Why Waste Waste?

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ENERGOS LTD

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Waste Disposal

- Whilst recycling rates have improved to 40% the residual, non recyclable waste is predominantly landfilled.
- Even in achieving the EU target of 50% recycling, we estimate that the UK has a need to build around 26,000,000 tonnes p.a. of final treatment capacity over the next 10 years.
- EU Laws requires waste to be diverted from landfill
- To force compliance the government has introduced laws that will fine Local Authorities who do not divert waste
- Landfill tax will also rise to £72 per tonne by 2013
- Other than thermal treatment, which reduces the level of Carbon to less than 3%, all other forms of waste treatment are intermediate steps and not a final solution.

Waste - The Potential

Based on conservative estimates:

26,000,000 tonnes of waste has approximately 8,250MW

This is able to provide:

- Approx. 6,800 MW of thermal energy (60,000 GWh p.a.) or
- Approx. 1,900 MW of electrical energy (16,600 GWh p.a.) 4.5% of UK demand
- Cleary, using the energy to provide heat is the most efficient method of utilisation, with the lowest carbon impact but there are many barriers to this.
- CHP a combination of heat and power is more deliverable.

Energy

We all know that the UK needs to reduce its carbon emissions, produce more renewable power, reduce its dependency on imported fuel, etc

Ignoring the benefits of reduced carbon emissions:

•As heat alone supplied by gas (at current rates) this would be equivalent to £800m in gas

•As electricity this is £680m

•Can we afford to waste waste?

•So how do we use it?

Forus Plant - 2002

Plant Description

- First plant with integrated pre-treatment
- facilities
- Fuel capacity: 38,000 tonnes per year
- Energy production: 86 GWh per year
- Footprint 1200 m^2
- Fuel bunker capacity 1300 m^3

Ownership & Partners

- Lyse Energi, 67%; IVAR IKS, 33%

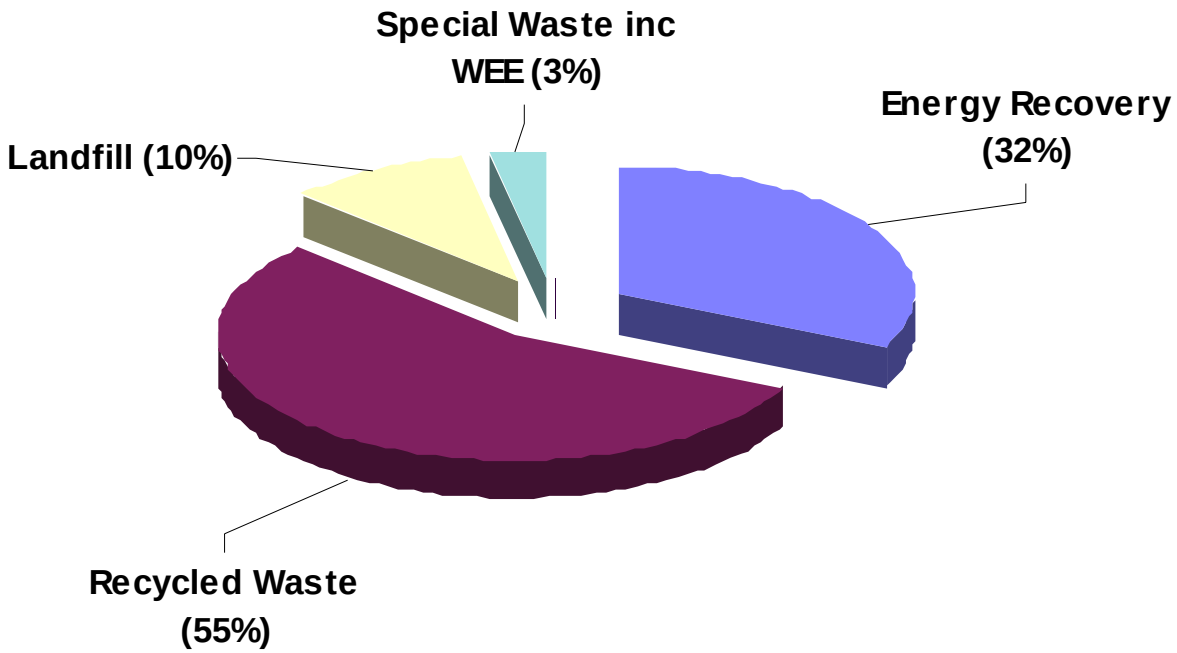
Waste Contracts

- **Residual Municipal Solid Waste**
- Local Commercial waste

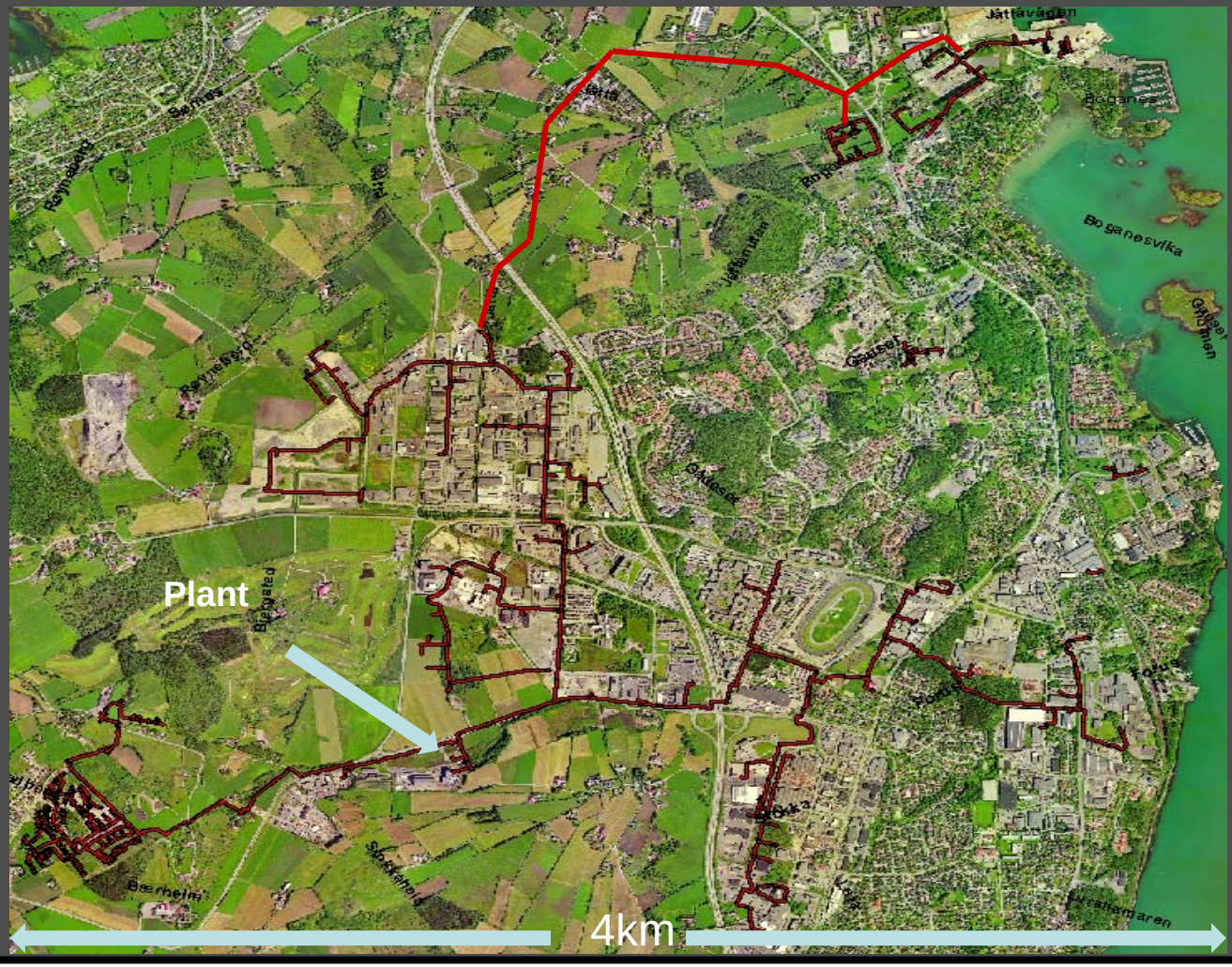
Energy Contracts

- Lyse Energi AS Steam for district heating and electricity for the grid

Stavanger Region – MSW in 2006



Forus - District Heating System



Averøy Plant - 2000

Plant Description

- First commercial plant
- Combined Heat & Power
- Partnership of local municipalities (estimated population 66,000)
- Fuel capacity: 34,000 tonnes per year
- Energy production: 65 GWh per year
- Footprint 1200 m^2

Ownership & Partners

- ENERGOS AS 90%
- NIR (community waste company) 10%

Waste Contracts

- Municipal Solid Waste from Nordmøre
  Local commercial waste

Energy Contracts

- Over 30GWh p.a. of steam for Skretting AS, a wholly owned subsidiary of the Nutreco Group
- Electricity for local grid

Averøy – Energy Customer

Averoy – part of the local economy

The plant provides:

- The region with waste treatment capacity
- Low cost steam to a major local employer

The result:

- Steam customer has increased production and staff as a direct result of their energy contract
- Direct displacement of Diesel oil and LPG.
- Directly related skilled jobs.

Ranheim Plant - 1997

Plant Description

- Pilot plant built with support from the Research Council of Norway, the Department for the Environment and the Norwegian Water Resources and Energy Directorate (NVE)
- Fuel capacity: 10,000 tonnes per year
- Energy production: 25 GWh per year
- Footprint 380 m2
- Fuel bunker capacity 560 m3

Ownership & Partners

- ENERGOS AS 100%

Waste Contracts

- Local commercial waste
- Paper waste from Peterson Ranheim Linerboard

Energy Contracts

- Peterson Ranheim Linerboard, a paper mill specializing in manufacturing paper from recycled cardboard

Hurum Plant - 2001

Plant Description

- First plant featuring modular design
- Fuel capacity: 36,000 tonnes per year
- Energy production: 90 GWh per year
- Footprint 1200 m^2
- Fuel bunker capacity 1300 m^3

Ownership & Partners

- Daimyo AS

Waste Contracts

- Municipal Solid Waste ROAF, a waste management company owned by several municipalities north of Oslo
- Commercial waste from Oslo international Airport
- Industrial waste (paper rejects) from Hurum Fabrikker, Sundal Eker, and Peterson Moss

Energy Contracts

- Steam for Hurum Fabrikker AB, a paper manufacturer

Minden Plant - 2002

Plant Description

- Turnkey supply with O&M
- Fuel capacity: 37,000 tonnes per year
- Energy production: 110 GWh per year

Ownership & Partners

- AML-IMMObilien GmbH, 100%

Waste Contracts

- RDF / SRF (100%)

Energy Contracts

- BASF PharmaChemikalien GMBH
- Steam from the ENERGOS plant replaces 19 Million m^3 of natural gas

Sarpsborg I Plant - 2002

Plant Description

- First double-line plant
- Fuel capacity: 75,000 tonnes per year
- Energy production: 190 GWh per year
- Footprint: 2100 m^2
- Fuel bunker capacity: 2500 m^3

Ownership & Partners

- Østfold Energi AS 100%

Waste Contracts

- Local municipal and industrial waste

Energy Contracts

- Borregaard Fabrikker, a large Norwegian industrial chemical firm Steam from the ENERGOS plant replaces 20,000 tonnes of fuel oil

Sarpsborg II Plant - 2010

Plant Description

- The Sarpsborg II plant is under construction and will be commissioned in 2010.
- This plant will compliment the existing Sarpsborg I plant which was opened in 2002 and is under separate ownership
- Fuel capacity: 78,000 tonnes per year
- Energy production: 230 GWh per year (steam). Will displace more than 20,000 tonnes of fuel oil per year.
- Footprint: 2100 m^2

Ownership

- Hafslund H&V AS, 100%

Waste Contracts

- Residual municipal and commercial waste

Energy Contracts

- Steam is supplied to the Borregaard Fabrikker chemical company

Why Choose Energos?

ENERGOS

*"The claim by ENERGOS that the process is 'environmentally friendly' is backed up by very low pollutant levels measured at Hurum and Averøy. **These emissions are probably the lowest measured anywhere for this type of process**, **particularly the NOx figures which can only be achieved by competing technologies with the application of de-NOx systems**."*

Juniper Consulting - an Independent due diligence review
Dec 2001

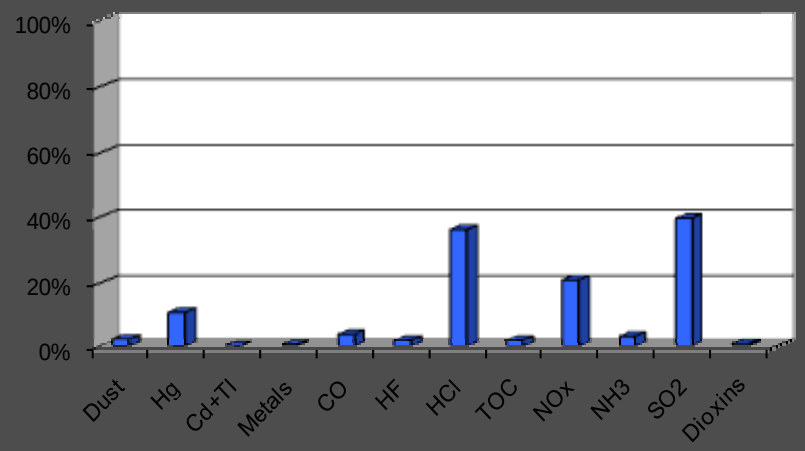
*"The basic design has achieved low emissions by every measure required under the Waste Incineration Directive 2000/76/EC with a substantial margin and this basic design has been retained as the product is developed for improved efficiency and availability. **Its capability to achieve low emission makes it ahead of all other technologies of which we are aware.**"*

Rowan House Ltd - a report prepared as an Independent technical due diligence report for United Utilities
Oct 2007

Emissions

The ENERGOS plant was designed to minimise emissions. It employs a a first stage gasification system followed by second stage oxidiser.
Its provides:

- Low carbon content in bottom ash (less than 3% TOC)
- Simultaneously low and stable Carbon Monoxide (CO) and Nitrogen Oxides (NOx) emissions



	EU Limits	Energos
Dust	10.00	0.24
Hg	0.0300	0.00327
Cd+Tl	0.050	0.00002
Metals	0.500	0.00256
CO	50	2
HF	1.000	0.020
HCl	10.0	3.6
TOC	10	0.2
NOx	200	42
NH3	10.0	0.3
SO2	50	19.8
Dioxins	0.100	0.001

Measurements taken at ENERGOS Averøy plant May 2007 by independent agency, TUV NORD Umweltschutz, and submitted to Norwegian Environmental Agency for regulation purposes. All measurements at 11% Oxygen. Limits are mg/Nm^3, except Dioxin / Furans at ng/Nm^3.

Proven Track Record

It is the only proven (working) gasification process on waste

With 7 operating plants and combined operating hours to exceed 400,000 in 2009, and with plants achieving up to 8,100 annual operating hours, ENERGOS can demonstrate the reliability and consistently low emissions.

Electricity produced will be awarded ROC's (as an ACT gasifier)

The plants operate on a range of wastes, including MSW, residual MSW, MBT residues (RDF/SRF), commercial and industrial waste

Small scale; – able to deliver the right amount of heat

– able to compliment recycling

– able to be built in existing industrial sites

Most importantly – it can be financed

UK

Energos has now started to develop in the UK with:

- The Isle of Wight - commissioned 2009
- Planning consents at:
- Irvine, Scotland (80,000 tpa) 8MW – (Energos)
- Melton Ross – North Lincs (80,000 tpa) 8MW
- Newport – South Wales (120,000 tpa) 12MW
- Knowsley – Merseyside (80,000 tpa) 9MW (Energos)
- Preferred Bidder at Derby – Planning pending
- Application at Ashton Park (planned new urban development for 10,500 home SW of Bristol) to provide the energy centre to heat and power the development and to provide waste treatment infrastructure
- Energos developed projects aim to deliver CHP

Isle of Wight Plant - 2009

Plant Description

- Retrofit of a conventional incinerator with ENERGOS technology. Features new primary/secondary chamber configuration
- Fuel capacity: 30,000 tonnes per year
- Energy production: 13.5 GWh per year (electricity)
- Footprint: 400 m^2
- New Technologies Demonstrator Programme (NTDP)

Ownership

- Waste Gas Technology UK Ltd, 100%

Waste Contracts

- Pre treated Refuse Derived Fuel (RDF) from Island Waste Services

Energy Contracts

- Electrical power will be exported to the grid

Developing Heat Sales

Obstacles to Developing Heat Sites

- Industry's cannot/will not sign up to long term take or pay contracts.
- Inherent risk if only one energy customer
- Bank funding therefore very difficult

The advantages of Heat only Sales

- Lower investment costs – no turbine
- Lower boiler pressure
- Lower energy price.
- Plant can be designed to be easily retrofitted to provide superheated steam – but requires 2 years to install and commission the turbine – export connection may be even longer depending on location. But approach can provide reduced risk.

Developing Heat Sales

Alternative solution

- Provide CHP with steam extraction / hot water off takes
- Provides ability to sell heat on short term contracts because alternative is electricity sales to many possible customers
- In the case of a developing district heating scheme, more electricity can be produced in the early stages when the heat load is smaller
- Electricity produced in summer when DH heat load is low.

Disadvantages are:

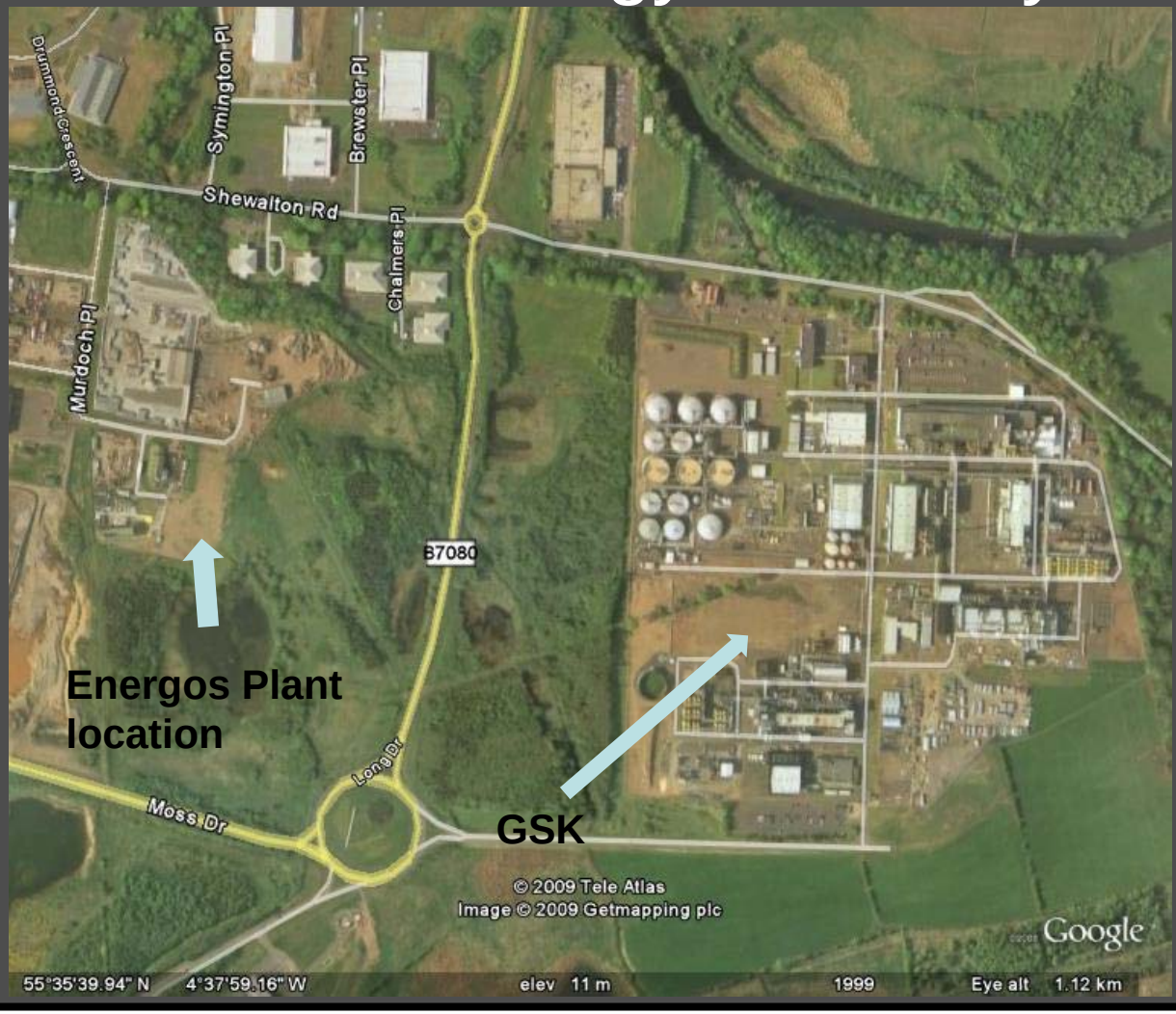
- Capital cost is higher
- Reducing the discount available on heat sales
- Compromise on turbine efficiency.

Irvine Energy Recovery

Irvine Energy Recovery

- Planning consent for 80,000 tpa site
- Local Area produces around 300,000 tonnes of MSW and suitable C&I Waste
- Plant ideally suited to area needs if 70% recycling is targeted
- Site located near GSK plant
- Discussions with GSK to install a steam / condensate line and supply steam.
- Steam supply will deliver a high efficiency “recovery” plant under the draft EU Waste Framework Directive
- Local solution for local waste
- Local energy for local Industry / large employers

Irvine Energy Recovery



ENERGOS

Sponsored by e·on

Carbon Action Network Conference 2009

Carbon Action Network
reducing carbon emissions & fuel poverty

Can

Knowsley Energy Recovery

ENERGOS

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Carbon Action Network Conference 2009

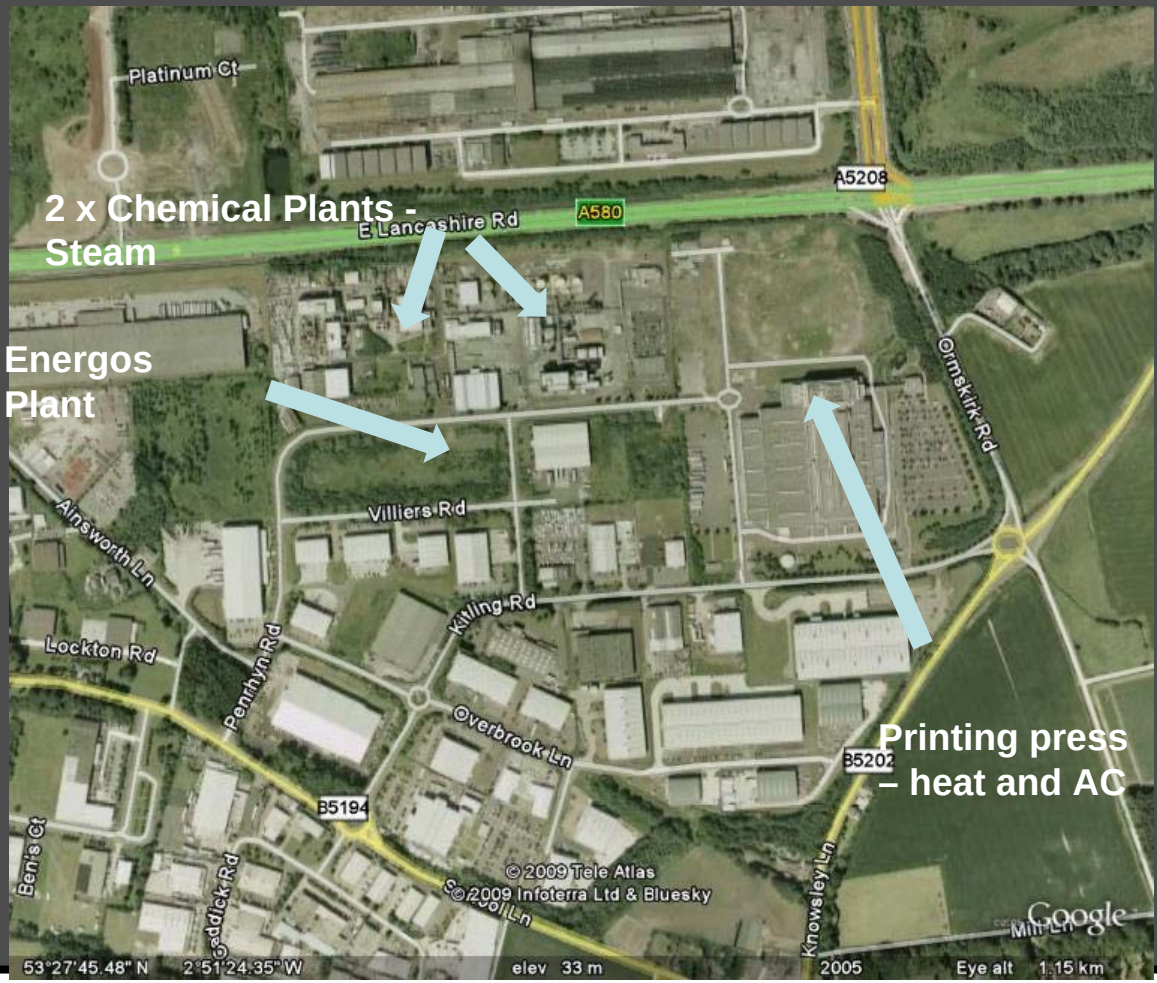
Carbon Action Network
reducing carbon emissions & fuel poverty

Can

Knowsley Energy Recovery

- Consented for 80,000 tpa plant
- The right size for the area
- Excellent road access (not through residential areas)
- Within an existing Industrial Estate
- Three sizable energy customers adjacent to the site.
- Steam/heat supply will deliver a high efficiency “recovery” plant under the draft EU Waste Framework Directive
- Local solution for local waste
- Local energy for local industries

Knowsley Energy Recovery



What is a suitable site?

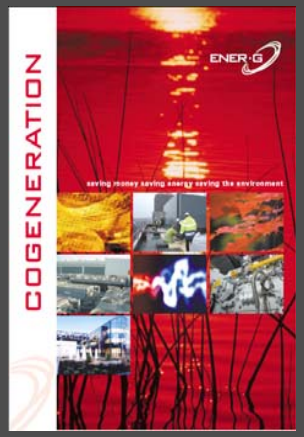
- A need for waste management infrastructure
- An nearby industrial energy (heat) customer or:
- A real chance of an energy customer(s) – e.g. a new industrial development or a large residential development – leading to an opportunity to develop a DH scheme
- 2.5 – 3 acres of available B2 designated land
- Good road access (preferably not through residential areas)
- Residential areas around 500m away

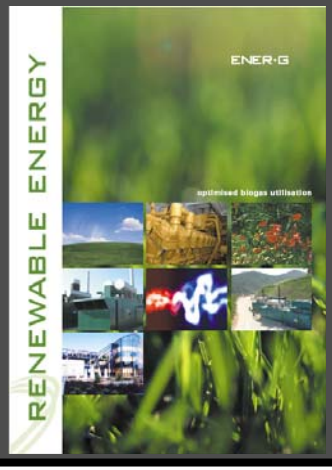
ENER•G – Salford, UK

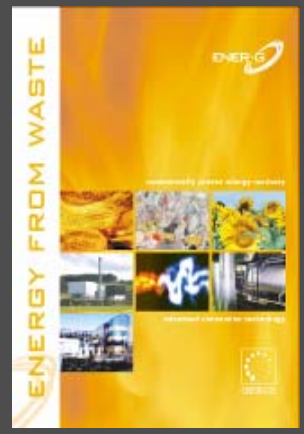
ENER•G Group has its origins in 1991 and was established in 1997. Over 18 it has grown and developed years, via acquisition and organic growth, to become a leading player in each of its markets

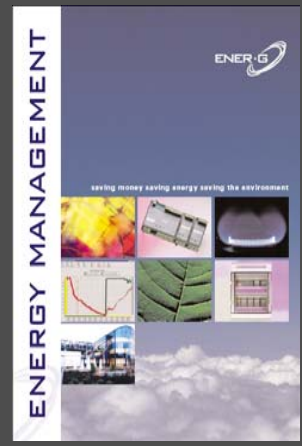
ENER·G Group

ENER·G offers a unique range of sustainable and energy efficient technologies and solutions across Europe and increasingly worldwide.









Worldwide operation

ENER·G employs over 700 people worldwide with a turnover of c. £100 million and operates over 365MW of electricity generation