



## Derwent 7 Micro Anaerobic Digestion

### Feasibility Study

24 September 2017

Derwent 7 in collaboration with Sustainable Keswick secured Rural Community Energy Funds for a Stage 1: Feasibility Study to enable them to examine the potential for generating renewable energy for use in local community facilities from a network of Micro Anaerobic Digesters using commercial food waste arising in the area as the main feedstock.





## Document Information

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<b>Client</b>	Derwent 7/ Sustainable Keswick
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## Document History

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30 August 17	1.0	hb	pd	Working draft of Feasibility Study for discussion with Steering Group 1 September 2017
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## FOREWORD

Rural Cumbria Connects (RCC) was commissioned by Derwent 7 in collaboration with Sustainable Keswick to undertake a Rural Community Energy Fund (RCEF) – “Feasibility Study”. RCC is a consortium of a range of private and charitable organisations who are working in community and commercial renewable energy generation. They have experience in a wide range of technologies – Anaerobic Digestion, Hydro, Solar, Onshore Wind, Marine, District Heating Systems and Biomass. The consortium also includes experience in energy reduction and saving.

RCC shares a common vision of local and distributed community energy (alongside a drive for energy savings) making a significant contribution to the generation of renewable energy and a reduction in carbon emissions in rural communities whilst contributing to sustainable development and quality of life. RCC wants to use its collective expertise to help rural communities who want to develop community energy systems; build increased capacity in Cumbria to deliver community energy projects; and create economies of scale to ensure value for money and affordability.

On this project the main companies involved in the research for the Initial Feasibility Study were Community by Design, Cumbria Action for Sustainability, and Reiver Renewables.

The Report will enable Derwent7/ Sustainable Keswick to decide if their ideas are viable or not by providing them with facts and figures and identifying alternative approaches and solutions where appropriate. This will enable them to decide on whether to make an application to Stage 2 of the Rural Community Energy Fund or not.

In compiling the report RCC, as required by WRAP, has used the RCEF Feasibility Report Checklist for the basic structure. This ensures the study addresses the questions it raises as listed. The aim has been to keep the body of the report relevant and focussed. The detailed workings and findings are to be found in the Appendices.

The study has been managed by a Steering Group made up of representatives of Derwent 7, Sustainable Keswick and RCC who have met six weekly since the project started. RCC would like to acknowledge the invaluable input from Derwent 7 and Sustainable Keswick and their support in providing local knowledge and direction as necessary as well as acting as guardians for the community interest. Finally, RCC would like to acknowledge the input from the community; the stakeholders; owners and operators of local community facilities; and the local food and beverage facilities without which this report would not have been possible.



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## Executive Summary

### 1) The Community

- a) The study covered the Derwent 7 area which is made up of seven Parish and Town Councils in the Lake District. The Parish Councils are clustered around the town of Keswick and consist of Keswick Town Council and the Parish Councils in Borrowdale, St Johns, Castlerigg & Wythburn, UnderSkiddaw, Bassenthwaite, Threlkeld and Above Derwent. The population is 8,023 of which 60% live within Keswick itself.
- b) The Councils are statutory bodies who have a wide range of powers. Their duties include spending for the benefit of some or all and considering bio-diversity in their decision making.
- c) The study was commissioned by Derwent 7 and Sustainable Keswick. Derwent 7 was formed in 2008 by the Parish and Town Councils as a community led planning group with the Environment as a key focus. Sustainable Keswick was founded in 2007 by a group of volunteers based in Keswick and the surrounding villages who were concerned about the twin threats of climate change and peak oil and the effect that these might have on the way people live.
- d) Micro Anaerobic Digestion (AD) was the technology studied with the aim of installing a network of Micro AD's (co-located beside community facilities) fed by commercial food waste across the Derwent 7 area with an overall capacity of 40kW.

### 2) The Feasibility of the Technology

- a) The study identified that there were both sufficient sites and commercial feedstocks to support a network of Micro AD's with an overall capacity of 40kW.
- b) Overwhelming community support was evidenced by a survey of 100% of the households in Keswick and 80% of those in the surrounding rural areas.
- c) The Planning Authority policies state their commitment to reducing carbon and supporting micro generation in the Lake District. Although planning consent requirements for Micro AD are site specific the study concluded that unlike onshore wind it was feasible that Micro AD's could be located where they would have no landscape implications.



- d) Regrettably it was not possible to make a network of Micro ADs financially viable in the Derwent 7 area. The key issues were that the financial model used depended on volunteer labour and on income from offsetting collection/disposal costs. These conditions did not apply in the Derwent 7 area – area suffering from volunteer fatigue; collection costs nominal and local authority disposal costs in widely dispersed rural area would only reduce if the scale of diversion from landfill was more significant.
- e) However it was possible to do so on a stand-alone site where operational activity could be contained within existing costs; food waste was generated on site; and digestate could be spread on site. Blencathra Field Study Centre (FSC) has signed up in-principle to install a 2kW capacity Micro AD. Other stand-alone sites have been identified with potential for future development.

### 3) Summary Case Study

“As detailed in the report there is enthusiasm for installing Micro AD systems in community facilities in the area, albeit with long timescales and concerns about the perceived workload for already overstretched volunteers. Similar workload concerns have been expressed in the commercial and school sectors. However, we are extremely pleased that the Blencathra Field Study Centre is enthusiastic about the opportunity to install a system. We firmly believe that having a local system that can be used to demonstrate the operational aspects and the benefits provided will pave the way for future installations. Blencathra FSC is one of twenty FSC Education Centres around the country, and as such is an ideal location for promoting the use of Micro AD technology for food waste management to a wider audience.

Finally we would like to express our appreciation for the highly professional manner in which the feasibility study has been conducted by the Rural Cumbria Connects team. Their knowledge, hard work and responsiveness has brought us to a point where we have a solid grounding to proceed with this initiative”  
(extracted from statement by Sustainable Keswick and endorsed by Derwent 7)



## Section 1: Local Community Engagement

### The Locality

Derwent 7 is a voluntary association of seven Parish and Town Councils in Cumbria. The Parish Councils are clustered around the town of Keswick and consist of Keswick Town Council and the Parish Councils in Borrowdale, St Johns, Castlerigg & Wythburn, UnderSkiddaw, Bassenthwaite, Threlkeld and Above Derwent (Appendix 1). Derwent 7 was formed in 2008 as a community led planning group. One of its four key themes is the environment (the others are transport, youth and housing).

The Derwent 7 area is rural with a population of 8,023 living in 3,524 households. 60% of the population and 63% of the households are centred in the town of Keswick (Census 2011). Cumbria has three tiers of local government – Cumbria County Council, District Councils and Parish/Town Councils. 6 of the Councils are in Allerdale Borough Council with Threlkeld in Eden District Council. Derwent 7 has an additional layer being within the Lake District National Park which was set up in 1951.

An issue for the area is the high percentage of second homes and holiday lets. For example in Above Derwent Parish Council area 16.7% are second homes and 15.8% are holiday lets (Allerdale Homelessness Strategy 2012-2015, Allerdale Borough Council). Issues for the area are outward migration of local people because of the high cost of property aggravated by the limited employment options-mainly low paid and unskilled ([www.lakedistrict.gov.uk/caringfor/policies/affordablehousing](http://www.lakedistrict.gov.uk/caringfor/policies/affordablehousing)).

The area is also a popular place for retirement. The percentage of Keswick's population aged 45+ is above national average. The largest difference being within the 75-84 years old bracket which makes up 9.6% of population compared with the national average of 5.5% (Neighbourhood Statistics: Keswick, LDNP, 2014).

The main economic activity is tourism. Its origins date back to the 18<sup>th</sup> and 19<sup>th</sup> Centuries. By the beginning of 21<sup>st</sup> Century, 60% of the population was employed in hotels, restaurants and distribution (Keswick, LDNP, 2005). The Lake District in 2014 had 16.4million visitors; 24 million tourist days; and visitors spending £1,164million (STEAM 2014- Cumbria Tourism). Keswick alone has at least 13 Hotels and 102 Bed and Breakfast Providers (Keswick Tourism Association).

The Lake District National Park (LDNP) was designated in 2017 as a UNESCO World Heritage Site. LDNP vision is to be an "inspirational example of sustainable development in action" (The Vision for the LDNP 2006-2030). It works in a Partnership (LDNPP) that signed up to Climate Change Action Plan in 2008 and has restated its commitment in their latest Partnership Plan (2015-2020) to reduce carbon in the Lake District by at least 1% per year (from a carbon budget baseline figure agreed in 2010).

Sustainable Keswick (who project managed this study on behalf of Derwent 7) was founded in 2007 by a group of volunteers based in Keswick and the surrounding villages who were



concerned about the twin threats of climate change and peak oil and the effect that these might have on the way people live.

### Local Community Consultation

At a local level the findings of the consultation exercise demonstrate that local people also want the area to improve its carbon budget and reduce carbon emissions. The consultation was done in two phases – one at the start of the study (Phase 1) and one at the end (Phase 2).

The Phase 1 study evidenced significant community support for the deployment of a network of Micro Anaerobic Digesters (Micro AD) across the Derwent 7 area. Over 99% of people who engaged in the consultation were either extremely or very supportive (see Appendix 2) with no strong objections raised.

The local consultation consisted of four key elements:

- Raising awareness in local press;
- Demonstrating a Micro AD over three days in Keswick (<https://www.youtube.com/watch?v=DfO0qOiBF5I>);
- Face to face surveys; and
- Delivering to 100% of households in Keswick and 80% of households in the surrounding areas a leaflet about the project which included a feedback survey.

Appendix 2 evidences the engagement through the local press and the results of the survey. It also illustrates local people engaging with a Micro AD over the three days that the demonstration unit was in the area (8-10 March 2017). On the 8<sup>th</sup> March the Micro AD was located at Keswick School (local secondary school); on the 9<sup>th</sup> at Fitz Recreational Park in Keswick; and on 10<sup>th</sup> in the Market Square in centre of Keswick. 200-300 survey leaflets (which included information on Micro AD) were distributed on the demonstration days. This also evidences the high level of interest. The leaflet is in Appendix 3.

In all, 120 people in Keswick and its surrounding areas responded to the survey. Of these, only 25% said they would be interested in getting involved and helping. This is indicative of the anecdotal evidence we gathered of “volunteer fatigue” in the Derwent 7 area. Although there is a larger than average retirement population many of them are already committed to a wide range of activities dependent on volunteers (Keswick Museum, Theatre by The Lake, Keswick in Bloom, The Town and Parish Councils, Sustainable Keswick, Tourist Information, U3A, Community Facilities and Village Halls etc.). We explored this further in Phase 2 (Appendix 4) of the consultation contacting all those who asked to be kept informed (76 people) and asking if they would attend a meeting about volunteering. Seven people agreed to attend, but only two turned up. This finding is an issue for a project which we will go into in detail in Section 4.



## Key Stakeholders Consultation

These were identified as being:

- **MPs** – During the study there was a By-Election and Trudy Harrison was voted MP for part of area. Rory Stewart MP is the MP for rest of area. Both MPs received a letter advising them about the study and an invitation to attend the demonstration. Rory Stewart MP visited the demonstrator; was supportive of the aims of the study; and advised that he would inform Trudy Harrison MP about it.

The By-Election was also an issue for survey leaflet distribution. There was anecdotal evidence of residents being overloaded with electioneering/campaign leaflets and consequently not reading/completing the survey leaflet.

- **Local Councils** (Cumbria County Council, Allerdale Borough Council, Eden District Council, Derwent 7 (Parish Councils and Town Council) and Lake District National Park Authority (LDNPA). All were sent letters via Local Councillors and key Officers advising about the study and then inviting them to attend demonstration of Micro AD. Allerdale Borough Councillors, Keswick Town Councillors and other local Councillors visited the demonstrator. LDNPA Planning Officers were also invited to attend demonstration.
- **Derwent 7** – is a joint meeting of Parish Councils and Town Councils in Derwent 7 area. We attended two meetings of Derwent 7 (30 January 2017 and 24 April 2017). We also attended a Keswick Town Council meeting on 16 March 2017. Sustainable Keswick reported on draft (V1.0) of final report to Derwent 7 on 4 September 2017 and feedback from Chair of Derwent 7 is “having read all the material sent to me I concur with Sustainable Keswick’s response (Appendix 5). The study has been meticulously planned and undertaken and is clearly of a very high standard. Derwent 7 would be pleased to put our name to the response” (email 17/9/17).
- **Keswick Tourism Association (KTA)** – a membership body (over 300 members) for food and beverage businesses in the Derwent 7 area. KTA advised membership about the study; circulated food waste arising survey link; and advised their members about demonstration of Micro AD.

We had overwhelming support from all the stakeholders consulted for the aims of the Feasibility Study and no major objections were raised.

Supermarkets and other food retailers were not consulted as part of this study. Firstly as we thought that there was likely to be more than enough food waste arising from the Hospitality Sector alone in Keswick; and secondly we were concerned about technical issues around packaging, best before/sell by issues and the complexities this would cause the project overall.



## Section 2: Community Benefits

### Raising Awareness of Food Waste

Every year an estimated 10 million tonnes of food waste in the UK is thrown away including 5.7 million tonnes from households. In the move towards a low-carbon society, managing these resources sustainably is becoming an urgent priority. In response to this, food waste collections by local councils are now offered to 100% of households in Wales and Northern Ireland and 91% in Scotland; but only just over half of households in England. There is currently 430 MW of AD installed in the UK, providing about 1.4% of the UK's electricity demand, with 40% of this coming from food waste. However, if all of the food waste we produce was processed by AD, it could supply up to 4% of our electricity demand and satisfy 5% of our fertilizer requirements.

The study has significantly raised awareness about food waste in the Derwent 7 area and the potential for it to be diverted from landfill and used as a feedstock for Micro ADs to produce energy/reduce carbon. The leaflet (Appendix 3) informed households about Micro AD and the impact it could have. This leaflet was distributed to 100% of households in Keswick (housing 60% of the Derwent 7 population) and 80% of the other households in the Derwent 7 area. The press coverage and the demonstration further raised awareness locally of the potential to use food waste to produce energy and fertiliser. The survey findings showed overwhelming support for the idea.

Dialogue with food producers also raised their awareness of food waste. Some had no idea how much waste they produced; others were committed to reducing food waste as far as possible; and one prided himself as a Chef who had no waste.

The next steps (Section 8) include for continuing to promote the need to reduce food waste and to find ways to meet the challenge of diverting food waste from landfill in a sustainable way.

### Volunteering

Although to-date only a small number of additional volunteers have been attracted to join Sustainable Keswick this has broadened the age mix of the organisation and the pool of skills and knowledge available.

### Demonstration

The installation of the first stand-alone Micro AD at Blencathra FSC (A Field Studies Council Centre-see Section 6) will give Sustainable Keswick and Derwent 7 a demonstrator that they can use to show other suitable sites (commercial and social enterprises) what can be done to reduce carbon by taking food waste out of the waste stream. Sustainable Keswick and Derwent 7 also believe that additional volunteer effort will follow once people are able to see what is involved in operation and talk with operators.



Interestingly a number of commercial sites expressed an interest but we failed to convince them about the return on the investment because of the low cost of collections (Section 4) and (often more importantly) the minimal impact of mixed collections on their current operation. A demonstrator will produce independent evidence that can be used to demonstrate the benefits of Micro AD – financially, environmentally and socially.

### Carbon Savings

The capacity of the demonstrator will be 2kW installed. However the associated carbon savings of the installation will be an estimated 31 t CO<sub>2e</sub> per annum at maximum 16 t CO<sub>2e</sub> per annum at minimum. To put this into context – it is equivalent to installing a 60kW capacity Solar PV installation.

### Promoting Low Carbon Living

During the study the potential to develop a community hub with a co-located Micro AD site emerged (Appendix 4). The vision is to create a hub that improves community cohesion and resilience whilst inspiring local residents and visitors about low carbon living. The hub would provide learning and information on climate change; practical low carbon activities; a community space for meeting and activities; and services for the community.

### Job Creation and Job Safeguarding

It is not possible to quantify job creation/safeguarding. However there are a range of emerging potential benefits which future Micro AD developments could support.

The business case for the community hub (although in its infancy) identifies the potential for the creation of 2 jobs.

The Micro AD at Blencathra FSC will move the Field Centre closer to its goal to be carbon neutral and will be added to the curriculum. This will help safeguard jobs at the Centre. The Centre has evidence of these benefits from its other renewable energy generation projects (Hydro and Biomass).

The siting, in the future, of a Micro AD at the Borrowdale Institute could contribute to saving energy and costs. A potential indirect benefit is that the Institute is considering plans for developing a showcase for Herdwick Sheep which are very closely associated with farming in the Lake District. By promoting this breed they hope to contribute to safeguarding agricultural jobs on farms on marginal land in the Derwent 7 area.



## Section 3: Technology

### Micro Anaerobic Digestion (Micro AD)

Micro AD was the only technology studied. Sustainable Keswick had previously looked into hydro on the River Greta in Keswick itself. However they had to abandon that idea after the major damage done in 2009 when the weir was demolished by flooding. They did start looking again in 2015 but the third significant flooding incident in December 2015 - Storm "Desmond" led to them deciding that Hydro on the Greta was never going to be feasible with the increase in extreme weather events. They continue to scan for Hydro opportunities elsewhere in Derwent 7 area.

Derwent 7 is located within the Lake District National Park which has recently secured UNESCO World Heritage Site status. Securing planning consent for onshore wind farms and other renewable energy developments at scale is virtually impossible. This is also in part why the economy is so dependent on tourism and small to medium enterprises. Micro AD was chosen because it is "micro" both in terms of size and technology. It is compatible with LDNPA's aims for sustainable developments which protect the areas heritage and environment.

The study looked at the feasibility of developing a network of Micro AD's in the Derwent 7 area fed with commercial food waste with the aim to reach an overall 40kW capacity. The aim was that the energy produced would be used by community owned facilities thereby lowering their operational costs and carbon footprint. Digestate would be spread on local amenity land.

A Micro AD Information Pack was produced (Appendix 7) to raise understanding of the technology. Although Micro AD technology is not widely used in the UK it is very prevalent abroad in countries such as India and China. There is a pilot project in Camden, London which was developed by Community by Design (<http://communitybydesign.co.uk/pages/our-pilot-system>). This project uses commercial food waste and helps fuel a café on the London Wildlife Trust's site in Camden. Biogas is also being used in trials with a domestic scale Stirling engine CHP unit.

Appendix 8 details the potential range of suppliers of Micro AD technology. The intent would be to invite the appropriate companies to tender for supplying, installing and commissioning the equipment (see Section 8).

### Suitability of Technology

#### Feedstocks

Where possible the research followed the methodology developed in the WRAP study undertaken in 2011 (WRAP, 2011 'The Composition of Waste Disposed of by the UK Hospitality Industry'). As defined in that study the hospitality sector is split into two subsectors:

the **profit sector**: businesses where providing catering and/or accommodation services is the primary purpose of the business and where the aim is to maximise profit (e.g. hotels,



guesthouses, bed & breakfast establishments, youth hostels, restaurants, Quick Service Restaurants and pubs); and

the **cost sector**: businesses where providing hospitality services is not the main function of the organisation and where the aim is not to maximise profit (e.g. catering and accommodation services within the premises of schools, hospitals, etc.)

To allow for comparison with the WRAP study the Food Waste Arising study focused on the profit sector and like the WRAP research, the study concentrated on Hotels, Restaurants, Pubs and quick service restaurants (QSRs); and excluded the leisure sector, including self-catering businesses; the cost sector; and businesses that do not pay for their waste to be removed on the grounds that these businesses only produce very small amounts of food waste.

During early February Hotels, Restaurants, Pubs, and QSR's were identified within the Derwent Seven area.

An online Survey Monkey was designed and promoted by the Keswick Tourist Association. However it was clear very quickly that the response rates to this survey was very poor and so a simple telephone survey was undertaken to identify key staff responsible for food waste; approximate amounts and types of food waste generated; collection arrangements, and whether the establishment would be interested in contributing food waste to a local scheme.

Where the establishment was interested the telephone survey was then followed up with an on-site audit and visit from late February through into early April. These on site audits followed the guidelines used by WRAP 2011 and consisted of an interview with the site manager about waste production and visual inspection of the waste and on-site containers

At each site the following information was obtained:  
waste type (e.g. residual waste, recycling (mixed glass), co-mingled recyclables);  
container type (e.g. wheeled bin, drum, sack, loose);  
volume of container;  
estimates of how full the container was at point of collection (%); and  
number of days' worth of waste presented in the container.

Using this data, the amount of food waste produced in a week was calculated and then sense checked with the site manager. At the same time an estimation was made of the type of 'Food Waste' produced by the establishment. As defined by WRAP 'Food waste' is the discarded food that arises from food service activities. This includes preparing food, uneaten plate scrapings, disposal of unopened packaged items, food spoilt during preparation and discarded ingredients. It does not include waste from drinks.

It is categorised as either avoidable or unavoidable food waste:

**Avoidable food waste** is food that could have been eaten, at some point prior to disposal (e.g. a slice of bread, apples, meat). This may be due to consumer behaviour or perhaps it could have been eaten if it had been better prepared, stored or portioned. Avoidable food waste also includes some food items that may or may not be eaten as a matter of consumer preference such as bread crusts and jacket potato skins.



**Unavoidable food waste** is food that is not, and has not been, edible under normal circumstances. This includes wastes that are associated with food preparation (such as vegetable peelings, egg shells, pineapple skins) or the inedible component of food that has been served (e.g. bones, apple cores). At a site preparing meals from raw ingredients, a higher proportion of unavoidable waste will be associated with food preparation than a site using pre-prepared ingredients.

Of the 143 identified profit centre enterprises within the Derwent Seven Area 69 were businesses that did not pay for their waste to be removed, and so were not surveyed further, and 4 others were part of National Chains and had national contracts for their waste collection. Out of the 70 other businesses, 42 responded favourably and site visits were conducted at 39. 3 sites were un-audited due to difficulties in arranging suitable times for the site manager to be available. The sheer volume of business at times like Easter, Bank Holidays, The Convention, and Summer Holidays meant that getting to meet/talk with people was very challenging for many aspects of the Study.

A critical factor at a number of establishments especially the larger Hotels was their coyness at the amount of waste they actually produced, and this was compounded by the fact that the bulk of the waste was collected by the Local Authority who do not have a separate collection for food waste. It was therefore agreed that individual establishments would not be referred to in this report and that the waste arising would be presented at a Parish level.

The key findings are detailed in Appendix 9. However at each site the average estimate of food waste arising were discussed with the site manager in relation to seasonality and other fluctuations in demand; together with portion sizing; and an understanding of size of business and the type of service provision in an attempt to minimise errors caused by these factors.

### Potential Energy and Digestate users

At the same time we identified the range of community facilities (23 in total including schools) in the Derwent 7 area and then evaluated their suitability using defined criteria. From this we drew up a shortlist of sites which would be suitable for locating a Micro AD. At all the shortlisted sites the intention was to use the energy generated in the co-located community facility. We therefore did not need to assess grid connection capacity and costs.

We also assessed what potential there was for using digestate. The issue of utilizing digestate constitutes one of the main challenges for anaerobic digestion across all scales. While some plants are fortunate to be able to sell digestate, others have to give it away for free, cover transport costs, or pay for disposal.

From recent experience in London, where it was assumed that having a comprehensive database of potential digestate users would suffice to manage the output of a Micro AD plant, it has been found that distributing even relatively small quantities of digestate in real

time can become problematic. Potential users may not take up the offer and existing users may or may not continue on a regular basis. Some potential users may not have their own



transport and the administrative costs of managing digestate in this piecemeal way can become a burden.

On another pilot Micro AD site, there is much more available space to utilize digestate and consequently, all digestate produced by this plant is used on-site. It is therefore recommended to locate digesters whenever possible where digestate can be utilized on-site. Where this is not feasible and some or all digestate must be utilized off-site, it is preferable to have written agreements in place.

In addition, potential users unfamiliar with digestate should trial the product first and consider storage capacity, suitable application methods and health and safety considerations. A range of information on digestate was produced and has been used when talking with sites (Appendix 10).

The shortlist of locations based on assessment criteria (Appendix 11) as being technically feasible (the key criteria being feedstock availability and uses for energy and digestate) was drawn up. At this point we identified 7 possible sites (Appendix 11). The only Parish area where we could not identify a site with the technical potential to host a Micro AD was Bassenthwaite. We also identified 4 potential Micro AD sites on commercially owned premises.

Of the shortlisted community sites identified the only technical limitations were at Keswick Secondary School (feedstock availability in school holidays) and Thirlmere Village Hall (digestate spreading on farmland accessible to farm stock). This left 5 shortlisted community sites.

Hope Park was withdrawn from the shortlist at the request of Keswick Town Council. The Parks in Keswick were very badly affected by flooding in December 2015 – Storm Desmond and the Parks management and staff under considerable pressure due to reinstatement works. Their concerns were about extra operational demands. They also expressed concerns about vermin based on experience they had had of a rocket composter. We were able to explain that this was not comparable as it was not an anaerobic process. But on balance the view was that Hope Park, although it met the Assessment criteria, should be withdrawn from the shortlist in view of the concerns expressed. This left 4 shortlisted community sites

Out of this process a Keswick Town Councillor (who is also an Allerdale Borough Councillor and during the study was elected to Cumbria County Council) suggested we look at a compound at Otley Road, Keswick (located next to a car park and a recycling centre). This site is not on the shortlist as there is not an obvious energy user or place to spread digestate (allotment sites have expressed interest but access issues would need to be addressed). However it has since emerged there might be an interest in the vacant building on site becoming a community hub (and therefore an ideal energy user). Appendix 4 details how this has progressed and how it might enable a Micro AD development in the future.



### Technically Feasible Commercial Developments

The 4 commercial sites identified at shortlisting stage came through the process of gathering data – they were Keswick Country House Hotel; Keswick Golf Club; Newlands Institute; and Lingholm Estate. Unfortunately none of them have progressed – Keswick Country House Hotel are developing the potential site for staff accommodation; Keswick Golf Club on the very edge of the Derwent 7 area and mileage assessed to be an issue; Newlands Institute unhappy to take on any operational work; and digestate would have to be spread on farmland with the associated issues of farm stock; and Lingholm Estate concerned about infancy of technology and operational requirements.

Our assessment is that there is technically the potential for stand-alone Micro ADs at a number of commercial operations and that these should be re-examined once a demonstrator is in place and evidence gathered about operation (Section 8).



## Section 4: Financial Projections

### The Triple Bottom Line

The study has taken a triple bottom line approach and identified financial, environmental and social returns in its assessment of viability. Micro AD technology is an early entrant in the UK to market and therefore the manufacturing costs are high. This means that at a small scale it is expensive to buy and making it economically viable is currently challenging. However its environmental and social impacts are significant.

### The Financial Model

The modelling of the financial returns was based on the work done by Community By Design on the LEAP Micro AD project (Appendix 13). The key assumptions in the model were that the major cost would be capital; operational costs would be marginal because labour would be provided by volunteers; and that costs would be offset by income generated from saving on disposal costs; recovered fertiliser value; equivalent fuel cost; and Bio-methane (RTFC).

### Financial Viability

Key issues of financial viability emerged in the study that seriously limited the development of the shortlisted locations identified in Section 3 as technically feasible. The feedback from the majority of the community facilities was that they would be supportive but only if they had no role in collection of food waste; operation; maintenance; and management of digestate. They alerted us to the fact (as volunteers running community facilities) that we would struggle as the area was suffering from volunteer fatigue. This is reflected in the findings reported in Section 1 and the work done (consequent to the consultation household survey) to talk with those who expressed an interest in helping.

This finding meant we could not recommend depending on volunteers for operation. The Study then examined the potential for a social enterprise (either existing or newly set up) to operate, collect waste, and distribute digestate. We modelled the estimated operational costs for 4 distributed Micro AD sites all around 2-5kW and 1 centralised Micro AD (20-25kW) using food waste collected from Keswick and the A66 corridor which runs through Derwent 7 area. The revenue costs are estimated to be around £21,000 per annum. This assumes capital is raised from grants, crowdfunding etc. and no payback is included and that there is some potential for an income stream from energy and digestate sales (Appendix 12).

We could not include any income for collection charges as food waste is not separated out in the Derwent 7 area and is mixed with other commercial waste in a range of sizes of wheelie bins. The majority of mixed commercial waste is collected by the Local Authorities and in the main by Allerdale Borough Council and goes to landfill. Allerdale Borough Council has a



policy of undercutting private commercial waste collectors. Our research found that on average commercial waste producers in the Derwent 7 area are paying £0.19-£0.45 for 10kg (price depends on size of bin). The discussions we had with food producers is that there was no financial incentive for them to pay a social enterprise to collect the waste when it was so cheap and they would have to take on additional operational roles in separating; removing packaging and other contaminants and making arrangements to store the food waste.

Discussions with Allerdale Borough Council identified that they might have looked at a way of helping the financial viability (e.g. diverting the gate fee that they would save for disposal which is £75.00 per tonne) but only if the scale of food waste removed from the waste stream had been significantly greater.

The study explored the potential to set-up or partner with an existing social enterprise to undertake the operational requirements. There is an existing social enterprise who operate all the local toilets in Keswick who showed some interest. A pre-condition to considering this was providing a worked up business plan that prove the viability. We have not been able to do this because of the issues above. We explored charging for waste collection again with some of the key food and beverage businesses. We asked if they would be willing to pay more to have the food waste collected by a social enterprise but they were not. There is considerable competition amongst this industry in the Derwent 7 area and managing costs is a key business pressure. Although supportive of the aims of the study they were not willing to bear extra costs to enable it to happen.

The only way we have identified to make Micro AD financially viable at the moment in the Derwent 7 area is to locate them on sites which meet “stand-alone” criteria. This means that on their site they produce food waste; use the energy; have labour capacity to operate Micro AD; and have land on which to spread digestate. This works because they have no additional labour costs and sites can lower their energy costs. The study has only identified one site (Blencathra Centre) which has a social purpose (See Section 6); meets the stand-alone criteria; and is in principle in agreement to move forward with an installation.

Sustainable Keswick are committed to continue to identify stand-alone sites and promote the installation of Micro AD's (Section 8). However they will also continue to scan/assess the financial viability of Micro AD's and look for opportunities to revisit the financial model.

### Capital Funding Opportunities

Blencathra FSC is a registered charity. It wants to raise the funding for the Micro AD (capital and installation cost estimated at £6,000) from grants. Four key sources of grant funding have been identified – The Postcode Lottery; Cumbria Community Foundation (who act as gateway for Cumbrian Funding organisations); Naturesave; and Cumbria Waste Management Environment Trust who all fund capital costs and environmental projects. We are also aware that (from experience on another project) that there is a high chance that Santander Discovery Grants would award £5000 which would have to be matched with grant funding from another source. Our assessment is that there is a low risk of grant funding not being secured.

### Environmental Returns



The environmental returns of Micro AD technology (especially where deployed at the source of waste) are self-evident. The potential for significant carbon savings for organisations and communities for relatively minimal effort is highly attractive. Further work needs to be done on the local environmental returns but the methodology already applied to the LEAP project demonstrates that the scale of carbon saving is substantial relative to the technology deployed capacity (Appendix 6).

## Social Returns

Three main areas have been identified where micro AD can bring about positive social impacts:

1. Educating and engaging local people with recycling and renewable energy
2. Improving the nutrient content of food through local food production
3. Supporting local training and enterprise opportunities

In terms of **education and engagement**, micro AD brings a renewable recycling technology normally seen at the industrial and farm scale down to a human scale where people can grasp its significance more easily. Small plants lend themselves to site visits and being part of schools educational programmes as well as being valuable real-world examples of sustainability in action and case study material for researchers and university students. The pilot plants in Central London have hosted many university student/researcher visits in particular as well as visits from community intern programmes, local authority officers, school groups, large and small company representatives, and utility companies.

Making the technology more familiar and accessible to the public in this way could also potentially increase its uptake at larger scales by raising awareness of the benefits and reducing resistance at the planning stage.

Normalizing a circular approach to organic resource management through increased visibility (more demonstration sites) can help influence behaviour change to increase recycling and food segregation rates and support local authorities in reaching recycling targets.

By **recovering and reusing nutrients** for local use, micro AD has the potential to address not only food waste challenges but also issues around the quality of food itself. It has been widely reported that the concentration of nutrients in our fruit and vegetables has declined since the 1950s, mostly due to a combination of early harvesting, longer transportation journeys, extended storage times, crop selection for disease resistance and reduced nutrients in the soil.

Micronutrients play a central role in human metabolism and in the maintenance of tissue function. There is growing interest in the role of these essential trace elements and vitamins in optimising health, and in prevention or treatment of disease. Many countries have now developed recommendations for intake of micronutrients in the normal diet.

While supplementation with synthesized vitamins and minerals can play a role in treating deficiencies, a more sustainable approach would be to increase the bioavailable nutrients in the food we grow, for which our bodies are better adapted to absorbing and utilizing. Micro AD could form an important part of the solution coupled with local food production using non-hybridized seeds and a more organic approach to soil management. These simple measures could reverse the trend towards nutrient depletion and local people could become more informed, educated and involved with the production of their own food.



**Training and enterprise opportunities** linked with micro AD depend on partnering with local stakeholders to establish successful closed-loop cycles. Possibilities for utilizing digestate include remediating contaminated land, turf strengthening for sports fields and golf courses etc. however, local food production has the potential to generate more training and employment opportunities. Trainees not only learn valuable vocational skills but also provide manpower to sustain an economically viable enterprise.

Closed-loop training topics could cover

- Organic waste management (AD, composting, vermicomposting)
- Food growing (soil-based and hydroponics)
- Nutrition (making links between human digestion, AD and composting)
- Food waste and climate change (GHG emissions, food and waste miles)
- Food waste reduction (tips for saving money)
- Food preparation

For community-focused organizations, the training remit can also expand to support disadvantaged people e.g. those with learning disabilities, mental health conditions etc. with opportunities to participate in lifelong learning. The mental health benefits of horticulture have been well documented and form the backbone of the work of organizations such as Thrive and Freedom from Torture. Combining a therapeutic approach with a structure that provides livelihood support is one way of simultaneously achieving economic, social and environmental objectives.

Identifying local restaurants, café and hotels that prioritize locally grown produce is an important step in creating the supply chain to drive demand as well as providing a source of feedstock. Food produced as part of a closed-loop cycle that combines benefits for local people through training and employment opportunities with improved nutrition value would be a unique selling point.

At a time when food and fuel prices are rising and climate change is of increasing concern, a move towards localizing supply chains would help strengthen local economies and boost community and environmental resilience.

### **Site Specific Financial, Environmental and Social Returns**

The assumptions for Blencathra FSC are that it will have annual feedstock of 7,300kg producing an annual biogas yield of 1,000m<sup>3</sup>.

This means estimated annual cost savings of £536.29; estimated maximum annual carbon savings of 31t; and Micro AD built into the Field Study Centre's significant educational activities with schools, colleges, universities and the general public.

Equally importantly they have agreed to allow Sustainable Keswick to use the site as a demonstrator to promote Micro AD; digestate and the opportunities it presents; benefits of diverting unavoidable food waste from landfill; and other spin-off opportunities which could be driven through the proposed community hub at Otley Road and underpin its viability.



## Micro AD v Larger AD Debate

The study identified that the sheer amount of food waste arising in the Derwent 7 area meant that Micro AD alone was not a significant solution to diverting unavoidable food waste from landfill. There has been interest in the past from the Local Councils (both the Waste Collection Authorities and the Waste Disposal Authority) in exploring the potential for Anaerobic Digestion of food waste. The assumption has been that this meant larger AD's but this study would propose that it is feasible to envisage a network of Micro AD's complementing larger AD's.

Published data (Banks et al., 2011) from a 900 m<sup>3</sup> commercial anaerobic digestion system fed on food and green waste allows a comparison of some of the performance outputs of micro-AD with large scale AD. Values either directly taken from or derived from the data presented in the paper are shown and compared with equivalent values for an example micro-AD site in Table 1.

Researchers found that the micro-scale system showed very similar operational characteristics to a standard large-scale facility. However, the energy balance of the plant was very different because unlike a standard large digester, the plant was housed indoors. Anaerobic digesters typically need to be run at 37-40°C, but the heating required by the plant was far less than normal. See "Assessment of micro-scale anaerobic digestion for management of urban organic waste: A case study in London, UK" M.Walker, H. Theaker, R. Yaman, D. Poggio, W. Nimmo, A. Bywater, G. Blanch, M. Pourkashanian Waste Management 61 (2017) 258-262

Results for volumetric biogas yield and biogas composition are broadly similar for both systems, thus demonstrating a similar level of performance in terms of biogas output when compared with the size of the system. The average specific methane yield from the feedstock was much lower in the large-scale system, which could indicate a performance difference. However, in consideration of the other available data on the monitoring of the large scale plant, it is thought that this can probably be attributed to an actual reduced biogas potential of the feedstock due to addition of green waste and the feeding of less fresh food waste into the system. In comparison, the micro-AD digester was fed predominantly food waste and oats, which both have a high specific methane potential.

The parasitic requirement of the large-scale system (31.4 %) is similar to that of the micro-AD system (31.7 %) and the parasitic heat requirement is much greater in the large system, which can be attributed to the pasteurisation heat (no pasteurization was performed at the micro-AD site).

Using the data available, it appears that the performance of the micro AD is either comparable or slightly better than the large scale AD system. However, the choice of appropriate scale is based on factors external to the system (e.g. collections, waste quantities and distribution of production, digestate use) and an economic analysis.



**Table 1: Comparison of key performance indicators of large scale AD and micro-AD plants.**

Performance parameter	Large scale AD (Banks et al., 2011)	Micro-AD
Average specific biogas yield ( $\text{m}^3 \text{tonne}^{-1} \text{wet}$ )	156	220
Average specific methane yield ( $\text{m}^3 \text{tonne}^{-1} \text{VS}$ )	402	595
Average methane composition of biogas (%)	62.6	60.6
Average volumetric biogas yield ( $\text{m}^3_{\text{biogas}} \text{m}^3_{\text{digester}} \text{day}^{-1}$ )	1.59	1.57
Variation in weekly biogas production (+/- % of average)	32.8	61.6 (manual) 38.6 (auto)
Average parasitic electrical demand (% of elec. output)	31.4	31.7
Average parasitic heat demand (% of recoverable heat)	30.3	18.0
Digestate nitrogen ( $\text{kg N tonne}^{-1}$ )	5.6	4.7
Digestate phosphorus ( $\text{kg P tonne}^{-1}$ )	0.4	0.2
Digestate potassium ( $\text{kg K tonne}^{-1}$ )	2.3	2.3

(Walker et al 2017)

The operational performance parameters of the plant were very similar to a large-scale AD plant treating source segregated food waste in terms of main outputs and parasitic energy requirements. The plant processed 5.23 TPA of urban organic waste producing an average of 595  $\text{m}^3 \text{CH}_4$  per tonne of VS destroyed with an average 60.6 % methane content in the biogas produced. The results showed that the plant was capable of stable operation despite large fluctuations in the rate and type of the feed waste biomass.

The system achieved a net positive energy balance and potential COP of 3.16 and 5.55 based on electrical and heat energy inputs and outputs respectively. Greenhouse gas emissions analysis concluded plant could result in carbon dioxide reduction 3878.7  $\text{kg yr}^{-1}$ , which was equivalent to carbon reductions of 2.95  $\text{kg CO}_{2\text{eq}} \text{kWh}^{-1}$  electricity production, or 0.741  $\text{kg CO}_{2\text{eq}} \text{kg}^{-1}$  waste treated.



Within an evolving organic circular economy, there is scope for small-scale decentralized networks to complement large centralized plants in treating organic wastes. While the benefits of large plants are more widely recognized and lead to obvious economies of scale, micro-scale AD has the potential to deliver a variety of additional benefits as described above.

In balancing the current bias towards large scale plants incentivized by green energy tariffs, the concept of 'appropriate' scale technology emerges when looking at organic waste management for specific sites/areas. This could ensure that plants make sense not only economically but also environmentally and socially.

Sustainable Keswick (Section 8) propose to re-open exploratory discussions with Allerdale Borough Council who collect the majority of food waste (both domestic and commercial) in the Derwent 7 area about the role in the future for AD (Micro and Larger) for diverting food waste from landfill.



## Section 5: Planning and Permitting

### Planning

The planning authority is the Lake District National Park Authority. They have no precedents for either Micro or larger Anaerobic Digester developments. They do have Policy CS16 "Generating Renewable and Low Carbon Energy". It states "we will support renewable energy development including any additional buildings or infrastructure directly related to the renewable energy scheme" and goes on to say "proposals should not adversely affect the landscape character of the National Park". At Blencathra FSC there are already consented renewable energy installations (300kW capacity biomass system and 35kW capacity hydro) and therefore there is precedent for the LDNPA approving such planning applications at the site.

At the Blencathra FSC site the Micro AD would be installed behind the kitchen where currently waste bins are stored and there is a nearby LPG gas tank. The digester would be housed in a structure or a lean-to. This will provide insulation and reduce heating losses. Visibility would be negligible as it will be screened by the main Centre Building and the kitchen extension in a structure/lean-to and is therefore not going to raise any landscape or heritage issues. The LDNPA policy map for Threlkeld identifies no designations at the Blencathra site (Appendix 14).

The Blencathra FSC is remote and sits at the end of a road which leads from the village of Threlkeld to a car park to enable access to Blencathra for walkers and climbers. The Parish of Threlkeld is in Derwent 7 area and was included in community consultation and no objections to Micro AD were raised.

When discussed with the Planning Authority they could not see any issues (subject to detail) and in fact there may be no need to apply for permission. The requirements for Micro AD are very site specific and once the detail for Blencathra FSC is finalised discussions would need to take place again with the Planning Authority and is scheduled into next steps (Section 8).

If consent is required the assessment is that the likelihood of success is high.

### Permitting

Discussions took place with the Environment Agency in February 2017 and they confirmed previous experience from Micro AD developments that the treatment process would be exempt under T25 exemption and the digestate processing exempt under either a U10 or U11 exemption. Appendix 15 details the legislation and regulation requirements in detail for the information of the Derwent 7 and the Blencathra FSC.



## Section 6: Sites

### Blencathra Field Study Centre, Threlkeld, Keswick CA12 4SG

The Centre is a Field Studies Council (FSC) facility ([www.field-studies-council.org/centres/blencathra/about.aspx](http://www.field-studies-council.org/centres/blencathra/about.aspx)). The FSC state that their mission is “bringing environmental understanding to all”. The Centre mainly provides residential courses for schools, colleges and universities about natural history and nature and the arts but it also provides family activities courses. FSC are strong advocates of learning in the “outdoor classroom” and carbon reduction. FSC own the site and would host the Micro AD.

It is an ideal example of a stand-alone site for a Micro AD. The Centre is set in gardens and grounds with mature trees which are ideal for use of digestate. They currently compost. They have grounds maintenance staff who would collect, store and apply digestate.

They use electricity and LPG for cooking (not on gas grid). They would convert a gas burner in the kitchen to use the biogas produced by Micro AD for cooking. They may need another gas application and an automatic system to ensure no biogas is vented. Or they may need a gas compression system with cylinder storage to minimise the gasholder footprint. These matters will be discussed and agreed with the suppliers.

Their food waste is currently co-mixed with other waste and collected by the Local Authority. They estimate that it is between 25kg to 50kgs per week as they prepare the food from fresh ingredients. They provide breakfast, packed lunches and evening meals. They do some functions e.g. weddings and provide a venue for meetings. During the academic months (30weeks) they regularly cater for the maximum of 120 covers at each sitting. Out of academic months they are usually averaging 60 covers for each sitting. Food waste would be stored/ separated and fed directly into the Micro AD by kitchen staff.

Blencathra FSC would manage the Micro AD day-to-day. Guidance on legislation and regulation (Appendix 15) would be provided along with risk assessment (Appendix 16).

Blencathra FSC have given their in-principle commitment to siting a Micro AD (Appendix 17).

### Borrowdale Institute

Discussions are on-going about the potential for siting a Micro AD. Revitalising and modernising the Institute are on-going and as part of that process there is a desire to install renewable energy technologies. The site itself currently produces little food waste but there are future development plans under discussion that include being a venue for weddings and other events; a showcase for Herdwick Sheep; and a significantly more vital community facility for use by the local community. The expectation is that food waste arisings will only increase. It is also close to hotels, cafes and a youth centre who all produce food waste.

The Institute own a field next to their building and are interested in exploring how the digestate could add value to this community facility.



The Micro AD would be included as part of a planning application for the whole development of the site. Landscape issues would be a serious consideration for the development and undoubtedly the Micro AD would have to be located sympathetically if consent is to be secured. The risk is assessed as medium as this would be done as part of the design of whole site.

If this site progresses a detailed assessment would be undertaken.

### Otley Road

As identified in Sections 1 and 2 the study has identified the potential for co-locating a Micro AD next to a community hub at Otley Road in Keswick. Again this site is dependent on future developments. The site is next to a car park in the Centre of Keswick which is also the main recycling centre for Keswick. Keswick is the major source of commercial food waste arisings in the Derwent 7 area. A micro-brewery is also located near Otley Road and has already indicated its interest in providing waste for a Micro AD. Delivery of food waste would have to be done by using a low carbon or zero carbon system similar to that in London. This is feasible because food waste producers are all located within around 0.5mile radius of Otley Road.

The energy produced would be used in the community hub.

Keswick has two large Parks; allotments; National Trust woodland and a significant number of flower beds and can see how it could benefit from the digestate.

The nature of the site is such that achieving planning consent is assessed as low risk.

If this site progresses a detailed assessment would be undertaken.



## Section 7: Operation and Governance

The outcomes of the study mean that there are no operational and governance issues to be addressed as the site is stand alone.

The proposed development of the community hub (Appendix 4) will have operational and governance implications. These will be identified as the Business Plan is further developed and this activity/support is identified in Section 8.

When a supplier is appointed for the Micro AD there will be a clearer understanding of maintenance and trouble-shooting requirements. It would make sense to buy-in where appropriate but one of the volunteers (Appendix 4) indicated an interest in getting involved and could play a role in day-to-day maintenance. This will be followed up once supplier appointed (See Section 8).



## Section 8: Scheduling

The Study provides a considerable amount of detail and will provide a sound reference document for Sustainable Keswick/Derwent 7. However Reiver Renewables are going to give ongoing pro bono support over the next 6 months and Cumbria Action for Sustainability will also provide some pro-bono support for development of Business Plan for Community Hub.

- **Ongoing** - Reiver Renewables to give pro bono support to Sustainable Keswick/Derwent 7 in progressing next steps as AD is not essentially a plug and play renewable technology.
- **Sept 2017** – Sustainable Keswick to identify dates in October to report on outcomes of study in first place to Derwent 7 and then at an open public meeting.
- **Sept/October 2017** – Reiver Renewables and Sustainable Keswick to agree a précis of report that can be supplied to press and media; at public and other meetings; and to other interested parties.
- **Sept/October 2017** – Reiver Renewables to progress discussions with LDNPA about need or otherwise for planning applications and implications (if any) for capital costs.
- **October 2017** - Sustainable Keswick to publicise the outcomes of the Feasibility Study in local press and media and to use as a vehicle to advertise the open meeting and kick start a campaign to reduce food waste in the Derwent 7 area.
- **October/November 2017** – Sustainable Keswick (with support of Reiver Renewables) to advise Blencathra FSC on grant funding strategy (including RR drafting applications to cover capital costs of installation and helping with submission)
- **December 2017** – once funding is secured to support Blencathra FSC procure Micro AD including installation works with support from Reiver Renewables
- **October/November/December 2017** – Sustainable Keswick, CAfS and Reiver Renewables to progress business case for Community Hub development including Micro AD.
- **October/November/December 2017** – Reiver Renewables to reassess on back of Business Case for Otley Road if this re-opens the potential for a social enterprise to collect food waste and other locations for digesters to come on stream. Reiver Renewables and Sustainable Keswick to assess the potential for combining Micro AD with a horticultural enterprise to maximise value added by digestate (Appendix 18).



- **Sept- December 2017** – Reiver Renewables to progress feasibility of larger AD and keep Sustainable Keswick and Derwent 7 informed of progress/issues.
- **Jan-March 2018** – assuming funding secured - Sustainable Keswick and Blencathra FSC to progress installation of Micro AD (with support from Reiver Renewables); commissioning; and initial operation period.
- **March 2018** – Sustainable Keswick and Blencathra FSC to publicise the progress with installation.
- **Beyond March 2018** – Sustainable Keswick to (in agreement with Blencathra FSC) launch a programme of demonstration events with aim to bring on stream other stand-alone installations and revisit the stand alone sites identified in the study having had six months hands-on/hands-held experience with Blencathra FSC.



## Section 9: Conclusions

Unavoidable commercial food waste arisings are significant because of the high dependency of the Derwent 7 economy on tourism and a predominance of food production from fresh ingredients. This is a concern to both the local councils and the local communities.

The low cost of commercial food waste collections mitigates against food producers looking at alternative disposal solutions for unavoidable food waste. However our findings on waste quantities and the anecdotal evidence from interviews show that commercial food producers are trying to reduce avoidable food waste with some success. One Chef having reduced his food waste to zero but having the advantage/flexibility of catering for an outdoor activity centre and therefore not being menu driven and having a pre-determined number to cater for.

The community consultation found that 99% were supportive of taking food waste out of landfill and using it to produce energy in a Micro Anaerobic Digester. Key stakeholders were also supportive and interested. Derwent 7 (for whom Sustainable Keswick commissioned this study) represents all the Parish and Town Councils in the area.

The aim was to try to identify the potential for a network of Micro ADs in the Derwent 7 area to convert commercial food waste into 40kW capacity of renewable energy to be used in local community facilities. The Derwent 7 area is predominantly rural with 60% of its population centred in Keswick itself.

Seven community sites were identified with the potential to host Micro ADs and have a 40kW capacity. Two were assessed in the process as unsuitable (one for feedstock reasons and the other digestate). A third was withdrawn because of the site's operational concerns. This was a recurrent theme which was exacerbated by the fact that the area suffers from volunteer fatigue. Most of the community facilities were already dependent on volunteers who had no spare capacity.

Alternative solutions were explored but all of them added cost and made the project financially unviable. This led to looking for sites which stood-alone in terms of food waste; employed their own staff; and where digestate could be spread on-site. The result was that Blencathra FSC has signed an in-principle agreement to host a Micro AD; Borrowdale Institute are considering as part of any future developments on site; and at Otley Road, Keswick the potential to site a Micro AD is being considered alongside the development of a community hub. These three developments could potentially take the capacity up to 10kW capacity.

The study also explored the potential for Micro ADs being based on commercial properties with the view to helping increase the amount of unavoidable food waste taken out of landfill. There was interest and four potential sites were identified. However the low cost of disposal; need for separation (currently mixed collections); issues with digestate; and the level of perceived innovation meant they have not proceeded.



The Micro AD at Blencathra FSC will be an invaluable local demonstrator of the technology and our assessment (and that of our clients) is that it will enable the conversion of a number of other stand-alone sites both at community and commercial facilities.

The sites at Borrowdale Institute and Otley Road (if they progress) would be demonstrators of how a Micro AD could be co-located with a community facility and provide them with renewable energy but using feedstocks sourced off-site; maximising the value of digestate for community benefit including horticulture on-site; and supplying digestate to others.

Although the financial viability proved to be a stumbling block for reaching the target of 40kw capacity the environmental and social returns were significant. The assessment in the study is that there is low risk associated with raising the capital for Blencathra FSC (a registered charity) through grant funding and labour inputs will be absorbed within existing staff budgets. This will ensure the Micro AD is financially viable.

The critical next step is to progress the development of the Micro AD at Blencathra FSC. This will be "the turnkey" that will enable further Micro ADs to be developed in the Derwent 7 area.

It is acknowledged that when the client hits their target of 40kW capacity there will still be a considerable amount of unavoidable food waste going to landfill. The study acknowledges that Micro AD has to be complemented by Larger AD. However it could have a significant role to play in dispersed rural communities where separate collection of food waste does not necessarily make financial or environmental sense. Early discussions have been opened with the Waste Collection Authority about the potential role of Micro and Larger ADs and these will be progressed in the next steps.

This study has been done in the context of community energy generation. However it is recommended that in tandem with progressing the Micro AD network that Sustainable Keswick and Derwent 7 continue to raise awareness and campaign for us all (householders, community groups, commercial food producers, supermarkets etc) to reduce the amount of avoidable food waste produced in the Keswick area. Next steps include for Sustainable Keswick to build on the awareness raising this project has achieved and it is hoped that the proposed community hub will play a key role in promoting low carbon living.



## Section 10: Appendices

Appendix No	Subject	Status
1	Map of Location	Attached
2	Phase 1 Report	Attached
3	Leaflet	Attached
4	Phase 2 Report	Attached
5	SusKes Response	Attached
6	GHG /Carbon Offset	Attached
7	Micro AD Info Pack	Attached
8	Range of Suppliers	Attached
9	Commercial Waste	Attached
10	Digestate Information	Attached
11	Site Assessment	Attached
12	Social Enterprise Financial Model	Attached
13	Financial Model	Attached
14	LDNP Policy Map	Attached
15	Legislation and Regulation	Attached
16	Risk Assessment	Attached
17	Blencathra FSC Site Agreement	Attached
18	Horticulture/Added Value/Digestate	Attached