Decarbonising Rossendale – Net Zero Terraced Streets

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# Valley Heritage and the Community Renewal Fund

[Valley Heritage](https://valleyheritage.org.uk/) is a not-for-profit organisation helping breathe life back into historic buildings across the Rossendale Valley. They were successful in a bid to the Community Renewal Fund for the project 'De-carbonising Rossendale' which sets out to undertake 3 strands of work:

1. Funding to complete the total low carbon retrofit of a grade 1 listed bank in Bacup. They have taken a fabric first approach and then installed ASHPS to provide the heating and hot water. The space is now available for community use (and demonstration of low carbon retrofit) and also apartments for young adults leaving care.
2. Community energy project development. The grant has allowed for paid consultancy time to undertake scoping and review of potential renewable energy projects that can be developed and owned by a new Community Benefit Society ' Rossendale Valley Energy' alongside community engagement work.
3. The net zero terraced street. A review and technical study to look at how a stone built, terraced street within a conservation area, can become Net Zero.

This outline is detailing the third strand, the Net Zero Terrace street.

# Net Zero Terrace street

Decarbonising urban areas is a complex problem, especially when considering the electrification of heat and transport with the corresponding impact on the grid. Current strategy is around macro (Heat networks centred around large loads and peripheral areas) and Micro (individual homes) solutions. Many communities will not be appropriate for either, especially terraced streets, where ASHPs can not be a feasible solution due to space constraints, noise implications, efficiency losses, maintenance issues and risk of damage in a confined area such as a small back yard.

The Net Zero approach to an area of terraced streets is considering:

* + Low carbon heat:
    - Ground source bore holes (150m deep, placed in alley and highways) for clusters of terraced houses,
    - Taking the ambient heat (10-150C ) and circulating it via brine, through a shared loop network for each cluster of homes.
    - Each home will have a small Heat pump within the home, which will upgrade this low temperature heat to useable heat (450C) for the central heating system.
    - Radiators would need to be upgraded to larger ones with a larger surface area to enable adequate heat transfer.
    - As the heat pumps will be operating on a source temperature of 10-150C, the scheme will offer better efficiencies for householders than ASHPs, which will ensure lower running costs and bills.
    - Thermal batteries (Sunamp) will be used for hot water – with the potential flexibility for the local grid.
    - The improved efficiencies mean that the pressure on the Electricity Grid at peak tea-time winter months will be less, with less requirements for expensive reinforcements.
  + Low carbon transport – EV charging and/ or EV Car clubs
  + Shared Solar PV across the Terraced street with shared battery storage and using Allume (sol-share) to ensure maximum generation is consumed across the terraced street.
  + Potential for urban battery utilising Local Supply model and peak shaving
  + Fabric retrofit – cost to benefit ratio– energy efficiency and flexibility, what pays off?
  + Grid Constraints
  + Engagement, including how to reach vulnerable households.

The area highlighted below has been chosen as the target area. The streets have homes with mixed tenures and some homes are in a conservation area. Work has been done to devise a questionnaire and a 'door knocking' survey approach is underway to start to build a profile of housing stock, energy use and demand. Energy audits will also be undertaken in a small number of homes. The overall heat demand will be used to size a communal heat scheme and review the number of boreholes required for an ambient loop and size heat pumps/ thermal store for each home.

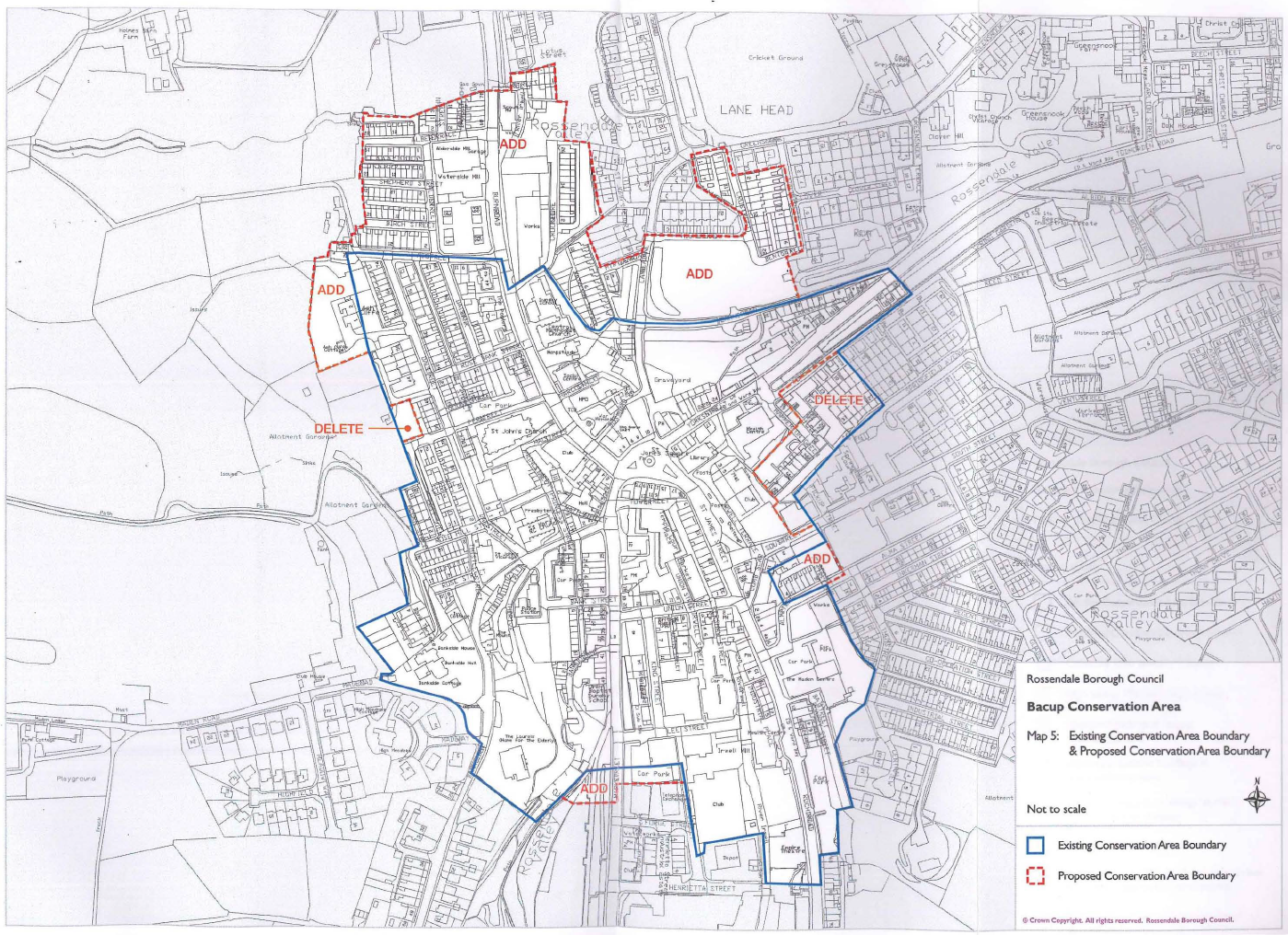
 

Figure – Area of Bacup targeted for the decarbonising Rossendale Net Zero Street

# Collaborative partners

There are many different partners building up a picture of how a Net Zero terraced street can be delivered, highlighting the complexity of the challenge:

* Valley Heritage
  + Conservation charity, recipient of the CRF and leading on full retrofit of Bacup Grade 1 listed Bank. Leading on the community energy asset development and the NZ terrace street, focusing in particular on engagement within the community.
* Rossendale Borough Council
  + Local Authority: Working and liaising with Joe Walker, climate emergency officer, Jackie Flynn, Communities engagement, Mandy Lewis Director of Economic Development, Adam Allen, Director of Communities
* Buro Happald
  + Technical feasibility, Community energy project long list and Net Zero Terrace street
* Community Energy South
  + Utilising and sharing their project development experience from 'Communi heat' and other community energy projects
* Kensa
  + Shared group loop design to provide low carbon heat and leading on work to develop an application for the Green Heat Network Fund
* Together Housing
  + Housing Association trail blazing in low carbon housing innovation (Solar and Battery storage project and low carbon heat solutions with Kensa) Large number of houses in Bacup and will be an 'anchor load' for the planned shared ground loop and application for the Green Heat Network Fund.
* Lancashire County Council
  + Strategic support: will need to engage with Highways and possibility of leveraging finance to meet gap funding from the GHNF.
* ENW
  + DNO keen to understand more around NZ terrace street standardised model of delivery within the constraints of a sub-station and engagement in an area with vulnerable customers and the potential to look at flexibility/ smart local energy systems solutions.
* IOT Horizons
  + Working on the Bacup bank and will look at sensors and monitoring for NZ terrace street with regards to smart local energy systems solution.
* Allume
  + Provider of sol-share, a solution that allows behind the meter distribution of solar generated to maximise consumption within the terrace street and minimise export to the grid.
* Insall Architects
  + Remodelling houses to offer different spaces for different households, alongside 4 different levels of retrofit
* Centre for Energy Equality
  + Fairer Warmth App. Virtual engagement application to support energy efficiency and affordability challenges. Funding application supported and would like to trail through the de-carbonising Rossendale project
* Rossendale Valley Energy
  + The Community Benefit Society that will be set up to develop community owned energy assets
* Lanxess
  + The Chemical manufacturer that will host the 2.5MW solar farm which will be installed by Rossendale Valley Energy as a community benefit project – part of strand 2
* Sharenergy
  + Undertaking project development on a 2.5MW solar farm on behalf of Rossendale Valley Energy – part of strand 2
* North West Net Zero Hub
  + Providing strategic support and a grant for the Rossendale Valley Energy project

# Next steps: Route to delivery & funding

The Community Renewal Fund is being used to create a template which could lead to a pilot project with significant value. Trailing a Net Zero terraced street, in a conservation area, with hard to treat homes with hard to reach households and within the constraints of the local substation. The area defined falls mostly in LSOA 003C – which is classed by the Indices of Multiple Deprivation as within the highest 7% of most deprived areas. These households are likely to be vulnerable to fuel poverty. Creating a replicable model to provide low carbon, affordable energy solutions, including upgrading the building fabric to provide warm, comfortable, healthy homes for the future will be a step forward in future planning to address Carbon emissions from swathes of terraced streets.

## The Strategic Innovation Fund

The potential to study and standardise a Net Zero solution for a terraced street area is something that could be further investigated through the Strategic Innovation Fund. An Expression of Interest has been submitted and successful projects will be announced in the autumn.

Terraced housing has a limited number of architypes and the ability to create a standardised methodology that can allow replication across areas, which can then be utilised in Local Area Energy Plans will be incredibly valuable. The SIF Discovery £150,000, Alpha £500,000 and Beta £2m phases would offer a route to delivery which would allow planning, operation, including a physical trail with collection of live data showing how technology works on the network and a delivery methodology for further housing.

Discovery phase: A plan for a Net Zero terraced area would enable work to be undertaken to answer many of the following questions and build a solution based on the headroom for individual substations.

* What will the overall load and demand profile be for heating across the street?
* What spare capacity do Sunamp Batteries give across the street?
* What will the generation be from PV?
* How much generation will be consumed across the terrace with sol-share and battery storage?
* What is the head room at the substation?
* How can Net Zero be reached within that headroom?
* Is an urban battery required and if so what size?
* What demand reduction through building fabric upgrades can be achieved?
* What level of fabric upgrade offers the best value for money within this model (both capital costs and ongoing operational costs for householders)
* What performance data can be live, how will that integrate with the network, what are the data exchanges?
* How can this be Benchmarked?
* Are properties looped, can they be unlooped as part of the project?

Community microgrids underpinned by novel commercial models and planned through an approach of developing smart local energy systems (SLES) could have the potential to deliver high value to both network customers/consumers and the DNO. A data driven approach of collecting winter data on homes to determine actual heat performance requirements through non-invasive means will significantly improve the benchmarking and forecasting capability for these homes. The data will be fed into a model that is developed to evaluate community energy options for clusters of terraced homes. Options will include exploring reducing the size of the heat pumps, utilising space saving thermal batteries instead of hot water cylinders. Community solar systems can be deployed which would provision for and aggregate roof top solar and virtually manage it behind the meter. The incorporation of novel emerging community models such as Energy Local can be leveraged to deliver further reductions to bills. Such systems would give access to a wider range of services than individual households could otherwise access and would ensure no one is left behind. Further opportunities exist to maximise value to the DNO vs the counterfactual as these systems will have far more ability to control heating and hot water demand through the technologies selected. This flexibility in addition to far more efficient heating can be quantified to determine the regional network benefits. Managing demand directly with generation at the local level will also significantly reduce the impact on the network of excess generation being distributed upstream as it will be utilised at point of generation.

This project proposes to develop modelled solutions which include real property data, techno-economic assessment and DNO grid impact studies to quantify and appraise the benefits to both network customers and the DNO for implementing such solutions. The network impact model will consider how reinforcement would be planned, network behaviour of different solutions, how the network would benefit from these configurations vs the counterfactual of individual home direct electric solutions. The modelling approach is initially focused on a small cluster of homes, but this will then be extrapolated for the larger area determined for the Green Heat Network Fund to look at opportunities to continue integration into developing a virtual energy management and forecasting capability that can be used for wider planning unifying the DNO asset planning and flexibility approach with community led schemes in an urban and semi-urban context. It will directly inform DNO data structures and processing techniques to understand the data that needs to be provided and that which can be obtained through the delivery of such schemes which can be disseminated widely to community groups, local authorities and other DNOs.

## The Green Heat Network Fund

The key to this project is establishing a route to delivery. The Green Heat Network Fund offers an opportunity to apply for a significant capital grant of £5m that will partially fund the infrastructure costs for a shared group loop heating solution. Utilising the Together Housing homes as 'anchor loads' an application for an area of Bacup of ~ 500 houses will be defined within the application for the Green Heat Network Fund. This is at an early stage of investigation and will draw on the broad consortium of partners to look at how this will be developed and how complementary strategies for engagement and fabric retro-fit will be combined.

# Powering Our Communities Fund

An application to the Electricity North West powering our communities fund has been submitted, for up to £15,000 for capacity/ resource for engagement. This work will be around developing the Community Benefit Society, Rossendale Valley Energy, engagement within the community of Bacup for the NZ terrace street project, including liaising on the 'fairer warmth app' and energy efficiency advice, and for time to monitor progress and link with Sharenergy on the Lanxess 2.5MW solar project.

# MSC foundation grant

An application is being prepared with Rossendale Borough Council and the Centre for Energy Equality to progress the 'Fairer warmth' app and trail it within the specified areas of Bacup for the Community Renewal Fund work and the wider area being targeted for the Green Heat Network fund. This work will also be used for a further application to the UK innovation fund for the app development. Please see the appendix for details of the Fairer warmth app.

# Conclusion

Of the 6.9 million terraced homes in the UK, many will not be suitable for ASHPs and will need to look at resistive electric for low carbon heating. This is ~3 times more expensive to run than a heat pump meaning a higher risk of fuel poverty for those in terraced streets.

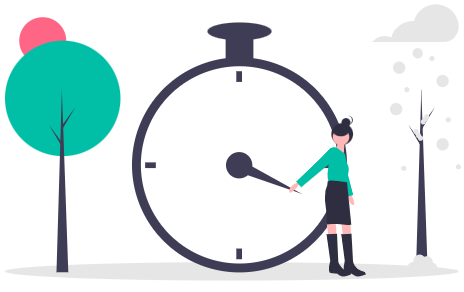
A street by street, planned approach utilising shared ground loops offers economies of scale, the ability to engage within communities and encourage a 'move with the crowd' uptake, the ability for the DNO to unloop houses and look at network capacity with a total NZ load plan, reducing overall upgrade costs and thus negating those costs being socialised and pushing up bills further.

With the dramatic rise in the cost of energy being a significant impact on the cost of living and with domestic heating being responsible for 14% of total CO2 emissions, targeting scalable, investible solutions in areas of need should be a priority to Local Authorities. [BRE identified the cost of poor quality housing](https://www.cieh.org/ehn/housing-and-community/2021/november/poor-quality-housing-costs-nhs-over-1bn-a-year/#:~:text=Poor%20quality%20housing%20in%20England,Health%20and%20Safety%20Rating%20System.) to wider society – to mental health, educational achievement, and long term care at £18.5bn each year.

Bringing the skills together from the collaborative partners, is allowing a holistic approach that's being driven by a sense of urgency in answer to the rising, multiple challenges facing our communities. The route to delivery, for this multi-faceted pilot project, is central to the work being undertaken. Sharing the learning and the ability to scale rapidly is the primary objective.

# Appendix

## Fairer warmth



**Fairer Warmth App**

**Virtual engagement application to support energy efficiency and affordability challenges**

**THE CHALLENGE**

Identifying and then supporting the people in most in need of home energy improvements is challenging. Current methods of engagement often rely on extensive and expensive marketing campaigns, that in many cases can only reach small sections of the target audience.

This in turn limits the ability for organisations wishing to influence behavioural change to make an impact and effectively communicate. Some of the resulting missed opportunities include:

* Identifying households who qualify for funded retrofit programmes (for example ECO4).
* Positively influencing household energy efficiency decisions (for example draft proofing).
* Understanding housing stock retrofit requirements in detail and at scale.

There is therefore an opportunity to find new ways of engaging with households to enable better identification of those most in need of advice and energy efficiency measures, as well as to improve understanding of community needs rapidly and at scale.

**PROPOSED SOLUTION**

We propose to develop a phone and web-based application that households can use to access simple energy efficiency advice that can make their homes more comfortable and economic to run, quickly assess eligibility for grants and target retrofit and home energy efficiency measures.

The solution will be highly adaptable to the unique requirements that organisations such as local authorities, schools, universities or energy companies have. However, the intention is that there will be several core features that work for both individuals and organisations.

## Individual User / Customer Facing Features

The aim of the individual user interface will be to provide simple, bespoke advice that will help people to access support and make simple home energy improvements. Figure 1 shows an example user interface. Key features are listed below:

* Postcode search enabling incorporation of public data about an individual’s home or dwelling.
* Short, modifiable survey to fill gaps in publicly available information. For example, asking questions about level of insulation and window type.
* Enables the user to quickly (~one minute) self-identify for eligibility for funding and grant mechanisms – providing contact details for local schemes and an option for someone to get in touch with them.
* Provide simple and focussed advice based on individual home improvement opportunities. Initially this will be delivered by providing links to advice leaflets but in the future will include short explainer videos.
* Signposting local community support services based on location data.
* Option to share and receive data/push notifications.

Graphical user interface, application

Description automatically generated

Figure 1: Example User Interface

**Organisational Features**

Again, the organisational features can be adapted and can also be integrated into organisational systems and data bases. All data received through the App will do so in a compliant way.

1. Collect information from App use, enabling proactive and focussed efforts to help allocate funds for those who qualify and who are in most need.
2. Aggregated data use, outlining local trends. For example, levels of insulation in certain regions and affordability challenges.
3. Bespoke dashboard options.
4. Forward push notifications showing new funding opportunities, or opportunities to take part in surveys or trials.
5. Two-way communication and chat features to provide advice.

**DEVELOPMENT & TRIAL APPROACH**

We will utilise an Agile approach to App development, creating a rapid prototype allowing simple user testing. Once features and functionality are agreed, we shall then progress with creating a solution for a trial roll out in the selected region

An outline of the process for developing the essential features are shown in Figure 2.

Figure 2: Development Approach