

Hanley Castle Parish
Rural Community Energy Fund (RCEF)
Stage 1 – Feasibility Report

A Report on behalf of Hanleys Energy Action Team (HEAT)

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1. Executive Summary

The Hanley Castle energy feasibility study was instigated by the Hanleys Energy Action Team (HEAT) who contracted most of the work to Sharenergy with funding obtained from the Rural Community Energy Fund (RCEF).

HEAT, a Community Interest Company (CIC), was set up with encouragement from the Hanley Castle Parish council to look into ways of helping the Parish to decarbonise. The Parish, near Malvern, consists of two settlements, Hanley Castle and Hanley Swan. There are 600 households, around 1,500 people, plus two schools, a small private college, two churches, a village hall, two pubs, two shops, three industrial estates, one large factory, two smaller business units and a care home. Most of the properties are heated by oil or electricity. There is a small clinical waste incinerator just being completed.

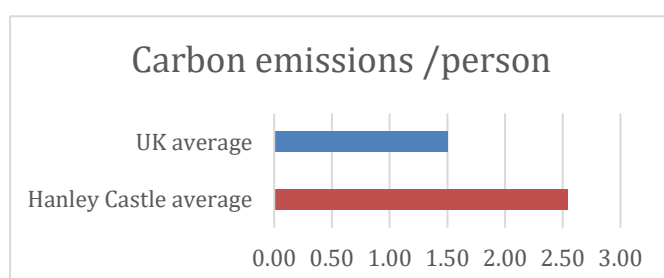
The project comprised of three main strands of work:

1. Baseline analysis of current energy usage, including a survey of local households
2. Assessment of local building stock, including case study work on 8 houses and analysis of Energy Certificates
3. A study of renewable energy options for the Parish and some more detailed work on three possible schemes arising from this study

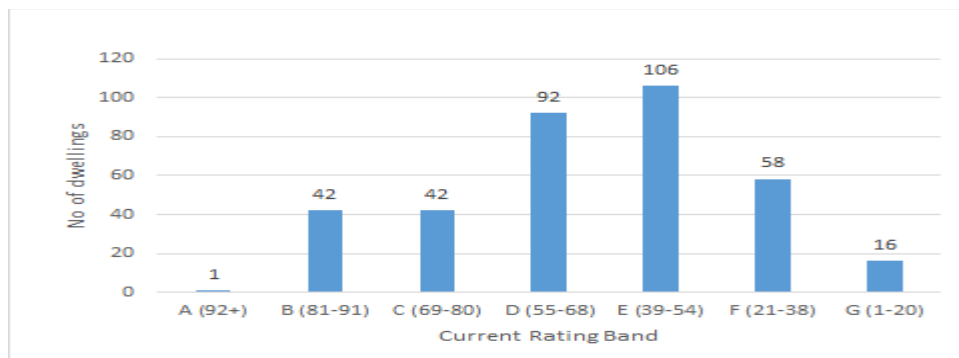
Separate reports detailing the analysis and investigatory work for each of these strands have been produced for the HEAT team and attached as appendices. These should be referred to for further information:

1. Energy Survey questionnaire
2. Energy Survey results
3. Baseline Energy Report including Case Studies
4. Renewables Assessment

The first two strands identified that a significant number of properties had already done some work to improve the thermal performance and carbon emissions of their properties, However, around 80% of the properties are heated by oil and the average carbon emissions per person are at least 60% higher than the national average at 2.54 tonnes.



The Energy Performance Certificate (EPC) analysis shows that at least 50% of the properties are in the lowest E, F and G rating bands, additionally 40% of houses don't have an EPC and these are more likely to be in the lower bands.



HEAT have been working on getting bulk discounts for heat pumps as part of this project. Several householders are interested in fitting air source heat pumps. HEAT have also been publicising the Green Homes Voucher scheme, the Domestic Renewable Heat Incentive and the business schemes BEEP (Business Energy Efficiency Programme) and LOCOP (Low Carbon Opportunity Programme).

The Renewables Study investigated a range of larger scale options including wind, hydro, waste heat, hydrogen, anaerobic digestion and shared loop ground source heat pumps.

Sharenergy recommended that three projects be studied more closely:

1. Non-domestic rooftop PV
2. Shared loop ground source heat pumps for a new development at Hanley Swan
3. Ground-mounted PV on fields on the southern edge of the Parish

Wind was considered as technically feasible but unlikely to be approved by the planning authority under current guidelines, especially as it is specifically ruled out in the Neighbourhood Plan.

Shared loop ground source heat pumps for existing properties were considered technically viable but not likely to proceed due to imminent withdrawal of the Non-Domestic Renewable Heat Incentive. A larger heat network was considered unsuitable due to the scattered housing in the Parish. Waste heat and hydro were considered not technically feasible, and no feasible options for hydrogen, battery storage or anaerobic digestion as community schemes were developed.

Feasibility work was undertaken on the three projects in November and December 2020.

1. Efforts have been made to contact potential hosts sites for non-domestic rooftop solar. To date there are promising leads, and HEAT are looking to continue with further work in partnership with the Big Solar Co-op.
2. The developers at Hanley Swan were interested in the possibility of a shared loop ground source heat pump scheme but two issues were identified. Firstly, confirmation was

received from BEIS that the Non-Domestic RHI would not be extended. Secondly, the developers were applying for 12 properties on the site despite the Neighbourhood Plan limiting all developments to 10 houses maximum. It was therefore considered that this scheme was unlikely to come to fruition and no further work was carried out.

3. Three potential fields for ground mounted solar have been identified, all near to the Brotheridge Green sub-station. Detailed investigations with WPD however revealed that there is a capacity issue further upstream. There are some planned works in Hereford that could enable a connection to be made, but this would be a 66kV connection, making it too expensive for a small scheme to carry. A sub 1MW wind turbine might be allowed but this is specifically ruled out in the Neighbourhood Plan. The area is also not included where flexibility schemes are welcomed. The only way forward would be to have a scheme that was not connected to the grid, for example, built purely to manufacture hydrogen, this was felt to be unlikely to be viable and beyond the scope of this work.

As of December 2020, there are no schemes that could be the basis for an RCEF Phase 2 application and there are no clear means at this point for realising the aspiration of Zero Carbon for the Parish. However, the grid capacity situation and planning restrictions are expected to change, increasing the viability of certain schemes in future years.

Recommendations

It is recommended that the HEAT Team:

- Continue to work with the Big Solar Co-op to bring about commercial rooftop solar schemes at the industrial estates and/or the ESP factory.
- Press for changes to the local grid and Neighbourhood Plan and monitor financial opportunities with a view to further renewable projects becoming feasible in the next few years, for example wind turbines or ground mounted solar.
- Continue to work with local businesses and households, the local councils and Act on Energy to promote energy efficiency and the use of grants such as BEEP and the Green Homes Voucher scheme.
- Promote the use of heat pumps, biomass boilers and domestic PV systems by advising on funding sources, sharing best practice and arranging for bulk buy discounts.

It is also recommended that Hanley Castle Parish Council continues its support for HEAT, encourages local businesses and households to reduce their carbon footprint and considers how changes to the Neighbourhood Plan could enable low carbon projects.

2. Community Engagement

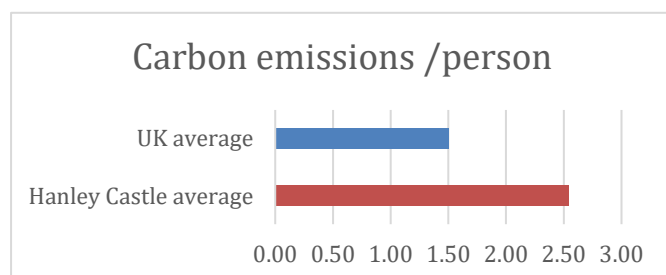
The Hanley Energy Action Team (HEAT) was set up in early 2020 after the Hanley Castle Parish council passed a climate emergency motion. A kick-off meeting was held early 2020 and the local community has been kept informed of this project through the Parish newsletter, HEAT newsletters, social media and the HEAT website <https://www.hanleycarbon.org>

Shareenergy and the HEAT team worked together to conduct a survey of the parish's current energy consumption. The Energy Survey questionnaire can be found in Appendix 1. This was posted on the website, and paper copies were distributed around the Parish by the HEAT team. The survey was completed by 72 households; a full analysis of the results was produced and shared with the HEAT Team. This can be found in Appendix 2.

The energy survey analysis identified that a significant number of properties had already done some work to improve the thermal performance and carbon emissions of their properties, including;

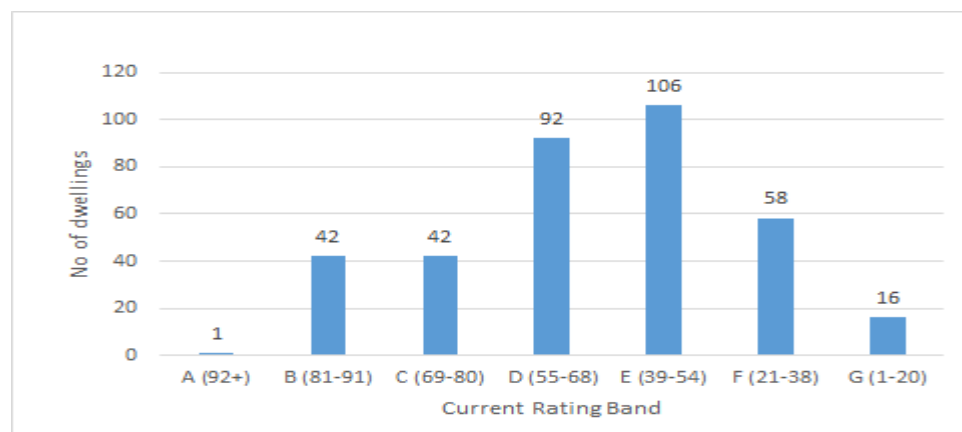
- Heat pumps at 36 domestic properties; 2 ground source, 34 air source
- Communal wood chip heating at 4 domestic properties and 2 with pellet boilers
- Biomass boilers at the care home, the college and part of the secondary school
- Photovoltaic (PV) systems at 41 domestic properties have, and the 2 schools
- Solar thermal systems at 20 properties

However, around 80% of the properties are heated by oil and the average carbon emissions per person are at least 60% higher than the national average at 2.54 tonnes.



(This figure allows for a significant proportion of the households who completed the survey having a green electricity tariff. If this is discounted, the average rises to 3.14 tonnes/person.)

The Energy Performance Certificate (EPC) analysis shows that at least 50% of the properties are in the lowest E, F and G rating bands; only 24% are in the top A, B and C rating bands. 40% of houses don't have an EPC and these are more likely to be in the lower bands.



Eight households have been given individual energy advice through the case study work. Five of these are interested in joining a scheme to bulk buy heat pumps. One property is only newly purchased, and whilst the owner will be undertaking significant thermal improvement works, he is unlikely to fit a heat pump at this stage. One other property is already C-Rated with fairly low bills, so significant investment cannot be justified. The last property is owned by an elderly couple and they have relatively recently replaced their oil boiler and are not planning major changes at this point. This work is being used to generate advice for the wider population.

HEAT have been working on getting bulk discounts for heat pumps as part of this project. It has proved difficult to find installers to quote for ground source heat pumps, despite one installer stating that the ground conditions are suitable. Several householders are interested in fitting air source heat pumps. HEAT have also been publicising the Green Homes Voucher scheme, the Domestic Renewable Heat Incentive and the business schemes BEEP (Business Energy Efficiency Programme) and LOCOP (Low Carbon Opportunity Programme). HEAT is planning to continue encouraging households and businesses to improve the energy efficiency of their properties and fit renewables.

The largest local landowner has been involved in the hydro and ground mounted solar projects, and is keen on the idea of a ground mounted solar project, having considered a larger scheme previously.

Contact was made with Malvern Hills District Council Sustainability team who were very supportive.

A public event is planned for January 2021 to inform local residents of the results of this work. Further consultation on rooftop solar will be undertaken if enough building owners or tenants express an interest.

3. Community Benefits

The largest benefit to the community of Hanley Castle through this work is likely to be a reduction in carbon emissions through energy efficiency, reduced use of oil for heating and increased renewables. Hanley Castle Parish council have set a target of moving towards being Carbon Neutral by 2025 following the declaration of a climate emergency by Malvern Hills Council in 2019. The Malvern Hills Climate Declaration included the aim *“to move as quickly as possible to net zero carbon emissions across the district”*.

Some homes and businesses should see reduced costs. If the ground mounted solar scheme comes to fruition, carbon emissions will be reduced, whilst the landowners will benefit from rental income.

No installers are based within the Parish, therefore most of the work arising from this project will need to be carried out by firms outside the area, although there may be an opportunity for project management or marketing work to be undertaken locally.

4. Technology

A full range of technologies were considered.

Heat Pumps

There is considerable interest in heat pumps within the community. 36 households already have them, and several have expressed interest in the idea of a bulk buy scheme. Unfortunately, no viable scheme for shared loop ground source heat pumps has been identified. This could change if the Government brings in new sources of support in future.

Rooftop PV

Rooftop PV is also popular, with 41 domestic installations identified, plus arrays at both the secondary and primary schools. It is felt that further non-domestic rooftop PV would be broadly acceptable on most sites; this will be put to the wider community if or when enough building owners or tenants express an interest.

Ground Mounted PV

Small scale ground mounted solar is likely to be acceptable, although not in all locations. Of the three fields identified, one is more visible to neighbouring properties than the other two so is the least likely to be acceptable. The HEAT team feel that a larger ground mounted scheme, (over 4MW) would be likely to lead to local opposition, so has not been considered as part of this study.

There is an issue with grid capacity, not at the local substation but further upstream at Feckenham. Whilst most of the electricity generated would be used locally, this would still affect the network, as electricity generated in other areas would no longer be needed in Hanley Castle. There are 'Active Network Management' schemes in place that could deal with this, but these are at full capacity at present. There is a planned network upgrade in the Hereford area as early as 2023, but this would entail connecting to a 66kV line, making it too expensive for a small scheme to carry. One option would be to have an array that was not grid connected to produce hydrogen, but that was felt to be unlikely to be viable and beyond the scope of this project *see section 6 for details of this*.

Wind Turbines

Western Power have suggested that a sub 1MW wind turbine might be acceptable within the current grid set up but wind turbines are specifically ruled out in the Neighbourhood Plan, therefore no potential sites have been suggested, despite the area being reasonably good for wind speeds. It is recommended that wind be considered an option in future years if the planning rules change and grid capacity issues are resolved. A larger wind turbine on the southern edge of the Parish could potentially connect into the 66kV line to Hereford, as this would potentially cover the costs of such a connection.

Hydro

Hydro power has been ruled out despite the River Severn forming one of the Parish borders, because there is no appreciable drop on the river at this point and tributaries are too small to

create a viable resource. The option of using a long drain on the Severn End estate as stored hydro was also explored and considered uneconomic. Grid capacity would also have been an issue had a scheme on the Severn been possible.

Other Options

Waste heat, battery storage, hydrogen and anaerobic digestion were also considered.

Hanleys Renewables Matrix (as prepared Sept 2020).

Technology	Technically Feasible	Financially Feasible	Any other constraints *	CO2 saving	Suitable for RCEF project - sept2020	Suitable for other HEAT input	Comments
Non Dom Rooftop PV	Y	Y	N	Y	Y		Very suited to a CE model, a number of potential sites have been identified
Ground Mounted PV	Y	Y	? ¹	Y	Y		Very suited to a CE model, Suitable sites not yet identified, Severn End estate interested.
Shared loop, domestic new build	Y	N ²	? ²	Y	Y		Very suited to a CE model, suitable site identified, developer not yet approached
Large Scale Battery storage	Y	?	N	? ³	Y		Should be considered alongside ground mounted PV if a suitable site can be found.
Domestic Rooftop PV	Y	?	N	Y	N	Y	HEAT could promote to homeowners with high enough direct usage to make it viable
Shared loop existing properties	Y	N	Y	Y	Not unless the	Not at this point	Removal of the NDRHI has taken away the support

					NDRHI is extended		this technology needs,
Individual heat pumps & biomass boilers	Y	Y	Y	Y	N	Y	HEAT could promote to business & homeowners and publicise the domestic RHI & voucher scheme, BEEP & LOCOP programmes
Domestic Batteries	Y	Not at this point	N	? ³	N	Y	HEAT could monitor situation to see when battery storage becomes viable.
Waste Heat	N		N	Y	N	Y	
Wind	Y	Y	Y	Y	Not at this point	Y	Currently constrained by planning, HEAT could work on easing of planning restrictions or prepare for when these restrictions are lifted.
Hydro	N	N	Y	n/a	N	N	Not suitable in this area.
Anaerobic Digestion	Y	Y	N	Y	N	?	Suited to waste streams rather than crops grown specifically, not suited for a CE model? HEAT could promote to farmers?
Hydrogen	Y	?	Y	Y	N	N	

More detail can be found in the Renewables Assessment Report produced for HEAT as part of this project. See Appendix 4.

5. Financial Projections

Rooftop Solar

The removal of all subsidies for renewable energy generation has hit the solar energy industry hard. As a rule, rooftop solar now needs to be sited either on top of, or near to, a user of power which will utilise at least half the generated energy.

Sample figures are given here for a 50kW array:

Installed cost	£33,000	assuming easy install
Annual production	47.5 MWh	
Income - electricity exported	£1,188	
Income - electricity used on site	£2,138	
Total income	£3,326	
Operations cost	-£1,273	maintenance, insurance etc
Depreciation	-£1,320	25 years
Operating surplus yr1	£733	

This yields a reasonable rate of return (IRR) of around 4%.

Ground Mounted Solar

Sample figures are given for a 4MW array:

Installed cost	£2,000,000	assuming grid connection and other costs not excessive
Annual production	3,821 MWh	
Income	£168,000	All exported to grid
Operations cost	-£50,000	maintenance, insurance, admin, rent etc
Depreciation	-£67,000	30 years
Operating surplus yr 1	£51,000	

Modelling shows a 5.86% project return (IRR) but with a competitive install cost. This is below the hurdle rate for most commercial projects, but may be realistic for a community-based project (which may, for example, be able to raise community share and bond capital at lower rates).

A 4MW solar array will take up approximately 4 hectares of land (i.e. an area of 400 x 100m). This is the largest project that is likely to be able to get a grid connection locally, and at the same time around the smallest viable grid-connected project. Even a scheme of this size would not get consent from WPD at this point.

A smaller solar field would still have similar grid connection costs and administration and management overheads, and is therefore unlikely to be viable unless it can be connected to a sufficiently large energy user to use a large proportion of its generated power. To our knowledge there is no such user in the parish apart from ESP. Apparently ESP have been in discussions with a solar developer; HEAT are looking into this.

Shared Loop Ground Source Heat Pumps, New Properties

The Non-Domestic RHI (NDRHI) can apply to new build properties, unlike the domestic RHI. Therefore, a new-build estate fitting a shared loop ground source system would gain RHI payments; a system for each house would not. It was considered that a scheme at Picken End should be viable and was worth pursuing, and discussions were held with the developer, but it was decided to discontinue this project before detailed costings were carried out, due to issues over funding and planning.

Shared Loop Ground Source Heat Pumps, Existing Properties

The 1950s houses at Winnington Gardens were investigated for a potential shared loop ground source heat pump system.

It was found that the income from the Non-Domestic RHI would not be sufficient to pay back the capital costs, running costs and interest. The NDRHI (Non-Domestic RHI) deadlines were also considered too tight to justify the progression of a complicated scheme with many owners.

The project was therefore not taken into the next phase of work.

6. Planning & Permitting

No proposals from this project have been taken to the stage where a pre-planning application or detailed discussion with the local planning authority was necessary.

Priority has been given to schemes that are likely to gain planning approval, hence the wind turbine and larger scale ground-mounted solar schemes have not been pursued.

The Parish Council has a target of the Parish moving towards being Carbon Neutral by 2025, Malvern Hills District Council declared a Climate Emergency in 2019. The Sustainability Officer at Malvern Hills District Council has been consulted and she is very supportive of HEAT's work.

7. Sites

Non-Domestic Rooftop Solar

Several sites have been identified for potential rooftop solar schemes, including Willow End Business Park, Merebrook Industrial Estate, Hanley Workshops, the Acorn Business Centre and the ESP factory.

The owner of two buildings on Merebrook Industrial Estate has expressed strong interest in the scheme, and discussions are currently ongoing. Attempts to engage with ESP and other owners are continuing. It has however been pointed out by WPD that whilst some rooftop solar may be acceptable in the Parish, larger schemes could fall foul of local grid constraints (see next section)

It would also be possible to fit PV panels on the Village Hall, however, this would not be viable financially unless grant funding is obtained, or the installation is carried out as an add-on to a larger scheme elsewhere in the Parish.

Ground Mounted Solar.

Three fields, owned by the Severn End estate, have been identified near to the Brotheridge Green substation. A site visit was carried out with the owner in attendance; he is very interested and has previously considered a larger scheme on the same fields, that did not proceed due to grid connection issues. WPD's capacity map shows that the Brotheridge Green sub-station has 5MW of spare generation capacity.

A Community Energy interview application was made to Western Power Distribution (WPD) and an email was received from WPD's 11kV planner in response to this which indicated grid constraints further upstream at Feckenham.

It has since been verified that these grid constraints are not likely to be lifted in the next few years, indeed upgrading work has already been carried out at Feckenham and that is already at full capacity. An alternative connection via Hereford was suggested but unfortunately this connection would be to a 66kV line, making it too costly for a small scheme to carry. This connection could however be useful in the future if a larger solar array or wind turbine becomes acceptable.

8. Operation and Governance

Shareenergy have briefed HEAT on setting up a Community Benefit Society (CBS), running a share offer and ongoing management of the CBS. HEAT is currently set up as a CIC, and as such could not easily raise funds through a share offer.

HEAT are currently exploring the option of delivering the rooftop solar project in partnership with the Big Solar Co-op, see <https://bigsolar.coop/>

9. Scheduling

The rooftop solar project will continue in partnership with the Big Solar Co-op (BSC). BSC has been in development during 2020 and is planning its first installations in spring of 2021. It is envisaged the first installations in Hanley Castle could be made later in 2021.

The ground-mounted solar project cannot proceed until capacity issues have been resolved which currently seems unlikely within 5 years. HEAT will however continue to monitor this situation.

10. Conclusions (Case Study Statement)

Hanleys Energy Action Team and Sharenergy have carried out an energy study of Hanley Castle Parish with Rural Community Energy Fund support. There are 600 homes and assorted businesses in the rural Parish, with mostly oil and electric heating.

The work included:

- An Energy Use Survey
- Assessment of local buildings, including case studies and analysis of Energy Certificates
- A study of renewable energy options

The Parish has several small renewable energy installations, but the local carbon footprint is much higher than the national average and a large proportion of houses are in the worst three energy rating bands.

The other community energy projects that were identified; a ground mounted solar, and new build shared loop ground source heat pumps, were hindered by capacity, funding and planning issues.

Given the amount of work that has been undertaken, it is frustrating for the HEAT team that further viable options have not been identified. However, the team will continue to work in partnership with the Big Solar Co-op (BSC) on the rooftop solar project.

HEAT are also keen to continue working to reduce carbon emissions in the parish by signposting local residents to grants, by arranging bulk buy schemes, by sharing best practice and by investigating future opportunities.

"The members of HEAT are disappointed that no renewable projects that are currently viable have been identified in the study. It has become evident that the carbon footprint of the Parish is higher than average and that the current options for decreasing it are limited. These options will depend largely on individual house owners investing in energy efficiency schemes and alternative heating systems. The baseline survey conducted during the study has provided the team with a clear set of metrics against which the Parish's carbon reduction progress will be measured. There are some options for commercial property owners to install rooftop solar. The team will continue to raise awareness of how local property owners can make improvements and will also actively look for new ideas and developments in technology or regulatory circumstances that may make it possible to progress some of our existing proposals, in particular the ground solar project."

Appendix 1 - Energy Survey questionnaire

Appendix 2 – Energy Survey results

Appendix 3 - Baseline Energy Report including Case Studies

Appendix 4 - Renewables Assessment