



Community Renewable Heat

Interest in the opportunities presented by community renewable heat in the UK is growing, given the desire of many heat consumers for lower and more predictable heating costs, reduced environmental impact, greater influence and control of their heating provision, increased security of supply, use of local energy resources and the opportunity to invest in local energy provision.

RINA has been active in the area of community renewable heat since 2015, supporting community energy groups to help develop their project ideas through feasibility studies and due diligence work.

Renewable heat in the UK

Renewable heat and district heating is currently a growth area in the UK. This has been driven in part by the UK's renewable energy target to 2020, including 12% of UK heat demand to be provided by renewable sources by 2020, and now the government's Clean Growth Strategy setting out the UK's aims to achieve an 80% reduction in carbon dioxide emissions by 2050 compared to 1990 levels. UK government has included as part of its long term energy strategy a significant increase in deployment of low carbon heating technologies and district heating as a means of lowering the carbon emissions associated with heat provision, in both urban and rural areas, improving security of energy supply, and improving the cost effectiveness of supplying heat. The anticipated future growth in new building development, along with a tightening of Part L Building Regulations will encourage the deployment of low carbon energy sources and district heating as a means to ensure new buildings meet the required standards. Renewable heat technologies are often combined with district heat networks, to enable multiple buildings to be served by shared heat sources – the ground, rivers, lakes, or the sea coupled to heat pumps, and heat generating plant – biomass boilers, combined heat & power (CHP) plant, and solar thermal collectors, delivering heat via buried insulated pipework.

Financial support for renewable heat projects

There are a number of financial support measures designed to aid the development of community renewable heating schemes. The Rural Community Energy Fund (RCEF) continues to provide grants to community groups to commission feasibility studies to determine whether their project ideas are technically and financially feasible, and allows a range of technologies including biomass heating, heat pumps, solar thermal systems, anaerobic digestion plants and also district heating to be examined.

Financial support is also available to plug a gap in project revenue or to provide additional capital such that a project can be financially viable and attractive as an investment. Revenue based support is provided by the Renewable Heat Incentive (RHI), providing payments per kWh of eligible heat supplied to domestic and non-domestic heat uses for a period of 20 years. The upcoming Heat Networks Infrastructure Project (HNIP) provides capital grants and loans, is the major support mechanism for the long term development of district heat networks in the UK, and can be combined with the RHI where the funding specifically supports heat network infrastructure as opposed to heat generating plant. The main HNIP project will be launched in autumn 2018, following a recent pilot scheme, and community groups can apply for additional funding in the event that their project

financial performance is not attractive enough to enable investment on the open market. In addition, there is capital support available from government programmes including the Energy Company Obligation (ECO) and Warm Homes Front, which are targeted at reducing fuel poverty.

Rural community heat

Fuel poverty in rural areas, outside of towns and cities where low cost mains gas is available, is often overlooked, and progress in tackling this in the past has been slow for a number of reasons. District energy schemes in these areas can be technically feasible, but projects often struggle with high capital costs for the quantity of heat delivered to customers, due to relative low heat density compared to blocks of flats for example, however terraced housing can be more favourable in this regard. Heat density is the annual heat demand in kWh per unit of land area. Depending on the details of the site, local renewable heat generation combined with district heating can often provide the lowest lifecycle cost of heat compared to conventional alternatives such as heating oil and LPG fuelled boilers, electric heating and solid fuels. Rural communities off the mains gas grid often have to rely on these conventional forms of heating, which are usually expensive, suffer from volatile price fluctuations, have high carbon emissions, and often provide poor heating control in the case of electric heating and solid fuels. Households and businesses connected to district heating should expect their total cost of heat to be lower and more predictable compared to individual heating systems using fossil fuels, and the economic benefits associated with the development and operation of a community heat project can be kept local, including equipment supply, fuel supply, revenues from heat sales, and equipment maintenance.

The Clean Growth Strategy includes a phasing out the installation of high carbon fossil fuel heating in new and existing homes currently off the gas grid during the 2020s.

Heat generation from a central source and distribution of that heat to multiple buildings results in heat losses through insulated flow and return pipework, and these losses can be a significant proportion of local heat demand in where heat density is relatively low. It is important to minimise these energy losses, and to ensure that best practices during the stages of feasibility, design, specification, installation and commissioning are maintained, the CIBSE Heat Networks Code of Practice CoP 1 should be followed. This document is relevant for many aspects of the development of community heat schemes.

Risks associated with renewable heat projects can be higher compared to renewable electricity projects, for example solar PV, as a degree of certainty of long term heat demand must be present to provide investor confidence. RHI tariffs - the amount payable in pence per kWh of useful heat supplied by individual technologies – are subject to degeneration for new projects, and this has been an issue in the past, preventing projects from going ahead, particularly for smaller scale biomass projects, where the RHI tariff at feasibility stage has resulted in a financially viable project, but tariff reductions through project development stages have changed the situation. Overestimating heating loads, and underestimating heat network losses at the design stage can result in lower project financial performance in practice, which can have a significant impact on typically smaller scale district heating schemes in rural areas.

Case studies

A number of case studies are presented below, and describe renewable heat projects where RINA has provided feasibility studies and technical due diligence services, working in partnership with community energy groups.

Technical Due Diligence – Village Biomass District Heating, East Sussex



The project had previously been examined through an RCEF feasibility study, and a decision taken by the local energy group to proceed with project development. RINA was engaged to carry out a due diligence of the study report, to confirm the technical and commercial aspects. The project included central heat supply from woodchip boilers delivered through a district heating network to a primary school, care home and surrounding residential properties. The village is off the mains gas network, with buildings heated by heating oil and LPG boilers, and electric storage heaters. The project included biomass boilers with a combined capacity of 500kW, delivering 760 MWh of heat per year. The results of the due diligence concluded that the project was not financially viable, for reasons including a significant reduction in the RHI tariff, and a similarly significant reduction in the price of heating oil since the feasibility study was completed, plus higher heat network losses, capital costs and operating costs than originally identified.

Feasibility Study – School and Conference Centre, East Sussex



The project involved an investigation into renewable heat options combined with a heat network, and included a refurbished school building, and a conference centre with swimming pool, near Uckfield, East Sussex. The site is not supplied by mains gas, with buildings heated by heating oil and LPG boilers, some of which were over 30 years old and in need of replacement. The feasibility study was funded by a grant from the RCEF, and RINA worked in partnership with Brighton & Hove Energy

Services Co-operative (BHESCO) to assess the technical and financial aspects. Technologies assessed included central woodchip fuelled boilers using locally sourced woodfuel, ground source heat pumps, a roof mounted solar thermal system and a small scale anaerobic digestion system supplied from locally sourced food waste. In addition, an assessment of solar PV mounted onto the roof of the conference centre building was included in the study. The school was already benefitting from a roof mounted PV system. The financial appraisal of the project considered financing and operation as a community investment, financed and managed by BHESCO, and providing returns to local investors. The results of the study determined that woodchip boilers with a combined capacity of 230kW and district heating network delivering 470 MWh of heat per year presented the most environmentally and financially favourable option, and would benefit from RHI payments for biomass heat supplied to each property. A 16.7kW_p PV system generating 17.6 MWh of electricity per year would supply the conference centre and also export to the grid. On completion of the study, uncertainty over future building ownership prevented the project from going ahead, however the opportunity remains, and it is hoped to become a reality in the future.

Feasibility Study – Schools and Sports Centre, West Sussex



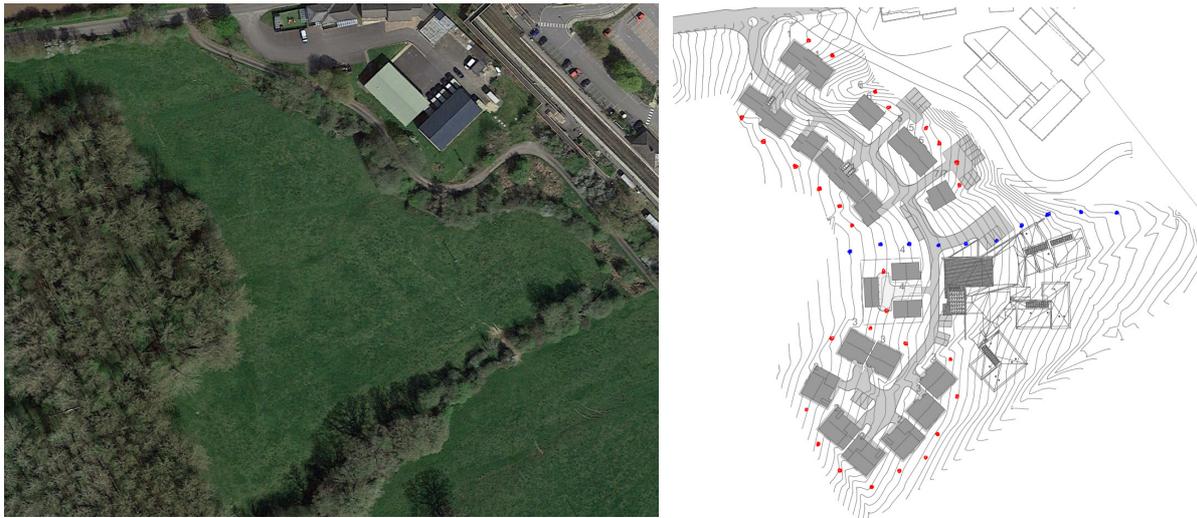
The project examined the options for ground source heat pumps combined with a heat network to supply heat to a primary school, secondary school and sports centre in Hassocks, West Sussex, in place of existing gas boilers. The feasibility study was funded by a grant from the Rural Community Energy Fund, and RINA worked with HKD Energy, a local community energy organisation already managing a solar PV system at the secondary school, to provide a technical and financial assessment of the proposals. The financial appraisal considered financing and operation as a community investment, providing returns to local investors, similar to the community-owned PV. An analysis of existing gas consumption data in addition to dynamic thermal modelling of the buildings were used to estimate building heating loads including the potential for building energy efficiency measures. The building modelling determined the quantity of heat which could be delivered by heat pumps, given their lower temperature heat generation compared to existing boilers. Heat collector options including a horizontal array, closed loop boreholes and open loop boreholes extracting ground water were considered. The results of the study determined that multiple heat pumps with a heat output capacity of 550kW coupled to a borehole heat collector, and combined with the existing gas boilers, would deliver 780 MWh of heat per year to the 3 buildings, benefitting from RHI payments for heat supplied by the heat pumps. The financial assessment determined that the project was not financially viable due to the low cost of mains gas, and high cost of both the heat collector and additional capacity of the electricity supply required to operate the heat pumps.

Feasibility Study – Care Home and Residential Properties, East Sussex



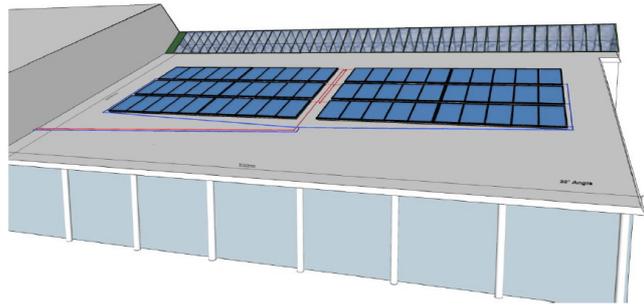
The project involved an assessment of individual ground source heat pumps coupled to a shared heat collector and low temperature heat network supplying a care home, including an existing building plus proposed new building, as well as housing association and private residential properties, in a village in East Sussex. Also included was an assessment of individual roof mounted solar thermal hot water systems and solar PV. The village is off the gas network, with oil boilers and electricity providing heat to all properties. The feasibility study was funded by a grant from the RCEF, and RINA worked in partnership with Brighton & Hove Energy Services Co-operative (BHESCO) to assess the technical and financial aspects. The financial appraisal considered financing and operation as a community investment financed and managed by BHESCO, and providing returns to local investors. The results of the study determined that the most favourable option from a financial perspective included a combination of individual heat pumps at each property served by a multiple borehole ground collector located in an adjacent field, and roof mounted solar PV systems on each of the care home buildings supplying a portion of the electricity demand of the heat pumps. The housing association were not able to support the project, and therefore the residential properties were discounted. 110kW of heat pumps would deliver 230 MWh of heat per year, benefitting from RHI payments, and PV systems with a total capacity of 34.7kW_p and generating 32.9 MWh of electricity per year would supply the heat pumps to generate hot water, provide for other electricity uses, and export a small amount to the grid. The project is currently being considered for further development by the various stakeholders.

Feasibility Study – New Housing Development, Oxfordshire



A planned new development including 25 detached and semi-detached residential properties and a care home on a greenfield site near Charlbury, Oxfordshire was the subject of a feasibility study considering options for renewable heating including individual heat pumps combined with a shared ground collector, a central biomass boiler and district heating network, and individual solar thermal systems. Mains gas is nearby, and a new supply would be required to be brought to the site to connect all properties in order for gas boilers to be the conventional heating option. Heat collector options including a horizontal array, closed loop boreholes, open loop boreholes extracting ground water, heat extracted from a local river and nearby sewage treatment works were considered. The feasibility study was funded by a grant from the RCEF, and RINA worked with Sustainable Charlbury during the assessment of the technical and financial aspects. The financial appraisal considered financing and operation as a community investment, providing returns to residents and other local investors. The results of the study determined that individual heat pumps installed in each property with a combined capacity of 248kW and delivering 260 MWh of heat per year to all properties, connected to either a shared vertical closed loop borehole array within the development site or a horizontal array located in an adjacent field, presented the most technically and financially favourable option. The overall cost of heat supplied by heat pumps was calculated to be the lowest cost option for property owners, compared to gas or oil boilers. The project would benefit from RHI payments for the heat pump-supplied heat to each property. The study has recently been completed, and the project is currently being considered by the various stakeholders involved to determine the next steps for development.

Technical Due Diligence – Solar Thermal for Leisure Centres, East Sussex



The project examined the technical and financial aspects of installing roof mounted solar thermal systems to provide hot water in place of a portion of boiler generated heat for 6 existing leisure facilities located in and around Lewes, East Sussex. The feasibility study was funded by a grant from the Rural Community Energy Fund, and RINA worked with OVESCO, a local community energy organisation, to provide a review of technical proposals put forward by DH Solar, a supplier and installer of solar thermal systems, and to compile a report determining whether any of the sites were suitable for further development. The report concluded that 4 of the sites are suitable for solar thermal systems, which include heat supply to swimming pools and other hot water uses, supplying approximately 183 MWh per year of heat, and benefitting from RHI payments. The 4 viable projects are currently being considered by all stakeholders for further development.

Feasibility Study – Village District Heat, Cornwall



This major project involved a detailed investigation into the options for a large scale district energy network supplying renewable heat to private housing, social housing and commercial properties in a coastal village near Penzance, Cornwall. The village is off the gas network, and buildings are currently heated by a mix of oil and LPG boilers, electric storage heaters, air source heat pumps and solid fuels. The feasibility study was funded by a grant from the RCEF, and RINA worked in partnership with the town council to assess the technical and financial aspects of the various technology options. The study considered central biomass boilers coupled with a district heating network, geothermal heat, individual solar thermal systems, and heat pumps coupled with heat sources including minewater and seawater. The results of the study determined that a seawater heat source system including a central pump/ heat exchanger station connecting individual heat pumps installed in approximately 680 properties via a low temperature glycol/ water based district heating network provided the most advantageous option from a technical, financial and environmental viewpoint. The total combined heat pump capacity is 4.9MW, and would deliver

around 7,000 MWh of heat per year, with RHI payments based on the EPC heat demand of domestic properties. The project is currently being considered by all stakeholders for further development.

Feasibility Study – College Campus, East Sussex

This is an ongoing RCEF funded project, considering biomass boilers and district heating, heat pumps, solar thermal systems and solar PV for education and residential buildings.

Feasibility Study – Horticultural Centre, East Sussex

This is an ongoing RCEF funded project, considering biomass boilers and district heating, heat pumps and solar PV, for greenhouses and other buildings.

For further information please contact:

Michael Beech

Manager – Bioenergy & Thermal

RINA Consulting

michael.beech@rina.org

01273 819429

www.rina.org