate net zero ambitions.
- Improvements to thermal efficiency of existing buildings is universally accepted as a no-regrets option. Failing to upgrade buildings will mean net zero targets are missed.
- Some progress towards decarbonisation may be made with minimal societal engagement. However, the question remains as to how more controversial / disruptive forms of change could be achieved without meaningful societal engagement.
- Equally, it will be possible to address decarbonisation to an extent, without addressing vulnerabilities. Again, progress towards decarbonisation will be frustrated if we fail to obtain a broad social mandate for net zero, and/or existing vulnerabilities are neglected.
- A plausible scenario exists in which decarbonisation is aligned with environmental, societal, and economic co-benefits. Again, this will require societal engagement across and beyond

the energy system, tailoring engagement to specific technologies and sectors of society, and coordination of energy system actors.

4.4 Questions for communities

By integrating a wealth of information relating to technological and societal change, scenarios can help to shape a framework for decision-making relating to housing, energy infrastructure, transport, and social engagement. They can be valuable tools for a range of stakeholders, including (but not limited to) investors, community groups, parish or town councillors, and the local public.

When starting discussions around what the transition to net zero might mean for your community and how you might go about achieving it in a desirable timescale, the following questions may be helpful:

Local engagement

- How engaged is our local community in sustainable energy issues?
- How do groups in our neighbourhood interpret and interact with the net zero agenda? What actions have been taken so far to engage our community on net zero issues and/or vulnerability?
- How can the parts of our community that are currently unable or unwilling to engage in energy issues be included? How are their views considered in the outcomes we want, as well as in decision-making processes?
- How can existing capacity and work that has already been done by local organisations be used to engage our community, particularly those who might be difficult or less likely to engage?
- How can our group increase the range of people and other organisations advocating and working towards inclusive net zero pathways in our community?
- How does energy relate to people's 'sense of place'? Do considerations about access to and consumption of energy and wider net zero issues resonate with local priorities and concerns?

The social feasibility of reaching net zero

- In thinking about programmes to retrofit energy efficiency measures at a community scale, what resources do we need?
    - Consider: access to advice and information, the capacity and skills of local installers, maintenance of infrastructure; also, are there locally trusted groups that will help provide endorsement of any plans?
- What are the range of local attitudes in support of / opposition to increased wind and solar power generation in our community?
- What avenues are there to engage with people who are not currently engaged with energy issues in our community?
    - This may include ensuring that local councillors and other key decision-makers are supportive of your plans.

The technological feasibility of reaching net zero

- How easy is it to connect new renewable energy infrastructure to the local network? Are there any local constraint issues with the electricity grid?
- What renewable energy resources already exist in our area?
- What is the potential for additional renewable energy generation in our area? How do the regional projections align with local ambitions for new renewable installations?

Housing

- Are there any specific challenges relating to retrofitting energy efficiency measures in our local building stock? For example, higher than average numbers of detached properties, lots of properties with solid wall or prefabricated construction.
- Are there any properties in our community not connected to main gas network (off-gas)? Where are they?
- Are there conservation areas, AONB, or other planning constraints that will impact the delivery of area-based programmes?
- Is it possible to identify quick wins for energy efficiency programmes that we can promote?
- Is there a Neighbourhood Plan(s) for our area? What does it and the current Local Plan propose for standards for new homes built in the future and how can we influence this?
- What plans are there for retrofitting existing housing stock with energy efficiency measures in our community? What investment in skills will be needed in the area to achieve this? Are there local exemplars of low carbon homes that could be replicated?
- How can vulnerable households in our community be assisted to access plans for decarbonising their homes?

Renewable energy generation and infrastructure

- What are the key energy challenges and opportunities for our community?
- What does the existing Neighbourhood or Community Plan say about renewable energy generation? What aspirations for the growth in renewable energy assets are included in the Local Plan (i.e., at the primary authority level – Unitary or County Council)? What opportunities exist to develop new renewable generation assets, such as solar PV or wind? Where could these assets be sited in the area (on buildings or land)?
- What forms of governance are most appropriate to maximise success in terms of both local carbon energy and social outcomes? See the Community Business Models Options paper. See section 7.5 for a link to more on community ownership or part-ownership, and community share offers.

Transport

- What are the challenges and opportunities regarding a transition to low carbon transport in our community? For example, train connections, bus routes, infrastructure for cycling and walking.
- What plans are there to introduce or extend active travel plans, for environmental and health reasons in our community?
- What plans are there to introduce electric vehicle charging points locally, to ensure accessibility, and that EV ownership is not dependent on being a homeowner of having access to off-road charging?

Cross-cutting issues

- What jobs and skills could be created through the transition to net zero in our community?
- What opportunities are there to align the transition to net zero with public health and environmental targets that have been established for our community?
- What activity or plans are in place to refer patients to support and advice keeping their homes warmer and free from damp to improve health outcomes?
- How might a local transition to net zero build on and support changes in neighbouring communities?
- What can we learn from other local communities who have trialled or delivered sustainability agendas?

4.5 Where to find out more

To read in more detail about the scenario planning that has been done for the NZCom project, see:

- Review of future energy scenarios and associated methodologies

  https://www.wren.uk.com/images/documents/NZCom/NZCom_Report_M21_Review_of_energy_scenarios_and_associated_methodologies_-_FINAL60052.pdf

- High level net zero scenarios developed for the Wadebridge and Padstow Community Network Area

  https://www.wren.uk.com/images/documents/NZCom/NZCom_Report_M22_High_level_scenarios_FINAL.pdf

To find out more about the information behind the scenarios that have been developed see:

National Grid. Future Energy Scenarios

Available from: https://www.nationalgrideso.com/future-energy/future-energy-scenarios

Regen/Western Power Distribution - Distribution Future Energy Scenarios

Available from: https://www.regen.co.uk/project/wpd-distribution-future-energy-scenarios-2020/

5 Carbon Modelling

5.1 Overview of Carbon Modelling

It is likely that many of the people reading this guide know about and have used online carbon foot-printing tools to help understand their own contributions to the climate change problem. To bring about lasting change, it is critical that we understand where we currently are, with regards to carbon expenditure and that we measure the impact we are currently having on the planet. **A key step in starting the transition to net zero is to understand where we start from.** This is where carbon modelling is a valuable tool.

Greenhouse Gas (GHG) accounting can be done at various levels. Looking at products or technology, individuals and households, organisations, or working at a community, city, or regional scale, all have value, but they each have a distinct purpose and set of challenges. Broadly speaking, GHG accounting can be done from two different perspectives,

1) Production-based (also known as territorial) accounting, and,
2) Consumption-based accounting.

Another way of categorising emissions is by Scope, based on the framework developed in 'The GHG Protocol Corporate Accounting and Reporting Standard' that provides requirements and guidance for companies and other organisations preparing a corporate level GHG emissions inventory.

Although many, larger businesses are familiar with understanding their emissions using this framework, communities and individual households are less likely to have used this approach and may not be familiar with the technical language. However, starting to think about emissions in this way is helpful to working out what can be changed at a community level, and what changes need the contributions of other organisations and decision makers.

Scope	**Categories of emissions by scope**	**Details**
1	*Direct GHG emissions*	Direct GHG emissions occur from sources owned or controlled by the household/ organisation, for example, emissions from combustion in heating systems.
2	*Electricity indirect GHG emissions*	GHG emissions from the generation of electricity consumed by a household/organisation. Scope 2 emissions physically occur at the facility where the electricity is generated.
3	*Other indirect GHG emissions*	Scope 3 emissions are a consequence of the activities of individuals/households/organisations but they occur from sources not owned or controlled by them. Some examples of Scope 3 activities are the extraction and production of materials for goods; transportation of goods or fuel; and the use of sold products and services.

Table 1: Emission Scopes

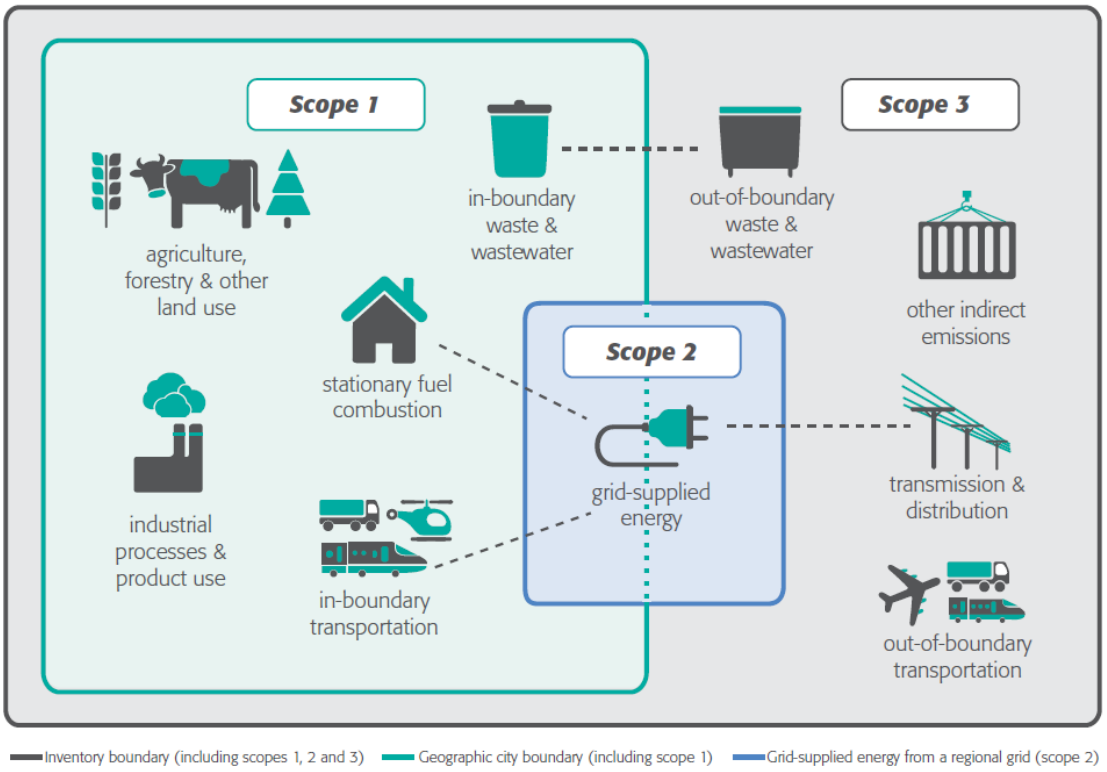


Figure 2: Sources and boundaries of the different scopes of GHG emissions

5.2 NZCom 2050 carbon accounting tool

The NZCom project has produced a carbon accounting tool to assist communities in quantifying their best approach to reaching net zero by 2050.

To reach an understanding of how to achieve net zero in your community, first you need to define and understand the mix of buildings in your community and their energy requirements. The Future Energy Tool (https://www.wren.uk.com/nzcom/future-energy-tool) will help you to complete this process for residential properties only, providing a model of what your community looks like now and allowing you test out different community scale interventions that can reduce carbon emissions.

To generate a carbon model of your community you will need the following information for homes in your community, based on actual data or derived from estimates where data is not available.

1. Property type and EPC rating – these are grouped to EPC C and above, and EPC D and below.
2. Heating system type and fuel
3. Percentage of homes that already have solar PV, heat pumps or use of an electric vehicle
4. The appetite of your community to reach net zero by taking low carbon actions
5. The local cost of different fuels (national averages can be used if unknown)

A step-by-step guide is available to download on how to use the tool, how to find the information that you need to input, and more importantly, what to do with the outputs. The model only covers energy usage and associated missions from domestic properties and transport.

Heating represents 17%[1] of domestic carbon emissions, so, it is therefore important that this information is determined as accurately as possible for your community, to ensure that the tool produces valid information.

To assign a carbon factor for the different fuel types used in a community, energy use for a typical home under different construction types and different heating fuels, needs to be categorised against unregulated electricity, space heating, and domestic hot water. (Calculations on all fuel types should be converted to tonnes CO_2 equivalent (tCO_2e) and the conversion factors used in the tool are based on the Greenhouse gas reporting: conversion factors datasets 2022 (see link in section 5.3).)

For example, the Wadebridge & Padstow Community Network Area was defined to have the following heating and domestic hot water (DHW) methods as follows:

Table 2: Example extract from Wadebridge and Padstow Local Network Area Net Zero 2050 report

Group no.	Energy & method used for heating homes & producing hot water	No. homes in community	Additional information
1	Gas heating and DHW	6,457	
2	Electric storage heaters – Economy 7	2,578	Electric immersion DHW
3	Oil heating and DHW	2,128	
4	Electric heating (standard tariff)	732	Electric immersion DHW
5	Electric heat pump	827	
6	LPG/bottled gas heating and DHW	412	
7	Wood/biomass heating	221	Electric immersion DHW
8	Coal heating	51	Electric immersion DHW
9	Electricity	0 – 1,318	Future additional homes

From the information entered, the Future Energy Tool will provide a community scale picture of energy usage, carbon emissions and energy cost to 2050. The tool can be run multiple times to explore what impact different decisions will have and the importance of the timing of those decisions.

Once you have established the pathway that your community wants to take, you can share the model with members of your community, and they can look at their own individual journey based on the context of the tailored model.

The tool is as much about engaging your community about net zero and energy efficiency as it is about setting ambitions and proposing collective actions.

5.3 Where to find out more

To read in more detail about the carbon accounting methods considered for the NZCom project, see

- Community scale NZC 2050 carbon accounting method

https://www.wren.uk.com/images/documents/NZCom/NZCom_Report_D6_Community_scale_NZC_2050_carbon_accounting_method_final.pdf

[1] UK Government, *Heat and Buildings Strategy* October 2021, p29, found at: https://www.gov.uk/government/publications/heat-and-buildings-strategy

- Wadebridge and Padstow Area Community Network Area Net Zero 2050 report

https://www.wren.uk.com/images/documents/NZCom/NZCom_Report_D8_Wadebridge_Net_Zero_2050_Report_Final.pdf

- Greenhouse gas reporting: conversion factors 2022

https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2022

6 Working out the technical solutions

6.1 What is achievable?

NZCom's next step was to work out what practical solutions could be developed to help the Wadebridge & Padstow Community Network Area start the transition to a net zero energy system. These solutions were based on the Societal Transformation scenario and based on the outputs of the carbon accounting tool. Figure 3 gives an overview of the approach the NZCom project team took at this stage:

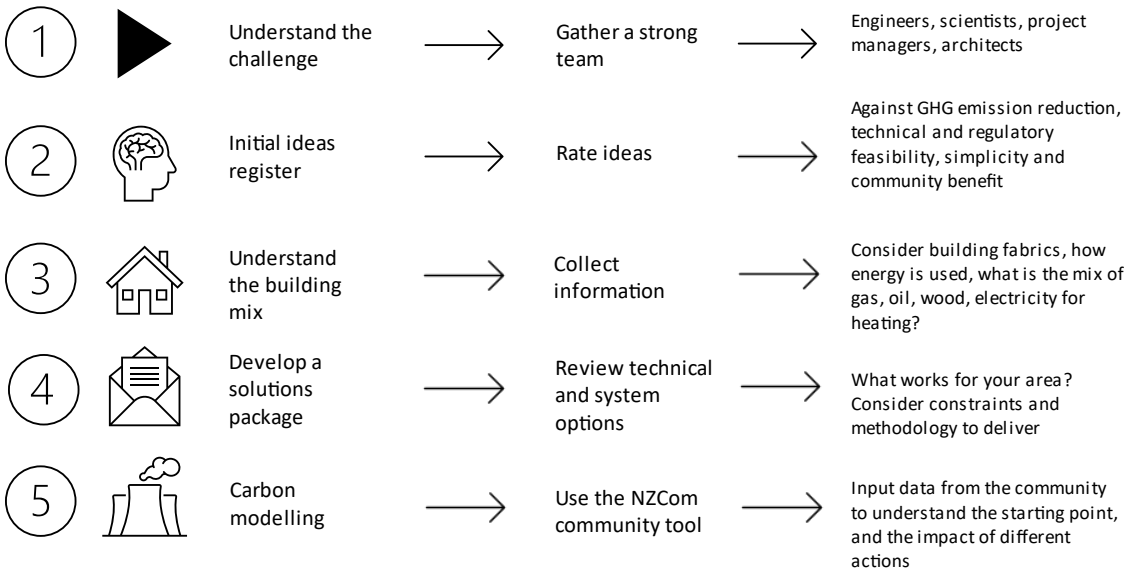
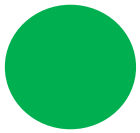


Figure 3: Thinking through the transition process

Some technical solutions will be better suited to delivering net zero for a specific community than others and each may also have different viability levels given the local situation. The tables below list some of the technical solutions which the NZCom team considered and that may be accessible to a community looking to reduce their carbon footprint, along with the benefits which may result from the implementation of these measures.

6.2 Decarbonised Heat

Table 3: Tackling heat in net zero

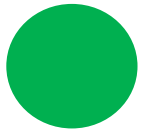
Measure	Community benefit	Reasoning	Rating of feasibility for a community energy group to contribute **Red** – Unlikely **Amber** – With difficulty but possible **Green** – Options for groups to consider	Find out more
Electrification of heat	• The electrification of heat (primarily using heat pumps) should include measures to retrofit and properly insulate buildings to minimise running costs. • Will meet net zero by replacing fossil fuels as primary heating fuel.	• The National Grid aims to decarbonise electricity generation by 2035 making electricity the cleanest available source of energy.		https://energysavingtrust.org.uk/advice/in-depth-guide-to-heat-pumps/
Solid fuel upgrade to Biomass	• Allows homeowners to retain the popular wood stove option for additional heat. Resistance is often met by the suggestion of removing open fires and wood burners.	• Wood is usually considered carbon neutral as it absorbs carbon during its lifecycle. • It is not considered to be viable for		https://energysavingtrust.org.uk/advice/biomass/

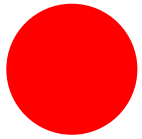
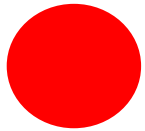
	• Local air quality will improve with the upgrade of appliances.	mainstream heat across the country as the UK's biomass resource is not sufficient.		
District Heat Networks (DHN)	• DHN and community heat schemes theoretically make the electrification of heat cheaper via the use of a centralised large heat source and a distribution network to households on the network. • This implies a reduction in the overall capital cost of an installation and, in the case of heat pump systems, gives a better performance efficiency.	• Sharing resources within a community for a localised heat network can be advantageous in terms of costs, efficiency, and maintenance.		https://energysavingtrust.org.uk/service/district-heating/ https://energysavingtrust.org.uk/what-district-heating/ https://www.cep.org.uk/wp-content/uploads/2018/06/Low-Carbon-Heat-and-Rural-Fuel-Poverty-Lessons-from-across-Europe.pdf
Combined Heat & Power (CHP)	• Typically, CHP works well for businesses such as hotels with swimming pools, or manufacturing /industrial processes with a 24/7 operating pattern. • This is achieved by burning gas more efficiently and simultaneously generates electricity for use on site.	• CHP systems rely on a gas connection and may only be beneficial in the short term unless replaced with a green gas alternative.		https://energysavingtrust.org.uk/advice/micro-combined-heat-and-power/
Upgrading gas boilers	• There is scope for the decarbonisation of the mains gas pipeline through injection of biomethane and/or hydrogen, as well as	• This is a short term solution only, as ideally, natural gas will be removed from the energy mix and		https://energysavingtrust.org.uk/advice/boilers/ https://energysavingtrust.org.uk/the-future-of-heating-in-the-uk-heat-pumps-or-hydrogen/

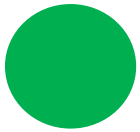
	ensuring properties already connected to mains gas have efficient boilers. • Improved heating systems for homes with old gas boilers will result in direct savings on heating bills.	replaced with electricity for heating or a green gas substitute will replace the existing supply.		

6.3 Using renewable electricity generation

Table 4: Renewable electricity for net zero

Measure	Community benefit	Reasoning	**Rating of feasibility for a community energy group to contribute** **Red** – Unlikely **Amber** – With difficulty but possible **Green** – Options for groups to consider	Find out more
Onsite renewable energy generation	• On site renewable energy generation such as rooftop solar PV, provides free electricity to your home or business if electricity is consumed whilst being generated. • Generation is installed "behind the meter" so no charges apply.	Renewable energy offers a reasonable payback on investment and the benefit lasts more than 20 years. Renewable energy generation is clean and free from greenhouse gases.		https://energysavingtrust.org.uk/advice/solar-panels/
Smart tariffs	• The carbon footprint of a community will be reduced if supply is from a certified 'green energy' supplier.	Some suppliers such as Octopus and Energy Local will enhance the benefit from local		https://energysavingtrust.org.uk/time-use-tariffs-all-you-need-know/

	• Suppliers may offer time of use tariffs which are cheaper than standard tariffs.	renewable energy generation, reducing costs to the users and making low carbon electricity available locally through specially developed supply mechanisms.		https://energysavingtrust.org.uk/advice/guide-to-smart-meters/
Pseudo-microgrid connected to the low voltage (LV) distribution network	• A lower energy tariff (p/kWh) can be achieved by connecting communities into a pseudo-microgrid within the LV distribution boundary. Renewable energy generation is distributed equally and fairly throughout the community.	This is an innovation developed by the project and is not yet available as a solution.		Contact the NZCom project team for updates on this proposal: https://www.wren.uk.com/nzcom
Pseudo-microgrid connected to the (HV) distribution network	• Economies of scale and cost reductions to the consumer can be achieved by connecting communities into a pseudo-microgrid at the HV distribution boundary, extending the area of benefit and increasing the scale of renewable energy generation that can be connected.	This is an innovation developed by the project and is not yet available as a solution.		
Divert existing commercial renewable energy generation into the	• Additional renewable energy generation will reduce the carbon footprint of a community in the reduction of main grid supplied electricity.	The energy generator may benefit from receiving a better rate per kWh than their current sale arrangement to the grid		

pseudo-microgrid, or to an existing load.	• Care is needed not to double count the carbon benefit of existing generation.	via Power Purchase Arrangement (PPA).		
Community owned solar PV generation	• Benefit may be shared by way of a reduced cost of electricity to local users, or by revenue benefit from the sale of electricity sale via a PPA. Carbon reduction may be counted towards the community footprint.	• Community owned solar is an assured way of generating clean electricity locally. This a mature market. • Clear community benefits in offsetting grid electricity with clean zero carbon electricity.		https://energysavingtrust.org.uk/how-community-energy-schemes-can-help-the-uk-reach-net-zero/
Community owned wind generation	• Benefit may be shared by way of a reduced cost of electricity to local users, or by revenue benefit from the sale of electricity sale via PPA. • Carbon reduction may be counted towards the community footprint. • May benefit from options such as the Octopus Fan Club tariff.	• Wind energy generation is a mature market though planning constraints exist. • Offers seasonal (year-round) electricity generation. • Clear community benefit in offsetting grid electricity with clean zero carbon electricity.		https://energysavingtrust.org.uk/what-are-the-benefits-of-community-owned-wind-power/
Community owned	• Provides additional power generation to the community primarily as green gas. The	• AD is only suitable for certain waste chains, for example		https://www.cep.org.uk/wp-content/uploads/2018/06/Low-Carbon-Heat-and-Rural-Fuel-Poverty-Lessons-from-across-Europe.pdf

Anaerobic Digestion (AD)	benefit is more likely shared via generation of electricity via a gas turbine, or development of a road transport fuel, but may be used directly as a heating gas. • Additional benefits include turning waste to power and minimising waste removal costs.	animal slurry. Generally required at scale and with careful planning. • Biomethane is carbon neutral as the methane emitted when burnt would naturally be released through decomposition of organic matter.		
Small-scale Hydro	• Where feasible, micro-hydro provides a continuous supply of electricity throughout the winter when rainfall is high – though this can be summer months too!) • Hydropower also provides interest to an area and attracts visitors. • Community scale hydropower can be considered for micro hydro (2-100kW) and small-scale hydro from 100kW up to 5MW – a significant contribution to net zero where the geography allows.	• Hydro is a fantastic resource but geographically limited. • Best suited to fast flowing rivers and streams where there are hills and mountains.		https://energysavingtrust.org.uk/advice/hydroelectricity/

6.4 Analysis of technical solutions in relation to NZCom

To ensure that the most appropriate methods of delivering net zero are considered a high-level assessment should be made in relation to the following characterisations: -

- **Technical feasibility**: This is a study to address technologies and actions in relation to suitability of location, technology availability, community benefit and technology readiness.
- **Regulatory feasibility**: This study identifies regulatory barriers – for example, the development of a pseudo microgrid challenges conventional regulation.
- **GHG reduction impact**:
- **Community Benefit**: Is there a financial and social benefit to the community? How is this justified, and how are the solutions inclusive of all members of the community?
- **Simplicity**: How challenging is this solution to implement? What skills are required to ensure it is managed effectively?

The full detailed analysis and prioritised list of potential interventions considered for the Wadebridge & Padstow Community Network Area are presented in the 'Review of Technical and System Options' report (link provided in section 6.5). This report can be used to provide an idea of the types of options that can be considered by other communities. Please note that not all, or indeed any, interventions may be appropriate for your community and that technical knowledge will be required to assess each option.

6.5 Where to find out more

To read in more detail about the technical options considered for the NZCom project, see:

- Review of Technical and System Options
  https://www.wren.uk.com/images/documents/NZCom/NZCom_Report_M41_Review_paper_V255995.pdf

- Wadebridge and Padstow Community Network Area Net Zero 2050 Report
  https://www.wren.uk.com/images/documents/NZCom/NZCom_Report_D8_Wadebridge_Net_Zero_2050_Report_Final.pdf

7 What can a community do?

7.1 The Role of Community Energy and Climate Action Groups

Community energy groups, local Transition groups and climate action groups come in all shapes and sizes. They reflect the interests and passions of their active members, usually all volunteers. From the experience of Community Energy Plus there are a range of activities that groups can focus on depending on the capacity and availability of group members; it is also our experience that many groups have members with considerable technical expertise, and they are often well connected to academic and technical experts who can help inform and guide plans and initiatives.

The three principal areas of activity that local groups may wish to pursue fall into three categories:

1. **Education**
   To inform and educate their community about opportunities for action. Although we may understand the challenge, the wider public are often unfamiliar with much of the language around net zero carbon and low carbon technologies. Community groups who can gain a reputation as a trusted source of impartial, accurate information are well placed to collaborate with their local authorities and others to educate their friends and neighbours.
2. **Facilitation**
   To facilitate engagement and discussion by making connections across their community, linking with experts and suppliers and other key players within their community and wider network.
3. **Action**
   To make things happen. Many community energy groups have developed renewable energy projects and now manage local assets that can make a significant contribution to local net zero plans.

From the research undertaken in NZCom, several conclusions have been drawn about how a community could start to transition to net zero. These include:

- Greater penetration of rooftop solar PV, both domestic and commercial
- Additional ground-mount solar PV and wind generation
- Greater adoption of heat pump technologies for domestic heating
- Greater use of EV with associated domestic and community-based charging infrastructure
- Options for community scale battery storage

As a Network Innovation project, NZCom has also proposed the creation of a Pseudo Microgrid (PMG) (as noted in table 4) as an efficient way in which locally generated renewable energy can be used within a defined community.

7.2 Community group activities

A series of options have been developed by NZCom for community energy or other community groups with interest and expertise in sustainability and carbon reduction to take meaningful actions within their communities.

For a community wanting to help households in its locality to start the transition to net zero/low carbon we suggest the following areas are ones where groups can help educate, facilitate and act:

7.2.1 Promoting Energy Efficiency

These activities can be supported by any community group. Encouraging property owners to improve the thermal efficiency of their homes and to consider retrofitting energy efficiency measures and low carbon technologies will make a significant difference to energy costs and reduce carbon footprints.

Understanding what is available – signpost to support
We strongly believe that community groups have a critical role offering impartial information to their communities. Understanding and communicating what grant support is available, both nationally and through your local Council, and knowing who will qualify for help, is a key role for a group that is well-known and trusted.

Thermal Imaging - *"A picture is worth a thousand words"*
Demonstrating to residents where the heat is escaping from their homes is a powerful way for a community group to start to engage with their neighbourhoods on the topic of energy and to help people see what actions they should further investigate. Low carbon whole house retrofit measures can be challenging but often there are small steps, like improving loft insulation, which are low cost and effective. Using a thermal imaging camera and being able to interpret the results to provide advice is a skill that needs to be acquired, but even without this level of understanding and experience it is a good educational tool and provides a clear call for action.

7.2.2 Encouraging the take-up of renewables

Community energy groups should look at the opportunities to promote and develop a range of renewable energy technologies (community owned or privately financed) such as rooftop solar, for both residential and commercial buildings, as well as ground mount solar PV, if feasible, and, potentially, once the planning environment changes in its favour, community owned wind power. There are many examples of how local energy groups have developed projects and then secured additional benefit into their communities from these ventures. A Community Business Models Options Paper has been published as part of the NZCom project, see link in section 7.5, which provides additional information on how to explore these opportunities further.

7.2.3 Renewable heat

Many people in your community will be wondering what they should do when their current heating system comes to the end of its life. It is not a decision anyone should rush and get wrong in the depths of winter. The ways to generate renewable electricity are now well established, but the technologies for creating renewable heat, both at a household and a community scale, are less well understood. So, there is a key role for community energy groups to explain and highlight technologies like heat pumps, to help de-mystify and promote the technology. Gearing your community up to be well prepared, and for households to have a new heating system plan is place, will ensure they make the best decision, both financially and environmentally.

7.2.4 Tackling community transport

In the transition to net zero how we move around is a big challenge. There is a lot of focus on the adoption of electric vehicles, especially cars, but there is potential for community groups to

widen the conversation and to consider car sharing clubs, campaigning for better public transport links, connected cycle routes and car-free zones.

7.3 NZCom Case Study: The Community Business Case for a Low Carbon Energy Adviser

During the delivery of the NZCom project, it had been evident that there is a significant need for quality advice and guidance on the challenges and opportunities in the transition to a net zero economy. This challenge is not unique to a specific location, in fact, this is an existing gap facing most communities; from engagement with energy advice organisations across England and Wales there is agreement that this is an area of advice provision that needs attention. Educating all sections of our community and building confidence in low carbon technologies is a critical element in helping people make the right choices at the right time, whether it is making improvements to their homes or considering how to adapt their work life to lower carbon consumptions. While there are a lot of resources accessible online to assist making decisions about low carbon investment, it is often difficult for people to translate generic information to their personal circumstances, their home, or their behaviours; it is also apparent that many people prefer face-to-face support from trusted local agencies. To expand on the impacts of the NZCom project a business case for a dedicated **Low Carbon Energy Adviser** role for WREN has been developed, along with a proposal on how to fund the role.

The purpose of the role is to tackle the gaps in knowledge and to build confidence within the local community and, importantly, to widen engagement to those who have not considered the impacts of low carbon adoption on their lifestyle. This proposal aims to achieve these outcomes:

1. Demystify the low carbon energy market and technologies
2. Provide consumers with independent whole house assessments and advice to make informed choices
3. Help consumers reduce the cost of carbon reductions through access to grants.

7.4 Engaging your community

Whatever the size or expertise of an energy network or climate action group, it is vital to remain visible and trusted within your local community. This is the foundation for building a positive reputation where community engagement, be that volunteer led or through funded low carbon energy advisers, forms an understanding of householders' issues that delivers impartial advice facilitating appropriate actions. Be prepared to follow up and 'handhold' through any suggested actions.

There may be occasions where it is difficult for local community groups to provide immediate help through a lack of high-level expertise of the local energy system, or because of extreme and unique customer circumstances that fall outside of normal energy advice provision. It is important that any knowledge gaps in advice given are made clear to the recipient and that additional help is sought from specialist providers. Being able to recognise the issues and effectively signpost to relevant organisations is a positive action that can enhance a local group's reputation.

Maintaining good relations with other groups and organisations operating in your geographical area can extend your network reach into the community, often allowing reciprocal 'piggyback' opportunities at engagement events. Be willing to voice your project aims at local forums such as parish and town council or community network panel meetings, further establishing your credentials as a serious group.

Climate action and energy groups will often be led and structured by motivated local people for the benefit of their local community. Local knowledge and experience, not just solely in the climate action and renewable energy space, but also in other areas such as planning, transport, business, tourism, urban design, landscape and nature-based solutions can add depth of your group.

Leading by example and being seen to live by your values may attract members of the community to your group. People might not want to engage with you if they feel that they are being told what to do. Help community members come to their own conclusions by providing relevant information to them.

Where possible, build upon values including:

- Trust & honesty - building a positive reputation
- Leading by example - be seen to live by your values and others will follow
- Giving time - often the greatest asset a volunteer group can provide
- Following up on enquiries and seeing through to the end
- Understanding strengths and weaknesses of your group - be realistic in what can be achieved
- Signposting to other networks and professional help
- Learning to identify between vulnerable and those financially astute seeking funding
- Highlighting local success stories of positive actions and behaviour change
- Sharing insights with other networks and learn from their achievements
- Identify options for householders and realistic timescale for transitioning to a NZ future

Be bold. Look to engage beyond the usual suspects of early adopters, climate activists and the energy literate.

7.5 Where to find out more

- Establishing socioeconomic outcomes of community business models

  https://www.wren.uk.com/images/documents/NZCom/NZCom_Report_M51_socioeconomic_outcomes_v22.pdf

- Community Business Models Options Paper
  https://www.wren.uk.com/images/documents/NZCom/NZCom_52_Community_Business_Models_-_v32.pdf

- Community Business Proposal
  https://www.wren.uk.com/images/documents/NZCom/NZCom_52A_Low_Carbon_Energy_Adviser_Outline_Business_Case_-_FINAL.pdf

Other useful resources about establishing and running community-led action:

- The Community Hub Handbook (Locality)
  Community-Hubs-Handbook-Final.pdf (powertochange.org.uk)

- The Climate Emergency Centres handbook
  https://climateemergencycentre.co.uk/handbook-2/

- Community Shares Handbook
  https://www.uk.coop/resources/community-shares-handbook

- Community Energy South Masterclass: Finding & Sharing Energy Data in your community.
  https://www.youtube.com/watch?v=BFURbhcYRa8.