



North West Energy Forum

In Partnership with **Envirolink Northwest**

Energy from Waste

25th May 2006

Haydock Thistle Hotel, Haydock



North West Energy Forum

In Partnership with **Envirolink Northwest**

Regulatory Drivers

Eric Adams

Parsons Brinkerhoff Power



PB POWER

Energy from Waste Regulatory Drivers

**Eric Adams,
PB Power**

North West Energy Forum, May 2006



PB Power - Profile

Technologies

- ❖ **Power generation**
- ❖ **Energy from waste**
- ❖ **Landfill**
- ❖ **Anaerobic digestion**
- ❖ **Combustion**
- ❖ **Gasification**
- ❖ **Pyrolysis**

Roles

- ❖ **Banks Engineer**
- ❖ **Technical Advisor**
- ❖ **Owners Engineer**
- ❖ **Project development**
- ❖ **Permitting**
- ❖ **Development of specifications**
- ❖ **Construction supervision**



Drivers

Waste

- ❖ Resource efficiency
- ❖ Diversion of landfill
- ❖ Waste management hierarchy
- ❖ Recycling/recovery targets

Energy

- ❖ Global warming
- ❖ Climate change
- ❖ Renewable energy sources
- ❖ Competition with energy sector
- ❖ Security of supply
- ❖ Reliance on imports





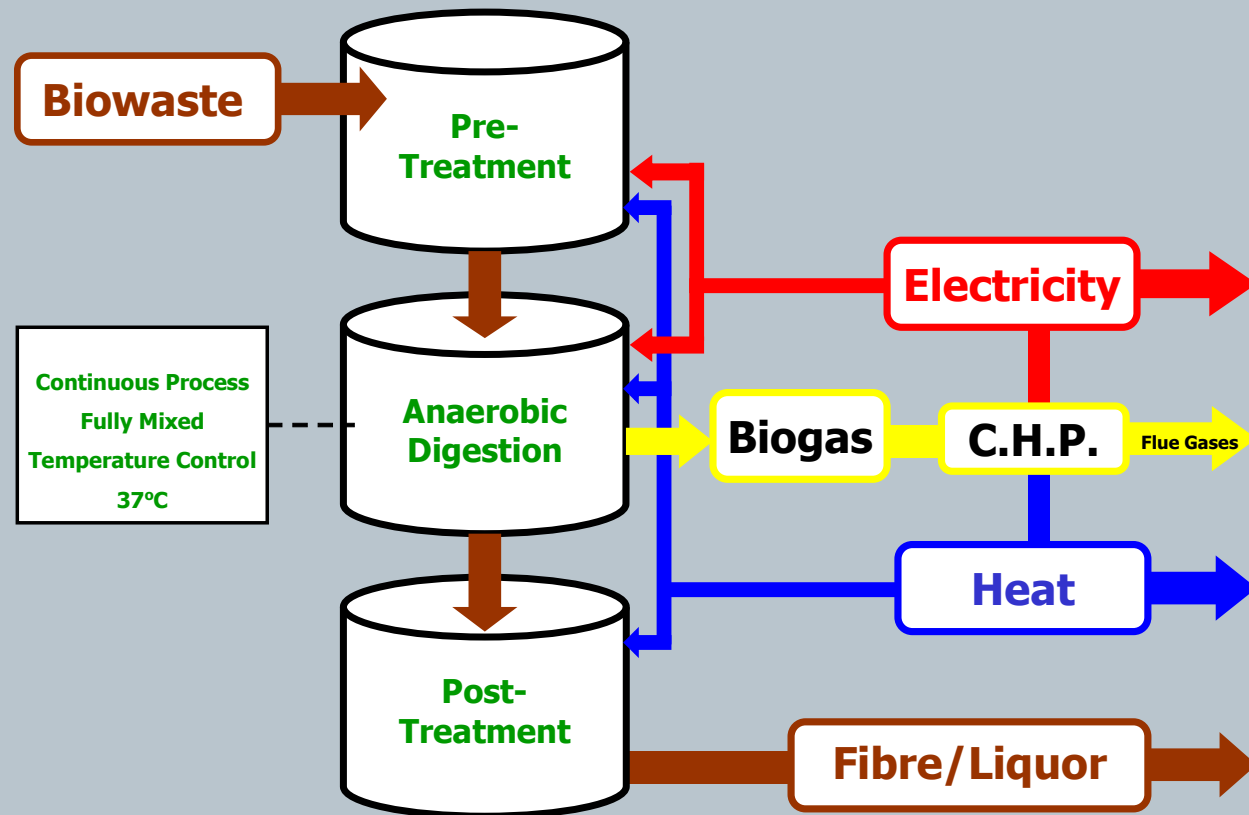
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Energy from Waste

The process of using waste to produce energy, either directly through incineration, or via gas collection, through the capture of methane

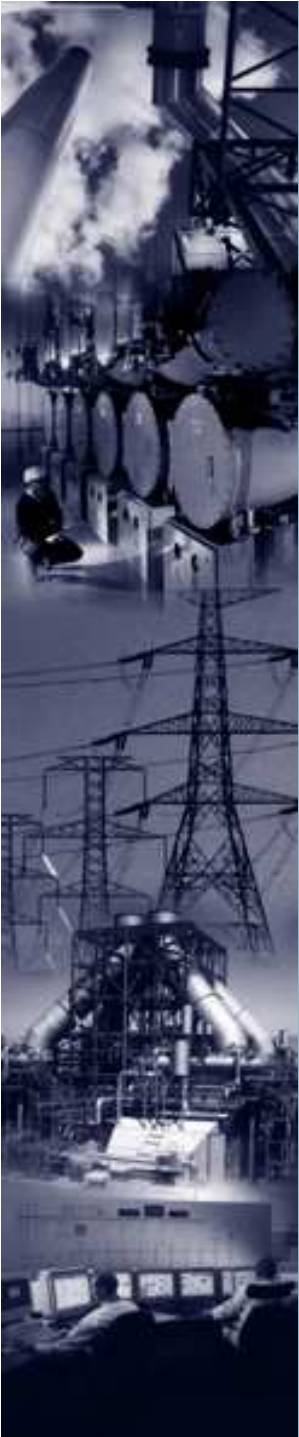


Anaerobic Digestion



Advantages

- ❖ Improves quality of landfill material
- ❖ Avoids generation of gas in landfill
- ❖ Contributes to recovery targets
- ❖ High gas collection rates
- ❖ Generates heat and/or electricity
- ❖ Digestate can be used thereby improving recovery efficiency



Regulatory Framework

- ❖ **EU Landfill Directive**
- ❖ **UK WET Act and LATS**
- ❖ **UK Landfill Tax**
- ❖ **Government Targets**
- ❖ **Animal By-products Regulations**
- ❖ **Renewable Obligation Certificates**
- ❖ **Biowaste & Soil Strategy Directives**





Landfill Directive

<i>Date</i>	<i>Requirement</i>
April 1999	Directive Passed
July 2005	All wastes to be separately collected, sorted or treated prior to disposal
July 2010	BMW to landfill: Limited to 75% of 1995 tonnage
July 2013	BMW to landfill: Limited to 50% of 1995 tonnage
July 2020	BMW to landfill: Limited to 35% of 1995 tonnage



BMW to be Diverted

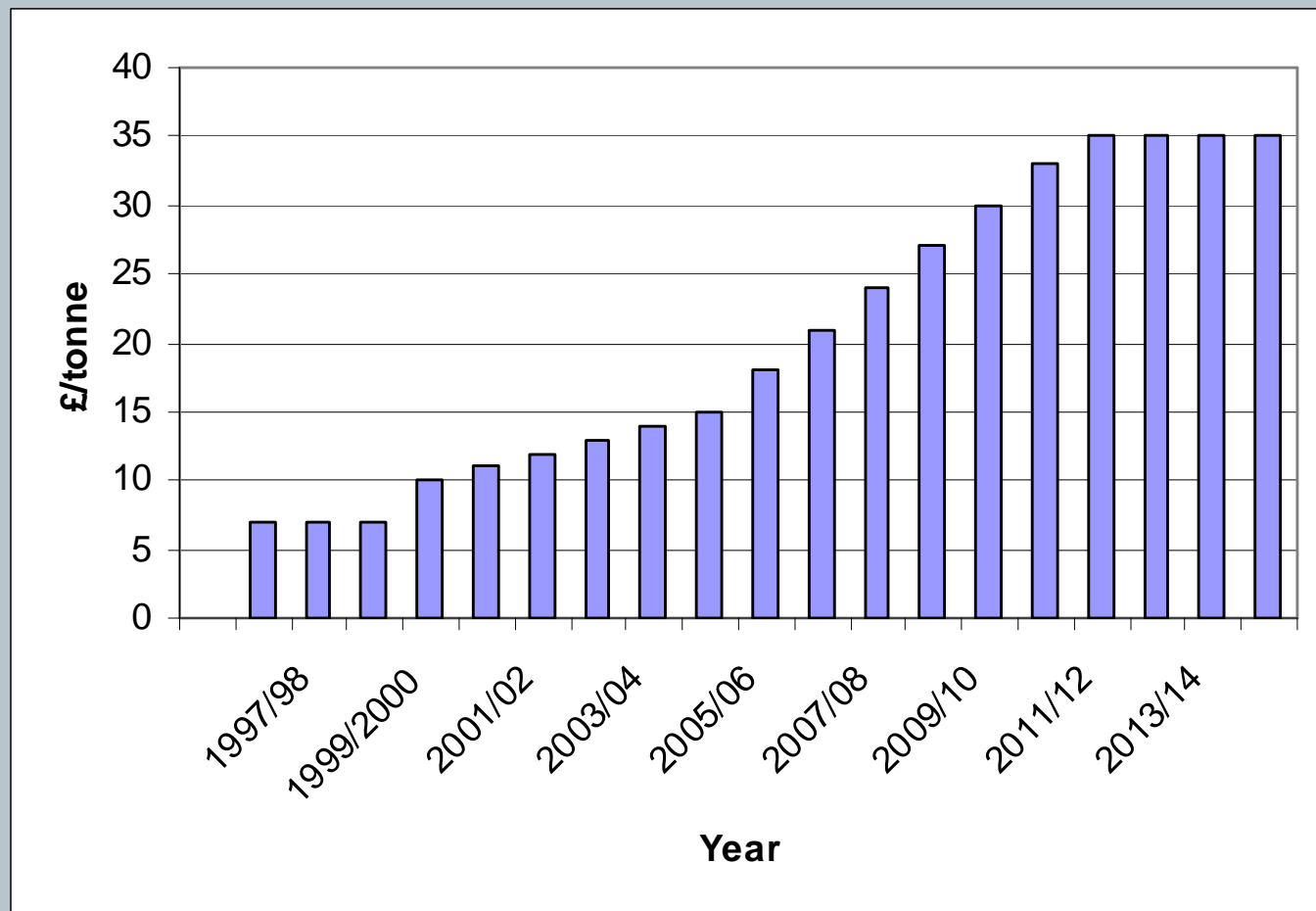
- ❖ **Landfill Directive dictates**
 - Reference Year fixed at 1995
- ❖ **Historical waste growth 3-5% pa**
- ❖ **BMW to be diverted from landfill:**
 - 2010: 5 to 10 Mt/y
 - 2013: 10 to 15 Mt/y
 - 2020: 15 to 20 Mt/y



UK Wastes and Emissions Trading Act

- ❖ **EU Landfill Directive: UK implementing legislation**
- ❖ **BMW to landfill limits passed down to LA's**
 - ❖ annually decreasing mandatory allowances
 - ❖ from 2005/6
- ❖ **Tradable allowances under Landfill Allowances Trading Scheme (LATS)**
- ❖ **Expected £50 to £150/tonne penalty for BMW to landfill above allowance.**

Landfill Tax





Government Targets

<i>Date</i>	<i>% Recycling & Composting</i>	<i>% Value Recovery</i>
2003/4	17	-
2005/6	25	40
2010	35	45
2015	45	67



Animal By-Products Regulations

- ❖ **EU Regulation & UK Implementing Law from May 2003**
- ❖ **Mixed MSW is classed as catering waste**
- ❖ **3 categories of waste**
- ❖ **Only Category 3 permitted for direct use in biogas and AD system to prevent disease and pathogen transmission**



ABPR - Requirements

- ❖ **Separation from animals**
- ❖ **Plant fitted with:**
 - Pasteurisation unit
 - Cleaning facilities
- ❖ **HACCP procedure in place**
- ❖ **Hygiene requirements**
- ❖ **Processing standards**



Renewable Obligations Certificates

- ❖ Tradable 'Renewables Obligations Certificates'
- ❖ Power from AD of waste qualifies for ROCs
- ❖ Renewable generators can sell ROCs to Power Companies
- ❖ Minimum ROC value set at £30/MWh
- ❖ Current ROC value is £40-45/MWh
- ❖ <http://www.nfpa.co.uk>

Biowaste & Soil Strategy Directives

- ❖ **Aims to establish rules on:**
 - Safe use
 - Recovery
 - Recycling
 - Disposal
 - Control of contamination
- ❖ **Commitment from EU to release directive in 2004**
- ❖ **No movement since 2005**



Planning & Permitting

- ❖ **Waste Management Licencing**
- ❖ **Planning & Environmental Impact Assessment**
- ❖ **Pollution Prevention & Control**



Waste Management Licensing

- ❖ **Technically Competent Management**
- ❖ **Means:**
 - Certificate awarded by WAMITAB
 - Qualifying experience
 - EA assessment
 - Pre-qualification technical competence
- ❖ **Depends on size and nature of installation**
- ❖ **Notion of ‘fit and proper person’**



Planning & EIA

- ✘ **Planning legislation**
- ✘ **Local Waste Plan**
- ✘ **Local Development Plans**
- ✘ **Environmental impact**
 - Pathogens
 - Air quality
 - Leachate management
 - Feedstock composition
 - Residue handling
- ✘ **Siting**



Pollution Prevention and Control

- ❖ **Part A(1) – Environment Agency**
- ❖ **Part A(2) & B – Local Authority**
- ❖ **Considerations**
 - Best Available Techniques
 - Site condition
 - Emissions to air*
 - Discharges to water
 - Noise
 - Energy Efficiency





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North West Energy Forum, May 2006





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Technologies and benefits

Patrick McConville
EnerG Group



Energos Gasification Technology

An Example of a Proven EfW Technology within Integrated Waste Management Programmes



patrick.mcconville@energ.co.uk

t: +44 161 745 7450



Introduction



- An analysis of the performance of a plants within an existing waste management strategy
 - Stavanger and the flow of waste during 2004 and 2005
 - Their performance versus diversion targets
- The Energos EfW plant and how it works
- A review of historic emissions data



Energos - Development History



Developed in Norway, the design remit was to deliver:

- A small scale Energy from Waste plant which could provide;
- Small communities with a cost effective alternative to mass burn incineration with;
- Minimum emissions to atmosphere

The result was:

- A two stage thermal process which enabled extremely good combustion control, eliminating the need for sophisticated and expensive flue gas treatment.



I·V·A·R

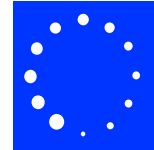


Forus – Stavanger's Energy From Waste Plant





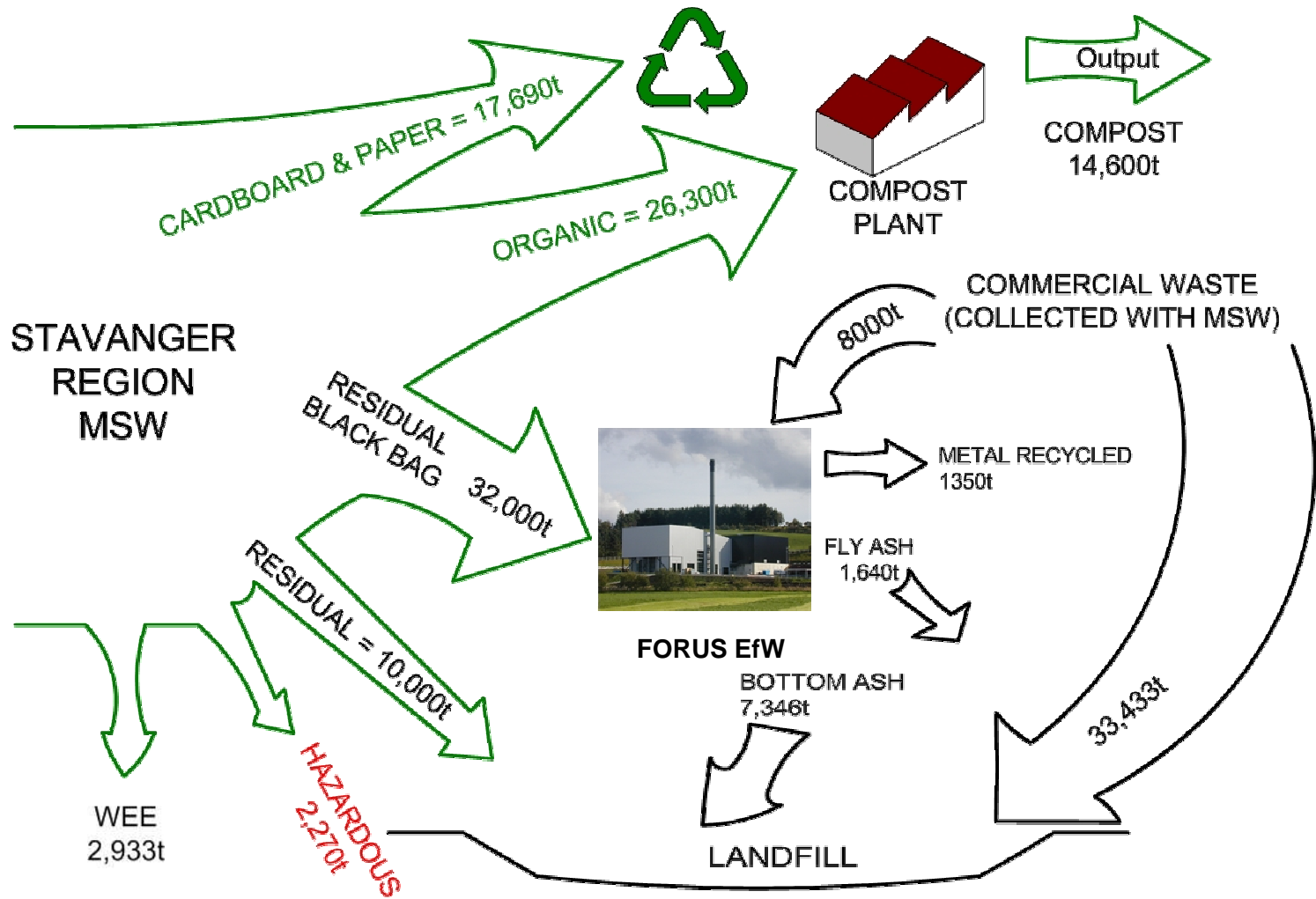
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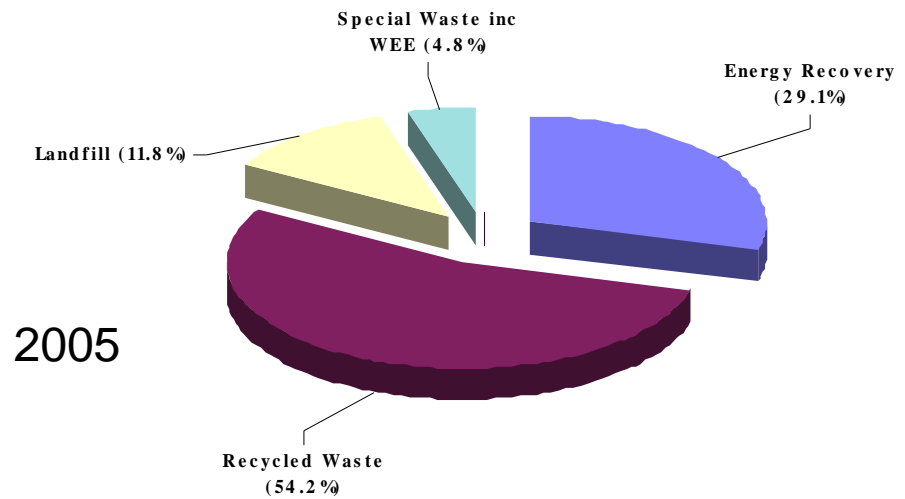
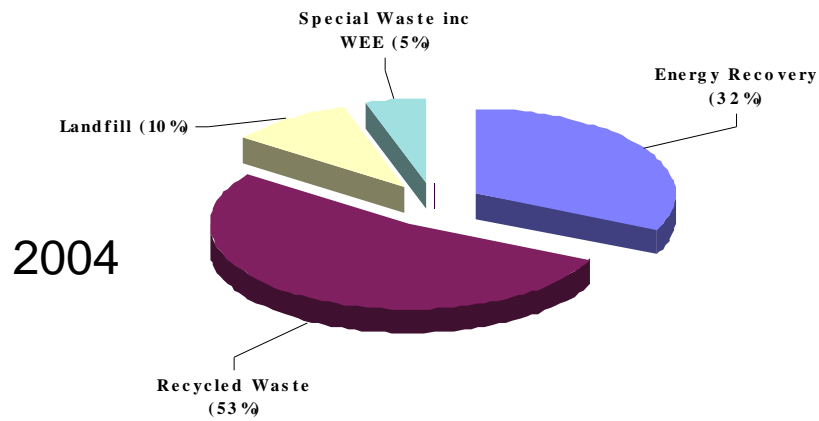
ENERGOS

- Waste in the Stavanger region of Norway is managed by IVAR and they provide this service for a population of approx 275,000 people
- IVAR is an inter-community Norwegian equivalent of a UK WDA and is owned by 8 municipalities. The company also provides waste water services.
- Since the late 90's, IVAR has progressively introduced an integrated waste management system to reduce dependency on landfill
- In 2000 IVAR commissioned the largest composting plant in Norway
- Opened the Energos EfW plant in 2000 in collaboration with local energy company Lyse AS
- The Forus plant receives residual MSW and some commercial waste

Stavanger Region Waste Flows - 2004



Stavanger Region's MSW – 2004 and 2005



A Comparison – Stavanger's Solution versus Bergen's

- The Forus plant serves a population of 275,000 people with a capacity of 40,000 tonnes p.a.

No visible plume under normal climatic conditions

The roofline does not dominate the skyline

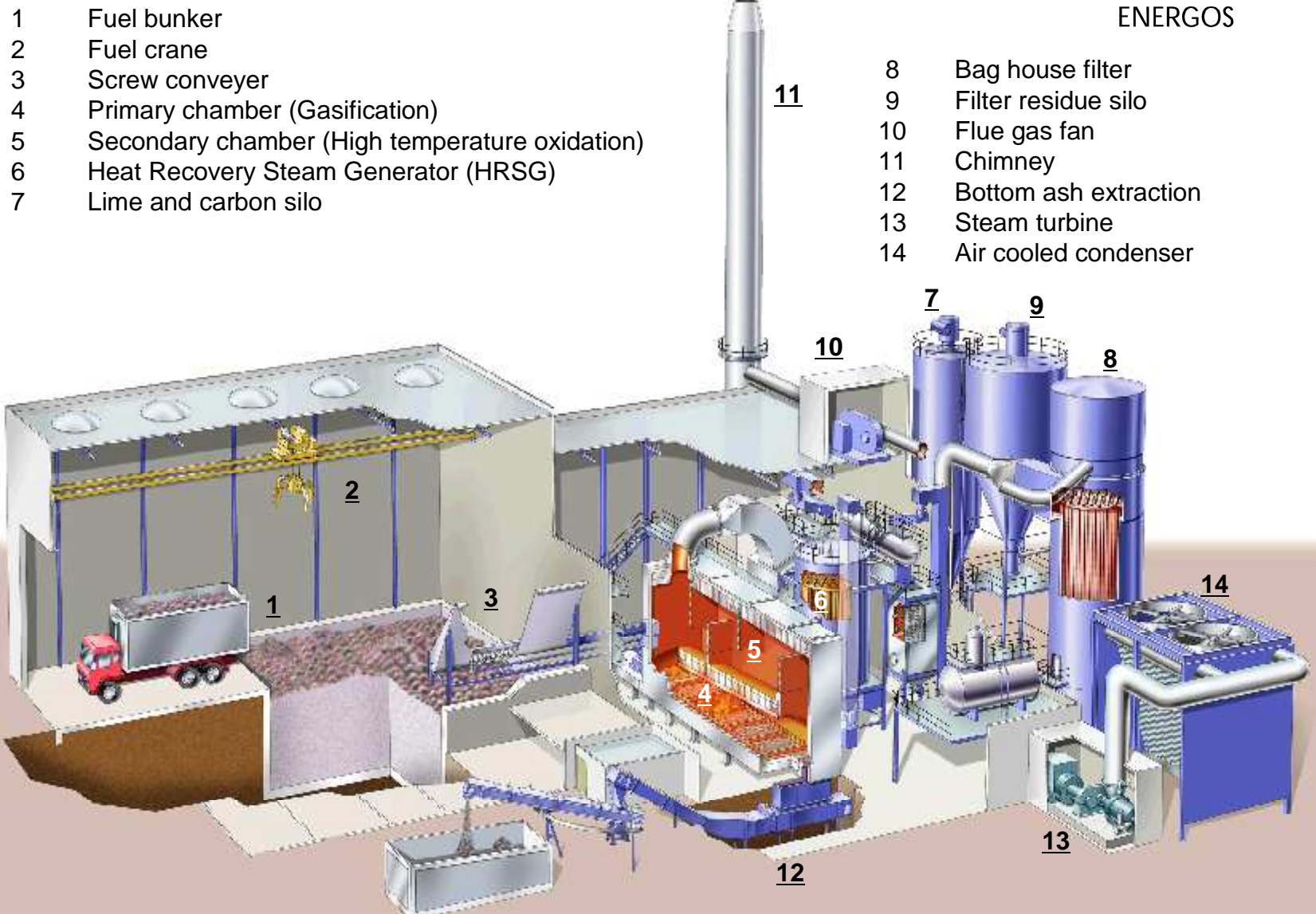
- Nearby Bergen has a population of 300,000 people and an incinerator with a capacity of 120,000 tonnes p.a. capacity (operating at 90%)



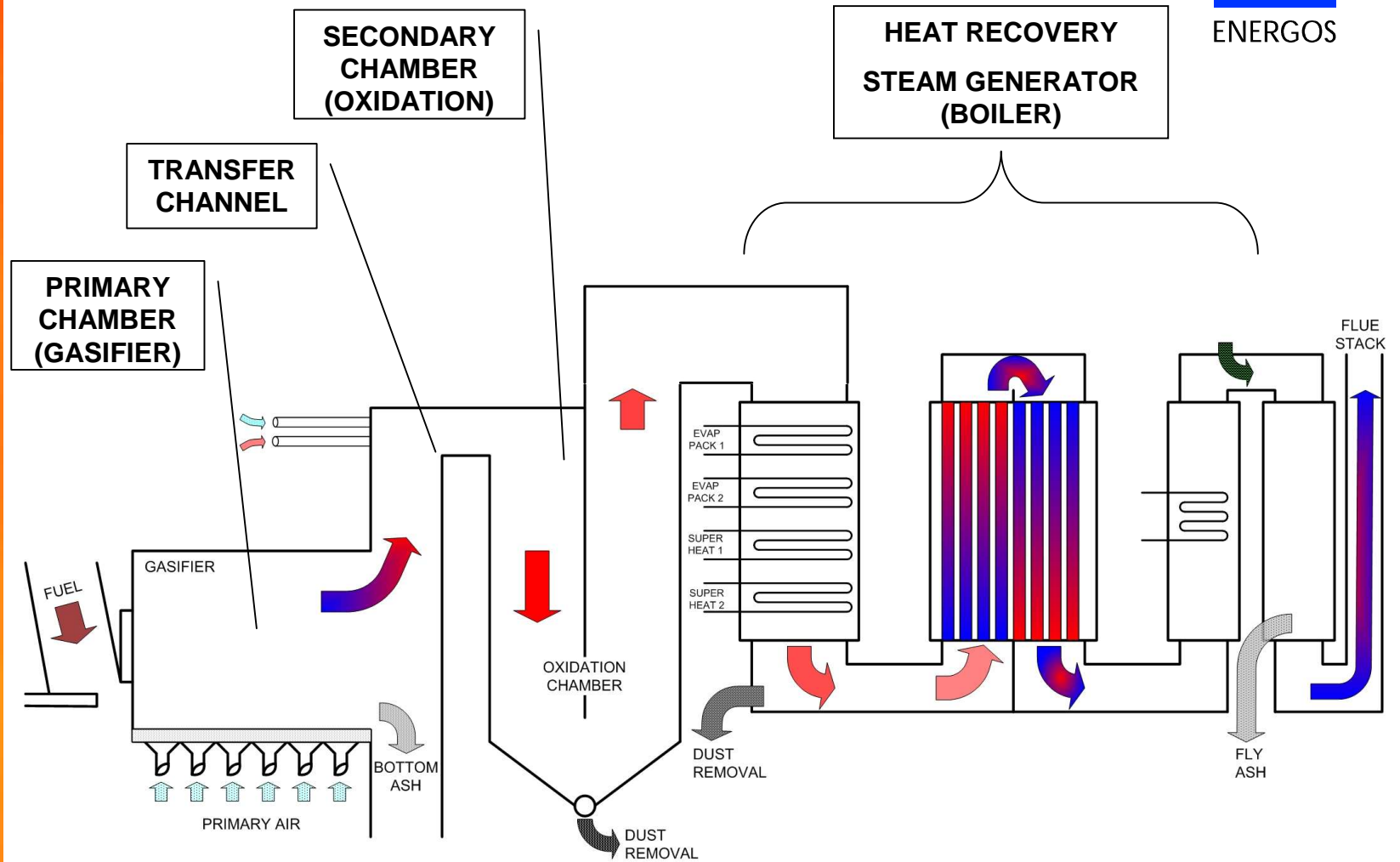
Energos EfW Plant Technology



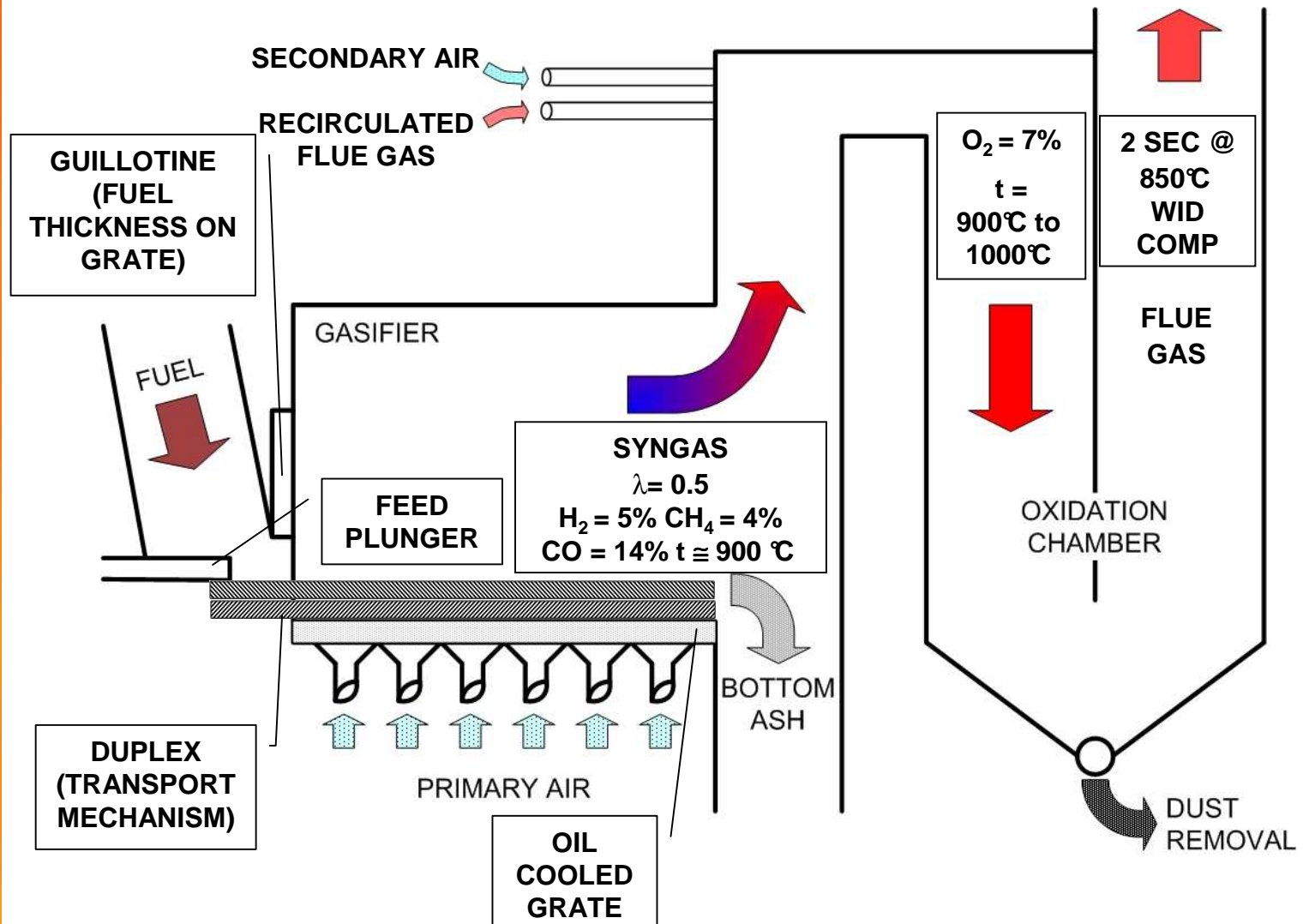
ENERGOS



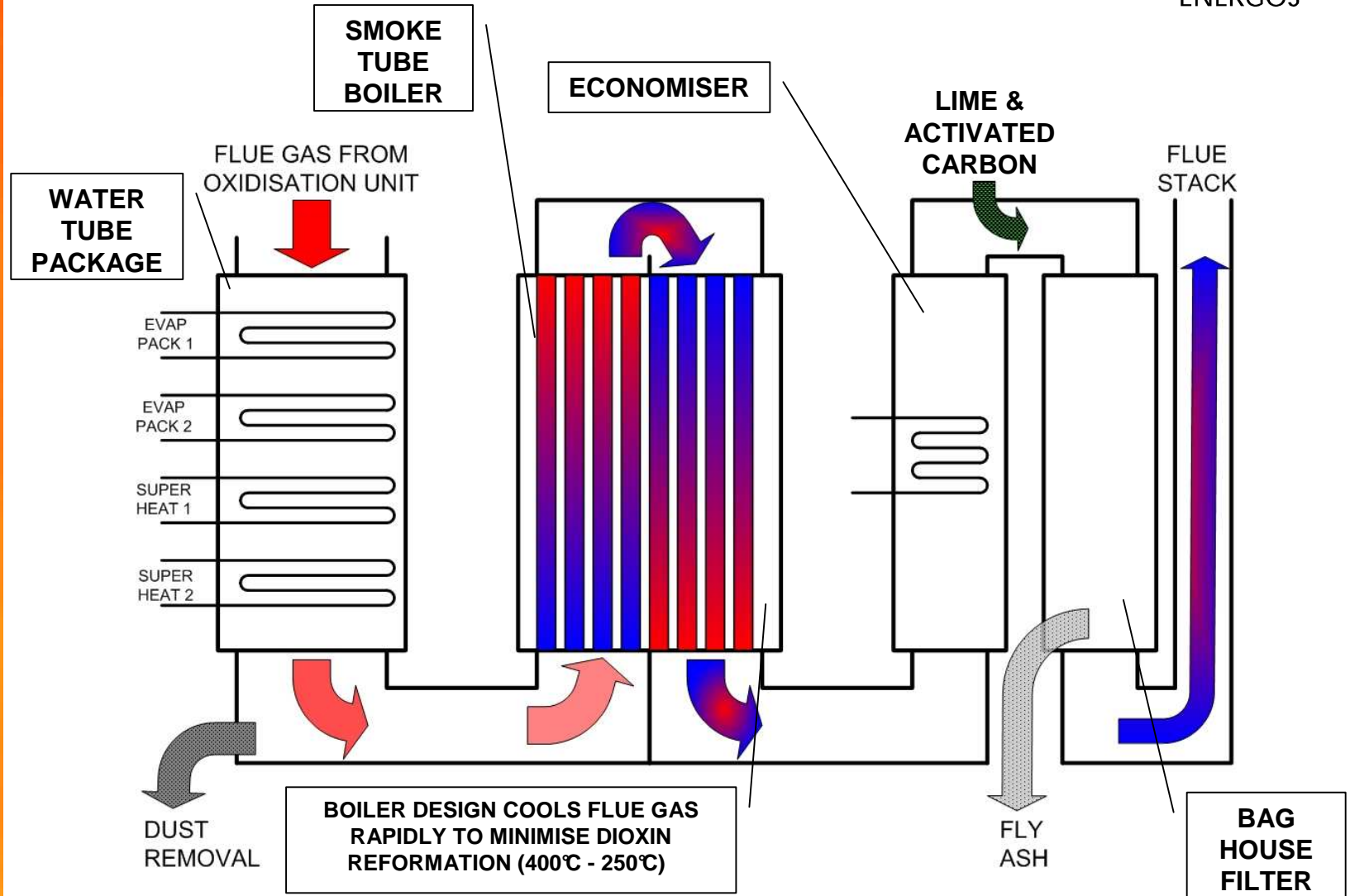
The Energos Process – Schematic Overview



The Gasifier & Thermal Oxidiser

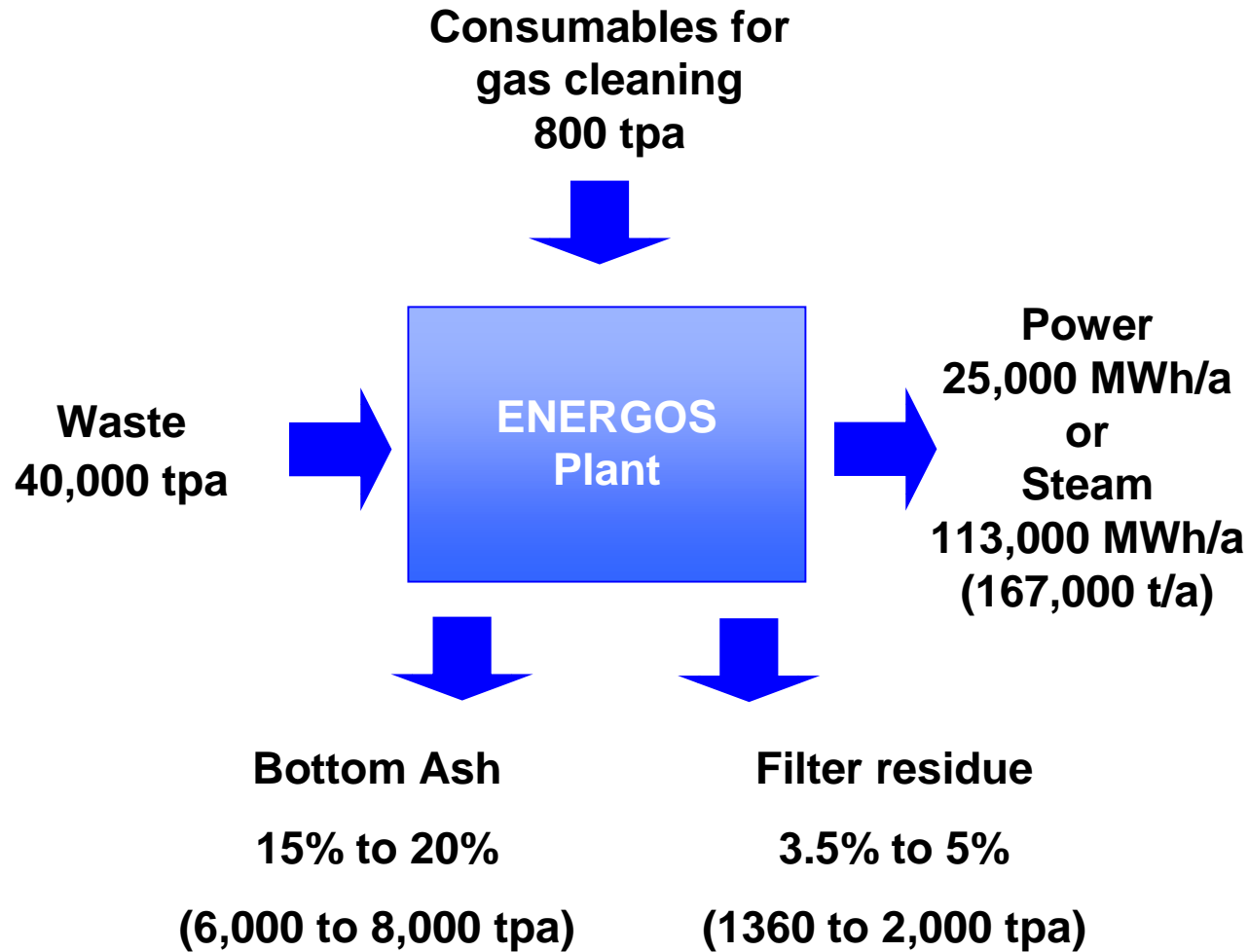


Heat Recovery & Steam Generation





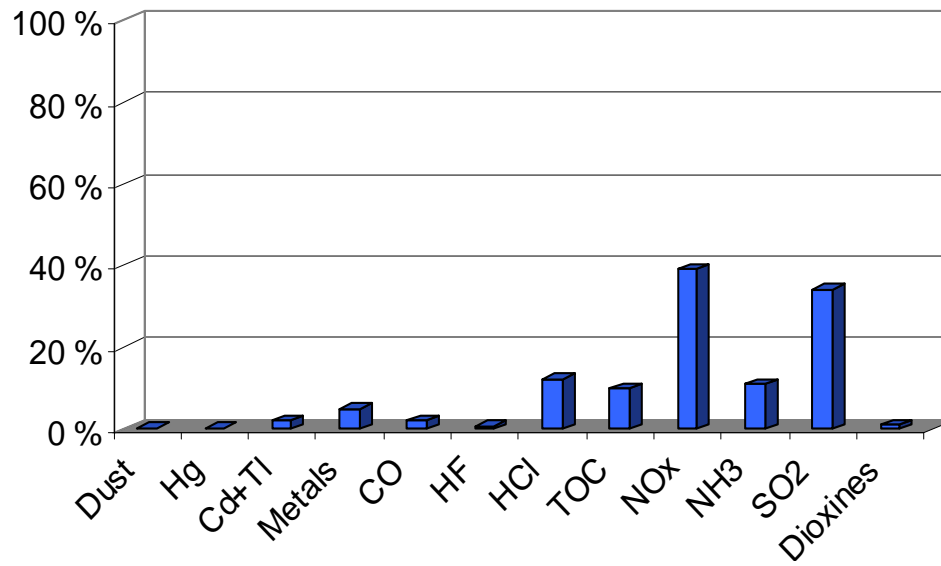
Typical Plant Inputs and Outputs



Emissions

The Energos plant was designed to minimise emissions. 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	0.01
Hg	0.0500	0.0001
Cd+Tl	0.050	0.001
Metals	0.500	0.024
CO	50	1
HF	1.000	0.008
HCl	10.0	1.2
TOC	10	1
NOx	200	78
NH3	10.0	1.1
SO2	50	17
Dioxins	0.100	0.001

Measurements taken at ENERGOS Sarpsborg plant May 2003 by independent agency, TUV NORD Umweltschutz, and submitted to Norwegian Environmental Agency for regulation purposes. All measurements at 11% Oxygen. Limits are mg/Nm³, except Dioxin / Furans at ng/Nm³.



Emissions at Forus plant - 2005



CEMS Measurement	Average for 2005 (mg/m³)	EU Limit (mg/m³)
NO_x	51.5	200
CO	15.5	50
HCl	6.2	10
SO₂	25.6	50
TOC	2.8	10

Gasification

- Sampling and independent analysis of syngas from Energos gasifier (taken from the transfer channel between the primary and secondary chamber):
Syngas measurements:
 - Hydrogen - 5% (dry basis)
 - Methane - 4% (dry basis)
 - Carbon Monoxide - 14% (dry basis)
- Conditions in the transfer channel are at $\Lambda = 0.5$
- The syngas is transferred to the secondary chamber where high temperature oxidation is undertaken
- The UK's New Technology Fund cannot be used for incinerators
- Defra have awarded (subject to contract) a grant under the New Technology Demonstartor Fund to ENER-G for the conversion of a conventional plant on the Isle of Wight.
- As a part of this process Defra and its consultants have undertaken due diligence on the technology.



Proven Track Record



With 6 operating plants and in excess of 200,000 operating hours collectively, Energos can demonstrate the reliability of the gasification process and consistently low emissions

Plant availability of 7,800 rising to over 8,000 hours per year is being achieved

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

The technology is bankable



The Benefits



- A local based solution for local waste arisings
- Small footprint and low roofline (19m) means the building does not dominate the skyline
- Compliments an Integrated Waste Management system (and does not discourage recycling)
- Minimises transportation costs and the related vehicle emissions
- Reduces the need for transfer stations and bulk haulage
- Reduces HGV traffic locally
- Minimises the cost of pre-treating the feed waste
- Electricity income enhanced by ROCs (UK only)
- Creates long term skilled jobs
- Dry APC - no visible plume



patrick.mcconville@energ.co.uk





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The Bell Project

Michael Gifford
Carbon Trust

Carbon Trust Enterprises Ltd

Building Low Carbon Businesses

North West Energy Forum: Energy from Waste
25th May 2006

“Project Bell”

Michael Gifford
CT Waste4Energy

Outline for today

Who is CT Waste4Energy?

What do we do?

What is our focus?

Our approach

A project example and benefits

Who is CT Waste4Energy?

Carbon Trust

Mission: UK carbon reduction

Not for dividend company

£100 million per annum funding

Carbon Trust Enterprises Limited (CTEL)

Mission: to commercialise Carbon Trust “assets”

100% owned by Carbon Trust

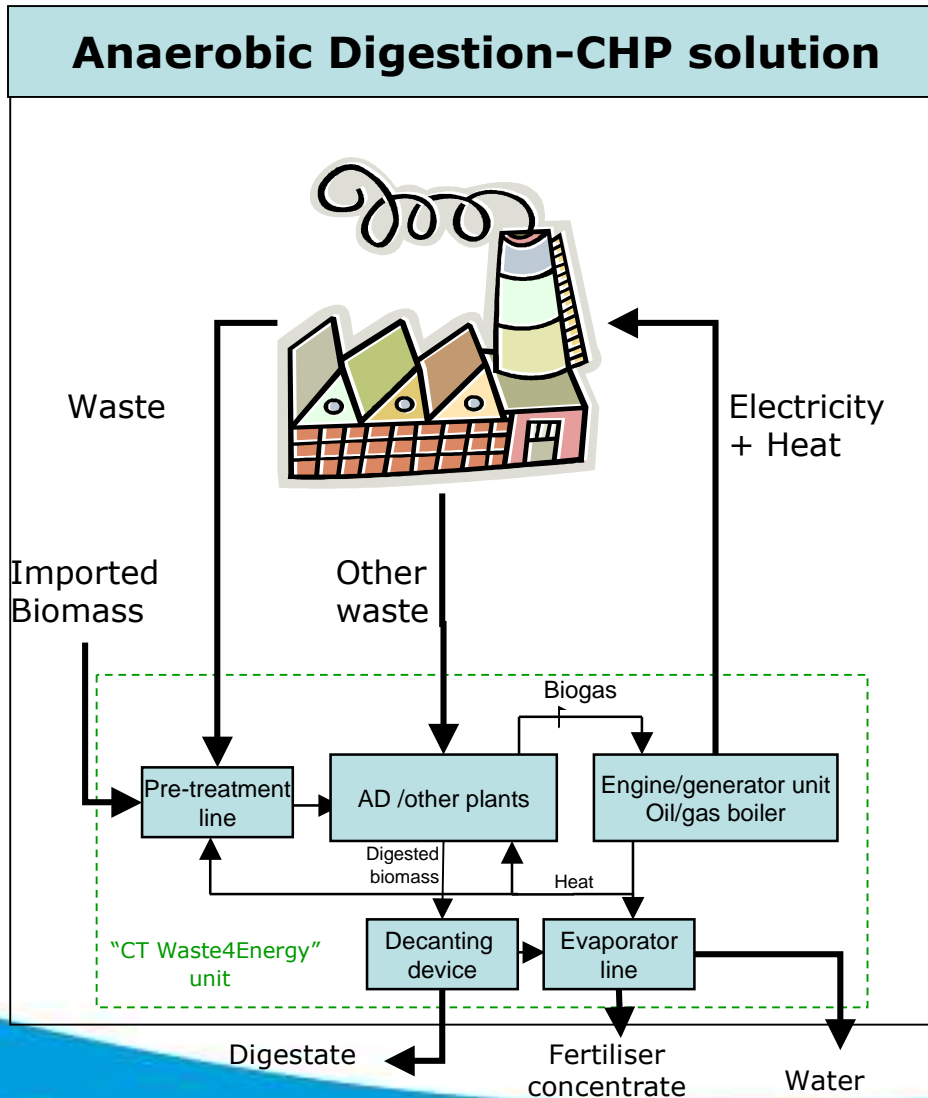
Start-up of 3 businesses

CT Waste4Energy Limited (CT W4E)

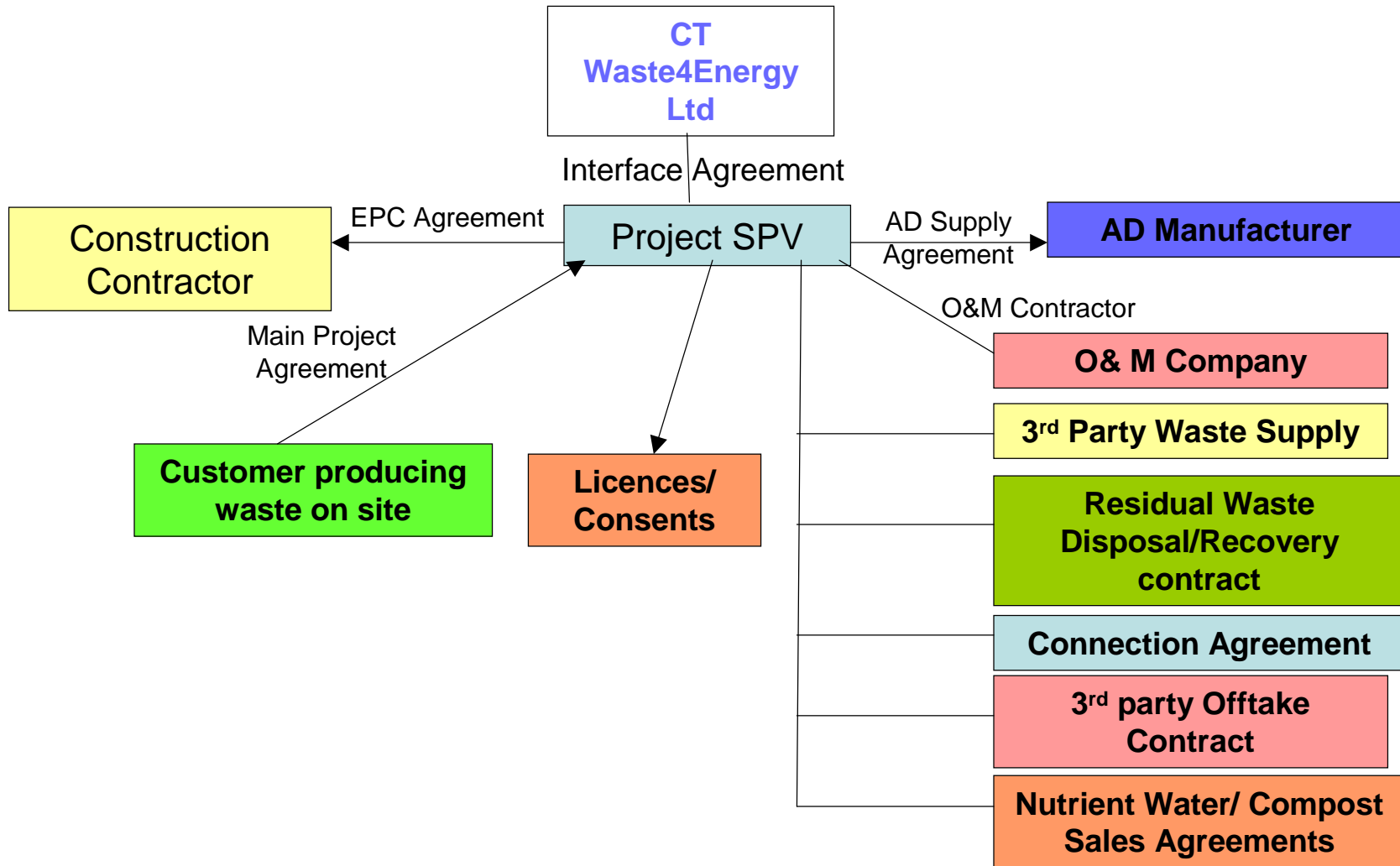
Mission: Energy and carbon savings for food and drink manufacturers

Owned and funded by CTEL

CT W4E What do we do?



CT W4E What do we do?



CT W4E What is our focus?

Companies in the Food and Drinks sector

Distilleries
Breweries
Carbonated drinks
Red meat
Dairy products (cheese)
Vegetables
Fish
Bread

- Large, discrete waste streams
- Major users of energy
- On-site requirement

CT W4E Focus on Food and Drink Manufacturers' Issues

Rising Costs } Waste and energy

Increased Risk } Regulation and pricing

Poor Service } Waste suppliers focused on utilising their assets, not providing solutions

Uncertainty } Solutions offered by suppliers with vested interest in their technology

CT W4E Our unique advantages

Focus on Food & Drink manufacturers' requirements

Solutions tailored and market tested to meet individual requirements

Independent selecting the best available technology and the best suppliers

Finance available to fund solution, development and installation of facilities

Risk commercial, technology and regulation/consent managed

Carbon Trust support

CT W4E Our approach to developing the solution

Understand the problem

Distinguish Core Business and Non-core Business in detail and agree with management what to include and exclude as “non-core business”

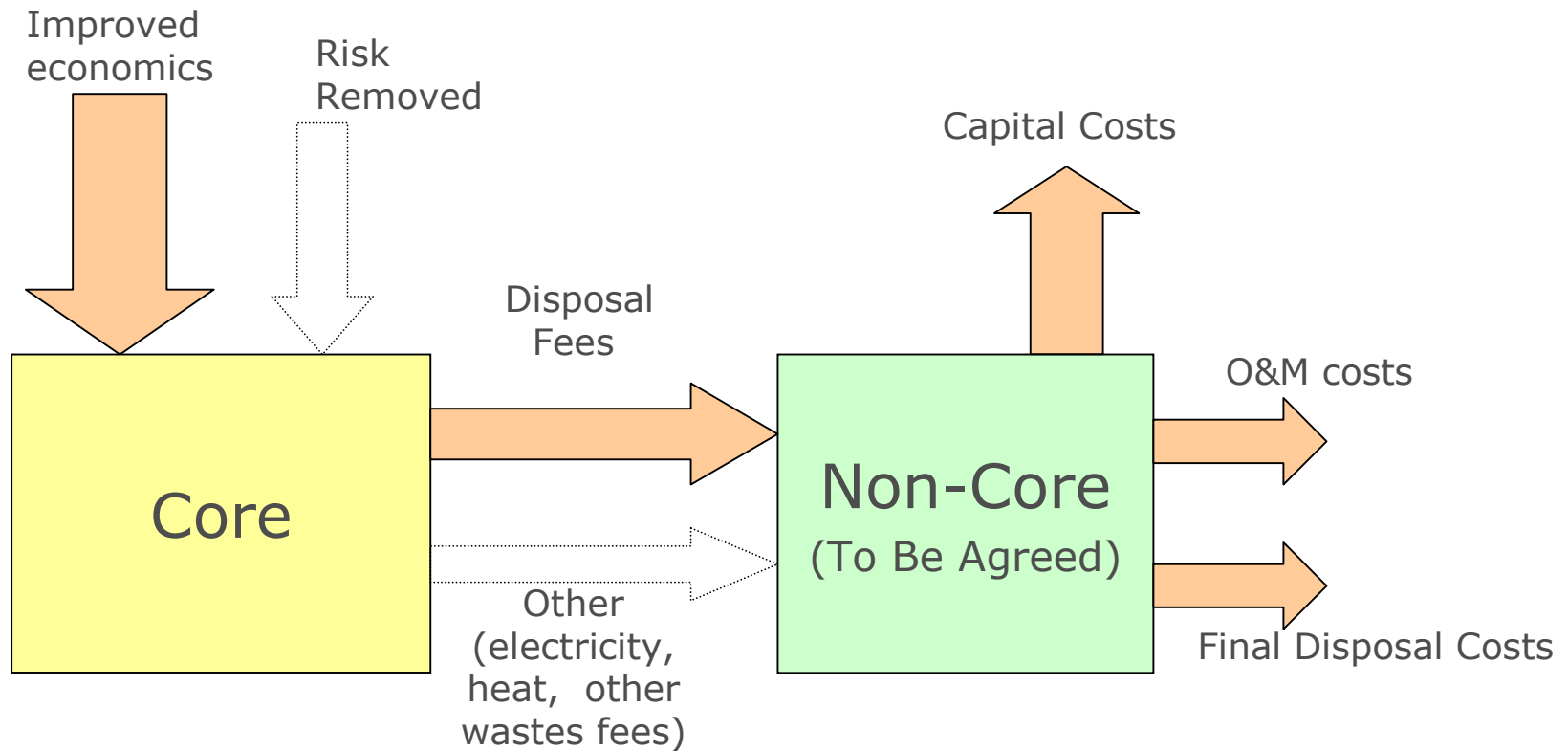
Detailed measurement technical and financial characteristics of “non-core business”

Develop a small number of potential technical and economic solutions for “non-core business”

Market Test Solutions for “non-core business” and agree best solution with management

Develop detailed open book financial model for best solution

CT W4E Our approach to developing the solution; core and non-core



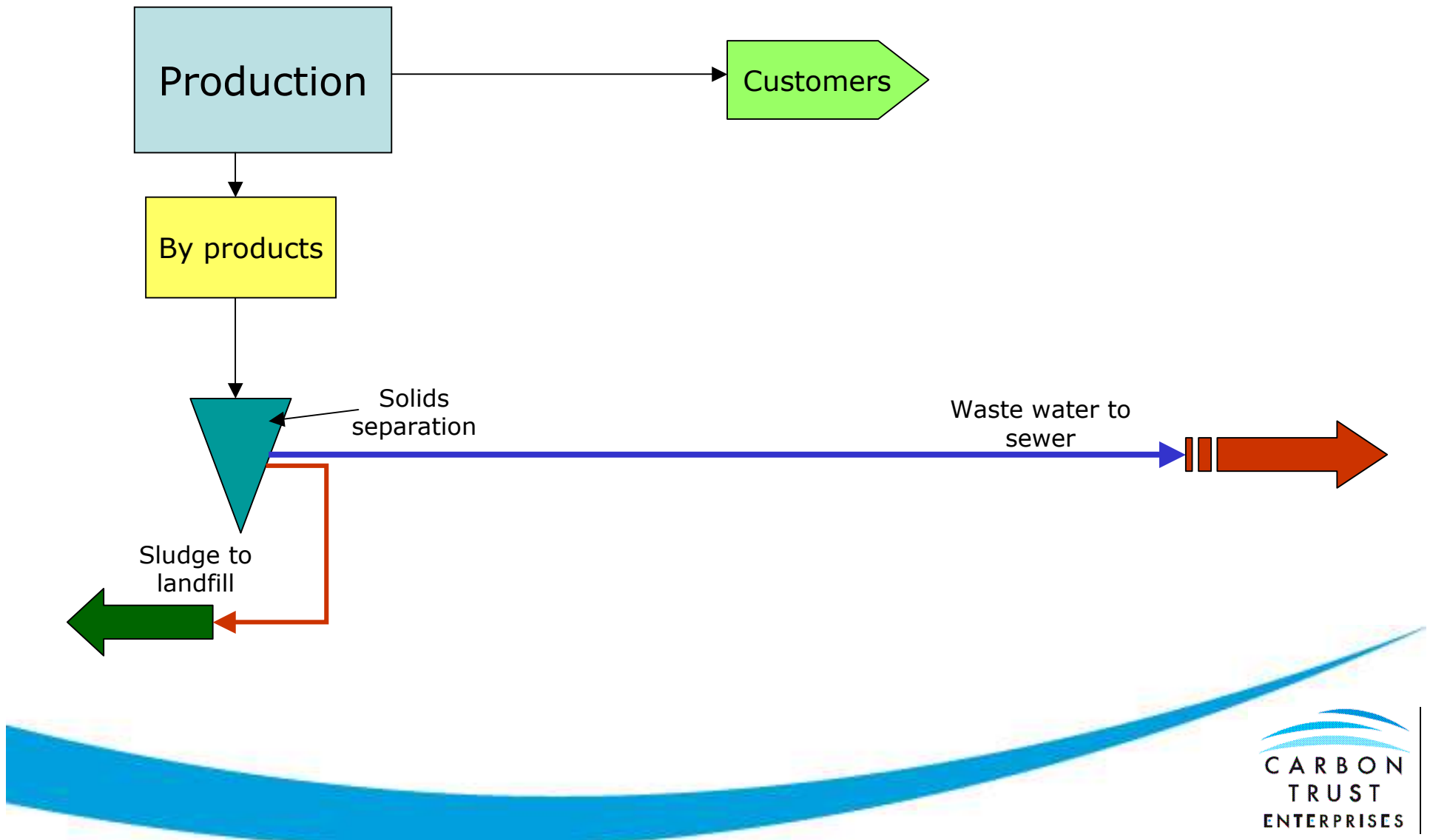
CT W4E Our approach:

Maximise value of whole company by maximising value of non-core business

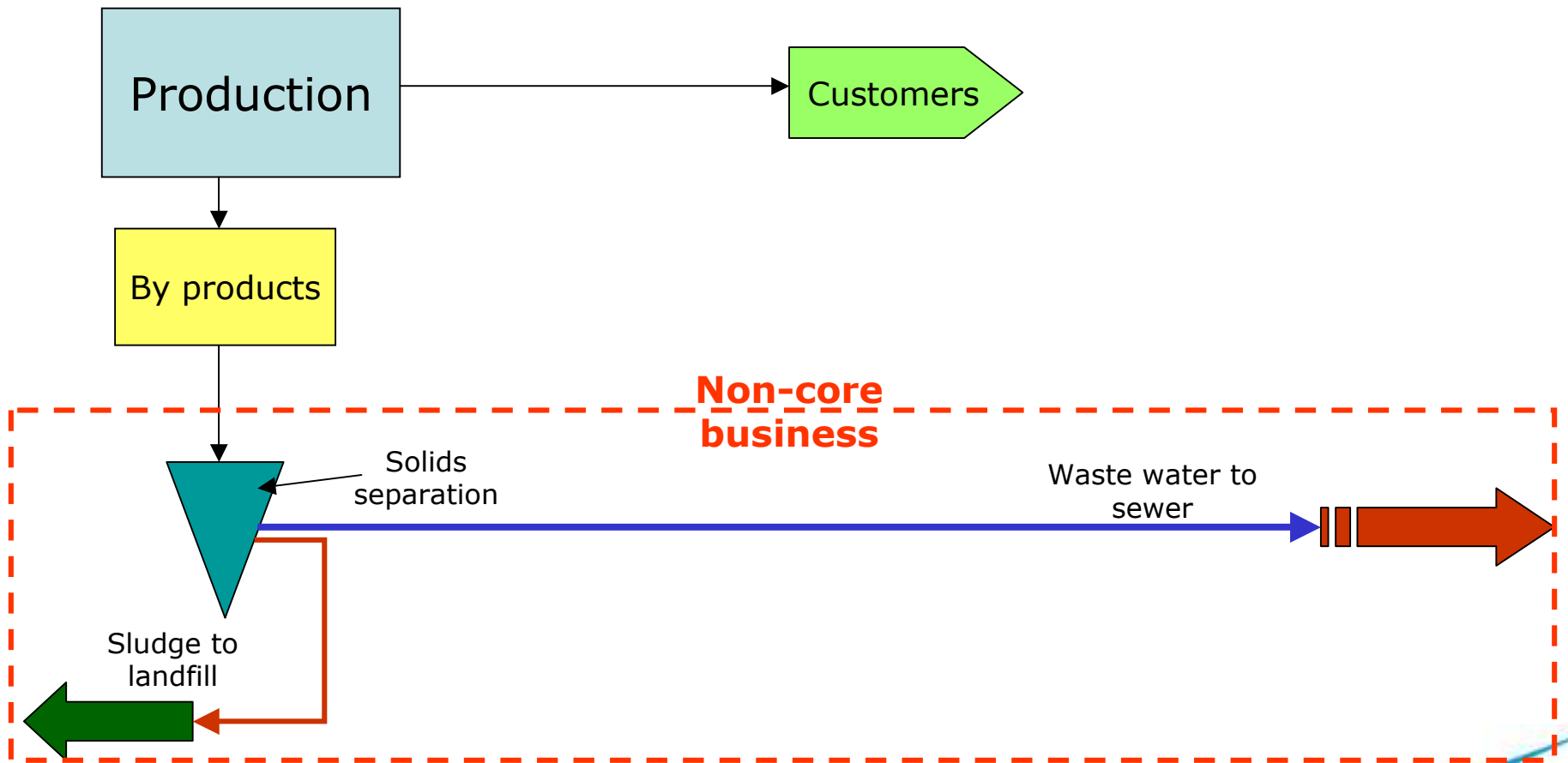
- By-products disposal – sustainability of current disposal costs
- By-products regulation – factor any increased restrictions
- By-products risk – exposure to future market prices
- Electricity prices – at historical highs and likely to be sustained
- Heat/gas prices - at historical highs and likely to be sustained
- ROCs & LECs – want to capture value
- EU ETS – want to capture value
- Energy usage – elimination of current usage
- Capital expenditure – avoided requirements
- Core operating capacity – impact of solution on it

Project example and benefits

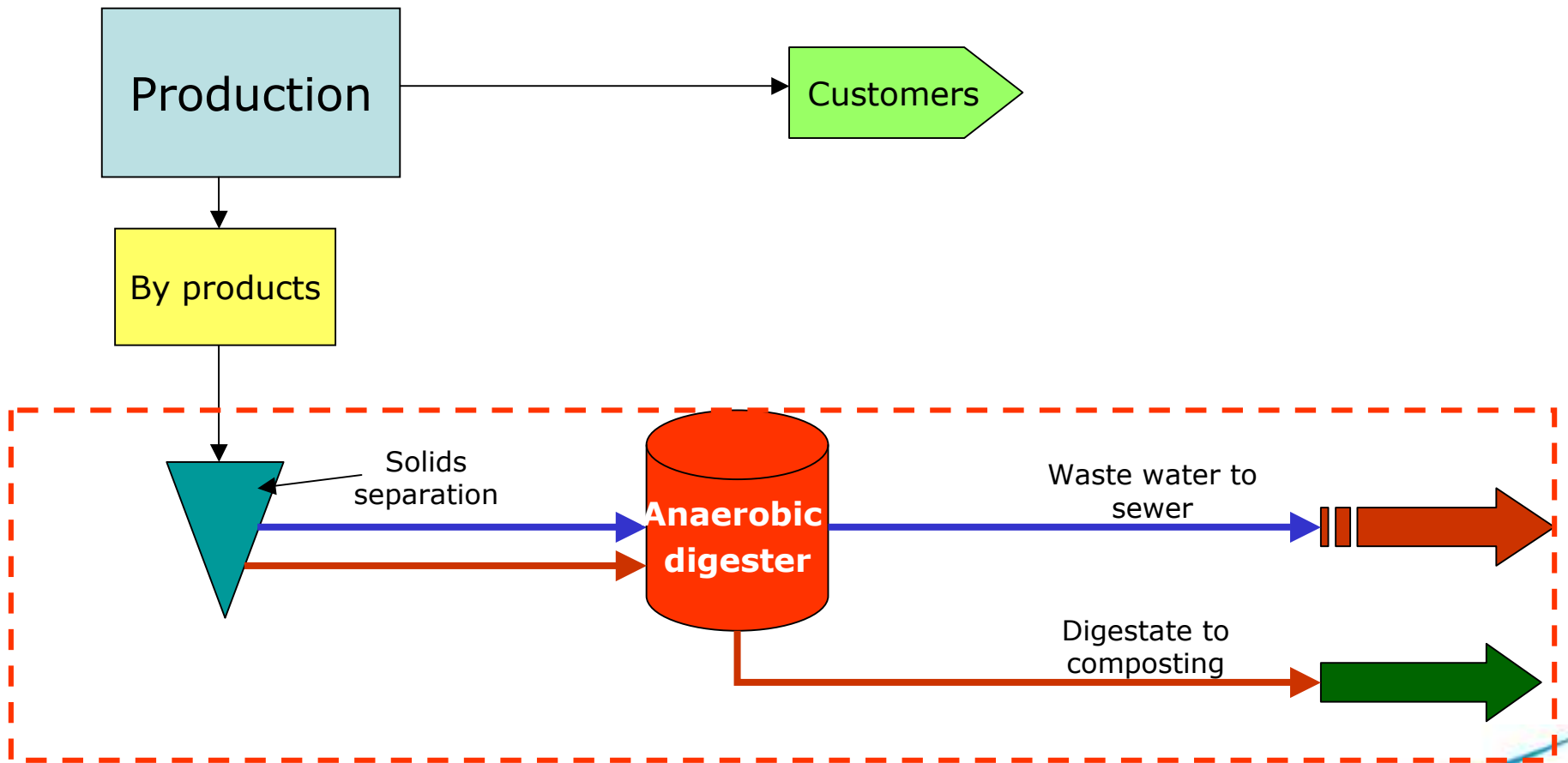
CT W4E: A project example



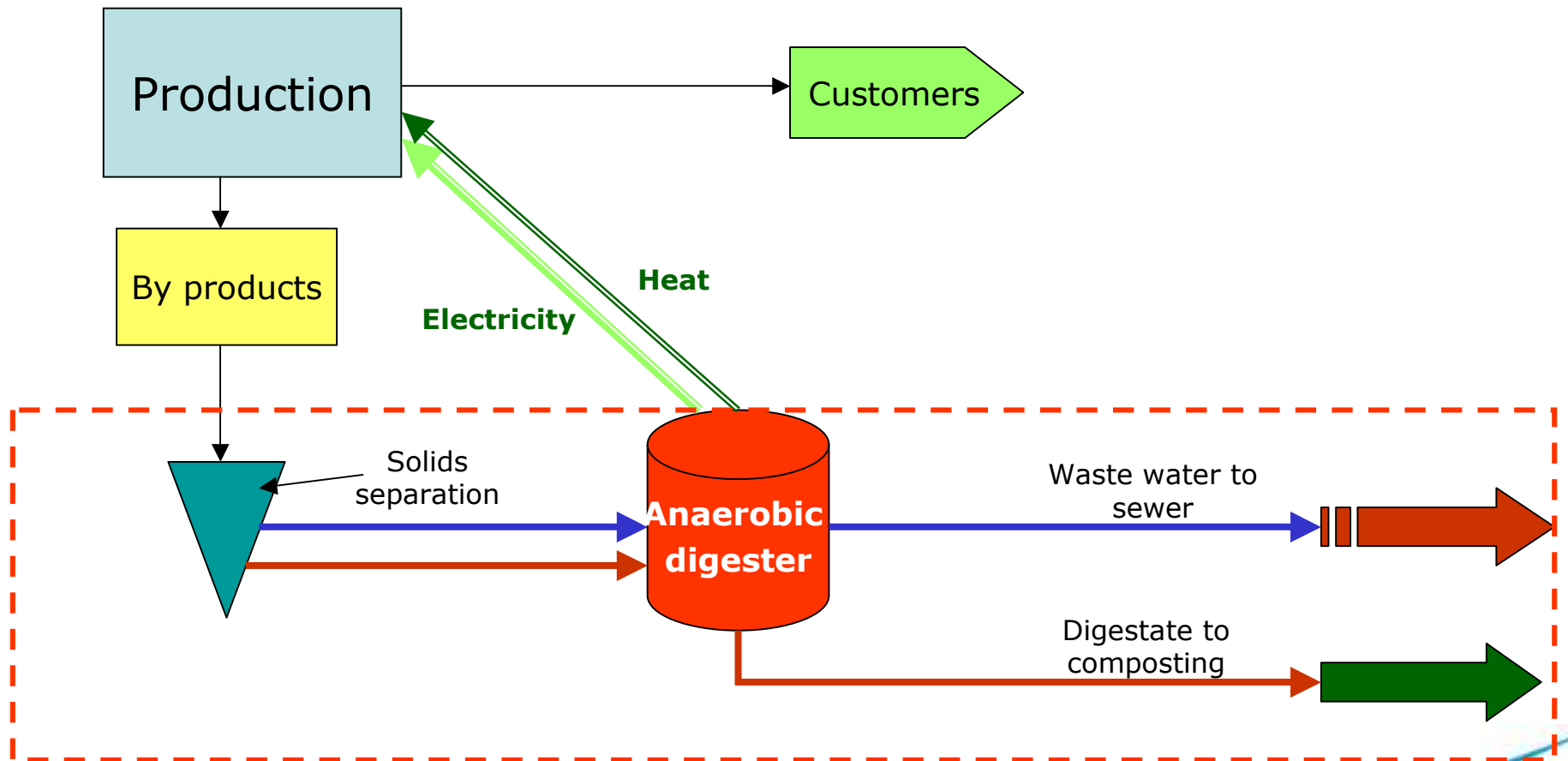
CT W4E: A project example



CT W4E: A project solution



CT W4E: A project solution



Benefits of CT Waste4Energy

Cost Savings

- Landfill/ rendering
- Electricity costs
- Heat costs

Reduced Risk

- Known future waste costs
- Known energy offsets
- Greater control of waste
- Improved compliance

Revenue Generation

- Electricity & Heat
- CCL
- ROCs
- EUETS
- By-Products

Carbon Reductions

- Shareholders
- Customers

Strategic

- Management focus on core business

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End