

Centre for Process Innovation

Environmental Drivers and Business Model for Food Waste Collection and Anaerobic Digestion for Renewable Energy on Teesside

September 2012



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Environmental Drivers and Business Model for Food Waste Collection and Anaerobic Digestion for Renewable Energy on Teesside

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Executive Summary

This work was undertaken by the Centre for Process Innovation on behalf of Northumberland College, a partner in the Enercoast Project under the Interreg IV initiative. The work concerns the way in which a new waste to renewable energy supply chain could be created in the North East of England. The work identified the potential for food waste being converted via anaerobic digestion (AD) as being the likely target of the initiative, and this was further explored with potential partners. While AD is underutilised within the UK, there is an existing and expanding base of operations that made the Enercoast initiative a timely catalyst for positive change.

The project managed by CPI was divided into a 5-phase programme, consisting of:

- A survey commissioned in the region to demonstrate the viability of the feedstock supply within the region
- An open forum gathering across a broad range of interested parties to establish the willingness to develop the initiative towards commercial contracts
- Interviews held with potential commercial partners to focus on the potential service offering that could be available, potential business models, and the state of preparedness for implementation of the supply chain
- Shortlisting the potential commercial partners in consultation with the interested local authorities in preparation for further contract negotiations prior to any procurement contracts being issued
- Facilitation of the early stages of the possible partnership by the development of a pilot study proposal to demonstrate logistical and commercial viability, prior to any completion of contracts

In the event, this work was halted at the last phase, with the interested local authority partners being constrained by central government austerity measures in early 2012. However, in an attempt to capture the context for change that had been gathered during the project, and also the commercial viability of the overall proposal, a report was prepared for the local authority which included:

- Context and drivers for change (social, governmental and legislative)
- The competitive nature of the offering from commercial partners and their repeated interest in developing the initiative further
- A draft outline of potential pilot work and costings that would help with the definition of the logistics and viability of the proposed service offering.

The summary report was submitted to the local authority waste management group as at least an overview of the current situation, and to allow them to review and restart the project in future with this background work already in place.

(Final comment to be inserted after TVLA decisions and feedback)

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1. Introduction

The North Sea Region Programme 2007-2013 (Interreg IV) works with cutting edge policy areas in regional development through transnational projects. A principal aim of the Programme is to expand the scope of territorial cooperation and focus on high quality projects in innovation, the environment, accessibility, plus sustainable and competitive communities. The 2007-2013 Programme connects regions from seven countries around the North Sea, incorporating policy level planning with the long lasting and tangible effects of projects. These are the foundations of the future transnational projects, which will create added value to partner regions and beyond.

The aim of the Programme is to make the North Sea Region a better place to live, work and invest in. This means that the North Sea Region Programme has a role in enhancing the overall quality of life for residents of the North Sea Region by ensuring that there is access to more and better jobs, by sustaining and enhancing the acknowledged environmental qualities of the region, by improving accessibility to places and ensuring that our communities are viable, vibrant and attractive places to live and work. This endeavour translates into four Programme priorities, which are to promote transnational co-operation that:

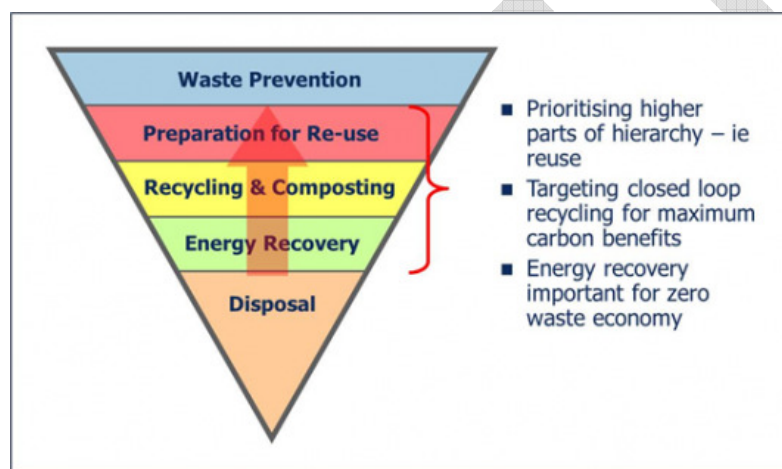
- Increase the overall level of innovation taking place across the North Sea Region
- Enhances the quality of the environment in the North Sea Region
- Improves the accessibility of places in the North Sea Region
- Delivers sustainable and competitive communities

Within the broad Interreg IV Programme, Enercoast is a project aimed to study the potential for blue-green energy generation. Capturing the potential of blue-green energy is a key contribution to attaining the EU's 20/20 renewable energy target. Currently this EU-wide target is being translated into national targets, some of which, for example in Germany, are being set even higher. This policy commitment is essential to overcoming the obstacles to renewable energy. However, a key characteristic of renewable energy is that, in contrast to the conventional power plants and their associated continental grids, they are a **decentralised** energy form. Hence targets cannot be implemented by the decision makers in Europe's capitals, the onus is on the regions and regional development initiatives. Transnational cooperation can play a major and cost-effective role in capitalizing on the North Sea Region's diversified but largely unaligned renewables expertise, especially with respect to the under-potential deployment of bioenergy resources.

Northumberland College is the UK partner in the Enercoast project. As part of this membership, the Centre for Process Innovation (CPI) was engaged to look at the potential for producing energy from waste streams via Anaerobic Digestion (AD). CPI has much experience in Anaerobic Digestion (AD), although the UK as a whole lags behind in the deployment of this technology. The Enercoast project hence represented a potential catalyst for the utilization of AD within the North East of England.

2. Innovative idea

The UK consumes natural resources at an unsustainable rate and contributes unnecessarily to climate change. Each year approximately 290 million tonnes of waste are generated, which causes environmental damage and costs money to both businesses and consumers (DEFRA, 2012). The Government has published the findings of its “Review of Waste Policy” (2012), setting out its policies plus a series of actions designed to help move towards a zero waste economy in England. Alongside the Review, the Government also published an Anaerobic Digestion Strategy and Action Plan. The essential feature of the Waste Policy is to follow the ideas of the “Hierarchy of Waste” to reduce the ultimate need to dispose of materials – a key element of the EU Waste Framework Directive (2008).



Hierarchy of Waste (WRAP, 2012)

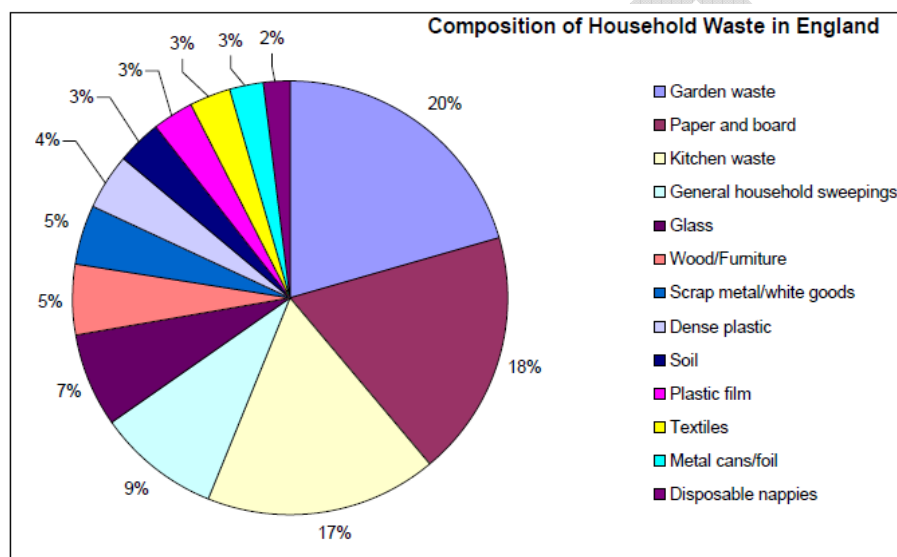
In the recent “Review of Waste Policy” (2012), there are many action areas where the movement of recovered materials up the waste hierarchy is encouraged. These include the reclaim and recycling of biowastes (the organic and biodegradable fraction of waste materials), and the use of such materials in Anaerobic Digestion (AD) processes for the generation of useful bio-gas or methane. This explicitly includes the segregation and collection of food wastes for this purpose. While the English situation is currently moving towards these goals, Scotland is already codifying these principles in a legislative framework. New regulations have been passed in May of this year, as the Waste (Scotland) Regulations 2012. A more detailed list of what these regulations contain is listed in Appendix 1, but a few relevant points are listed below:

- Businesses generating more than 50kg of food waste per week will need to separate and recycle this from 2014, and if generating between 5 and 50 kg/week, by 2016
- Household food waste collection / recycling will also start as of January 1 2016
- A movement away from the use of incineration for waste treatment is encouraged
- Carbon metrics will be put in place as one way of measuring recycling performance to encourage the movement away from Green House Gas (GHG) emissions (e.g. methane and carbon dioxide)

3. Supply chain gap

3.1 United Kingdom food waste potential

Although not yet scheduled for England, it is clear that the overall intent of the UK waste policy is likely to follow that of the Scottish model, and is also likely to adopt a similar legislative driver in time. Hence, further analysis of the opportunity for developing plans to deal with biowastes (particularly food waste) is now timely, in readiness for the foreseeable changes in the regulatory framework in England. Food has been shown to make up about 17% of household waste in the UK:



Composition of Household Waste in England (Parfitt, 2002)

While this waste can be disposed of alongside other wastes, for example, into landfill or incineration, these methods do have some drawbacks. For landfill, there is currently an escalating tax which will ensure that disposal via this route will quickly become very costly, with a minimum fee of £80/te to be in place by 2014 (excluding landfill operator costs). Also, landfill does give rise to other environmental problems such as the uncontrolled generation of methane, a potent greenhouse gas. Disposal by incineration can be a cost effective option, with the recovery of heat energy for use in other processes. However, this burning process does release concomitant quantities of carbon dioxide and other gaseous / particulate materials. WRAP (Waste and Resources Action Programme), a UK government agency, has looked at the potential for realising value from food waste, rather than simply treating it as a stream to be discarded. In 2007 WRAP published a report prepared by Eunomia Research and Consulting (Hogg et. al., 2007) that looked at the comparative costs and benefits, including monetised environmental factors of different approaches to managing household biowastes (garden and food waste). The study looked at different collection and treatment systems including schemes in which food and garden wastes were collected separately from one another and schemes in which they were collected mixed. Different levels of home composting uptake and promotion were considered in the options examined.

The main finding was that the design of the collection system and the way in which the waste is collected will influence the amount of material captured and will have implications for how it is treated, which in turn will impact on overall costs and the diversion of material from the residual waste stream. In particular, the report concluded that collecting food waste separately at kerbside and weekly could increase the capture of food, would help keep processing costs to a minimum and was overall the more financially plus environmentally attractive option.

The research suggested that there would be significant additional costs associated with adding food waste to an existing garden waste collection due to the low captures of food waste and very high quantities of garden waste (particularly for fortnightly collections) plus the requirement to treat all the organic waste at facilities compliant with the requirements of the Animal By-Products Regulations (2003). Hence, they recommended that separate food waste collection was the most cost effective method to use. Between 2007 and 2009, WRAP catalogued the work done within 21 trials within the UK (Bridgewater and Parfitt, 2009). In particular, for those authorities where the pilot trial was extended into a full food waste collection and treatment service, the quantities of food collected per household mirrored the amount from the trial data, indicating that such data can be used for wider collection planning.

3.2 Recycling rates in the UK and in the Tees Valley

In 2008/9 WRAP reported that 31% of local authorities had food waste collection regimes, (Bridgewater and Parfitt, 2009) which has increased over the intervening time. Following the WRAP trials in 2008/9 Calderdale have continued with food waste collections to the present day. DEFRA Waste Data Flow reports that they collected 5721 tonnes of food waste between July 2010 and June 2011 from 88,000 properties, although it is unclear what percentage of properties have access to this service. Calderdale would be the nearest local authority to visit to harvest data, experiences and best practice as background for any planning for Teesside. In December 2011 the top ten local authority recycling rates were as follows:

1. Rochford District Council	66%
2. South Oxfordshire District Council	65%
3. Surrey Heath Borough Council	65%
4. Bournemouth Borough Council	64%
5. Cotswold District Council	60%
6. Staffordshire Moorlands District Council	60%
7. Stratford-on-Avon District Council	59%
8. Epping Forest District Council	59%
9. Suffolk Coastal District Council	59%
10. Harborough District Council	58%

(Source: LetsRecycle.com)

For comparison, the recycling figures for the TVLA 2009-2011 are shown below:

Change in TVLA Recycle Rates, 2010/2011 (DEFRA, Council Websites)		
Local Authority	2009/10, %	2010/11, %
Darlington	36	42
Stockton on Tees	30	30
Redcar & Cleveland	43	41
Hartlepool	39	41
Middlesbrough	23	23

The national target is to achieve a 50% recycling rate by 2020, and also for the UK to comply with the EU Waste Framework Directive. Clearly the TVLA have some way to go to achieve this, and are also some way behind other leading recycling authorities. A more detailed breakdown is given in Appendix 2. However, the other line of note in the table of Appendix 2 is that concerned with the improvement in recycling performance that food waste collection could deliver. Recycling performance overall would move from about 35 to 49% - almost meeting the 50% recycling target required by 2020. Food waste recycling therefore offers an opportunity to not only provide a way to support and encourage social attitudes on waste disposal, but also to provide a big boost to regional recycling numbers. Further data on TVLA waste streams is also recorded in Appendix 2.

3.3 Supply chain gap for food waste to AD in the North East of England

3.3.1 Opportunity

The intervention described in this report is based on a number of factors that present an opportunity for the development of a supply chain for the utilization of food waste. These factors include:

- A developmental, but commercially-driven approach to AD in the UK
- A widely-recognized and accepted need for society to recycle rather than dispose of waste arisings
- A developing framework based on European and UK directives supporting the general concept of the "Hierarchy of Waste"
- The development of legislative support for the framework on waste, as evidenced through changes in Scottish law
- The piloting of separate food waste collection in the UK, supported by the WRAP agency through the collation and dissemination of case studies
- The creation of recycle targets (50% of all waste by 2020) and individual local council measures throughout the UK
- The opportunity for the local authorities in the North East of England to essentially meet this target by the use of food waste collection for AD purposes.

3.3.2 Barriers

In addition to the above opportunities, there are still barriers within the UK to AD technologies. These include:

- The range of technologies available. In addition to standard AD processes (mesothermic, 40 day cycle time) there are also processes with longer cycle times (e.g. 100 days, higher biogas conversion) and shorter (Advanced Anaerobic Digestion, ADD, faster digestion)
- Inexperience with newer businesses based on AD
- Existing methods of waste disposal, including landfill and incineration
- The need to compete with these existing business models at the current disposal fees

3.3.3 Supply chain gap

The supply chain gap in this instance is composed of several features to be overcome:

- Potential misunderstanding of the nature of the legislative frameworks. The movement from ideas of the waste hierarchy to driving these ideas through law may not be fully understood as a key driver for a change in waste practices
- Existing, but increasingly discouraged established practices. Landfill and incineration both suffer from problems as outlined in section 3.1, and will become less reliably economic methods for the disposal of household waste with time
- The competitiveness of the offer from AD operators. Local authorities are unlikely to make changes if newer disposal offerings are not only socially and politically acceptable, but are also commercially competitive. This is particularly true in the current European and national austerity programs supported by central governments
- The awareness of the high level of good quality pilot study data and support that has been generated by the UK waste agency, WRAP (Waste Resource Action Programme). This data shows that pilot studies, at relatively low cost and reduced risk, can provide reasonably accurate data that can be translated into established practice and viable business models

These gaps are the basis for the enablers and intervention for this part of the Enercoast project, outlined in the next section. However, it is important to note that the nature of the intervention in this supply chain project is less the creation of novel business models, but more the bringing together of disparate parties that hold knowledge of some part of the chain and confirming the willingness to work together on a complete solution.

4. Strategy enablers and project intervention

4.1 Phase 1-5 of the strategy for intervention

The strategy adopted by CPI to enable the potential joining up of the supply chain for AD facilities in the North East of England was comprised of five phases:

1. Survey the potential supply of materials in the North East of England by both quantity and location. This is to ensure that there is sufficient readily available material in the right location to guarantee the potential viability of an AD facility in the area
2. Convene a general meeting to report the outcome of this initial survey to those parties who may be potential suppliers of food waste, suppliers of AD technology, AD plant operators and facilitators to gauge directly the interest in joining up the supply chain for this initiative
3. Move to specific functional meetings to present interested parties with a chance to reassure themselves with the interest and viability of the commercial parties who wish to be considered as possible partners for a food waste to energy supply chain
4. Refine these initial commercial interests into a selected shortlist of companies, and engage with the food waste suppliers regarding the outline and potential contract for the supply of services plus agreed business model
5. Facilitate the progression of the contractual arrangements for a pilot study in preparation for contract finalisation and completion of the operating supply chain.

Phase 1: Survey for potential supply of food waste in the North East of England

CPI managed a study and report by WSP Environment and Energy (2010), aimed at surveying the potential for the supply of food waste from local councils in the North East of England to a suitably sized AD facility. The study identified that there was a good opportunity for the collection of food waste from households and the commercial sector to support the development of an AD facility in the Tees Valley region (Hartlepool, Stockton and Middlesbrough) of the UK. The household waste formed the major part of this material, and this is shown in the Table below:

Potential 30,000 te/a AD Plant in the North East of England (WSP, 2010)		
Waste Fraction	Quantity (te/a)	Proportion of total
Source segregated household food waste	24,605	80%
Commercial and industrial waste	4,613	15%
Manure from livestock - liquid	1,077	5%
Manure from livestock - solid	461	
Total	30,756	100%

Based on these results, the report outlined recommendations to do a more detailed assessment for the implementation of segregated food waste collection within the Tees Valley region, requiring a continued collaborative approach to ensure the viability of the proposed AD facility.

Phase 2: Presentation of report findings to begin joining up the supply chain

Following on from the above work, the report was circulated to potentially interested parties, and a meeting was convened in Middlesbrough to present the case for joining up the supply chain in the Tees Valley Local Authority (TVLA) area. The meeting was held in July of 2011, and involved over 40 people representing:

- Local authorities (Hartlepool, Redcar, Middlesbrough, Stockton, Darlington)
- Commercial interests (AD operators, waste management companies)
- Engineering and other project consultants
- Representatives from CPI, Renew⁺, WSP and NISP (National Industrial Symbiosis Programme)

The meeting itself considered all aspects for the potential to join up the food waste to AD supply chain, including:

- Collection contract
- Legislative drivers
- Contracting structure
- Procurement route
- Site
- Technology
- Finance

At the end of this meeting, there was a consensus that the idea remained appealing to both the local councils and to commercial companies, and there was a clear commitment on all sides to a next step in the process. The day was generally seen as providing a clear overview of what may be possible, after further discussion of the report contents plus detailed answers to specific points.

Phase 3: Specific functional meetings to join up the supply chain

After the successful meeting in July, a further day was organized in November to begin working on the specific needs of the TVLA councils with the commercial parties that would be able to offer a partnership for the joining up of a food waste to AD supply chain. In this phase of the project, eight commercial AD companies expressed their interest in being considered a partner in the scheme, and attended an interview round in Hartlepool to discuss plans and capabilities in more detail. This round centered much more on individual company capabilities and business proposals. The more detailed aspects of the interview process included:

- Experience in the field of AD (operator, AD contractor)
- State of the facility in the region (built, in construction, planned)
- Potential approach to managing the whole of the supply chain
- Preferred business model (independent, joint venture with local councils, other)
- Preferred length of contract
- Management of risks for the venture
- Management of the digestate produced by the process
- Preference for product output (biogas, product upgraded to methane, converted to electricity, gas to grid, gas to vehicle)

The commercial companies included in this stage of the work included:

- Northumbrian Water
- J&B Recycling
- QR gas
- Kelda Water
- Enpure Limited
- Larkfleet group
- Agrivert Limited
- Biogen Greenfinch

The outcome of these interviews were analysed and rated for technical and commercial capability, to arrive at a shortlist of potential partners to work with for further definition of a commercial proposal.

Phase 4: Ranking of the commercial offers and preparation for contract

The outcome of the above phase was a list of three companies that were considered to be technically and commercially experienced in the field of AD operation to ensure that any potential contract could be reliably operated. At this stage, the process was moved to engagement with a member of the TVLA Procurement Group, as the department which would engage with the commercial side of the contractual arrangements. After initial meetings, it was suggested that the right form of contractual draft would help to underline the TVLA's commitment to getting a professional service contract in place.

Phase 5: Facilitation of movement towards a full supply chain contract

At the start of Phase 5, the state of the progress made was reported to the TVLA through their Waste Management Group (WMG) in February 2012. This was to ensure that there was still the previous commitment to this waste-to-energy supply chain initiative, and to keep them informed of the likely next steps. At a meeting of the WMG, a decision was taken to move the project from "Active" to "On Hold". Although CPI and Renew+ were thanked for the work done up until this point, the deterioration of the TVLA budgets in the face of continued austerity measures from central government meant that it felt it was no longer possible for the TVLA WMG to continue to support the initiative. Although a surprise at this stage of the initiative, the support of CPI / Renew+ / Enercoast in getting the project to the stage at which full commitment was the necessary next stage was clearly acknowledged.

4.2 **Phase 6** of the strategy for intervention

Although the TVLA WMG had decided to put the current project "On Hold", there was clearly some good commitment to the ideas and viability of the initiative. Hence, further discussions were held with two of the companies that were seen as potentially good commercial partners for the food waste to AD to energy chain. This **Phase 6** was to ensure that at least all the drivers for the work done to date were recorded in full, in case any future change of circumstances allowed the project to be restarted at a later date. This phase consisted of a full report with recommendations to the WMG:

-
1. Recording the commitment of the two commercial companies currently involved in AD to the idea of a food waste to AD project in the Tees Valley region
 2. Record their ability to operate competitively with an indicative gate fee of around £40/te
 3. To record the drivers (both legislative and social) for the joining up of this supply chain
 4. To capture the work done to date for future use as appropriate
 5. To give the TVLA WMG a reference report for their future use when circumstances allow

The report was completed, agreed with the commercial companies, and submitted to the WMG for consideration. The outcome of this submission is described in the next sub-section.

4.3 Tees Valley Local Authority decisions on the initiative

(To be completed – still awaiting feedback from TVLA)

5. The business case

In the above sections, the legislative and social reasons for the use of food waste to give energy are outlined. Here the commercial context is highlighted as supporting data for commercial viability.

5.1 Waste disposal and gate fees in the UK

In order for any waste collection and treatment business to be commercially viable, the current business structure should be understood. In the waste sector, the key indicator is that of gate fees, that is, the amount of money to be paid for disposal of different waste types. WRAP report each year on the cost and methods of disposal for waste that are used by the local authorities in the UK. Although only a guide, the figures that WRAP have collected show some interesting trends.

Waste Gate Fee Comparisons from 2010 to 2011 (WRAP)				
(All figures in £/te)	2010		2011	
	Median	Range	Median	Range
Material Recovery Facilities	33	-5 to 42	15	-36 to 85
Incineration – Pre 2000	49	32 to 79	54	35 to 79
Incineration – Post 2000	92	78 to 109	73	54 to 97
Landfill – Gate Fee	22	11 to 44	20	12 to 55
Landfill – Gate Fee plus Landfill Tax	70	59 to 92	76	68 to 111
Anaerobic Digestion	57	50 to 90	43	36 to 64
WRAP = Waste and Resources Action Programme, agency to help the UK meet its national and international targets on waste				

Key points from this survey for the UK waste industry are:

- Most gate fees for waste received into the processing area have been falling between 2010 to 2011
- For material recovery centres, there are some companies now paying to take the waste, rather than charging a gate fee for taking this
- Anaerobic digestion fees are falling with time, with a median price of about £43/te

The trends reflect the identification by a number of businesses that waste can be recovered or recycled rather than simply being tipped to landfill or burnt for energy. While incineration offers a cost effective route for disposal, it also destroys a resource that can be otherwise recovered and re-used. This is in keeping with the principles of the “Hierarchy of Waste” that has been developed over time, and shown above. It should also be borne in mind that incineration will be disfavoured by the recognition that not only should waste be recycled wherever possible, but that carbon metrics (as in Scotland) may become one of the UK measures to help with the assessment of recycling performance. In discussions with two of the eight commercial companies originally interviewed, a price of £40/te was floated as an indicative gate price for a food waste scheme on Teesside. Both companies thought that at such a price, there was definitely a case to continue with potential plans for a food waste / AD project in the region, and could well form the basis for further discussion. In order to progress this further, some estimates for the potential of a food waste collection trial were drawn up.

5.2 Business model and commercial viability

The establishment of typical gate fees for waste disposal in the UK was essential in order to find a reference point for both local authorities and commercial AD companies to consider. In the event, separate discussions with the commercial AD companies confirmed that this level of fee was indeed an acceptable starting point on which to continue negotiations. This encouraging response demonstrated that the business models based on a gate fee of about £40/te were certainly viable. On this basis, further work was initiated to draft out potential pilot trial costs, in order to not only confirm commercial interest in using food waste for AD in the North East of England, but also to prepare the next action steps for presentation to the local authorities.

5.3 Estimated food waste collection costs and potential pilot work

While WRAP have published a lot of help and guidance about separate food waste collection in both general and specific guidance, there is a recognition that for any trial or continued service provision that each area of the UK will need to work out the cost of such services for themselves. Clearly, any collection of food waste will also reduce the amount of general waste from each household by the same amount. In many other areas of the UK, a pilot trial has been conducted in order to demonstrate the intent by local councils to proceed to a full scale service, to provide a low-cost way of gaining publicity for the intended move to a full service, and to gain detailed knowledge on the logistics and economics of the process. As a guide, some numbers have been drawn up to provide a first estimate of costs for a potential pilot trial within the Tees Valley region. These may be further refined as any potential plan is taken further towards implementation.

5.3.1 An initial estimate of the costs of waste collection

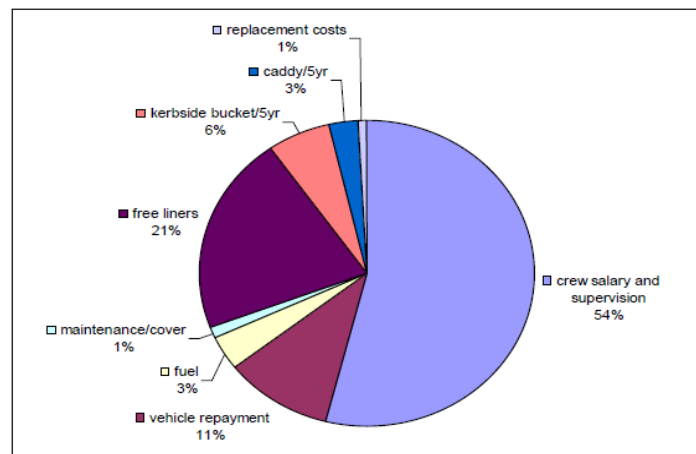
A first estimation of the costs of collecting food waste has been made, and details of this are included as Appendix 3. However, the key findings are as below. These figures are based on:

- Typical truck rental costs
- Simple minimum wage estimate
- Likely yield from 1,300 properties, and typical waste yields per household

An Initial Estimate of Food Waste Collection Costs			
Item	Per Week	Per Month	Per Year
Transport and labour	£1,045	£4,528	£54,340
Yield	8.5 – 12.85 te	34 – 51.4 te	442 – 668 te
Gate fee (£35 – 40/tonne)	£297 - £340 to £450 - £514	£1190 - £1360 to £1799 - £2056	£15,470 - £17,880 to £23,380 - £26,720
Gate fee (median)	£319 - £482	£1275 - £1928	£16,675 - £25,050
Total (using median)	£1,364 - £1,527	£5,803 - £6,456	£71,015 - £79,390

5.3.2 An initial estimate of the costs of a pilot food waste collection scheme

Although the above figures show some of the main costs for food waste collection, a pilot scheme would require more detailed scoping in order to be fully effective. Although final costings for such work are heavily dependent on local conditions, there is a checklist for the types of aspects that need to be considered. A summary graphic is included below.



Source: Bridgewater and Parfitt (2009)

For the purpose of this report, the following is assumed for illustration purposes

- Trial to last in one area for 6 months
- Above costings assumed as a reference point
- Double the draft costings to cover all of the items shown in the above graph

Indicative total trial cost = £6.4k x 6 x 2 = **£76,800**

5.3.3 Provision of food waste caddies

In addition to the collection services, households will need to be provided with kitchen caddies, biodegradable liners for these, and an outdoor food waste container. Indicative costs for these are as follows:

- Kitchen caddies £3-5
- Liners (roll of 100) £10
- Food waste container (23 litres) £12-15

Assuming a 20% discount for bulk purchasing, and a collection round of 1300 households, the cost of the supply of these items is:

Indicative food waste caddy / storage = £18 x 1300 = **£23,400**

5.3.4 Funding sources for a potential pilot food waste recycling scheme

While the above estimates are a good starting point, there will need to be a more detailed estimate for a full pilot trial should the Tees Valley Waste Management Group wish to proceed with this initiative. It is also unlikely that the potential commercial partners will be interested in spending such money if there is no longer term commitment by the TVLA to continue with food waste collections after any pilot trial.

However, it is understood that both Middlesbrough and Stockton Councils have also applied for financial aid through the DCLG's Weekly Collection Support Scheme, which has been reported to be available for weekly food or organic waste collections (letsrecycle.com, 2012). Although the results of this will not be known until the decisions are announced in October 2012, this may be a potential way for the Tees Valley Local Authorities to commence these pilot studies prior to a broader rollout of the resultant learning, prior to taking advantage of the logistical economies of scale.

5.4 Business model proposal summary

The business model essentially depends on the context of the intervention, and also on the viability of the current gate fee for waste. The factors of context consist of the drivers for mobilizing the "Hierarchy of Waste" approach, particularly through law as in Scotland. However, the establishment of both viability with current commercial companies in addition to a draft costing on pilot scale work, provide two essential elements of the proposal for the TVLA:

- Viable commercial propositions opposite current gate fees (no penalty to move to the more sustainable way of operating)
- The ability to make the change in a controlled way via a pilot programme (low cost / low risk trials to establish logistics)

6. Summary assessment

The intention of this section is to provide an assessment of some of the key aspects arising from the work that has been done within this part of the Enercoast project, and to conclude with recommendations for how to adopt this work more widely.

6.1 Drivers for change

Within the UK, the development of AD technology lags behind the rest of Europe. However, during the work catalysed by the Enercoast project, a number of key drivers were identified for the potential joining up of a food waste to AD energy chain in the North east of England. These include:

- European Directives on Waste: These directives (such as Directive 2008/98/EC) continue to stress the need to consider moving waste from simply a disposal problem, to the ability to value it within the context of the “Waste Hierarchy” approach
- UK Legislation: Scottish Legislation has already recognized the need to separate and valorize food waste for other purposes, particularly AD, and are moving towards the introduction of carbon metrics as a way of measuring and monitoring this
- Social pressures: the introduction of many food-waste-to-AD schemes within the UK has been facilitated and widely reported by WRAP, who have issued extensive pilot scheme reports on the practical detail of such supply chains
- Commercial opportunity: there has been extensive interest in encouraging the joining up of the supply chain described here, with two potential partners happy to support this work beyond an initial strategy of interest by the TVLA WMG. This continued interest at a gate fee of around £40/te shows the viability of the business models that both operate
- Technology: during the detailed discussions with the eight interested commercial companies, at least three different AD technologies were discussed as part of their business offerings. This range of technology showed that the AD field remains an innovative and competitive field

6.2 Risks

The key risks that were foreseen in the project were as follows

- The ability to engage with commercial companies: This was seen as the biggest potential problem, as suitable interest, plant facilities and flexibility were required to enable the project to progress. In the event, the commercial companies proved to be the most willing partners, demonstrating a clear message that the business model and potential viability of the project was likely to be correct.
- Engagement of the local council authorities: This was seen as a medium risk, as the ultimate business model for commercial viability was going to sit with the commercial partners. The local authorities would simply be buying in a service, and be able to greatly increase their recycling profiles in line with social preference and likely legislative drivers. In the event, the local authorities proved to be an uncertain potential customer, due to the need to trade off their own budgets and priorities with those imposed by central government austerity policies.

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- The state of development of AD in the UK: Although there was a clear recognition that the UK lags behind other European countries in the deployment of AD, nevertheless a broad spectrum of AD processing types were found to be on offer once more detailed interviews were conducted with each of the eight interested parties in Phase 3 of the original strategy. This is clearly an encouraging development in the UK, and should enable faster uptake over time.

6.3 Summary assessment of project intervention strategy

Overall, the strategy adopted for the intervention in this project was one of education and facilitation. This was due to the developmental nature of the deployment of AD technology for municipal waste treatment in the UK, and the need to ensure all aspects of the deployment could be brought together. These other aspects included the appreciation of the social and political landscapes, plus the commercial viability of the AD technology offerings. This awareness of the multifaceted nature for the deployment of AD in the UK was necessary in order to allow parties to see the social and economic benefits of the potential way of operating.

6.4 Recommendations for future interventions

The intervention that the Enercoast project has provided has allowed the definition and commercial viability of a food waste to energy supply chain to be defined. In spite of the current decision by local authorities to place this initiative “on hold”, there are some clear recommendations for any replication of the UK work into other regions of the North Sea Region. These include:

- **Knowledge of the logistics for the potential supply chain:** an appropriate survey of potential volumes and sources of feedstock for any commercial initiative should be planned out to ensure sufficient material for year-round processing.
- **Using the potential for doing pilot scale work:** this way of operating offers the potential to reducing risk and ensuring logistical feasibility via a low cost study method.
- **Understanding of the external drivers for change:** in each country around the North Sea Region, social, policy and legislative changes should be used as the background context for any engagement with potential partners to ensure both existing and future incentives are recognized.
- **Understanding the commercial context of the initiative:** within the UK, gate fees are a good indication of both levels and movements in the financial models operated by waste companies. This forms a basis to allow potential partners to have a meaningful discussion on contractual arrangements as appropriate.
- **Engagement with existing commercial interests in the area:** by engaging with current commercial interests, the opportunity to join up both suppliers and users of any service can be developed jointly over time.

7. References

- Bridgewater, E. and Parfitt, J. (2009) "Evaluation of the WRAP separate food waste collection trials", Resource Futures Ltd report on behalf of WRAP, available from: [http://www.wrap.org.uk/sites/files/wrap/Evaluation of the WRAP FW Collection Trials Update June 2009.pdf](http://www.wrap.org.uk/sites/files/wrap/Evaluation_of_the_WRAP_FW_Collection_Trials_Update_June_2009.pdf)
- DEFRA (2007) "Waste strategy for England 2007", available from: <http://archive.defra.gov.uk/environment/waste/strategy/strategy07/documents/waste07-strategy.pdf>
- DEFRA (2012) "Progress with delivery of commitments from the Government's Review of Waste Policy in England", available from: <http://www.defra.gov.uk/publications/files/pb13738-waste-review-progress.pdf>
- DEFRA (2012) "Controls on animal by products", available from <http://www.defra.gov.uk/food-farm/byproducts/>
- European Parliament (2008) " Directive 2008/98/EC of the European Parliament and council of 19 November 2008 on waste and repealing certain other Directives", available from: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:312:0003:0030:en:PDF>
- Hogg, D., Gibbs, A., Favoino, E and Ricci, M. (2007) "Managing biowastes from households in the UK: Applying life-cycle thinking in the framework of cost-benefit analysis" Eunomia report on behalf of WRAP, available from: http://www.wrap.org.uk/sites/files/wrap/Biowaste_CBA_Report_Appendices_May_2007.4.pdf
- Holden, B. and Starberg, K. (2010) "Anaerobic digestion feasibility study for Hartlepool, Middlesbrough and Stockton local authority areas", WSP report on behalf of Centre for Process Innovation.
- Letsrecycle.com (2012) "Food waste to qualify for Pickles' £250m fund", available from: <http://www.letsrecycle.com/news/latest-news/councils/food-waste-to-qualify-for-pickles2019-ps250m-weekly-fund>
- Parfitt, J. (2002) "Analysis of household waste composition and factors driving waste increases", WRAP.
- Scottish Statutory Instruments No. 148 (2012) "The Waste (Scotland) Regulations 2012", available from: <http://www.legislation.gov.uk/sdsi/2012/9780111016657/contents>
- WRAP, (2010, 2011) "Comparing the cost of alternative waste treatment options: Gate fees report", available from: <http://www.wrap.org.uk/sites/files/wrap/Gate%20Fees%20Report%202011.pdf>
- WRAP, (2012) "Food waste hierarchy", available from: <http://www.wrap.org.uk/content/energy-recovery-maximising-value-waste-materials>

Appendix 1: Some features of recent Scottish waste legislation

Scotland Legislation
The Legislation New regulations in Scotland, The Waste (Scotland) Regulations 2012, have just been passed by the Scottish Government (May)
Business Recycling/ Food Waste Recycling This will require all businesses in Scotland to separate card, paper, tins, glass and plastics for recycling by 2014. Businesses that produce more than 50kg of food waste per week will also need to separate this by Jan 2014 (less than 2 years) and businesses producing between 5kg and 50kg of food waste per week will be asked to follow suit from 2016
Household Food Waste Subject to a number of exceptions, local authorities will have the duty to provide receptacles to householders for food waste collection from 1 January 2016 – less than 4 years away.
Waste Disposal Units Use of food and food waste digesters which involve treated non-domestic food waste being discharged into public sewers will be banned from 1 January 2016. The purpose of this requirement is to ensure that food waste is treated higher in the waste hierarchy in anaerobic digestion facilities.
Landfill & EFW Bans Scotland will also seek to ban food waste from landfill (2021) <u>and</u> from 2014 ensure that no segregated waste is mixed with other wastes where this would hamper further recycling also ensure no separately collected waste capable of being recycled is incinerated.
Carbon Metric New way of measuring waste recycling performance. This will move the emphasis away for tonnage based measurement of performance to one which links the recycling of materials to GHG emissions, with a weighting for each material.

Appendix 2: Tees Valley recycling performance summary

Tees Valley Local Authority Recycling Performance Summary (DEFRA)					
Item	Darlington	Stockton	Middlesbrough	Hartlepool	Redcar
Population	100,800	192,400	142,400	91,300	137,400
Households	43,000	82,630	60,510	42,070	61,990
Total MSW Arisings (tonnes)	70,635	101,159	79,086	51,476	73,760
Waste Collection Regime	Weekly residual	Weekly residual	Weekly residual	Fortnightly residual	Fortnightly residual
Recycling Rate 2010/11	42%	30%	23%	41%	41%
Top Ten Local Authority Recycling Rates	58% – 65%				
Recycling Target 2020	50%				
Current Gap	8%	20%	17%	9%	9%
Potential Food Waste Arisings for Capture (tes)	7501	10,743	8399	5467	7833
Additional Recycling % From Food Waste	+ 16%	+15%	+21%	+8%	+11%
Total Potential Recycling Rate %	58	45	43	49	52

Appendix 3: Food waste collection cost estimates

A3.1 Collection / operational costs

Emerging from best practice via the various WRAP trials and current food waste collection regimes is the deployment of 7.5 tonne enclosed, non-compaction vehicles with plastic coated interiors (body) to accommodate a dry/wet mix of food waste arisings.

Riverside Truck Rental report that an average weekly hire rate is about £350/week excluding fuel, labour and insurance for this type of vehicle (Isuzu chassis) which are being used by local authorities for food waste collections and trials.

Minimum Weekly Wage	= £224.96 per employee/week, 2 employees per vehicle = c.£450
Fuel Costs	= est.£150/week per vehicle
Cost per week	= £950 excl. fleet overheads (insurance etc)
Estimated overhead of 10%.	
Total estimated cost per week	= £1045

Totals:

- About £1045/week per vehicle round, or
- £4528/month per vehicle round or
- £54,340/year per vehicle round

A3.2 Likely yields (based on WRAP research)

WRAP report that a typical round size would be c. 1300 properties per day = c.6800 per week. This would yield a range of arisings based on their trials of between 1.25 – 1.89 kg / household / week. This would mean an estimated yield in the range of 8.5 – 12.85 tonnes/week.

Monthly yield: 34 – 51.4 tonnes. Annual yield: 442 – 668 tonnes

Note: A trial may be smaller in size than that quoted above.

A3.3 Costs Summary

Summary of Initial Estimates of Costs for Food Waste Collection			
Item	Per Week	Per Month	Per Year
Transport / Labour	£1,045	£4,528	£54,340
Yield	8.5 – 12.85 tonnes	34 – 51.4 tonnes	442 – 668 tonnes
Gate fee (£35 – 40/tonne)	£297 - £340 To £450 - £514	£1190 - £1360 To £1799 - £2056	£15,470 - £17,880 To £23,380 - £26,720
Gate fee Median	£319 - £482	£1275 - £1928	£16,675 - £25,050
Total (using median)	£1,364 - £1,527	£5,803 - £6,456	£71,015 - £79,390



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