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# Green Lane Eco Park: Summary Heat Demand Study

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## 1. Introduction

Sky Properties Ltd instructed Entec UK Ltd to review heat demand in the vicinity of the proposed development of the Green Lane Eco Park which will comprise energy generating gasification and anaerobic digestion technologies. Flammable gasses produced through the treatment of waste will be used to raise steam to power a turbine and generate electricity. However, there will be a significant quantity of surplus heat available and the potential use of this heat for space and process heating, hot water and even cooling is beneficial environmentally, increasing the efficiency of the plant and displacing fossil fuel use at third party sites.

As well as the environmental benefits, the export of residual heat can in some cases offer significant economic advantages to both the supplier (in the form of heat sales and potential reduction in gate fee), and the customer (in the form of reduced energy costs and security of supply). This report presents the results of a study to determine the potential demand for heat in the area.

## 2. Report Objectives

The report considers the heat demand potential in the vicinity of the site by identifying the most promising sites for heat supply. It identifies potential heat customers, quantifies the demand and presents a simple economic appraisal in order to determine the most promising sites for further investigation.

In order to achieve this, a review of large heat users was carried out by reviewing maps of the area and carbon emissions databases to determine large energy users. A visit was then made to the site to review the potential, verifying the findings of the desk based exercise (detailed survey area covered a radius of approximately 3 km).

After surveying the area, heat demand estimates have been made for promising sites and a simple assessment of the economic viability has been performed, based on generic assumptions regarding infrastructure requirements. Following this an estimate of the heat available from the treatment plant was made, and the impact of exporting heat on plant performance and energy revenues assessed.

## 3. Analysis

### 3.1 Identification of Potential Sites - Existing

Possible sites were identified firstly by a desktop review using carbon databases and a review of maps and aerial photographs in order to develop a list of sites for further investigation. Sources of information reviewed included the Industrial Heat Map website (administered by BERR

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[Business, Enterprise and Regulatory Reform] and DECC [Department of Energy & Climate Change]), the EU Emissions Trading Scheme, and Climate Change Agreements database.

Following the desktop study a survey of the area was conducted by means of a drive around the locality to consolidate information from the desktop study, identify additional sites and to consider potential routes for pipework and any obstacles and barriers. The main criteria used to decide whether sites were of interest included:

- Type of building and estimated heat demand;
- Proximity to the site and ease of installing pipelines; and
- Location relative to other potential heat customers (as a cluster of smaller customers can offer more potential than individual sites).

The final point is important since a small site in isolation may be uneconomic to supply heat to, but if there are a number of sites located close to each other the pipe lengths required will reduce and a scheme may become more economically viable.

The large heat users identified from this task within a 10 km radius of the site are provided in Appendix A. Some these sites were judged to offer potential.

### **3.2 Identification of Potential Sites - Proposed**

The study has looked at potential planned developments within a radius of 10 km of the Green Lane site. Firstly a review of local planning policy provided an indication of where development suitable for the provision of heat from the gasification/anaerobic digestion plant is allocated; and secondly, discussions were held with a Local Planning Officer to give a more specific indication of current or forthcoming development within the vicinity of the site.

Proposed developments in Trafford were also considered, however it is thought unlikely that these will provide a realistic opportunity.

#### **3.2.1 Regional Planning Policy**

The site is located within the City of Salford, a metropolitan borough of Greater Manchester. As Salford is located within the North West region, the North West of England Plan provides the Regional Spatial Strategy (RSS). The RSS was adopted in September 2008 and provides a framework for development and investment in the region over the next fifteen to twenty years. Policy W3 (Supply of Employment Land) of the Plan provides for the provision of employment land throughout respective sub-regions. Policy W3 sets out a need for 1904 hectares of employment land in the period 2005-2021 within Greater Manchester. Furthermore Table 7.1 of the RSS indicates that Salford itself is allocated to provide an annual average rate of housing provision (net of clearance replacement) of 1600 houses, at least 90% of which is to use brownfield land/buildings. It is therefore clear that significant development in general is planned for the area surrounding the proposed site.

#### **3.2.2 Current Local Planning Policy in Salford**

The City of Salford Unitary Development Plan (UDP) 2004-2016 was adopted in June 2006. Whilst a number of policies contained within the UDP expired in June 2009, those that remain are saved until they are replaced by the incoming Salford Local Development Framework (LDF) (see below).

A summary of policies relevant to the site contained within the UDP are as follows:

**Policies E4** (Sites for Employment Development) and **H9** (Sites for New Housing) allocate land for employment use and new housing over the plan period. Sites allocated here have policy backing and therefore proposals are expected to come forward on these sites over the plan period. Furthermore Policy **MX1** (Development in Mixed-use Areas) allocates a number of locations for development as vibrant mixed-use areas with a broad range of uses and activities. Finally Policy **S1** (Retail and Leisure Development Within Town and Neighbourhood Centres) sets out that planning permission will be granted for retail and leisure development within certain designated town centres and neighbourhood centres. Within such existing settlements there may be potential for infill development.

### 3.2.3 Forthcoming Local Planning Policy in Salford

However the Salford UDP is set to be replaced by a number of documents making up the Salford LDF. The Core Strategy will be one of a number of documents within this package. This Strategy, scheduled for adoption in September 2011, will provide the central Development Plan Document (DPD) within this Framework. This provides a strategic level document that will provide the spatial planning vision and strategy to shape the future of Salford. At present a draft Core Strategy is out for public consultation. Whilst not yet adopted, the draft Strategy does provide an indication of potential forthcoming allocations and policy with respect to the concerned site.

Draft **Policy E1** (New Employment Development) provides an indication of where new employment development is planned for in Salford. Table 1 indicates the following scale of development in Salford over the period 2007-2027:

**Table 1 Policy E1 - Employment Allocations as in Draft Core Strategy**

Type of Development	Floorspace Provision 2007-2027 (square metres)
Offices (Use class B1a/b)	650 000
Industry (Use class B1c/B2)	210 000
Warehousing (use class B8) (excludes the proposed inter-modal freight terminal at Barton)	250 000

Policy E1 outlines two proposed site allocations of interest. The first is referred to as a 'Regionally significant site', approximately 3.5 km southeast of Green Lane Eco Park. This is an area located on the Salford Quays termed 'MediaCityUK'. This site encapsulates the Salford Quays site allocated as MX1/3 in the saved UDP and extensions to the north and west. Furthermore the proposed area expands across the Manchester Ship Canal into the neighbouring borough of Trafford.

Second, a 40 hectare 'Sub-regionally Significant Site' is proposed to the west of City Airport Manchester, approximately 2.5 km southwest of the site. Policy E1 indicates that this site is scheduled to come forward from 2015 and that the site is to be used primarily for industry and warehousing.

Table 2 provides greater detail on the information provided within Policy E1 as to when and in what form the sites are likely to come forward.

**Table 2 Policy E1 - Regionally/Sub-regionally Significant Sites**

What and Where	When	How	Proximity to Site (approx)
<p><b>Regionally Significant Site - MediaCityUK</b></p> <p>Develop one of a handful of 'media cities' in the world, known as MediaCityUK, providing an internationally important employment area. This will cover approximately 200 hectares of land, focused on Salford Quays and extending westwards and northwards within the former Enterprise Zone south of Eccles New Road, and across the Manchester Ship Canal to Trafford Wharfside in the neighbouring borough of Trafford. The range and quality of premises available to media-related industries will be enhanced across the area. The broader office role of Salford Quays will also be expanded, providing an additional 170 000 square metres of office floorspace. All development proposals within the area should support the success of MediaCityUK.</p> <p>The Central Salford Urban Regeneration Company (URC) has been established to help guide this process. Furthermore Salford Quays &amp; Trafford Wharfside Planning Guidance provides an indication of the development expected on this site.</p>	2007-2027	<p>MediaCityUK is being delivered through a partnership of Salford City Council, Central Salford URC, the NWDA, the BBC and Peel Media. Development at Quays Point in the heart of MediaCityUK has already commenced, with the BBC due to move in 2010. The partnership will work with other landowners and media organisations to ensure a high concentration of media-related activity. A mix of public and private sector investment will be used to improve premises outside Quays Point.</p>	3.5 km Southeast
<p><b>Sub-regionally Significant Site - Land West of City Airport Manchester</b></p> <p>Develop 40 hectares of Green Belt land to the west of City Airport Manchester for employment purposes (primarily industry and warehousing). Ensure that this is located so as to:</p> <ul style="list-style-type: none"> <li>• Minimise the loss of Grade 1 agricultural land and existing arable uses;</li> <li>• Minimise the fragmentation of agricultural landholdings, with any active agricultural uses relocated onto appropriate land elsewhere within Chat Moss;</li> <li>• Retain the ability to provide a road link between the A57 and M62; and</li> <li>• Minimise the impact on the function and openness of the remaining Green Belt.</li> </ul>	2015-2027	<p>Work with landowners to define the precise boundary of the site in the Allocations Development Plan Document. It is envisaged that the site would be reliant on infrastructure to be provided as part of the inter-modal freight interchange, and therefore would be phased after that scheme has been delivered.</p>	2.5 km Southwest

The Core Strategy at this stage does not provide specific sites for housing allocations. However Policy H1 (Scale and Distribution of Housing Development) does aim to deliver a net increase of 33 750 dwellings in Salford over the period 2007-2027. Distribution figures based on a

Strategic Housing Land Availability Assessment (SHLAA) are provided as to where these homes are planned. Eccles is to provide 1,600 homes and Eccles New Road is to provide 650 homes. This suggests there will be significant housing development around the site throughout the plan period. These are to be provided somewhere within the zones set out in Figure 8.1 of the Strategy.

### 3.2.4 Discussions with Salford City Council Planning Authority

Discussions with a Planning Officer at Salford City Council provided further detail as to prospective developments within the area that may be of interest. Table 3 provides a summary of these discussions.

**Table 3 Potential Development Following Discussions with Salford CC Planning Officer**

Area	Broad Location	Prospective Development
MediaCity UK	Approximately 3.5 km South east of site	This site is allocated as a 'regionally significant site' in Policy E1 of the Salford UDP.  As noted the 'Salford Quays & Trafford Wharfside Planning Guidance' provides greater detail on what the development will contain.  Further detail available at <a href="http://www.mediacityuk.co.uk/">http://www.mediacityuk.co.uk/</a>
City of Salford Stadium, North of Ship Canal	Large site North of Manchester Ship Canal and South of Liverpool Road.  Approximately 3.5 km Southwest of site	Outline planning application (reference number 09/58253/OUT) for the erection of 20 000 seat sports stadium with associated integrated facilities including a 208 bedroom hotel, gym, exhibition space (6340 m <sup>2</sup> ), bars (Class A4), restaurants (Class A3), takeaways (Class A5), museum, offices, media/crèche rooms, gym and free standing 21 367 m <sup>2</sup> non-food bulk retail development. This application is as yet undetermined.
Redevelopment of Hope Hospital	Approximately 2 km East of site	Planning Officer mentioned phased redevelopment of Hospital is planned. This is a strategic hospital for the North West and thus redevelopment has potential to be substantial.

### 3.3 Demand Estimates

An estimate of the heat demand of each site has been derived using as much information that could be gathered as possible about the site operations and using benchmark energy consumption data. No sites were contacted as part of this study.

Benchmark energy consumption data is published by the Chartered Institute of Building Services Engineers (CIBSE)<sup>1</sup>. This data is available for numerous building types, and typically provided as energy (heat and electricity) consumption per year per unit floor area. Hence if the floor area is known a reasonable estimate of the annual demand can be made.

<sup>1</sup> CIBSE Guide F, Energy Efficiency in Buildings, 2004.

### 3.4 Viability Appraisal

Using the demand estimates, potential CO<sub>2</sub> savings and simple payback periods can be calculated. This is a high level estimate based on the time required to payback the capital cost of installing steam or hot water pipework. This is a useful way of considering potential customers for heat, based on the likely economic viability, and hence determining which sites are worth further investigation. Note that this is not intended to be a detailed analysis and contact with identified sites will always be necessary in order to fully understand the potential. For example in many cases commercial and contractual issues will be key, and even sites that appear very promising may not be viable in practice because the site is unwilling to enter into a long-term heat supply contract.

The simple economic appraisal assumes an installed cost of £1000 per metre for pipework (no auxiliary equipment is included), a long term heat sale price of £20 per MWh and assumes the annual demand remains constant.

**The assumption made in this study is that the operator of the plant pays for the necessary connecting pipework and recoups this investment via heat sales. Other arrangements are possible though; in some cases the customer or other third party may pay for some or all the necessary infrastructure.**

## 4. Potential Sites

### 4.1 Identified Opportunities

A description of the most promising sites is provided in this section, grouped by the areas in which they are located.

#### Naysmyth Business Park

Naysmyth Business Park is a small estate which borders the southern and eastern boundaries of the site. It consists primarily of warehouses and light manufacturing sites, including UPS, Walkden Warehousing, Manuli Hydraulics and Walkwell Flooring to name the largest. The estimated heat demand and location adjacent to the site means the possibility of providing heat to these units appears promising, although existing warehouse buildings are not always suitable for retrofitting district heating (particularly where radiant heaters are used). Hence the key issue will be the existing heating systems and whether it is feasible to supply heat from the gasification plant.

A good example of this type of arrangement is Slough Trading Estate, Berkshire, where a biomass power plant (Slough Heat and Power) supplies both power and heat to all businesses on the estate, with heat available to tenants, either in the form of hot water or steam<sup>2</sup>.

- Estimated Demand Naysmyth Business Park - 5700 MWh per year.

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<sup>2</sup> see the following link for further information on this scheme:  
<http://www.sloughheatandpower.co.uk/energycentreintro.htm>

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### **Lynwell Trading Estate**

This industrial estate is located to the east of the site and the largest tenants are Sambro (toys) and Ritrama (labeling). There may be opportunities to supply heat to this estate, although the nature of the businesses (primarily distribution and light manufacturing) may not be ideal for the retrofit of district heating. Again, the best opportunity may be provided by any future redevelopment or expansion of this estate, though none is known to be planned at present.

- Estimated Demand Lynwell Trading Estate - 5800 MWh per year.

### **Other Sites in the Immediate Vicinity**

The Business and Technology Centre on the opposite side of Green Lane, to the south west of the Eco Park, appears inherently unsuitable for heat supply unless the site is redeveloped. The existing buildings are old and in a state of disrepair, and in any case the heat demand is predicted to be insufficient at present to justify a heat supply from the plant.

There is a small industrial area on the opposite side of the Bridgewater canal to the west of the site on Weymouth Road, consisting of small businesses including ACE Scaffolding, APR Windows and Creamline Dairy. This estate also appears unsuitable for a heat supply due to the small demand and the type of buildings on the site (most of the buildings are small and unlikely to require much heating).

To the south of this estate is a large warehouse formerly occupied by Shop Direct. The site, on Worsley Road, closed in 2006 and the building is currently being demolished. Should the site be redeveloped for similar usage then there may be good potential to supply heat, as the predicted heat demand is sufficient to suggest a hot water connection may be viable, assuming a similar size and type of building is developed (i.e. a 30 000 m<sup>2</sup> warehouse). Alternative types of development on this site such as housing or manufacturing processes could also offer significant potential. A pipe crossing of the canal appears the main obstacle, though a simple pipe bridge may be suitable at this location.

- Estimated Demand for Worsley Road site - in the region of 5400 MWh/year (from redevelopment of Shop Direct site).

### **Salford Royal Hospital (formally Hope Hospital)**

This large, 840 bed hospital is located approximately 2 km from the site, and is estimated to have a heat demand in the region of 22 000 MWh per year. It may be possible to supply hot water from the plant to meet all or part of this demand, and initial estimates suggest this could be a viable option worth considering further. Based on information in the Industrial Heat Map it does not appear that the hospital has an existing CHP unit, and Entec is aware there is redevelopment planned; hence the hospital may be interested in alternative sources of heat should this be economically attractive. Hospitals generally have relatively flat heat demand profiles (i.e. a high load factor), requiring heat throughout the day which is beneficial as it helps minimise fluctuations in demand.

- Estimated Demand Salford Royal Hospital - 21 600 MWh per year.

### **Akros Chemicals**

This site on the north bank of the Manchester Ship Canal is the headquarters of Akros in the UK. The plant produces additives for the plastics industry, and is identified on the Industrial Heat Map. It is estimated that the annual heat demand is similar to that of Salford Royal

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Hospital, but the type of process and the demand profile may be very different. A supply of hot water to this site may be viable as initial estimates of payback appear reasonably good. However a steam supply is very unlikely to be viable given the required pipeline route through a heavily built up area.

Hence the viability will depend on the whether the site would be willing or able to accept a hot water supply from the gasification plant; if steam is required there may be little opportunity.

- Estimated Demand Akcros Chemicals - 20 000 MWh per year.

### **Eccles Town Centre**

A number of sites in the town centre may offer potential, particularly the large office blocks near Albert Street, the shopping centre and high rise residential blocks to the east of Church Street. However, in order to be viable a scheme supplying a number of sites would be necessary as individually the costs of infrastructure are expected to be too high to justify a connection to a single site. Realistically, this may only be viable with additional support and funding (perhaps a scheme established by the Council for example), but this may be worth pursuing further.

- Estimated Demand Eccles Town Centre - Not quantified.

### **Trafford Park**

Trafford Park contains a number of industrial sites that require large quantities of heat which may be supplied from the gasification plant, including Cargill (sweetener manufacturing plant) and Proctor and Gamble on the south bank of the canal, within 2 km of the site. However supplying heat to this area requires a pipeline crossing of the Manchester Ship Canal. This presents a very significant barrier since all existing bridges are of swing type and inherently unsuitable to attach pipelines to. Crossing the canal via a dedicated pipe bridge may not be possible, and even if feasible it may be prohibitively expensive, given the quantity of heat expected to be transferred. The best option may be to consider using an existing service or utilities tunnel that crosses the canal but at this stage the potential to do so is unknown.

Other major heat users in the region include The Trafford Centre, a very large shopping complex approximately 2 km from the site which may be well suited to a hot water supply. However again this depends on whether it is at all viable to cross the canal.

- Estimated Demand Trafford Park - Not quantified.

### **Other Residential Sites**

The housing density in the vicinity of the site, and in Eccles in general, is relatively high with a large proportion of terraced housing and flats. Given the high density there may be an opportunity to develop a hot water based heating network supplying housing.

There are also several schools in the vicinity; a dedicated connection to these does not appear viable as the heat demand is expected to be relatively low but they may be suitable for connection as part of a wider residential network.

- Estimated Demand Adjacent Residential Properties - Not quantified.

## 4.2 Summary

There is potential heat demand within the immediate vicinity of the site. Opportunities presented by redevelopment in the Green Lane area, particularly on Naysmyth Business Park where there may be potential to develop the area adjacent to the site as a 'green' business area, with heat for new buildings supplied by the gasification plant. Further opportunities may be presented by the redevelopment of the former Shop Direct site on Worsley Road, and any future refurbishment of the Business and Technology Centre opposite the site.

The two main existing large sites of interest are Salford Royal Hospital and the Akcros Chemicals plant, as both may offer potential for a supply of hot water. The hospital is thought to be the most promising of these at present.

There are many other large heat users nearby, particularly on Trafford Park, but it may be very challenging to supply heat in this direction given the difficulties of crossing the Manchester Ship Canal.

A summary of some of the promising sites is provided in Table 4. The simple payback periods calculated are based on the time required to payback the cost of pipework, which it is assumed the operator bears. This does not take into account the cost of any auxiliary equipment, nor does it allow for the benefits of possible capital grants or other support mechanisms (such as the proposed Renewable Heat Incentive and potential carbon emission reduction benefits).

**Table 4 Potential Sites for Heat Export**

Site	Estimated Heat Demand (MWh/year)	CO <sub>2</sub> Savings (tonnes/year, based on displacing gas) <sup>3</sup>	Approximate Distance from Site (km)	Estimated Income from Heat Sales (£)	Simple Payback Period (years) <sup>4</sup>
Existing Sites					
Naysmyth Business Park	2 703	500	0.5	£54 000	9.2
Lynwell Trading Estate	5 786	1 070	0.9	£116 000	7.8
Salford Royal Hospital	21 622	4 000	2.3	£432 000	5.3
Akcros Chemicals	19 920	3 685	2.2	£399 000	5.5
Potential Sites					
Naysmyth Business Park - Extension	2 952	546	0.2	£59 000	3.4
Worsley Road Industrial Site	5 412	1 001	0.3	£108 000	2.8

<sup>3</sup> Heat from EfW plant assumed to displace natural gas, and a carbon factor for natural gas of 0.185 tonnes CO<sub>2</sub> per MWh (Defra 2009 figures).

<sup>4</sup> Assuming £1,000 per metre for hot water pipeline only (does not include ancillary equipment) and heat sale price of £20 per MWh.

## 5. Energy Production Potential

### 5.1 Introduction

This section looks at the potential energy output of a typical waste gasification plant using Entec's in-house model, in terms of both electricity and heat. We have used the results of the heat demand study to estimate the impact of supplying this demand on the energy balance of the plant, including how the provision of heat impacts the electricity production, and the consequential impact on revenues from energy sales and additional support mechanisms (ROCs [renewable obligations certificates], LECs [levy exemption certificates] and potential feed-in tariffs and Renewable Heat Incentive).

A brief discussion of potential financial revenues that could be gained, and how CHP can impact upon these revenue streams, is also included. An attempt to quantify these potential revenues is set out following the assessment of heat demand potential.

### 5.2 Potential Energy Output of the Plant

To quantify the potential heat and electricity available, a nominal 80 000 tpa gasification plant combusting residual waste has been modelled. The net Calorific Value (CV) of the waste is assumed to be 10 MJ/kg. However it is acknowledged that this figure could vary significantly with the composition of the waste and the type of pre-treatment technology.

For the modelling it has been assumed that the gasification plant contains a standard furnace/boiler unit, producing high pressure steam which is fed into the high-pressure end of a turbine. Low pressure steam would then be 'bled' off the turbine as required, and either distributed to third party users directly or alternatively used to produce hot water for feeding into a district heating network. It is also possible to use steam or hot water to power an absorption chiller, which produces cold water which can, for example, be used in air conditioning systems.

Extracting steam in this way means that there is less steam available to expand through the turbine, and therefore less electrical output. The Entec model also considers the reduction in steam available for electricity generation, and the estimated electrical output has been noted for each scenario modelled.

A number of heat offtake scenarios were modelled, assuming different levels of steam extraction. It was assumed that steam is extracted at low pressure (2 bar) suitable for producing hot water by heat transfer for a district heating network, though higher pressure steam could be extracted for industrial process requirements. The results of this analysis are set out in Table 5. The table also shows the variation in electrical output for each scenario; this falls somewhat as higher levels of steam are extracted from the turbine for heating rather than being used only for electrical power production.

The overall conversion efficiency of the waste's chemical energy to energy in a useful form is presented in the right-hand column of the table, which clearly demonstrates the benefits of CHP when compared with electricity only production.

**Table 5 Modelling Steam and Electricity Outputs from a 80 000 tpa Gasification Plant (2 Bar Steam Offtake)**

Scenario	Annual Heating Potential (MWh per annum)	Heating Steam Flow (TPH)	Heating Steam Thermal Power (MWth)	EfW Net Electricity Exported (MWe)	Overall EfW Thermal Efficiency Net CV Basis (%)
1 No steam export - electricity only	0	0	0	6.6	23% <sup>5</sup>
2 Steam exported at 2bar (10 000MWh)	10 000	1.9	1.3	6.4	27%
3 Steam exported at 2bar (25 000MWh)	25 000	4.7	3.2	6.1	33%
4 Steam exported at 2bar (50 000MWh)	50 000	9.5	6.4	5.7	43%
5 Steam exported at 2bar (50 000MWh)	75 000	14.2	9.5	5.2	52%
6 Steam exported at 2bar (100 000MWh)	100 000	18.9	12.7	4.8	62%

### 5.3 Additional Revenue Streams and Good Quality CHP

The biodegradable proportion of waste is considered to be a renewable resource. Typically this makes up around 50% of the feedstock input. Hence the equivalent proportion of electricity and heat produced by the plant is considered to be renewable energy. There are several financial support mechanisms that exist to support renewable and low carbon energy projects. Applicable to EfW plants are Renewable Obligation Certificates (ROCs), when in CHP mode and Climate Change Levy Exemption Certificates (LECs) in both electricity only and CHP mode. The introduction of the Renewable Heat Incentive (RHI) in 2011 may potentially provide an additional or alternative revenue stream, but the value of this and any qualifying criteria are not yet known.

In the case of ROCs, the most significant potential additional revenue at present, waste gasification plants are eligible for either 1 or 2 ROCs per MWh of electricity, depending on whether they classified as 'standard' or 'advanced' gasification, which depends on the quality of the syngas produced. The Energos technology has been certified as satisfying at least 'standard' gasification, with the expectation of meeting the criteria of 'advanced' gasification though this is yet to be confirmed. **ROCs will be awarded regardless of whether the plant is electricity only or CHP, hence there is no financial support for the export of heat other than direct income from heat sales.**

<sup>5</sup> This is based on assumptions for a typical gasification plant at this scale to illustrate the impact of heat supply; it is not an accurately represent the Energos process specifically.

Conventional incineration-based EfW plants must operate as CHP and achieve a satisfactory energy efficiency performance rating through the CHP Quality Assurance scheme to qualify for ROCs; this does not apply to gasification plants.

In addition to ROCs revenue, LECs, are a small benefit also attributable to the electricity generated from EfW plants (only the proportion of the waste deemed biodegradable) *whether or not they have CHP*. This is a further small benefit that could be gained by the generator, currently valued at £4.56 per MWh of the renewable or eligible component of the electricity (deemed as 50%).

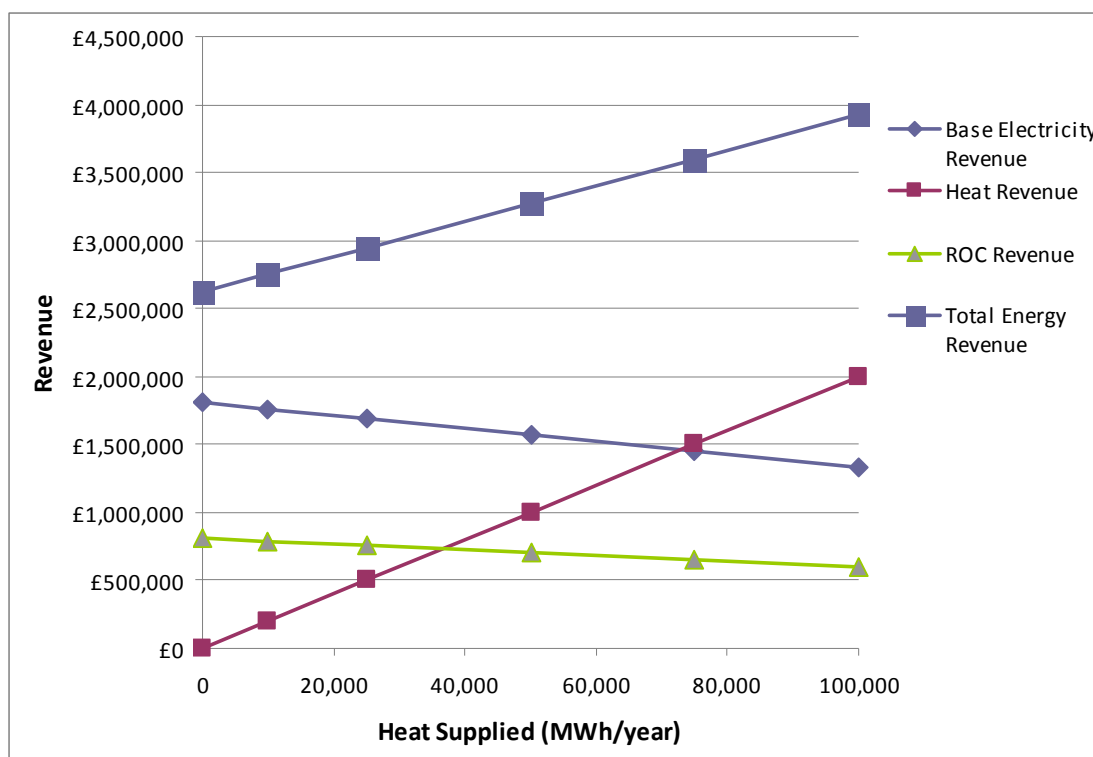
ROCs and LECs are now both available through electricity sales to the grid or to private wires networks (i.e. direct connection to a site avoiding the use of the grid).

#### **5.4 Financial Impacts**

Exporting heat can provide a significant revenue stream in addition to the environmental benefits associated with CO<sub>2</sub> emission reductions. Plate 1 shows how the estimated revenues using a typical 80 000 tpa gasification CHP plant vary with increasing levels of 2 bar steam offtake, based on generic assumptions regarding energy sale price and including ROCs. The assumptions made are as follows:

- Base electricity price (exported to the grid) of £35/MWh;
- ROC value of £45/MWh and assumes the plant is eligible for 1 ROCs per MWh ('standard gasification' band);
- Heat sale price of £20/MWh (for hot water supply); and
- Biodegradable percentage of MSW assumed to be 35% for ROCs eligibility (to be the case from 2018, represents a worst case).

**Plate 1 Impact of Heat Export on Revenues**



The figure demonstrates that exporting heat can result in significant additional revenues; for example supplying approximately 50 000 MWh per year of heat could yield additional revenues in the region of £0.7M per annum compared to electricity-only operation. However this is very much dependent on the heat sale price, which could be significantly higher or lower than modelled depending on factors such as the type of customers supplied and the prevailing gas price. It is also important to note that the capital costs associated with heat supply infrastructure are high, as discussed below.

It is worth noting that the financial benefits of supplying heat are less than for conventional incineration, where ROCs are only available if heat is exported.

## 6. Heat Supply Infrastructure and Commercial Arrangements

### 6.1 Steam Supply

The large industrial sites identified may require heat to be delivered in the form of steam, either for compatibility with existing heating systems or because process requirements demand steam rather than hot water.

As steam pipelines are subject to significant expansion, it is expensive and technically challenging to bury them for long distances as regular expansion loops are necessary. The plant is in an unfavourable position to deliver steam beyond the immediate vicinity as there will be significant barriers to the routing of steam pipelines given the built-up residential nature of the

surrounding area. However, it is anticipated that supplying steam will be feasible if a new plant with significant steam demand is developed within no more than 1 km of the site.

Costs of steam pipeline installation can vary considerably and are often influenced by local environmental factors, but a budget figure of between £1000 and £2000 per metre installed is typical.

## 6.2 Hot Water Supply

There is potential to supply hot water to various sites, including the development of district heating schemes in areas such as Eccles town centre. The costs of such schemes are significant however, and establishing satisfactory heat supply contracts is often a complex process. These issues are briefly considered within this section.

The capital cost associated with installation of heating pipework and associated equipment is high, though modern pre-insulated pipes have been demonstrated to be efficient and reliable, with low heat losses and low maintenance requirements. They need little maintenance and typically have an operational life of at least 50 years. Heat loss can become an issue over long distances, but is generally not of major concern when the heat is a waste by-product as is the case when exported from an EfW plant.

Pipework economics are dominated by civil engineering works and installation costs, and can vary widely (typically between £500 and £1500 per metre installed). The costs of retrofitting district heating within an area may be significantly higher than those required for connecting to new build structures within a new estate. These, additional costs, which primarily arise from the requirements for laying the heat distribution pipes in a built-up area and conversion of heating systems in some buildings, may be considerable. In new build developments costs can be minimised by installing pipelines in unmade ground and/or in a common utilities trench.

Developing a district heating scheme can be a costly exercise which may require financial support from central or local government given that payback periods may be long (>10 years), but can yield good returns in the long run.

The following equipment will generally be required:

- Transmission pipeline from the plant to the development (as estimated for identified sites in heat exchangers and heat meters in buildings);
- Standby boiler(s) to guarantee heat supply to customers during plant downtime (though not required in all cases);
- Substations with heat exchangers and pumping equipment in larger networks; and
- Project management and design costs.

District heating schemes can be very successful means to increase process efficiency, cut carbon emissions and provide a secure and local source of heat. It is however important to appreciate that a sizeable heating network will require a high capital expenditure and if borne by the EfW plant developer/operator it can be a significant cost element of the overall project.

It may be necessary in some cases for a speculative investment to be made in a district heating pipeline to a promising region, in anticipation of connections being added at a later date.

### 6.3 Other Commercial Issues

The export of heat differs from the export of electricity where an outlet for surplus electricity is always available, i.e. the national grid or local distribution network. As no similar infrastructure exists for heat, there will be complex commercial issues to negotiate even where there is good technical potential for heat supply. One of the major obstacles to development occurs because the life of a waste gasification plant may be in excess of 25 years, but in our experience few heat customers are willing to commit to a contract for more than 5 years at a time. Given the high capital cost of the heat supply infrastructure a guaranteed income is highly desirable, if not a necessity, for significantly longer than the 5 years usually offered. A pricing index for any such supply contracts could be based on appropriate indices for such as those relating to gas prices. Such contracts could be written with specific clauses relating to heat supply contract termination which place the risk of supply pipeline assets with the energy customer.

A district heating scheme with many consumers can be a more complicated arrangement than a dedicated pipeline to a single user, and in this case it is often appropriate to outsource either the build and/or operation of the network to a specialist Energy Services Company (ESCO).

## 7. Conclusions

### 7.1 Summary

There is potential for parts of the Green Lane Eco Park to operate in CHP mode, with a number of small to medium potential heat customers. However supplying a single large load able to take a high proportion of the available heat does not appear feasible. The true realisable potential remains uncertain until discussions have taken place with identified sites and feasibility assessed in detail for each potential customer. The key conclusions of this study are as follows:

- The existing site with most significant potential is expected to be Salford Royal Hospital. The Akcros chemical plant may also offer some potential;
- Other existing sites are only expected to be viable when connected as part of a wider district heating scheme. Areas of interest for this type of network include the nearby industrial estates, Eccles town centre and regions of high density housing;
- Future development may also offer potential, particularly extension of the Naysmith Business Park, redevelopment of the former Shop Direct site and any extension of the hospital;
- Numerous large heat users have been identified in Trafford Park and the surrounding area; however the potential to supply these sites is expected to be low given the costs and complexities associated with crossing the Manchester Ship Canal;
- Supplying heat could significantly increase revenues from energy sales compared to the electricity only case. However the capital expenditure can be high, so commitment to a long term supply is needed from both the operator and heat customers.

## 7.2 Recommendations

Contact with promising sites identified in this study will help to determine the true viability and interest in such as scheme. Where there is a positive response, the energy demand can be determined in more detail. This will enable a much clearer judgement as to the viability to be made.

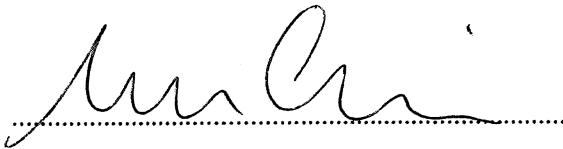
Early discussions with developers would be encouraged in order to maximise the potential for heat supply to future buildings in this area.

*Author: Steven Wood*



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*Reviewer: Ian Cromie*



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# Appendix A Existing Large Heat Users

2 Pages

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Technical Note  
A1

**Large Heat Users Identified from Desktop Study**

<b>Site</b>	<b>Sector</b>	<b>Postcode</b>	<b>Thermal Demand (MW)</b>
Cheshire Brickmakers Ltd	Ceramic products	M17 1SX	7.75
The University of Manchester	Combustion installations	M13 9PL	27.61
Basell Polyolefins UK Ltd - Carrington	Combustion installations	M31 4AJ	17.83
Alexandra Park Community Heating Scheme	Combustion installations	M16 7LR	n/a
Energy Centre - Great Lakes Chemicals	Combustion installations	M17 1WT	13.62
Manchester Sweeteners	Combustion installations	M17 1PA	189.96
Royal Brewery	Combustion installations	M15 6LD	18.85
AHLSTROM CHIRNSIDE LIMITED - RADCLIFFE PULP MILL	Pulp from timber	M26 3SB	3.57
Kellogg Company - Manchester	Combustion installations	M32 8RA	6.06
Tissue & Towel plant, Trafford Park Manchester	Paper and board	M17 1NX	41.55
ELYO CHP Plant at Kellogg	Combustion installations	M32 8RA	32.49
Hope Hospital	Combustion installations	M6 8HD	5.38
Manchester Metropolitan University	Combustion installations	M15 6BH	n/a
Akcros Chemicals Ltd	Chemicals	M30 0BH	2.27
MANCHESTER METROPOLITAN UNIVERSITY	Services	M15 6BH	1.35
SCOTTISH COURAGE – ROYAL BREWERY	Food & Drink	M15 6LD	7.47
Sterling Technology Ltd	Chemicals	M17 1DU	2.27
PROCTER & GAMBLE PRODUCT SUPPLY (UK) LTD	Pulp & Paper	M17 1NX	15.71
CERESTAR (UK) LTD - MANCHESTER	Food & Drink	M17 1PA	n/a
Dalkia Utilities Services Plc	Chemicals	M17 1WT	7.27
AHLSTROM-CHIRNSIDE LTD	Pulp & Paper	M26 0SN	1.94
Magnesium Elektron Ltd	Chemicals	M27 8LS	2.27
Lakeland Laboratories Ltd	Chemicals	M29 7FE	2.27
Akcros Chemicals Ltd	Chemicals	M30 0BH	2.27
Nova Chemicals Europe Ltd	Chemicals	M31 4AJ	2.27
BASELL POLYOLEFINS UK LTD	Chemicals	M31 4AJ	22.46
KELLOGG COMPANY OF GREAT BRITAIN LTD	Food & Drink	M32 8RA	n/a
Degussa Ltd	Chemicals	M40 7AA	2.50
Lanstar Waste Treatment Ltd	Chemicals	M44 5DT	2.27

**Large Heat Users Identified from Desktop Study (continued)**

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<b>Site</b>	<b>Sector</b>	<b>Postcode</b>	<b>Thermal Demand (MW)</b>
POLYFLOR LTD.	Chemicals	M45 7NR	4.05
SALFORD ROYAL HOSPITALS NHS TRUST	Services	M6 8HD	1.85
UNIVERSITY OF MANCHESTER INSTITUTE OF SCIENCE AND TECHNOLOGY (UMIST)	Services	M60 1QD	3.32
INTERBREW UK LTD	Food & Drink	M60 3WB	3.05
HMP MANCHESTER	Services	M60 9AH	1.30

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