Net Zero

# **Barningham Net Zero Energy Project**



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



### Barningham Net Zero Intr

# Introduction & Overview

- Objectives of our community's project
- National and regional context
- Energy project activities and current status
- Details of the proposed sites for electricity generation
- Agriculture and solar PV
- Solar PV ground mounting
- Aim of financial arrangements
- Next steps
- Questions



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# Objectives of our community's project

- Why are we doing it?
  - Climate emergency
  - Benefit to the community
    - Financial profit to our community rather than large corporations
    - Stability of supply for future increased demand EVs, electric heating
  - Get to net zero sooner locally



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## National & regional context

- The Climate Change Act puts a legally binding requirement on the UK to reduce its net greenhouse gas emissions to zero or below by 2050 (compared to 1990 levels)
- This is a huge undertaking for the energy industry and for society as a whole it will require political, cultural, behavioural and technological changes, innovation and collaboration
- Community energy is in every Distribution Network Operator's mix (DNO)
  - Flexibility optimise bi-directional flow of low carbon energy
  - Infrastructure upgrade costs to meet future increased demand
  - High transmission losses ~30% over larger distances
  - Get to net zero faster
- Adopt transition technologies
  - Hydrogen may be distributed via the gas network...
  - ...but not yet & not here



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## Energy project work to date

- Established electricity demand baseline (Energy Survey)
- Evaluated multiple sites around Barningham for solar photovoltaic (PV) panels and wind turbines:
  - Generation potential
  - Potential impacts
  - Discussions with landowners
- Assessed planning issues and engaged with Durham County Council
- Negotiations underway with Northern Powergrid (our DNO)
- Outline scheme identified and budget quotes obtained
- Planning commenced for Stage 2:
  - Business case
  - Planning development
  - Detailed design



The Energy Survey form

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# Electricity demand & sites assessment

- Electricity demand
  - Current demand in local area ~660,000 kWh/year, requiring 700kW of generation capacity
  - Estimated demand by 2028 is >800,000kWh (~25% increase)
- Outcome of generation site assessment
  - Majority of potential generation sites now eliminated
  - No available site suitable for wind turbines
  - Two sites remain for PV solar:
    - Bull Acre
    - Field next to the Saw Mill





## Barningham Net Zero Site 1: Bull Acre

- Proposed development: array of solar photovoltaic (PV) panels
- Generation potential: can supply part of current demand but not all
- Owned by Barningham Parish so potentially more profitable for the community
- Assumed continued use of Bull Acre for grazing by current tenant
- Combined land use well established with good practice guidance produced in 2014 by the Building Research Establishment (BRE)
  - Coincident grazing is beneficial as it keeps vegetation under control
- Slight impact to visual amenity
  - Would not alter the landscape character
- 3-phase power connection required to export electricity
  - Already runs past Bull Acre and Mill Hill Farm



## Barningham Net Zero Site 2: Sawmill



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# Site 2: Sawmill

- Proposed development: array of solar PV panels
- Generation potential: could supply all or some of current and future demand
- Owned by Barningham Estate
- Assumed continued use of field for grazing by current tenant
- Slight impact to visual amenity, being confined to Northwest edge of field only
- Proximity to cairnfields on Barningham Moor will require archaeological evaluation (Scheduled Ancient Monument)
- 3-phase power connection required to export electricity
  - Requires transmission through village, preferably underground to Coach House



MA

PV panels located adjacent

to wall at NW side of field

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## Agriculture & solar PV



Agricultural Good Practice Guidance for Solar Farms



Guidance from the Building Research Establishment

BRE National Solar Centre Independent, evidence based information on solar energy systems and related technologies



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# Solar PV panels ground mounting



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# Aim of financial arrangements

- The renewable electricity generation scheme is owned by a community organisation for the financial benefit of the community
- We cannot viably set up as an electricity supplier
  - Current regulatory system makes this too expensive...
  - ...pending development of the Local Electricity Bill and it becoming law
- There is potential to directly supply high electricity users prior to export to the grid this would:
  - Enable higher generation level over likely export constraints
  - Make scheme more profitable for the community
- Optimise payback period
- Allow the community to decide how to use surplus income, e.g.:
  - Payments to households
  - Community fund for energy efficiency improvements
  - Other ideas?
    - ...early comments welcome



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# Next steps

- Complete Stage 1 Feasibility Study:
  - Report on sustainable heating and cooking solutions
    - Fuel oil is the largest local contribution to greenhouse gas emissions
  - Electricity generation scheme financial analysis:
    - Implementation cost and payback period
    - Scheme funding and risk/reward strategy, e.g. loan, share offer or partnering with an electricity company
    - Financial benefit to the local community
  - Operating & maintenance strategy and organisation requirements
  - Further community consultation
- Stage 2 proposal for further funding
  - Feasible scheme detailed design
  - Planning application
  - Business model and funding proposal



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## Questions

• Questions and answers to date

• More questions...



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# Single phase versus 3-phase power supply

#### • Single-phase

- Power supplied through two wires: one delivers the current, the other provides the return path
- During cycles power fluctuates, with peaks and dips in voltage
- At two points in a cycle power is at maximum at other times power is less than optimum
- Single-phase supply is fine for home use and in some low-consumption commercial applications
- Typically used where the total power requirements are low ~23kW maximum, i.e. current <100 Amps

#### • 3-phase

- Load is shared across three power wires
- Wires arranged to be out of phase with each other
- Three phases of power peak in voltage at different times
- No peaks and drop-offs power is supplied constantly

#### • Single-phase and 3-phase compared

- Consistency of 3-phase power delivery
  - Important for safety and security of systems
  - Power delivery never drops below the maximum
- Load capacity single-phase is lower power peaks and dips
- Any electric circuit has a maximum load the total current that it can run before being overloaded



#### **Typical service connections**

- A standard **single phase** connection is capable of providing a maximum capacity of **23 kW**, sufficient for a house with 5 bedrooms, 1 electric shower and no significant loads, although many domestic connections require less.
- + A 3-phase connection is capable of providing a maximum capacity of 69  $\rm kW$



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## Local Electricity Bill

- You cannot currently buy your electricity from *local* renewable sources
- The problem is disproportionate costs
  - Becoming a supplier of energy involves set-up and running costs of millions of pounds
  - These costs are due to issues such as complex grid balancing and network agreements, which are controlled by the largest six utilities
- The aim of the Bill is to provide a mechanism that makes costs proportionate to the size of the local energy operation
- The Bill gives the task of setting up this new mechanism to OFGEM, the energy market regulator
- Reform of market regulations would make it financially viable for small local electricity generators to sell their energy directly to local people



