



SHREWS Ltd

Energy from Waste

The Way Forward



John Birchmore
Managing Director
SHREWS Ltd
24 Lyne Park
West Linton
Peeblesshire
EH46 7HP

Tel +44 (0) 1968 660022
Mob +44 (0) 7711 33755
Fax +44 (0) 870 120 6872
john.birchmore@shrews.co.uk
www.shrews.co.uk and www.energyfromwaste.co.uk

The Problem



We are creating waste and do not know what to do with it

National Waste Strategy



- Reduce
- Recycle
- Recover
- But still left with lots of waste and need to find a safe environmentally benign solution

Size of the problem?



- Scotland produces each year
 - 3 million tonnes household waste
 - 2 million tonnes commercial waste
 - 2 million tonnes industrial waste (excl. demolition)
- only 3.5% is recycled

The throw away solution

- 3 tonnes of MSW about equal to 1 tonne of oil so Scotland putting about 1 million tonnes of oil into the ground each year

Changes from EU and greater environmental awareness

- Diversion targets
- Recycling targets
- Stricter regulations
 - what can go to landfill
 - emissions standards
 - Recycling requirements



Optimistic approach

- Scotland reaches 50% reduction recycling, but still putting 0.5 million tonnes oil equivalent into the ground

Own goal for thermal treatment?

Mass burn incinerators:-

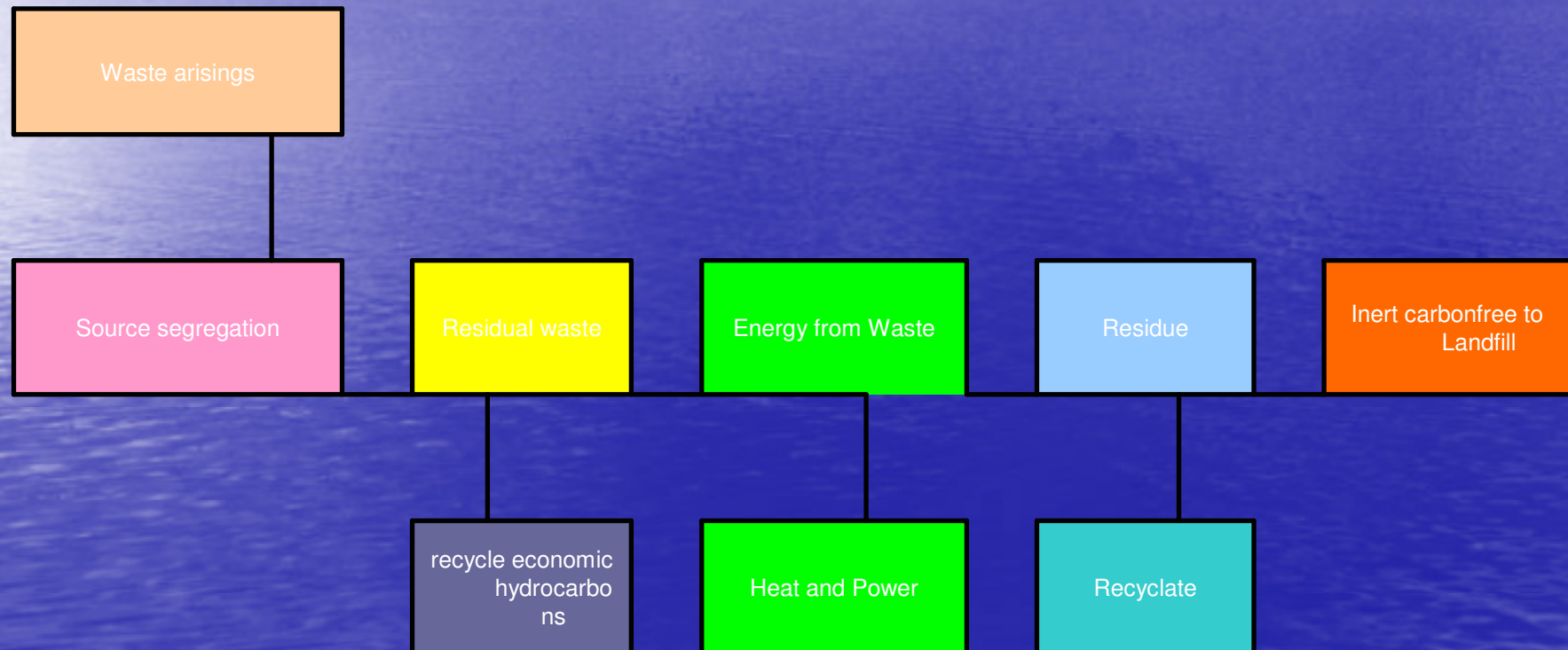


- Big and expensive
- Poor emissions standards
- Inflexible
- Easy option which discouraged recycling

BEST PRACTICE BUSINESS PLANNING



Energy from Waste Concept



Opportunity



- niche for small, agile company
- niche for small scale projects
- demand for local solutions
- multiple non-specific waste streams
- technologies developing to point of being commercial

Acceptable technologies?



To make a success in the niche market identified had to use advanced thermal processes based on pyrolysis and gasification

Technology development

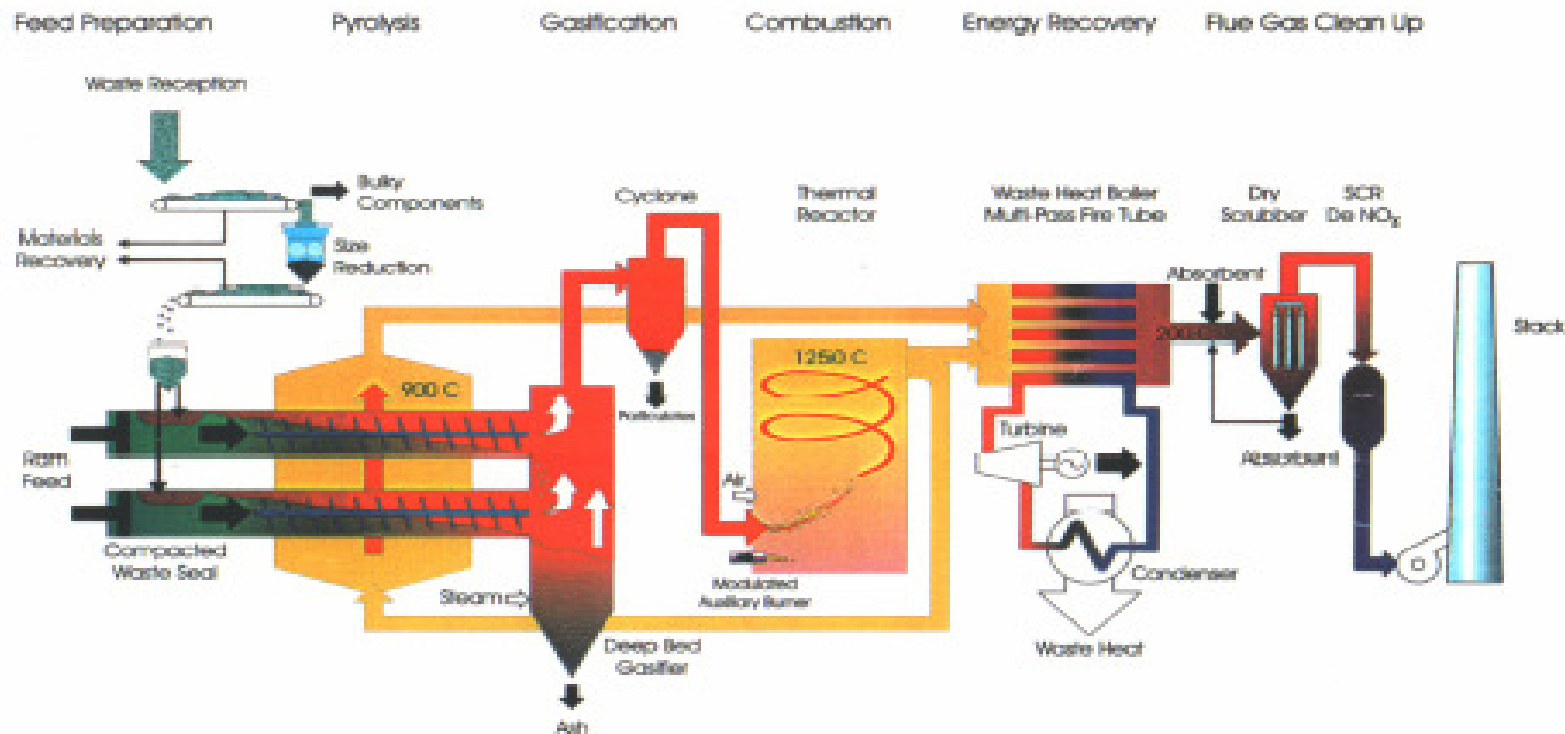
Plants now:

- Small scale
- Modular
- Integrated with power production and recovery of heat
- Very high emissions standards
- Reducing perceived technological risk

The technology



Compact Power



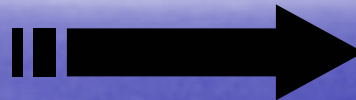
© Compact Power 1998

Process description

Pyrolysis

- Materials heated in the absence of oxygen
- Temperature up to 800°C
- Hydrocarbons converted to simple gases
- Residues of carbon char and inert materials

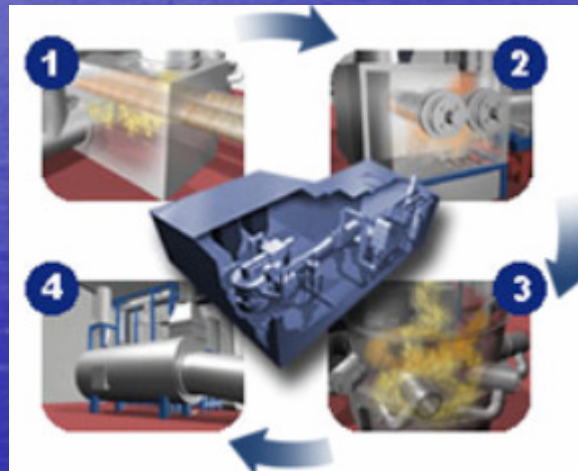
GAS PRODUCTION



Gasification

- Carbon residues reacted out with air and steam
- Hydrogen and carbon monoxide produced

GAS COMBUSTION



Energy Conversion

- Exhaust gases passed through a steam boiler
- Up to 80% of available energy from waste recovered
- Steam used for power generation and/or combined heat and power (CHP) applications

ENERGY RECOVERY



High Temperature Oxidation

- Gases reacted at high temperature (1,250°C) for more than 2 seconds
- Organic pollutants & particulates destroyed
- Energy released

Environmental Impact

mg/Nm ³ 11% O ₂ @ 273K & 101.3kPa	EU Directive Limits		<u>Compact Power</u>
	s: spot / d:daily	½ hour	
Particulates	10 (d)	30	0.2
VOC's as carbon	10 (d)	20	Trace
NO (NO + NO ₂)	200 (d)	400	<37
HCl	10 (d)	60	2
HF	1 (d)	4	<0.1
SO ₂	50 (d)	200	< 25
CO	50 (d)	150	Trace
Cd & Tl	0.05 (s)		0.006
Mercury	0.05 (s)		0.006
Pb Cr Cu Mn Ni As Sb Co V Sn	0.5 (s)		0.006
Dioxins TEQ ng/Nm ³	0.1 (s)		<0.003
N ₂ O	30 (d)		Trace
NH ₃	10 (d)	20	< 1

Planet BOS System



Problem ?



Where?

- Site where can get planning consent
- Get agreement of owner to sell lease the site
- Power connection
- Close to waste stream
- Access

Project 1 – Dargavel, Dumfries

- Access to main road
- Adjacent to landfill site
- Restored quarry
- Willing owner
- No hostile neighbours
- No inherent site contamination
- Power off-take possible
- Heat outlet

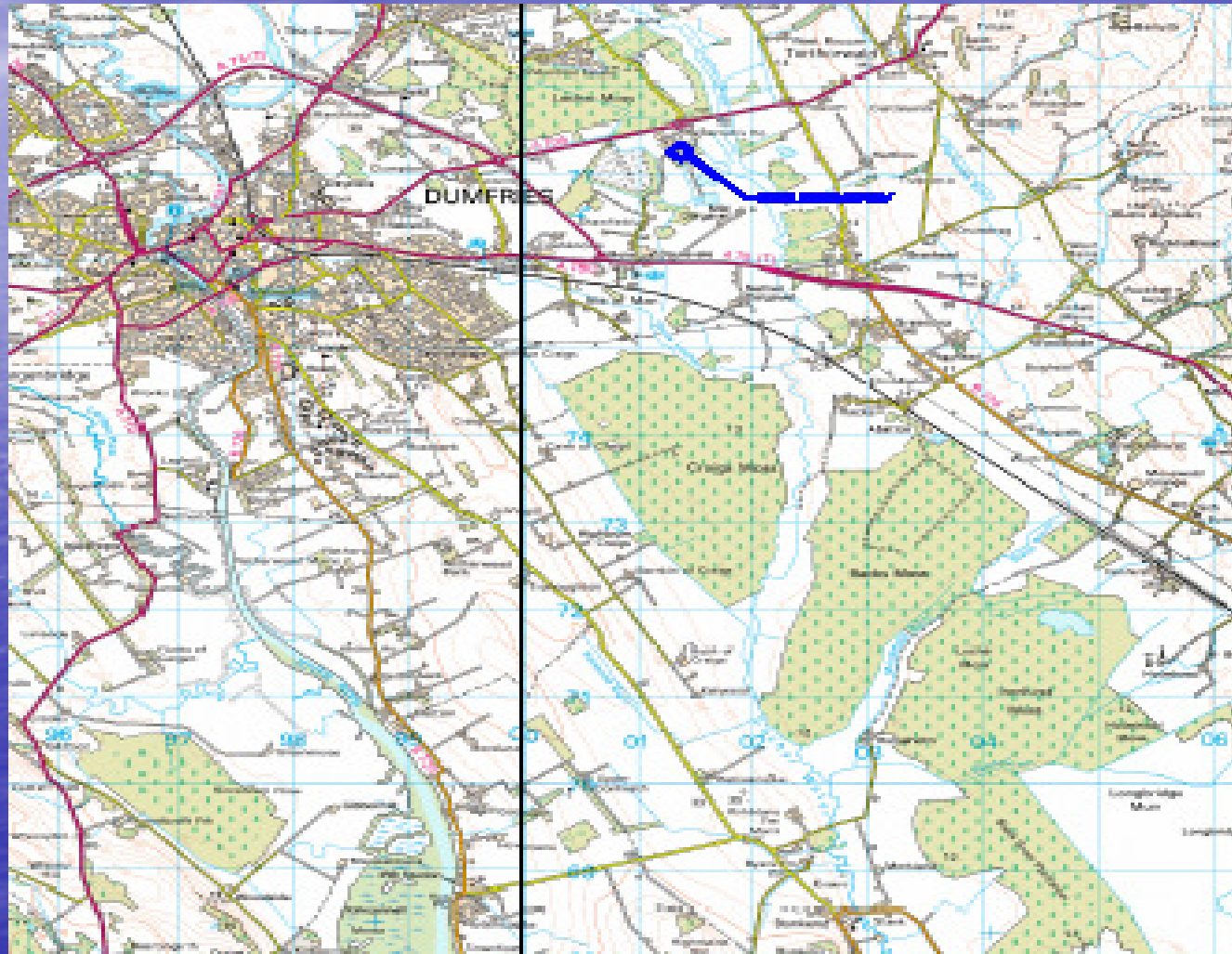


Site found – what then?



- Secure lease
- Secure SRO for 7.2MWe
- Do basic engineering
- Commission EIS
- PR programme
- Commission architects
- Secured planning consent (secured May 2001)

Location of Plant



Revenue streams



- Waste – council PFI for MSW/RDF, tyres, industrial waste, meat and bone meal, abattoir, etc. - 64,000 tonnes per year with average CV 18MJ/kg
- Power – SRO for 7.2 MWe
- Heat – looking at options

Environmental Considerations

- Emissions to air:
 - cleaner than the air in Princes Street
 - Less pollution than burning 3 tonnes garden waste
- Ash:
 - 5-20% original weight
 - Inert and sterile
 - Can be used for construction



Financial Considerations



- Capital cost about £26 million
- Banks won't go more than 70% debt
- Returns currently 20% on equity
- Banking on real increases in gate fees

Timescale



- First thought of in 1998
- Lease option secured 1998
- SRO awarded March 1999
- Planning consent May 2001
- Avonmouth plant commissioned and IPPC 2001
- *Funding secure May 2005*
- *Construction start June 2005*
- *Testing Feb 2006*
- *Full production June 2006*

Royal Botanic Garden Edinburgh

- 10,000 -13,000 tonnes per year of MSW and other controlled wastes
- Production of 2.2+MWh to heat offices and glass houses
- Oil boiler back up
- Education and demonstration role
- Reduces primary hydrocarbon use by c85%

RBGE

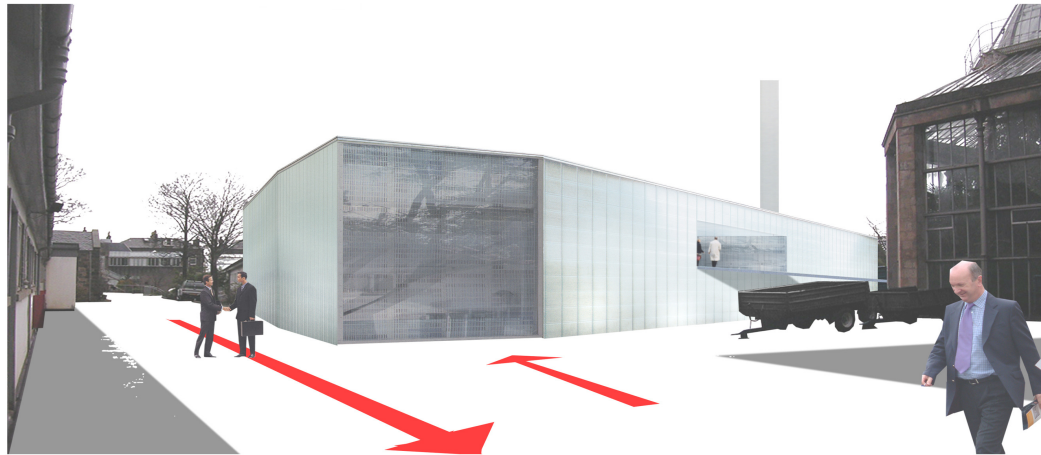
- Urban environment
- Edinburgh introducing source segregation
- Backing of Royal Botanic Garden Edinburgh
- Heat for glass houses
- Reduce primary source of carbon by about 90%

Royal Botanic Garden Edinburgh

Reiach and Hall Architects

replacement boiler
for
Royal Botanic Gardens
Edinburgh

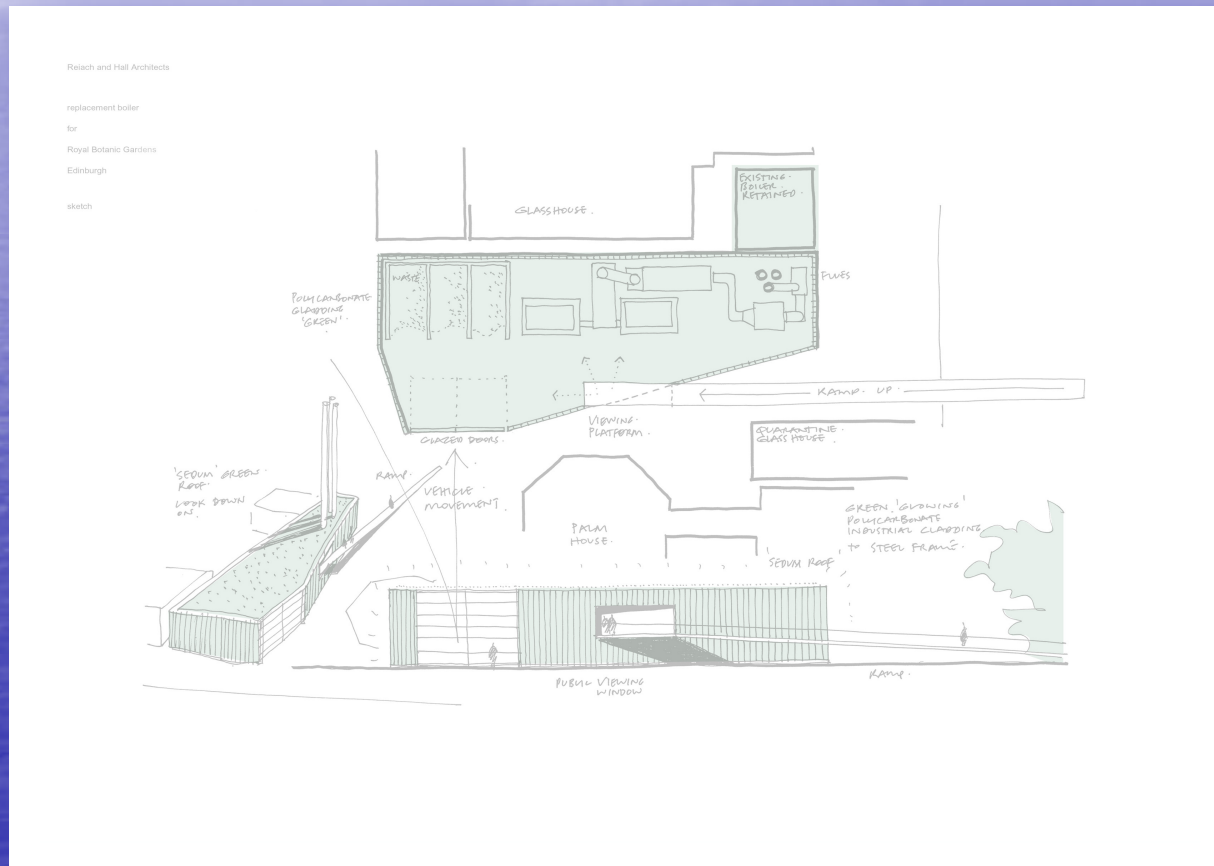
impression



Project 2 – Planet Batch System



RBGE Concepts and plant layout



Project 3

Island of Arran

No landfill and costly to get off the island

Energy shortages

So combined biomass/waste project
generating about 3.5MWe

Key issues



Depends on

- **political will** (Scotland, UK, EU, International agreements)
- Finding sites
- Planning process
- Landfill tax
- Landfill restrictions
- ROS regulations
- Vested interests
- Investment funds and banks coming on board
- Equity partners

Potential?



- 7 million tonnes of waste
- Say 50% recycling, reduction and recovery
- Leaves 3.5 million tonnes
- At 15,000 tonnes generates 1 MWe
- 2300 MWe
- Landfill at 15% reduced to 525,000 tonnes