LEO | Local Energy Oxfordshire

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Developing an ethical framework for local energy approaches

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Context

The UK Government has legislated to reduce its carbon emissions to net zero by 2050. Meeting this target will require significant decarbonisation and place an increased demand upon the electricity network. Traditionally an increase in demand on the network would require network reinforcement. However, technology and the ability to balance demand on the system at different periods provides opportunities for new markets to be created, and new demand to be accommodated through a smarter, secure, and more flexible network.

This future energy market offers the opportunity to create a decentralised energy system, supporting local renewable energy sources, and new markets that everyone can benefit from through providing flexibility services. To accommodate this change, Distribution Network Operators (DNOs) are changing to become Distribution System Operators (DSOs).

Project Local Energy Oxfordshire (LEO) is an important step in understanding how such new markets can work and in improving customer engagement in them. Project LEO is part funded via the Industrial Strategy Challenge Fund (ISCF) who set up a fund of £102.5m in 2018 for UK industry and research to develop systems that can support the global move to renewable energy, called: Prospering From the Energy Revolution (PFER).

Project LEO is one of the most ambitious, wide-ranging, innovative, and holistic smart grid trials ever conducted in the UK. LEO will improve our understanding of how opportunities can be maximised and unlocked from the transition to a smarter, flexible electricity system and how households, businesses, and communities can realise the benefits. The increase in small-scale renewables and low carbon technologies is creating opportunities for consumers to generate and sell electricity, store electricity using batteries, and even for electric vehicles (EVs) to alleviate demand on the electricity system.

Project LEO seeks to create conditions that replicate the electricity system of the future to better understand these relationships and grow an evidence base that can inform how we manage the transition to a smarter electricity system. It will inform how DSOs function in the future, show how markets can be unlocked and supported, create new investment models for community engagement, and support the development of a skilled community positioned to thrive and benefit from a smarter, responsive, and flexible electricity network.

Project LEO brings together an exceptional group of stakeholders as partners to deliver a common goal of creating a sustainable local energy system. This partnership represents the entire energy value chain in a compact and focused consortium. It is further enhanced by global leading energy systems research brought by the University of Oxford and Oxford Brookes University, consolidating multiple data sources and analysis tools to deliver a model for future local energy system mapping across all energy vectors.

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Acknowledgements

1   Introduction and purpose

Project LEO aims to transform the technology and markets that underpin Oxfordshire's energy system, and so demonstrate it's possible to meet our energy needs in a way that's good for people and good for the planet.

Project LEO is predicated on the hypothesis that a decentralised, or local energy solution, focused on balancing energy use at the grid edge, will be the most desirable approach to accelerating our transition to a zero carbon energy system.

At the heart of Project LEO is Scottish and Southern Electricity Networks' (SSEN) transition from Distribution Network Operator (DNO) to Distribution System Operator (DSO) which 'will enable customers to be both producers and consumers' where a key operational principle will be 'enabling customer access to networks and markets' and where the DSO will 'use market mechanisms that are fair, transparent and competitive.'[1]

So achieving energy equity is both a key aim, and a key driver, of the transition to a local energy system. As a result, enhancing our understanding of what constitutes equity in an energy context, and how to achieve it, is key to the successful delivery of Project LEO, and our Smart and Fair Neighbourhood (SFN) trials aim to do just that.

The two-year trials will involve the setting up and testing of local, low carbon energy trials that use market mechanisms and smart technology to bring value to the electricity network and the people connected to it, working with local energy communities.

As well as testing technical and financial innovation, our SFN trials give us the opportunity to explore the social innovation that can lead to the development of a portfolio of successful service offerings, and better understand the processes by which appropriate offerings can be deployed to meet the needs of individual communities as well as the wider network.

Our ultimate aim is to identify service offerings that are technically, financially, and socially viable, as these will be crucial if grid edge engagement is going to become self-sustaining. However, it may be that some or all of the approaches that we test will only become viable in the 'real world' if key changes are made to the way the energy system operates. A key element of these trials will be to highlight what changes would need to be made within the energy system, and by whom – at a legal, regulatory, policy, market, social, or technical level – in order for a new business model to become viable.

None of this work would be possible without the collaboration and support of the many communities taking part in our SFN trials. Thank you for working with us to help create a smart and fair local energy system for the benefit of all.

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[1] Quotations from section 1.8, Appendix 1 of the original Project LEO bid.

Purpose

This document is a staging post in a three-year process to develop and test a framework to support the ethical delivery of local energy trials and the design of equitable local energy offerings.

The ethical framework will provide a set of tools and processes that can be used alongside others being developed as part of Project LEO:
- The technical framework under development in the Minimum Viable System (MVS) trials to guide the development and delivery of SFN trials
- The energy mapping work being done in work package WP4
- The data and communications protocols being developed through the WP2 market development work and the People's Power Station 2.0
- The Stakeholder Engagement Strategy developed in WP6.
- The transition from DNO to DSO as part of WP5

Through this process we will also gather evidence on the interactions between the current governance and operation of the broader energy system and proposed new local energy services. We will assess how they impact on the ability for local energy services to thrive and meet the energy needs of people in an equitable manner with a view to making proposals for future changes.

Approach

Our approach will be one of learning by doing. The development of the principles, framework, and supporting processes and tools will be iterative, with learning from the experiences of each SFN trial being regularly reviewed and fed back into the design of these principles.

Our approach to delivery will be guided by the Low Carbon Hub's social purpose and values (Box 1). The SFN trials will enable us to demonstrate 'real world' practical evidence for low carbon solutions in the new smart flexible energy markets of the future. We anticipate we will learn as much from what does not work, as from what goes well.

Box 1: The Low Carbon Hub's social purpose and values

Our approach

Agile; pragmatic; practical; innovative; creative; transparent; non-proprietorial; convenors; prepared to try and fail; holistic solutions: viable, feasible and desirable.

Our principles

Community focused; inclusive; collaborative.

Our impact

Maximises leverage; tangible; visible; lasting; replicable and scalable.

What makes us different

Community rooted; people focused; motivated by equity above profit; on-the-ground practical

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In the context of this ethical framework, the SFN trials are operating at three different levels:
1. The development of the principles themselves
2. The development and refinement of the tools and processes to translate these principles into practice in different neighbourhoods and flexibility services
3. The design and testing of a range of equitable service offerings themselves.

Each strand will need its own monitoring, evaluation, and learning loops.

Output

By June 2022 we aim to deliver the following outputs:

- Principles for ethical local energy trial delivery
- Principles for equitable local service offering design
- An ethical local energy toolkit, with templates, processes, and techniques to translate the principles into best practice
- A report identifying the learning from the SFN trials and implications they highlight regarding the way the wider energy system impacts on the delivery of equitable local energy services.

2   Equity in a local energy context

The energy system is changing – and needs to change fast. Decarbonisation, decentralisation, digitalisation are all disrupting the way our energy system works, and are going to fundamentally change the way we interact with energy.

Our energy system is much more than the wires and switches that make up its physical infrastructure. It is also a social system, developed by people for people. As we transition to a zero carbon energy system, the changes required will be as much about people and the way they interact with it as it is about technology.

Why choose a local energy approach to decarbonisation?

In 2018 National Grid set out four possible pathways for the UK's energy system, depending on the level of decarbonisation it would achieve, and the speed at which it would achieve it.

Scenario matrix for 2018: © National Grid plc, all rights reserved.

Only two of these scenarios would meet the UK's 2050 goals for carbon reduction, according to the National Grid: Two Degrees and Community Renewables.

Two Degrees	Community Renewables
Large-scale centralised solutions	Decentralised pathway
Large-scale solutions are delivered and consumers are supported to choose alternative heat and transport options to meet the 2050 target. UK homes and businesses transition to hydrogen and electric technologies for heat. Consumers choose electric personal vehicles and hydrogen is widely used for commercial transport Increasing renewable capacity, improving energy efficiency and accelerating new technologies such as carbon capture. Usage and storage are policy priorities.	Local energy schemes flourish, consumers are engaged and improving energy efficiency is a priority. UK homes and businesses transition to mostly electric heat. Policy supports onshore generation and storage technology development, bring in new schemes which provide a platform for other green energy innovation to meet local needs.

Project LEO is predicated on the hypothesis that the community renewables path, with a decentralised, local energy approach, focused on balancing energy use at the grid edge, will be the most desirable pathway to accelerating our transition to a zero carbon energy system. This is because it:
- Minimises the need to massively strengthen the network infrastructure
- Offers the potential for a more diverse range of solutions
- Is more likely to result in improved energy equity.

Author note: in a future version of this document we will explore the more recent Future Energy Scenarios 2020 developed by National Grid, leading to a 100% reduction in carbon emissions by the energy system, as well as the broader benefits of a decentralised approach in terms of engagement on carbon reduction strategies beyond the energy system.

What do we mean by energy equity?

The World Energy Council (WEC) sets out the challenge to achieving a successful energy transition as one which meets the 'energy trilemma' – in that it successfully meets three core dimensions: *energy security, energy equity, and the environmental sustainability of energy systems.*

The term trilemma implies an either/or trade-off between three dimensions. In its index tool however, the WEC ranks countries on their ability to provide sustainable energy through the three dimensions: Energy security, Energy equity (accessibility and affordability), Environmental sustainability – both in terms of its overall performance in achieving a sustainable mix of policies and how well a country manages the trade-offs of the trilemma, delivering successfully against all three dimensions.
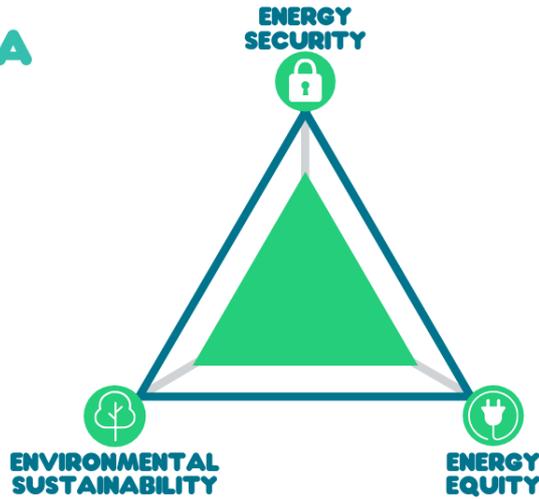
THE ENERGY TRILEMMA

Energy security
The capacity to meet current and future energy demand reliably.

Energy equity
Universal access to affordable, fairly priced and abundant energy.

Environmental Sustainability
Mitigating and avoiding potential environmental harm and climate change impacts.

Adapted from The World Energy Council Energy Trilemma Dimensions diagram

Although often reinterpreted to simply mean 'affordable' or 'cheap' energy, the World Energy Council's description also encompassed universal access to energy. In the context of the transition to a zero carbon local energy system, we seek to broaden this concept to equitable access to the benefits and opportunities our future energy system can deliver.

Equity, or fairness, can be considered in a number of different dimensions:

Fairness of outcomes
This relates to the distribution of outcomes – fair access to the opportunities, benefits, and value that is created as our energy system is decarbonised and digitalised, and the fair distribution of costs.

This may be at an individual situational level (is the price of participation in a service fair exchange for the value derived), within a group (am I paying more than my neighbour), or at a system level (where does value generated by a service offering accumulate, and who picks up the bill).

It needs to consider both issues of accessibility (is there a range of services that between them meet everyone's needs) as well as the relative distribution of costs and benefits (how much each participant benefits, and who pays what.)

Fairness of process

This relates to the process by which the distribution of outcomes is arrived at, and the degree to which stakeholders have the capacity to influence the outcome. For example, processes may be more likely to be perceived as fair if they are accurate, unbiased, consistent, correctable (can be modified and grievances aired), ethical, and representative in reflecting the basic concerns of the people involved.

Fairness of treatment

This relates to the way we interact with people, both in terms of the information they receive (e.g. adequate information and explanation of the process and outcomes) and whether we meet their expectations in terms of the way we treat people – in a respectful, honest, and sensitive manner.

Only by addressing all three are we able to achieve energy equity.

Why is energy equity important?

The International Panel on Climate Change highlights that equity can be considered in a number of ways: a moral justification, founded on ethical principles; a legal right upholding existing treaties and agreements, or from the perspective of effectiveness.[2]

Any arrangement considered fair is more likely to meet with social approval. Social licence to operate not only then makes it more likely that local energy solutions will be agreed and implemented, but that we will achieve the mass participation required to deliver a locally balanced energy system at sufficient scale. The pursuit of energy equity therefore is not only an admirable goal for the energy transition – but also a means to our end.

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[2] Fleurbaey M., S. Kartha, S. Bolwig, Y. L. Chee, Y. Chen, E. Corbera, F. Lecocq, W. Lutz, M. S. Muylaert, R. B. Norgaard, C. Okereke, and A. D. Sagar, 2014: Sustainable Development and Equity. In: *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter4.pdf, accessed 10 June 2020.

3   Principles

We are proposing the following draft principles. Through the SFN trials we aim to explore:
- whether these are the right principles
- how to translate these principles into best practice.

Principles for an equitable local energy service offering

Principle	Description
Collaborative design	We will design service offerings in partnership with the community in which they are to be delivered, so everyone potentially impacted by the service can influence its design.
Inclusive offering	When we design a service offering we will seek ways to minimise the barriers to individuals benefiting from the offering.
Fair distribution of benefits and costs	The success of a service offering will depend on the efforts of many stakeholders. The value created by the service, and costs that arise should be fairly distributed amongst these stakeholders.
Minimise risk	No one should be materially worse off as a result of the service. This does not preclude individuals being exposed to some level of risk through their involvement in the trial (e.g. financial), as long as it is with full information regarding the risk, participation is their own free will, and should it arise, the risk does not cause significant or lasting harm.
Informed consent	We will ensure potential service users have adequate information, presented in a clear and accessible way, about the benefits, costs, and risks associated with using the service to make an informed decision about participation, including influencing decisions around the wider infrastructure.
Respect	We will treat all those affected by the service with respect and sensitivity.
Data fairness	We will be open and transparent about the data we are collecting through the use of a service, how it will be used, managed, owned and shared, and seek informed consent from service users.

An additional principle relating to choice, around the right of the individual to influence decisions made at an infrastructure level, will also be considered as we develop and test the principles.

Principles for ethical SFN trial delivery

Principle	Description
Clarity of scope	Stakeholders are clear about the anticipated scope of the project – what it can and can't address or deliver within the available resourcing and timeframe.
Collaborative design	We will work with the community such that the trial meets both the needs of Project LEO and the catalysing community group.
Inclusive participation	We aim to make it possible for a wide number of stakeholders to have a voice in the design and delivery of the trial, including the service offering that it will test, even it if they do not directly participate.
Do no harm	We aim to protect all participants directly involved in the trial, and ensure that no one from the wider community is worse off as a result of the trial. This does not preclude individuals being exposed to some level of risk through their involvement in the trial (eg financial), as long as it is with full information regarding the risk, participation is their own free will, and should it arise, the risk does not cause significant, lasting harm.
Rewarding experience	We want to see fair distribution of the benefits arising from the trial and make each touch point rewarding for the participant.
Informed consent	We will ensure participants in the trial have adequate information, presented in a clear and accessible way, about the benefits, costs, and risks associated to make an informed decision about participation.
Respect	We will treat participants and other stakeholders fairly, sensitively, and with respect throughout the trial. This includes being respectful of their time, views, and property.
Continuous improvement	We will actively seek feedback during the process. We will monitor and review the trial as it is underway, and use the learning to modify and improve elements if necessary.

4   Smart and Fair Neighbourhood trials

Our *'Smart and Fair Neighbourhoods'* programme will demonstrate how flexibility services can sit at the heart of a smarter, low carbon, locally focused, energy system.

Working with seven Oxfordshire communities we will trial different approaches to flexibility at the grid edge. We will explore how smart technology and new commercial models can create opportunities in a prototype local energy market place - and help us to understand how to do this in an equitable and fair way for everyone in Oxfordshire.

Each trial will be based in a particular neighbourhood, linked to an electricity substation. Areas selected for the trials are those identified as those that are likely to face more challenges to network managers as patterns of demand and supply change.

In the past the solution to dealing with capacity challenges would be to upgrade the network with costly new equipment and the disruptive digging-up of roads. Our aim is to find new ways of 'balancing' electricity supply and demand using new technologies and practices and prove this as a viable alternative to network upgrades, whilst ensuring a safe and secure electricity supply. One of the challenges in doing this, is that demand fluctuates due to all sorts of reasons, not just varying with the seasons, or even daily, but minute by minute. To make sure electricity supply and demand are in balance, the local network needs to be more 'flexible' and adaptive to changes in generation and demand.

We need to use and develop new technologies and practices, including electricity storage using batteries (including electric vehicles), software tools that gather and make sense of network information, and manage demand where this can be done without disrupting services to customers – for example, through switching water heaters on when there is plentiful supply and off when supply is tight. This approach, called a 'demand side response', unlocks new opportunities for businesses, households, and communities to be paid for being more flexible and adaptable in how they use electricity.

It is in all our interests that no one is left behind in the transition to a zero carbon energy system. Opportunities must be available to all businesses, households, and communities. Any new, locally balanced energy system, needs to benefit and be fair for everyone, not just a minority with their own solar panels, battery storage or electric vehicles.

As with other commodities, energy can be bought and sold in a market place where there are buyers and sellers and someone to manage the market. There are also markets where flexibility is traded – the ability to shift demand in time.

Taking a place-based (or neighbourhood) approach to re-imagining the energy system is key to achieving benefits for everyone. It helps entire communities come together to pool resources into

new flexibility markets, whilst identifying and negotiating the benefits they want to receive for helping balance the local energy system.

We call these benefits 'place-based value' and are looking to achieve outcomes such as:
• Improving community resilience
• Working towards District, City and County Council goals to reach net-zero carbon emissions
• Generating community benefit (such as income for spending on community projects)
• Reducing air pollution

Smart and Fair Neighbourhood trials will include technical, social, commercial, governance and regulatory innovations, and LEO's aim is to develop all of these while safeguarding electricity services.

5   Smart and Fair Neighbourhood trials design stages

Phase 1: Brief Development to March 2021

Project team and lead community group develop a brief for the project, taking account of both the catalysing community group's aspirations for the project as well as the requirements of Project LEO.

Outputs: for each SFN trial	
Project brief	Co-created by the project team and lead community group. To include: - Energy challenge to be explored - Project scope – timeframe, geography, etc - Aligned impact goals for the community SFN trial and LEO's goals.
Energy landscape map	To include: - Geographic boundaries including the primary substation area, community's social and administrative boundary - Technical map of the electricity distribution system within the area, EV infrastructure, gas coverage, and heat map plus any information about services SSEN are already procuring in the area eg through project TRANSITION. - Energy demand status of residential and commercial loads
Outputs: for the ethical framework	
Brief co-design process	A replicable process for co-designing a local energy project brief with a community organisation
Principles review plan	Agreed plan for the testing of the principles through the SFN trials and consultation with wider stakeholders

Phase 2: Community Engagement to March 2022

During this phase, we will take the brief and initial 'value proposition' and engage with the wider community to get their views on the proposal. By the end of this stage, we will have a full specification for the project to be implemented during the final phase. The work will be done by the Low Carbon Hub team with the community contributing their time to the Local Steering Group and to supporting local engagement activities.

Outputs: for each SFN trial	
Memorandum of Understanding (MoU)	Between the community and Project LEO setting out exactly what the project is, how it is to be resourced, and what the expectations are of each side in taking the project forward
Situational analysis	Building on the energy landscape map to include: - Strengths Weaknesses Opportunities Threats - Geodemographic analysis - Community capabilities
Stakeholder analysis	Stakeholder mapping
Offer formulation	Who: Audience segmentation and targeting What: objectives How: product, place, price, promotion, people, process, physical evidence Competitor Analysis Value proposition from the perspective of: - The lead community group - The energy system - Delivery partners offering services. - The service user Equitable design statement: how the service offering addresses equity in its design
Trial delivery plan	Activities and timetable
Ethical trial delivery statement	The processes by which the trial will fulfill the ethical SFN delivery principles
Monitoring, Evaluation and Learning (MEL) plan	- Trial learning objectives (technical, social, commercial, environmental) - Identifying data to be collected - Data collection process - How the trial will be evaluated - Feedback loops for continuous improvements - Dissemination of learning
Outputs: for the ethical framework	
Community consultation framework	A replicable process for consulting the wider community in the design of a local energy service offering
Equitable service offering design and delivery statement template and process	A replicable process and template for incorporating equitable principles into the design and delivery of local energy service offerings
Ethical trial statement template	A replicable process and template for incorporating equitable principles into the design and delivery of local energy service offerings
Toolkit library – phase 1	A library index of existing tools and resources to facilitate ethical trial delivery and equitable service offering design
Toolkit gaps analysis	Analysis of gaps in existing tools and techniques to support the design of ethical trials and service offerings

Phase 3: Implementation, until March 2023

In this phase we will implement each SFN project as described in the specification agreed in the Memorandum of Understanding. We will then monitor the results and report on them to the community and to Innovate UK.

Outputs: for each SFN trial	
A project delivery report	- Describe the implementation that happened, the processes followed, and what worked and what didn't - Summarise the monitoring, evaluation, and learnings that come out of the trial and recommendations to be fed into the overall project delivery report
Service offering review	An evaluation of the effectiveness of the service offering to meet the needs of users and recommendations for next steps and improvements
Ethical trial statement review	A report on the trial's delivery of the ethical trial statement and reflections and learnings for the ethical principles
Outputs: for the ethical framework	
Final ethical principles	Finalised version
Ethical energy system recommendations	Evidence based learnings and recommendations
Toolkit	Finalised version

6   Developing an ethical toolkit

Alongside the SFN trials, we will be developing a toolkit to support the ethical and equitable design of low carbon service offering and community-led trial delivery.

Each trial will give us the opportunity to trial different tools and techniques and learn about which approaches and combinations of tools are most effective in different situations.

We are fortunate that many existing tools and resources already exist or are under development by the extraordinary ecosystem of people and organisations currently striving to develop a smart and fair energy system. Rather than start from scratch, our aim is for this framework to build on this existing work and resources, and to make our findings freely available to all those who may find it of value.

Through the trial we will also identify gaps in the toolkit and work with partners and the wider local carbon community to look to plug these gaps. For example, this could include a 'community lens' approach situational analysis and build on the new stakeholder mapping approaches already under development.

We have arranged the tools into **three** key areas:

A. **Community Led Trial Design** – A collection of tools and resources to help facilitate a grass roots, community-led approach to service offering design. This area includes resources such as stakeholder mapping tools and consultation technique methodologies, frameworks, and perspectives.

B. **Local Energy Offering Assessment** – A set of tools and resources that help us better understand who may or may not benefit from, or participate in, an offering, as well as who pays for associated costs or how to increase accessibility. This area includes resources such as mapping tools, capability profiling tools, value proposition development documents, innovation impact tools, business models with assessment ideas and a number of reports which highlight why certain schemes have been successful and others less so.

C. **Ethical Trial Delivery** – Guidance and best practice in trial delivery. This area contains resources including biodiversity and environmental best practice guidance. The majority of resources in this area are online documents that show learned best practice standards and accompanying case studies or examples showcasing where things have gone well and where they haven't and how to address these difficulties.

We have also compiled a bank of **reference documents** for Smart and Fair Neighbourhood trials which consists of various research, policy, and opinion pieces relevant to the ethical framework. This ranges from Intergovernmental Panel on Climate Change (IPCC) reports to local articles as well as projects and trials that have been conducted in the past (e.g. The DEMAND – Dynamics of Energy, Mobility & Demand – project, run by Lancaster University).

We are aware that all the Smart and Fair Neighbourhood trials will be different and require different advice and guidance. It is our intention that through this toolkit any and all trials and services will be able to benefit from the wealth of information and experience documented in these resources.

7   Appendix: Definition of local energy

Energy arrangements led by (or for the benefit of) local citizens within a local distribution geography. Local energy services will be characterised by
- The involvement of local stakeholders
- Local decision making
- Local asset ownership
- Local benefit distributions

These can be delivered through a community energy model, which also adds an approach to local corporate governance and financing that requires democratic ownership and distribution of profits.