

**Barningham**

Net Zero

## **Feasibility Study Outcomes – Presentation & Question Session**

12 May 2021

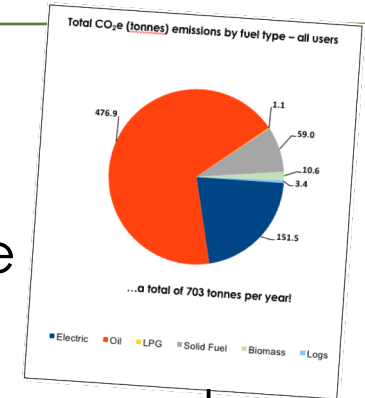


This Project is supported by the BEIS funded Rural Community Energy Fund which is managed by the North East Yorkshire and Humber Energy Hub and administered by Tees Valley Combined Authority



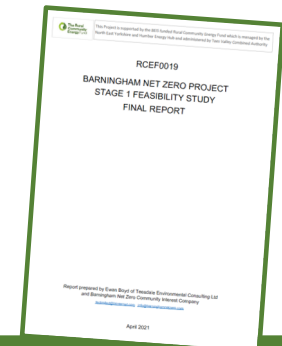
# Aims of the renewable energy feasibility study

- Assess total village energy consumption to provide a baseline generation target
- Identify opportunities to reduce energy usage to provide immediate benefits to the community
- Evaluate the feasibility, cost-effectiveness and funding approach for a community-owned renewable electricity generation scheme, which would:
  - Enable the village to become self-sufficient in electricity supply
  - Provide a source of income for future energy efficiency improvements
- Investigate the feasibility and cost-effectiveness of renewable and sustainable heating solutions



## RCEF Stage 1 Feasibility Study timeline

- 16 April 2020 Barningham Net Zero Community Interest Company formed
- 1 May 2020 Application to Rural Communities Energy Fund (RCEF) for Stage 1 Feasibility Study submitted
- 6 August 2020 Contract valued at £38,400 with Tees Valley Combined Authority signed
- 6 August 2020 Subcontract with Teesdale Environmental Consulting Ltd to undertake the study awarded
- 16 April 2021 Completed Feasibility Study Report submitted to RCEF
- 6 May 2021 Report accepted by RCEF...



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## ...some words from our sponsor...

**Subject:** RE: RCEF0019 - Barningham Net Zero - Stage 1 Feasibility Study Report

Hi Mike,

This is to confirm that your feasibility meets all our requirements, enabling the final tranche of the grant to be released. It is an extremely detailed piece of work, and while I am sure you will be disappointed on the outcomes relating to viability of the options, for the Energy Hub it is really useful that the barriers to delivery are so clearly stated. As well as feeding information back to BEIS on a regular basis, this will be one of the key areas we focus on through the programme evaluation. It is also fantastic so see some of the additional work you have been involved in, including the energy efficiency factsheets.

We will be in touch both about the upcoming programme evaluation and also about linking to your website.

Best wishes

Alan

Alan Millar | Rural Community Energy Fund Project Officer

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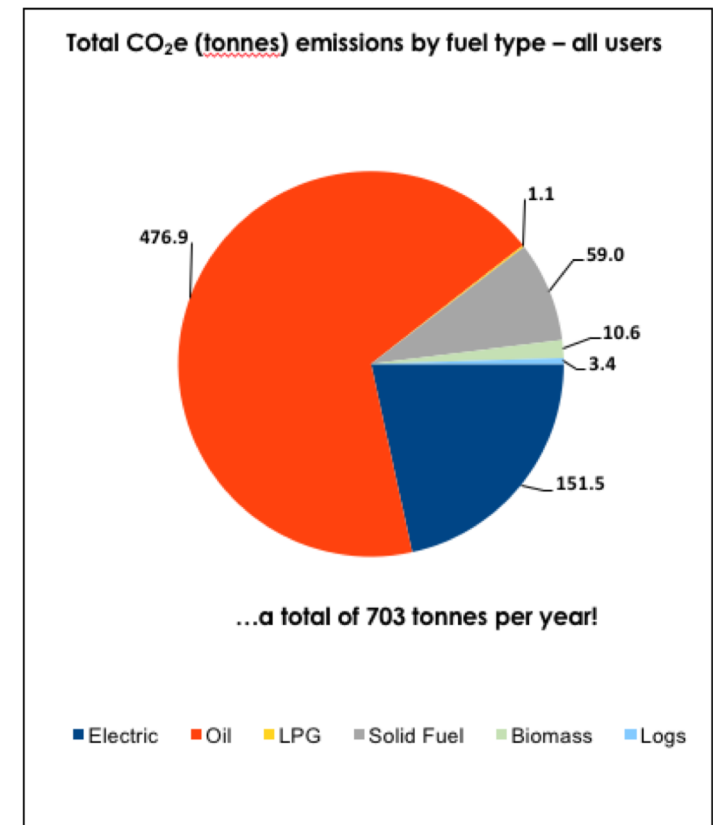
Normal working days- Tuesday- Friday

Tees Valley Combined Authority



## Household energy survey – (1) heating & emissions

- Nearly 70% of the community contributed energy data required to establish a target for electricity generation
- Local carbon emissions calculated as 703 tonnes per year
- Heating oil is the greatest contributor
  - Only 35% of costs
  - 53% of energy demand
  - By far the largest source of CO<sub>2</sub>e emissions at 68%
- Importance of identifying alternatives to oil as part of the Feasibility Study



## Household energy survey – (2) electricity demand

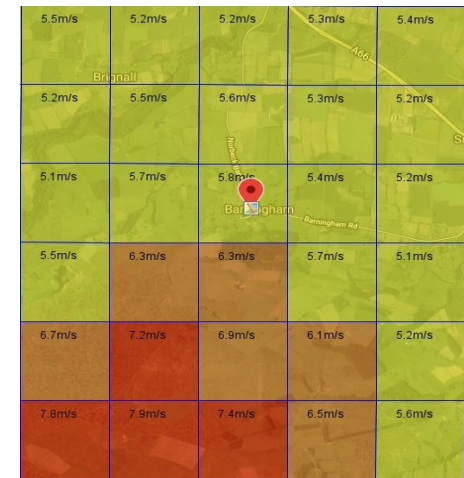
- An estimate of current electricity consumption was established
- Future increases in electricity demand were estimated
  - Proposed housing developments at Hill Top and Glebe Farms
  - Electrical heating solutions
  - Electric vehicles
- Summary of electricity demand
  - Current demand ~660,000 kWh/year
  - Requires 700kW of generation capacity
  - Estimated demand by 2028 is >800,000kWh (~25% increase)

Electricity Demand	kWh per year	% increase over current
Current Barningham & vicinity usage	658,700	
New houses (1,375m <sup>2</sup> )	77,300	11.7%
Electric heating solutions in existing houses (2)	8,540	1.3%
Electric vehicles (23)	63,250	9.6%
<b>Total:</b>	<b>807,790</b>	<b>22.6%</b>

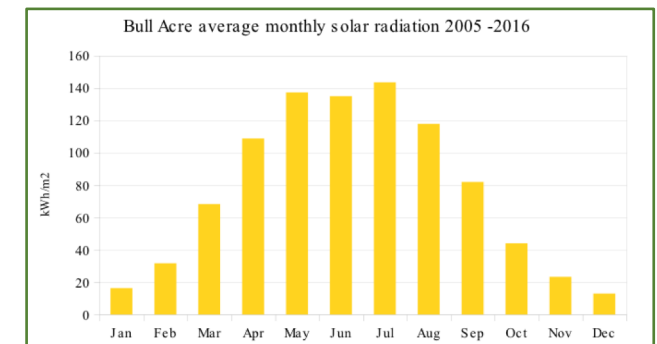
Estimation of potential future electricity demand (by 2028)

# Renewable technologies scoping study

- Purpose of the scoping study:
  - Identify key renewable electricity generation technologies likely to be feasible within the area
  - Assess the existing resource availability and sufficiency
  - Establish key criteria for acceptability against which specific installation sites could be assessed
- Scoping study also referenced the results of the household energy survey to:
  - Identify sufficient generation options to meet current and likely future electricity demands
  - Consider options for provision of renewable heat technologies



Wind speed database @25m height



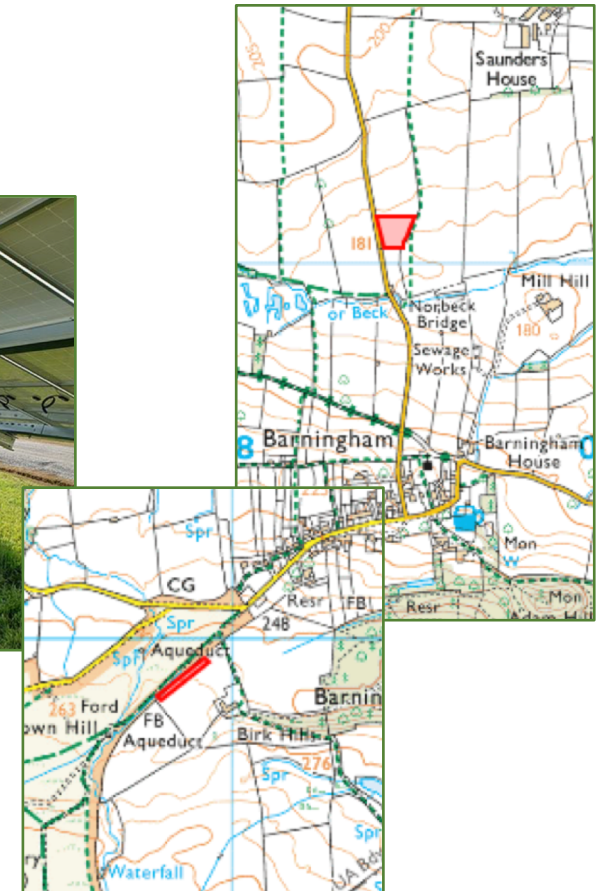
# Renewable electricity generation

- Baseline for local electricity demand established
- Feasibility of a wind turbines and solar photovoltaic (PV) scheme was examined:
  - Assessment of the suitability of local sites for electricity generation
  - Consultation with:
    - Land owners – for permission to use their land for the generation technology
    - The community – for acceptability of proposals
    - Northern Powergrid – for grid connection
    - Durham County Council – for planning acceptability
    - Equipment vendors – for technical feasibility
  - Evaluation of the financial viability



## Sites assessment

- Majority of potential generation sites eliminated
- No available site suitable for wind turbines
- Two sites proposed for PV solar:
  - Bull Acre
  - Field next to the Saw Mill



# Financial viability

- Neither the Bull Acre or the Saw Mill site scheme is financially viable at present:
  - High projected capital costs
  - Low electricity purchase rate via the grid ~4.7p/kWh
  - No guarantee of purchase price under “Smart Export Guarantee” – suppliers can offer as little as £0.01
  - High cost to connect to the grid network and necessary upgrades to the village electricity supply
  - The regulatory system makes it disproportionately expensive for small-scale generators to supply electricity directly to end users

Financial outturn for Bull Acre and Saw Mill PV installations

Site:		Bull Acre	Saw Mill
Generation (MWh)	Grid	63.5	53.3
	Estate	0.0	33.8
	Local	148.0	124.4
	Aggregate	211.5	211.5
Financial outturn			
Annual revenue (£k) <sup>1</sup>	Grid	3.0	2.5
	Estate	0.0	4.8
	Local	10.3	8.7
	Aggregate	13.3	16.0
Operating costs (£k) <sup>1, 2</sup>		4.5	5.0
Net income (£k) <sup>1, 2</sup>		8.8	11.0
Aggregate net income (nominal) (25 years) (£k)		281.4	350.2
Capital cost (£k)		246.4	392.2
Internal Rate of Return (IRR)		1.01%	-0.80%

Notes:

- 1) All values are an annual average in real terms, unless otherwise stated, and are based on a 25-year operation.
- 2) Operating costs and net income exclude capital depreciation and funding costs.

# Financial summary

- In summary
  - Disproportionate costs of grid connection
  - The returns, particularly from the low export price, are insufficient to ensure repayment of the capital outlay
  - Critically, the project costs are fixed and the potential revenue is both variable and volatile
  - There needs to be major energy market reform to change the pricing structure of community owned projects
- Nevertheless, a significant benefit of the Feasibility Study is that potential changes, which could make the project viable, are now understood and the situation can be monitored going forward using the bespoke financial model already developed for the project

Percentage changes in factors required to achieve  
5% Internal Rate of Return over 25 years

Site:		Bull Acre	Saw Mill
Capital cost reduction	Percentage	38%	52%
	Absolute	£90k	£196k
Average power price increase	Percentage	40%	73%
	Absolute	2.55p	6.62p
Grid power price increase	Percentage	181%	468%
	Absolute	8.49p	22.00p
Power output	Percentage	40%	88%
	Absolute	105kW	229kW

# Sustainable heating

- Solutions limited at present but evolving
- Wood and wood-product fired systems currently available
- Electric boilers with heat batteries, linked to dynamic or off-peak tariffs, will provide a good solution in the near future
- Within 10 - 15 years, biofuel blends and 100% biofuels are likely to be commercially available for use in existing oil-boilers with minimal modification



Log gasification boiler (left) and wood pellet boiler (right))  
Reproduced from [www.buffertanks.co.uk](http://www.buffertanks.co.uk)



Example of a conventional electric boiler (left) and a Tepeo 'Zero Emissions Boiler' (right)  
Reproduced from <https://www.thermogroup-heating.com/>  
<https://tepeo.com/blog/2019/01/16/tepeo-zero-emission-boiler-lives>

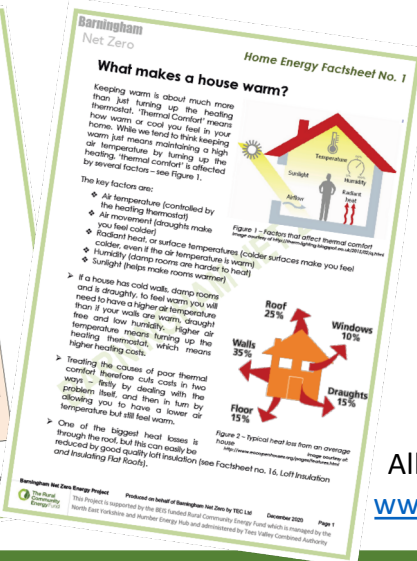
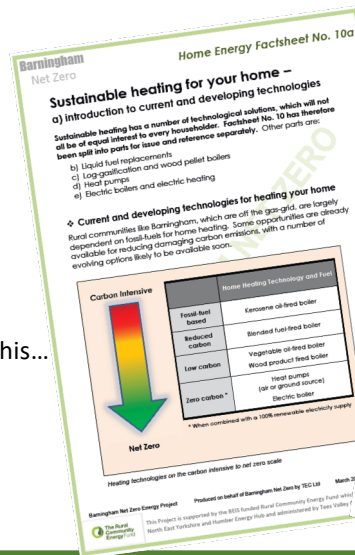


Modern wood pellet combination boiler and cooker (Klover Smart 120)  
Reproduced from <https://www.klover.co.uk>

# Energy efficiency factsheets

- The project published 24 factsheets on household energy efficiency and management
  - Categories covered are:
    - Simple energy tips
    - Advice for vulnerable or elderly residents
    - Heating, cooking, lighting and house maintenance
    - Draught-proofing and insulation

They look like this...



...and here's the Index

All available on our website:  
[www.barninghamnetzero.com](http://www.barninghamnetzero.com)



# Study recommendations – 1

- Potential generation scheme
  - Retain the Bull Acre solar PV option under periodic review of evolving technology costs, government policy, regulatory system and funding options
  - Discuss Energy Local Club model with Good Energy and other potential providers to test future potential and likely price point
  - Continue conversations with Durham County Council regarding loan finance
- Future projects
  - Trial dynamic tariff contracts to provide information and feedback to residents
  - Test and trial electric heating and storage options
  - Seek funding for pilot schemes to explore the cost-benefits of new technologies



## Study recommendations – 2

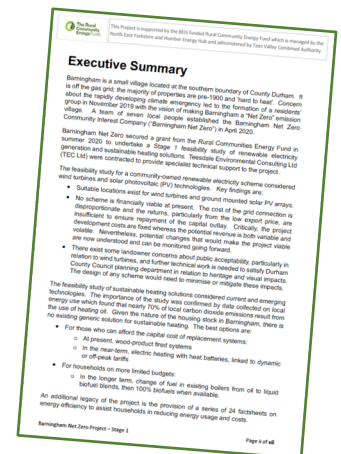
- Energy cost savings and emissions reductions
  - Encourage and facilitate supplier switching to directly benefit residents on standard tariffs
  - Encourage residents to switch to 'green' suppliers, preferably those actually helping to build new sources of renewable energy\*
  - Follow up the issue of the Energy Factsheets and help with implementation of some of the measures
  - Promote clean-burning wood and stove use (included in Factsheets)
  - Arrange community events together with relevant third parties once restrictions allow, e.g. renewable energy suppliers, domestic renewable energy installers, advice teams from DCC, Help the Aged and other organisations



\* Currently recommended are Good Energy, Green Energy, Octopus Energy, Ecotricity & Co-op Energy. Avoid suppliers claiming to be 'green' by buying REGOs (Renewable Energy Guarantee of Origin certificates), which non-renewable energy generators can purchase without themselves generating renewable energy, thereby appearing 'green' (greenwashing...)

# Feasibility Study summary

- Electricity generation
  - A high community response rate to the energy survey established a target for electricity generation
  - Suitable locations found for wind turbines and ground-mounted solar PV arrays
  - No scheme is financially viable at present, primarily because of high grid connection costs and the low electricity export price
- Sustainable heating
  - Solutions limited at present but evolving
- The project published 24 factsheets on household energy efficiency and management



## Next steps

- Monitor developing technology, financial and regulatory changes using our bespoke financial model
- Continue to work on the study recommendations and our goal of reducing our net carbon emissions to zero
- Lobby government in support of the Local Electricity Bill and necessary regulatory change
- Once plans are more developed we will engage with the community for your views hopefully, support



- Questions and answers to date
- More questions...

