GREEN ENERGY FEASIBILITY STUDY
Introducing

The VillageGreen Project

a strategic business case for new community energy services

WILSFORD VILLAGE HALL, WILSFORD COMMUNITY LAND TRUST LTD, WILSFORD PARISH COUNCIL

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WILSFORD COMMUNITY LAND TRUST LTD

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1. Executive Summary

This “Stage 1” study was commissioned by Wilsford Community Land Trust (WCLT) and was funded by the Rural Community Energy Fund (RCEF).

The study was undertaken by QEnergy (Qbots Energy Limited). QEnergy is an award winning multi-disciplinary energy services company based in Manchester. QEnergy is active in promoting new business models for creating local value and decarbonising heating.

The Stage 1 output is the Strategic Business Case (SBC) for the introduction of new energy services (referred to as “The VillageGreen Project”) which is based on Community Energy service delivery principles. A Community Energy project is wholly or partly owned or controlled by a community group and includes energy co-operatives.

In addition to this document QEnergy has prepared a supporting financial case.

The project addresses the needs of The Village Hall and ten adjacent houses which are all on WCLT freehold land. The wider stakeholder vision is to prove the benefits and then enlarge the enterprise to serve the wider community in the village of Wilsford.

The VillageGreen Project has been created to alleviate fuel poverty, address sustainability issues and to enhance the local community. The project defines an alternative to the status quo which is referred to as the “Supplier Hub” model which does not encourage or reward sharing of locally generated energy within a community. VillageGreen uses the archetype of a local energy marketplace in which all customers (also referred to as off-takers) access services created by shared locally owned assets and also pool demand for a grid supply in order to achieve economies of scale and avoidance of waste.

The services includes;
a) local electricity generation and supply
b) A shared heat source and supply
c) Electric vehicle charging facilities
d) Flex Services
e) Additional Vehicle Parking

A snapshot of the financial benefits of this project include forecast annual savings to each household of £1,865 attributed to the 420% operational efficiency of new heat pumps. The Hall can expect to save £1,498 by switching away from using heating oil. A switch to an electric vehicle, and the use of the EV charge points, would yield annual savings of around £800 assuming a typical annual mileage of 8,000 miles.

The environmental benefits include a reduction of 31 tonnes of carbon emissions with a remaining combined carbon footprint of just 4.4 tonnes as shown in the table below. Replacing the oil fired boiler in The Hall will also result in air quality improvements due to eliminating nitrous oxide emissions.

	Qty	Current Carbon KgCO2	Carbon using Heat Pumps KgCO2	savings due to SolarPV KgCO2	New Carbon Footprint KgC02	Total Carbon Savings kGCO2
Village Hall	1	10,180.78	2,195.79	3,439	-1,243.47	11,424.25
Two bedroom homes	7	16,674.04	6,008.09		6,008.09	10,665.95
Three bedroom homes	3	8,852.91	3,515.08		3,515.08	5,337.83
EV Canopy	1			3,821	-3,821	3,821
		35,707.73	**11,718.96**	**7,261**	**4,458.30**	**31,249.43**

The socio-economic benefits are expected to be the most rewarding and are derived from retaining more value in the local community and creating community cohesion which comes from sharing the responsibility for achieving these common energy goals.

In the system design QEnergy has proposed a microgrid and outlined why it is essential for sharing resources and therefore for achieving the stated benefits. All assets, such as heat pumps, SolarPV and energy storage, all share one grid connection which means that only one electricity supplier is required. This supplier is required to become a strategic partner and trade the flexibility in demand on the day-ahead electricity markets which is a primary source of local value. A shared ground source heat network also provides the best value for money and provides the assurance of performance.

To complete the Village Green Project WCLT will need to complete two more planning stages before the construction stage can commence. Stage 2 will provide a detailed design and also complete the commercialisation of the

services. Stage 3 is focused on raising the necessary funds and taking the investment decision leading to procurement. QEnergy has forecast a 12-15 month period to complete this project.

The cost for completing the project has been estimated in the table below.

Capex	
Stage 2 & 3	£115,000
Stage 4	£438,850
Contingency	£66,462
Total (Excl VAT)	**£620,312**

QEnergy recommends that WCLT proceed with raising the funds for Stages 2 & 3.

1. Introduction

Qbots Energy Limited (QEnergy) was appointed, on 15 December 2021, by Wilsford Community Land Trust (WCLT) "Stage 1" Green Energy feasibility study. This work is funded by the Rural Community Energy Fund (RCEF).

The WCLT brief was;

Identify a single, or mix of, potential renewable technology option(s) for the site, and to develop a potential project using that technology.

The RCEF aims are to:

a. Increase the level of community and locally owned renewable energy generation to support the Government's goal of achieving net-zero carbon emissions by 2050;
b. Support rural communities by helping them to reduce energy costs or generate income from renewable energy and reinvest this income in the local area, and
c. Promote rural growth through the creation of jobs and volunteering opportunities in the communities where projects are located.

2. Definition[1] of a Community Energy Project

Any energy project that is wholly or partly owned or controlled by a community group, including energy co-operatives; or Any energy project where two or more of the following conditions apply:

1) a community group that hosts a project on a site they own or manage; community benefit societies, including non-localised schemes, where profits are directed towards the community and members share democratic control;

2) There is an active role for community members in the project, perhaps taking part in collective energy saving actions, active load management or producing energy (e.g. through domestic solar PV) shared among other community members through some kind of local supply arrangement.

[1] Green Alliance publication Community energy 2.0

This definition covers energy service companies which are emerging in response to changes in the energy market, access to finance and consumer needs.

3. Stage 1 Deliverable

The output of Stage 1 is this Strategic Business Case (SBC) for new energy services (referred to as "The VillageGreen Project") based on Community Energy principles. The services are initially to be offered to the properties occupying the WCLT's freehold land in School Lane, Wilsford, Grantham NG32 3PF however the vision is for a wider deployment in the village following this proof of concept. The site layout is shown on the cover page of this report.

As defined the HM Treasuries guide a project needs;

- a defined and finite life cycle
- clear and measurable inputs and outputs
- a corresponding set of activities and plans
- a defined amount of resource, and
- an organisational structure for governance and delivery.

In addition to this document QEnergy has produced a financial case .

4. Methodology

The methodology used in the preparation of this Strategic Business Case was as follows;

1) Reviewed the building loads to be included within the scope of the project;
2) Reviewed available locations for renewable generation;
3) Reviewed the issues with the current buildings using publicly available energy performance certificates;
4) Held a workshop with WLCT to create a menu of potential development ideas linked to technology types.
5) Eliminated ideas/technologies which could not be developed sufficiently by the 31 March 2022 project deadline;
6) Developed concepts to be shared with the stakeholders and held a briefing with LincsRural Housing Association seeking their support;
7) Held an on-site contractor day (after sharing the concepts) and visited homes to define upgrade solutions;

8) Prepared a 50-year financial case incorporating costings received from the contractors;

5. Stakeholder engagement

Initial stakeholder engagement included the Wilsford Community Land Trust, LincsRural Housing Association, and The Village Hall Committee.

The WCLT is the freehold owner of the village hall and associated land. In December 2013 Wilsford CLT purchased the entire site, including the village hall from Lincolnshire County Council, a long lease having already been drawn up between the County Council and the Housing Association. The CLT receives an index-linked ground-rent from the Housing Association for the life of the lease (125 years).

The Village Hall Committee, under a lease from WCLT, manages the building day-to-day. Further to this Wilsford Parish Council has a role as custodian trustee of the lease. This tripartite arrangement ensures that the interests of local people are fully represented. The three groups are working together to renovate the hall and, as part of this project, wish to find the most efficient green energy system for the building.

QEnergy facilitated a workshop in January 2022 where members of WCLT considered a range of potential services and enabling technologies resulting in an initial menu of concepts. A number of the options were quickly discounted due to complexity and timescales. A final set was documented offering low carbon heating supply, electricity generation and supply and EV charging together with a new car-parking proposal. In early February 2022 this set was presented to LincsRural Housing Association, who own the Blackberry Way homes and manage the tenancies. LincsRuralHA offered their full support to the proposed services and agreed to engage with the project as it further develops.

There was only limited time available to engage with all of the housing tenants although there was positive feedback from the one tenant who was approached.

5. Strategy

The VillageGreen project is designed to meet the needs of the users of the Village Hall and the residents of Blackberry Way. These properties include a combination of two and three bedroom homes built in 2015 with a total of ten dwellings.

VillageGreen has been created to alleviate fuel poverty, address sustainability issues and to enhance the local community. VillageGreen will enable local decision making in regard to electricity generation, type and pricing of energy services and the distribution of the value created. This collective decision making

can also be applied to the WCLT commitment to achieving Net Zero carbon emissions by 2030.

VillageGreen is the alternative to the status quo which can be referred to as the "Supplier Hub" model. This is a centralised and highly regulated marketplace in which only licensed electricity suppliers can offer energy services. The main issues with this model is that it doesn't address local issues and does not recognise or reward local value creation adequately. An example of this limitation is when one household is unable to share their excess SolarPV output with a neighbour. Currently this model is leading to growing hardship across the United Kingdom due to price volatility linked to the reliance on fossil fuel and geo-political instability. Equally importantly, these large operators are not taking sufficient action to curb climate change therefore strengthening the case for this VillageGreen project.

VillageGreen uses the archetype of a local energy marketplace in which all customers (also referred to as off-takers) access services created by shared local assets and pool their demand to achieve economies of scale and to avoid waste.

In response to RCEF advice "to make the SBC intentionally ambitious" the proposal includes both a heat network, a microgrid and battery storage. The intention is for the design to form a blueprint, and in the near future to further expand the network out across Wilsford. This level of ambition is required for VillageGreen to be attractive to the RCEF funders due a higher level of additionality.

6. The Services

With the VillageGreen Project a new social enterprise is defined for the purpose of facilitating energy sharing and therefore minimising the amount of energy collectively imported from the Grid.

The services includes;

a) local electricity generation and supply - A low cost/carbon supply produced by blending grid supply with the output of a new 38kWp SolarPV array supported by battery energy storage. Due to the low value of exported electricity to the Grid , a microgrid will be 'smartly managed' to minimise export from the solarPV storing it in the battery. There will also be the capability to "flex demand" as the heat pump will use variable speed technology. More detailed modelling will be performed in stage 2 to determine how much energy will be imported from the Grid and the solar export.

b) A shared Heat Source and supply - Space heating and domestic hot water will be produced by a shared ground collector feeding distributed high efficiency (420%) heat pumps. This will replace the oil fired boiler in The Hall and the costly

inefficient storage heaters in the homes. The existing solar thermal hot water panels on the homes will be integrated into this system.

c) EV charging facilities - an 8-bay covered parking canopy complete with a roof-top mounted 20kWh solar array has been proposed. In addition a double 22kW fast charger has been specified for the Village Hall car-park. Wilsford Village is highly reliant on motor vehicles and it is believed this will promote the transition to electric vehicles. EV charging is the only service that will be offered to the public in addition to the WCLT leaseholders.

d) Flex Services

Western Power Networks is a member of Flexible Power, a joint initiative from five UK Electricity Distribution Network Operators (DNOs); Western Power Distribution, Northern Powergrid, Scottish and Southern Electricity Networks, SP Energy Networks, and Electricity North West. The role of this organisation is to standardise how flexibility services are procured from providers. Flexibility services are used as an alternative to traditional network reinforcement projects which achieve increased capacity by capital intensive new infrastructure. Flexibility is where a customer will reduce their demand in response to an advance request from Western Power.

The VillageGreen Project could offer flexibility services by utilising the battery storage and by turning down the output from heat pumps.

The Western Power Networks requirement along with the fee structure is summarised in the table below;

	Secure	Dynamic	Restore
Use Case	Pre-fault mitigation	Post-fault recovery (often under planned outages)	Post-fault network restoration
Advanced Payment	Yes, an arming payment for the accepted availability time: £125/MW/h	Yes, an availability payment for the accepted availability time: £5/MW/h	No
Utilisation Payment	£175/MWh	£300/MWh	£600/MWh
Availability Declarations	By midnight every Wednesday for the following week (Mon-Sun)		
Availability acceptance	By noon every Thursday for the following week (Mon-Sun)		
Dispatch Notice	Week Ahead, on acceptance of availability	15 minutes ahead of requirement	15 Minutes ahead of requirement

Flexibility Services purchased by Western Power Networks

The proposed 50kW battery has the potential to vary site load by 100kW as it can both charge and discharge. The heat pumps could vary the load by as much as 90kW.

The value of this flexibility would attract Advanced and Utilisation Payments. Q Energy recommends further discussions with Western Power Networks before modelling this revenue stream.

e) Additional Vehicle Parking

The Hall has lacked sufficient car-parking spaces to accommodate larger events and would value the spaces proposed under the Solar Canopy structure.

7. The Benefits

The scheme benefits are presented as financial, environmental and socio-economic.

Financial

The analysis undertaken in the business plan predicts an annual reduction in Blackberry Way resident annual expenditure of £1,865. This is primarily because the heating solution saves 75% of their current costs.

The Village Hall, with improvements in the heating and parking, will attract more bookings and therefore release more funds into the local economy. There are also major cost savings on heating oil to be realised. The current price of heating oil has reached £1.15 /litre which equates to £0.11/kWh. Assuming The Hall is heated for 1,500 hours per annum (using 38,400kWh), there will be an ongoing annual cost of £4,224. The VillageGreen project will decrease this cost to £2,742 yielding 1 35% saving of £1,498 (assuming 30p/kWh unit cost and heat pump COP of 4.2).

In addition anyone in Wilsford (not just Blackberry Way residents) can use one of the proposed nine(9) new electric vehicle charging stations. Based on the projected electricity costs, and the cost of fuel at £1.65/litre, a typical motorist with an annual mileage of 8,000miles could save £837.40 per annum. Should they choose to use the local charging points, WEnergy will also make a proposed 20% margin on the service.

Resilience

In time, the VillageGreen project will contribute to grid resilience as microgrids can weather the impact of natural disasters like storms. There is the possibility to operate in “islanding mode'' which allows a limited service when disconnected from the Grid for periods of time.

Environmental

The locally generated electricity will have zero carbon content and will offset Grid supplied energy which has a carbon content currently of 212.33 grams/kWh based on the data source listed above. See the Government's Greenhouse gas reporting: conversion factors 2021.

The table below shows the current carbon footprint and compares it with the VillageGreen low carbon heating figure showing a saving of 23.98 tonnes.. The solarPV will further reduce emissions by 7.26T with a remaining carbon footprint of just 4.45 T and a total saving of 31.24 tonnes.

	Qty	Current Carbon KgCO2	Carbon using Heat Pumps KgCO2	savings due to SolarPV KgCO2	New Carbon Footprint KgC02	Total Carbon Savings kGCO2
Village Hall		10,180.78	2,195.79	3,439	-1,243.47	11,424.25
Two bedroom homes	7	16,674.04	6,008.09		6,008.09	10,665.95
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EV Canopy	1			3,821	-3,821	3,821
		35,707.73	**11,718.96**	**7,261**	**4,458.30**	**31,249.43**

There is also an air pollution issue with oil fired boilers as the boilers emit nitrous oxides which is a pollutant. This Government Website details the particular health issue. Each litre of oil releases 6.2grams/litre of NOx into the local environment.

Socio-economic

The VillageGreen project will impact the local economy in a number of ways. First of all, less money will be leaving the village as the off-takers spend less with their foreign owned electricity supplier. In fact under this proposal the offtakers will no longer have a contract with a licenced energy supplier, rather they will purchase their energy through the new local social enterprise "Wilsford Energy" or WEnergy. WEnergy can be set-up to return a percentage of an annual surplus to the offtakers and also fund other improvements to enhance village life. WEnergy may also use the surplus to expand the VillageGreen project to other residences in the locality and therefore multiplying the benefits.

LincsRural Housing Association also highlighted the knowledge transfer opportunity presented by using this project as an educational aid for local schools as part of the sustainability curriculum.

Another benefit is that local tradespeople would get an opportunity to work on an innovative project and enable them to develop new skills. With these new skills they can win more business, therefore expanding the local economy.

8. Proposed System Design

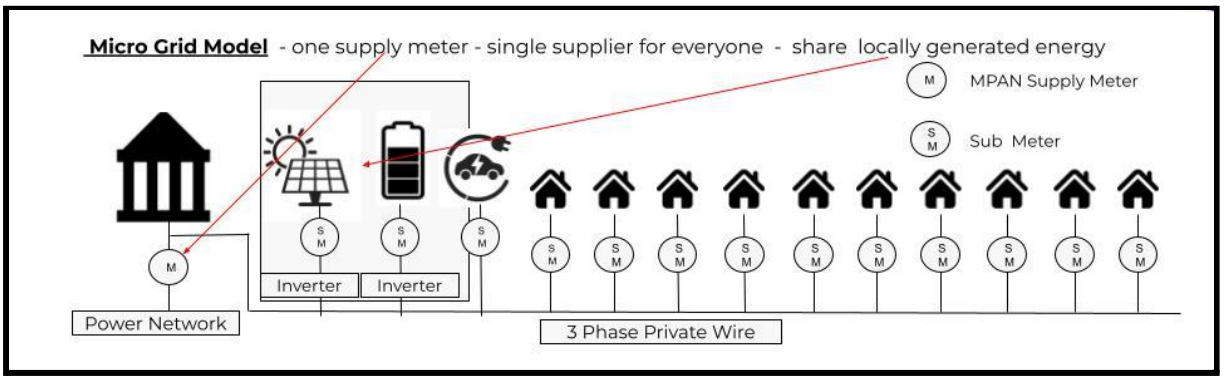
The proposed design is a major departure from how energy is purchased and delivered today and there is a good reason.

The proposed system is designed to share common local assets and therefore a heat network with a shared ground heat source has been proposed, along with a microgrid for sharing the output of two solar arrays and a centralised battery energy storage facility.

Micro Grid

A direct supply over a private wire is where a generator supplies power to a third party through a private wire and does not use the distribution network. This is usually referred to as a microgrid when there are multiple parties involved.

There will be a contractual relationship[2] between the generator and the third party that specifies the price paid for the power. This type of arrangement has become increasingly commonplace as the generation export offsets the site import for the third party and the potential value of the generation can therefore be judged against the import costs of the third party.



The Wilsford Community Land Trust Microgrid

[2] Cornwall Insights

The additional value generated under this type of arrangement will be split between the generator and the import site. The value of the energy sold takes into account the cost of installing and maintaining the private wire. If the generator spills any excess generation onto the distribution network a PPA with a supplier will be required to capture this additional revenue. A private wire arrangement means that customers are (typically) being supplied with electricity without a supply or distribution licence. There are a number of class exemptions that enable this and the relevant entity will need to ensure it is compliant with the exemption criteria.

Key Features:

• A contractual relationship will need to exist between the generator and the end customer(s). This will set out the terms for the supply, including the price for the power

• The generator and customer(s) will each need to consider their access to the public network and the degree to which they have independent access

The generator may need to qualify for a class exemption to enable it to supply power to a third party without having a supply licence and similarly for a distribution licence exemption

• Export does not have to travel long distances, minimising system losses.

• On site generation may need to register with DNO even if not exporting

• May impact on the pre-existing import supply arrangements as import profile will differ.

• To protect customer choice Customers on the private wire have a right to use an independent supplier to source their electricity

Additional features of the VillageGreen project

A. The EV chargers which are also connected to the microgrid therefore increase the load diversity for the generation assets.

B. The Battery Storage will provide flexibility to store both energy generated locally and also import energy from the Grid. The smart controls will produce daily charging schedules which will maximise the variation in the day ahead wholesale energy markets. Charging will take place during the lowest cost four periods and discharging during the highest four periods. This value of this strategy has been quantified in the Financial Case.

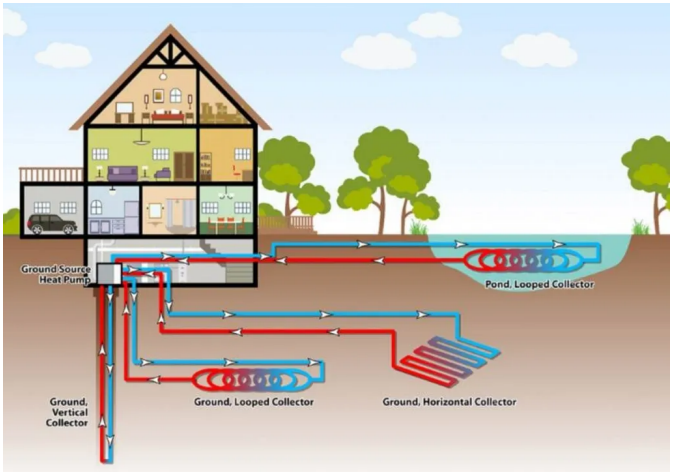
It is important for the viability of the business model that the local distribution network operator, Western Power Networks, supports connecting the houses to

the microgrid. This will be addressed in stage 2 with a submission for permission to connect the SolarPV, the battery and to introduce the microgrid connection.

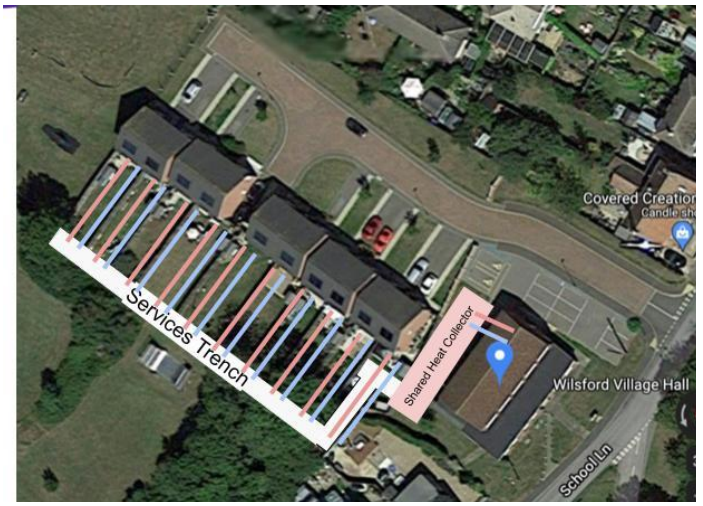
Heat Network

The proposed heating system is based on distributed heat pumps moving heat from a shared ground heat collector. A shared ground collector design offers the advantage of being able to reduce the overall size of the collector by exploiting the diversity of heating demand. This refers to the daily combined demand profile which can be 25% lower than the sum of all the individual heat loads.

The diagram below shows the different types of ground collectors. As shown in the diagram on the right a vertical ground collector can be accommodated in the space between The Halls and the houses. A horizontal collector is also an option, offering a small cost advantage, however a larger area of land is required. The adjacent park is a suitable location however the increased disruption to the community would need to be considered.



Ground Source Collector Options



The shared ground collector scheme

The Hall

The Hall is currently undergoing a major refurb with 55mm internal insulation being fitted to the walls and 200mm being fitted to the ceiling. This is in addition to a project in 2020 to upgrade the windows with double glazing.

The Hall floor layout is as shown in the plan below. The hall is approximately 18 metres long and 9.5 metres wide. It has a pitched roof about the 5.8 metre wall height and the top of the pitch

The Village Hall becomes the “Energy Centre” and the main hub of the microgrid. It will also provide the sole connection to the electricity Grid. The existing 3 phase

supply will be upgraded and all the houses will be connected to a new distribution board. Three shared generation assets will also connect to this board;

a) An 18kWp SolarPV array on the south eastern facing roof
b) A second 20kWh SolarPV canopy over 8 new parking spaces.
c) A 50kW/100kWh battery located in the Hall plant room

.

The Hall will receive a two pipe (flow and return) brine supply from the shared ground collector. There will be a 30kW heat pump, with heat storage buffer, serving four new fan convectors in the main sports hall and other heat emitters in the kitchen, meeting room and public spaces. The hot water cylinder will also be upgraded to connect to the heat pump.

Examples of Heat Pumps and Heat Storage Vessels

Proposed Battery Energy Storage

Blackberry Way Homes

All ten houses were built as a single development and therefore have identical “C” rated energy performance certificates (EPCs). The issues with the dwellings are listed below.

Main heating	Room heaters, electric	Very poor
Main heating control	Appliance thermostats	Good
Hot water	Electric immersion, standard tariff, plus solar	Poor

Extract from certificate 8808-5563-1339-8727-4253 for 1 Blackberry Way

The project will address these issues by converting the direct electric storage heating units and the domestic hot water to a new wet system with new heat pump compatible radiators. The houses will receive a two-pipe (flow and return) brine supply from the shared ground collector. A high efficiency variable (1-6kW) output heat pump is proposed for installation in the existing hot water cupboard located on the first floor of each dwelling. The existing solar thermal roof panels, which currently only provide hot water, will be diverted to provide both space heating and hotwater. A new hot water tank is also proposed. Advanced controls will be specified which exploit the variable temperature flow and weather

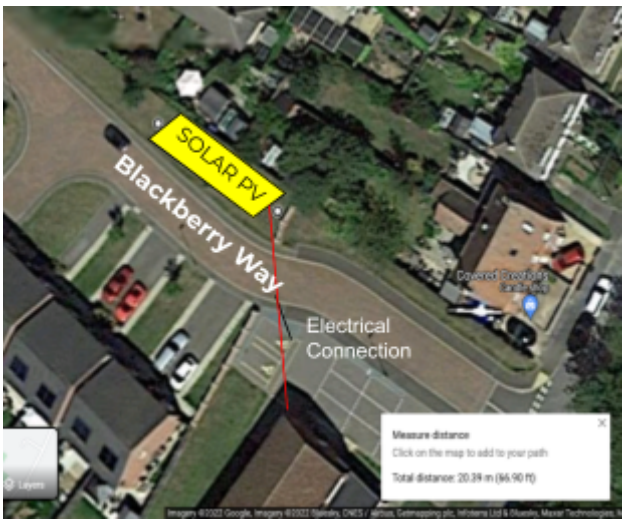
compensation to deliver maximum comfort while avoiding energy waste through overheating.

To access the solar and battery storage, the houses will be connected to the Village Hall via a private wire. This will be the sole electricity supply and a new "sub-meter" will be fitted replacing the supplier's meter.

SolarPV and Electric Vehicle Charging

The proposal is to erect an 8-way EV charging station on vacant land on the northern side of Blackberry Way installed as part of a 20kWp Solar PV canopy structure. The approximate size of the structure will be 20 x 5 metres. This facility will provide a charging service to the public targeting the users of The Hall and the adjacent park. Local SolarPV will be available to provide some of the electricity for vehicle charging.

Example of Solar Canopy



Proposed Location

The EV chargers will be connected by a new cable back to the main distribution board in the Hall. Each charging point will be able to charge at a rate of 7kW and are suited to charging a vehicle overnight.

Proposed 18kWp SolarPV array on Hall

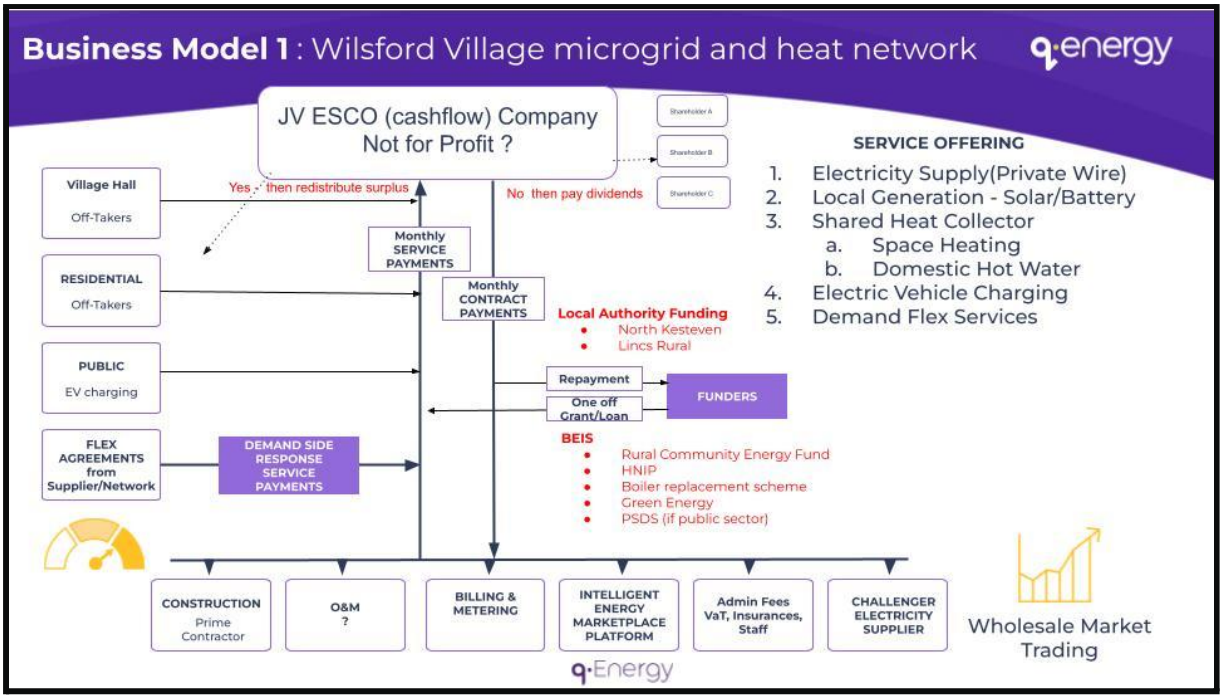
A second 22kW fast charging point will be installed on the side of The Hall and will be able to serve a maximum of two parking spaces. The 22kW charger would suit visitors to the village who may need to charge for a fews hours and then complete a 100-200 mile journey home.

There will be a fee for the charging service and therefore a commercial agreement between WEnergy and a commercial charging operator is proposed. Through this agreement the charge points will be promoted as part of the partners national network and also on Zap Map.

9. Service Delivery Model

The proposed service delivery is designed around a community energy model in which a social enterprise with charitable status, fulfils the customer obligations in exchange for payment. Local people are offered the opportunity to serve on its board or steering committee making decisions on how the services are delivered and how the operating surpluses are re-distributed.

This is in agreement with the RCEF who expect that the wider community should benefit from having the project based within it. It is therefore expected that the income from the final project, whether from energy generation or savings from reduced energy costs, should be passed to the wider community itself.



Proposed Service Delivery Cashflow Model

The success of this project will depend on securing the necessary funding. There are a number of organisations who have been established to support projects like VillageGreen.

Community Energy England is an organisation whose mission is to "To help active community energy organisations implement new projects, innovate, improve and grow". They have produced an extensive schedule of sources of funding which includes the following major funding bodies.

Rural Communities Energy Fund

RCEF provides support to rural communities in 2 stages: Stage 1: grants of up to £40,000 for a feasibility study for a renewable energy project. Stage 2: grants of up to £100,000 for business development and planning of feasible schemes. RCEF is being run by 5 regional Local Energy Hubs. Wilsford in the Midland Hub administered by Derby, Derbyshire, Nottingham, Nottinghamshire.

Note - currently The Fund is closed to new applications.

Energy Company Obligation (ECO)

ECO funds energy conservation measures to reduce fuel poverty in the community.

Under ECO, medium and larger energy suppliers fund the installation of energy efficiency measures in British households. Each obligated supplier has an overall target based on its share of the domestic energy market in Britain. The obligated energy suppliers work with installers to introduce certain efficiency measures into your home, such as loft or wall insulation, or heating measures.

The ECO3 scheme consists of one distinct obligation: the Home Heating Cost Reduction Obligation (HHCRO).

Energy Industry Voluntary Redress Scheme

Your guide to understanding the Energy Redress Scheme
Energy Saving Trust has been appointed by Ofgem to distribute payments from energy companies who may have breached rules. Registered charities can apply for funds to deliver energy related projects that meet the scheme priorities and benefit people in England, Scotland and Wales. Energy Saving Trust will be administering the scheme until 2022.

Pure Leapfrog is another not for profit organisation who claim to be able to provide legal templates, consultancy services, financial and modelling services, and project development support.

10. Financial Case

The financial case highlights the level of grant and loan funding required to achieve a positive internal rate of return. It is also used to determine the level of initial funding required to maintain a positive account balance. The cost and operating cost schedules are presented along with risk factors to be assessed as part of the Stage 2 detailed design.

Service Fees

The unit rates for the service fees have been set to have parity with the marketplace. A daily standing charge and unit rate have been defined. The model includes forecast usage for each property type and therefore annual revenues have been forecast.

Capital Expenditure

On 3 March 2022, a group of contractors attended the site having been provided previously with the QEnergy concept design. They were requested to propose

technology solutions and budgetary costs. As a result of this event a schedule of costs has been prepared and is shown in the table.

Capex	
Stage 2 & 3	£115,000
Stage 4	£438,850
Contingency	£66,462
Total (Excl VAT)	**£620,312**

QEnergy also factored the service life-time of each system and created a capital expenditure forecast over the 50 year life of the project.

Funding

In addition to the capital sum, the model determines the initial investment that is required to achieve a positive bank balance for the life of the project. In the model the funding can be in the form of a grant, or an interest bearing loan, or a combination of both.

Operating Expenditure

The financial case is highly sensitive to the cost of electricity purchased from the Grid. As there is only one grid connection point there will be one supplier contract This contract is the most important determinant of operating margin. WEnergy will develop expertise in the electricity markets as a way of creating local value.

The initial financial model has made a simple assumption that WEnergy will buy energy from the Grid and make a 10% margin. In reality WEnergy will want some exposure to the day-ahead Electricity Wholesale Market and buy energy at low price to charge the battery and then discharge the battery at the highest rate.

A more detailed model will be developed at the next stage which breaks down the cost of Grid energy into its component parts and a procurement strategy will be defined to achieve best price.

SolarPV and Battery - The value of the outputs of these assets has been modelled as a credit in the OPEX.

The solarPV output has been estimated in the table below;

	Peak Output kWp	Annual Output kWh	Annual 2022 70% Value - Local Use @ £0.30/kWh	Annual 2022 30% Value - exported @ £0.05/kWh
Solar array on Village Hall. 36 x 500W panels	18	16,200	£3,402	£810
Solar array on Parking Canopy 40 x 500W panels	20	18,000	£3,780	£900
		34,200	**£7,182**	**£1,710**
Each KWp of Solar has potential to produce 900kWh of electricity per year			**Total**	**£8,892**

The value of the battery has been estimated in the table below;

Battery Storage. 50kW/100kWh Microgrid connected battery			
	Notes	**Annual Output kWh**	**Annual 2022 Value @ £0.30/kWh**
Trading Gain for 100 kWh battery	Discharge 12p gain	36,500	£4,380
Avoided distribution charges (35kW avoided @ 7p per kWh week-days only)	6 periods of red band	27,300	£1,911
Avoided Transport Network Charges	£46/KVA 25kW avoided	N/A	£1,150
Shifting Solar from Export		10,260	£2,565
			£10,006

11. Project Risks

A risk register has been developed as part of the financial case and is presented under the “Risk” tab.

At this stage gaining the necessary permissions required for service development are the key risks. These include;

- Permission to connect the microgrid to Western Power Network. This may require an increase in the supply capacity to the Village Hall.
- Permission from North Kesteven Council to erect the Solar Canopy over the car-parking spaces

- Government regulations are frequently changing and this business case requires permission to offer an electricity supply using a supply licence exemption.

12. Timescales for future project stages

Stage	Gateway	Status
Stage 1 Strategy	Business Justification' prior to the detailed planning phase	Complete
Stage 2 Detailed Design	Delivery Strategy' prior to the procurement phase	Complete within 3 months - finance needed for design
Stage 3 Procurement	'Investment Decision' prior to contract signature	Complete within 3 months - finance needed for managing procurement
Stage 4 Implementation	Readiness for Service' prior to 'going live' and implementation	Complete within 3-6 months

13. Setting the scope for Stage 2

The following Scope of work has been based on the HM Treasury projects guide.

Stage 2 – Planning the scheme and preparing the Outline Business Case (OBC)

Step 4: determining potential Value for Money (VfM)
Step 5: preparing for the potential Deal
Step 6: ascertaining affordability and funding requirement
Step 7: planning for successful delivery
Gateway 2: delivery strategy

QEnergy proposes to undertake this work and our fee would be £47,000 excluding VAT and expenses. There are also separate additional legal costs which have been estimated in the financial case.

14. Conclusions

1. WLCT, and its partner stakeholders, has the key role in addressing these issues;

a. alleviating the effects of increasing fuel poverty in the Blackberry Way homes;
b. provision of Village Hall facilities that best meets the needs of the village and continue to grow the operational income.
c. providing a pathway to Net Zero carbon emissions and minimisation of air pollution;
d. Boosting the economy of the wider Wilsford Village community.

2. A Community Energy approach provides the Service Delivery framework to meet this need.

3. The VillageGreen project Strategic Business Case details;

    a. A defined service offering
    b. Recommended technologies and a design concept
    c. A benefits analysis
    d. Service delivery organisation
    e. Financial Case
        i. Capital Investment
        ii. Operating costs
        iii. Funding requirement
    f. Risk assessment

4. The benefits to the people of Wilsford are compelling.

5. The microgrid and heat network architecture are underpin the business model.

6. Local contractors have the skills to deliver the project.

7. A new legal entity has been identified as necessary to deliver the service.

8. The legal entity will need to comply with electricity licence exemption criteria.

9. The success of this project will depend on securing the necessary funding.

10. The final 3 stages of the project are expected to take 9-15 months in duration.The cost for completing the project has been estimated in the table below.

11. The required investment has is shown in the table below

Capex	
Stage 2 & 3	£115,000
Stage 4	£438,850
Contingency	£66,462

Total (Excl VAT)	**£620,312**

12. The wider stakeholder vision is to realise the benefits in this proof of concept and then enlarge the enterprise to serve the wider community in the village of Wilsford.

11. Recommendations

1. Gain LincsRural Housing Association endorsement for the VillageGreen project.
2. Extend the stakeholder engagement to include the tenants and secure commitment for all ten homes to join the project.
3. Approach Community Energy England for support on applying for funding. Pure Leap Frog is another organisation who has a track record of supporting community energy projects.
4. Consult with Western Power Networks on the transition to the microgrid as a top priority. Also consult on the commercial Flexibility Services opportunity.
5. Arrange for design drawings for the solar canopy and submit to North Kesteven Council for outline planning approval prior to applying for funding..
6. Having secured items 1-4 proceed with funding applications for Stage 2.
7. Commence Stage 2