

Optimising Energy Recovery from Waste

Association of Public Sector Excellence

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B9 Organic Energy International Ltd



Prequel

People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices.

Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of*

Nations

Prequel

- **Adam Smith** - *'The real tragedy of the poor is the poverty of their aspirations'*.
- *'Science is the great antidote to the poison of enthusiasm and superstition'*.
- **It's from this last premise that I hope to approach the energy and waste linkage today**

Relevance of these quotations in an energy and waste context?

- We need meeting of minds to appreciate the link between energy and waste
- We need government to grasp the need for urgent action on technology introduction
- We need to lift our aspirations in order to optimise that change
- In the context of the foregoing, how can we optimise our technological opportunities and make the right decisions for change?

Overview

- **What are the elements of waste from which energy can be recovered?**
- **What are the various means of recovering energy from waste and what are their relative efficiencies?**
- **How can we achieve excellence in Scotland in optimising our resources?**

RES / B9 Energy

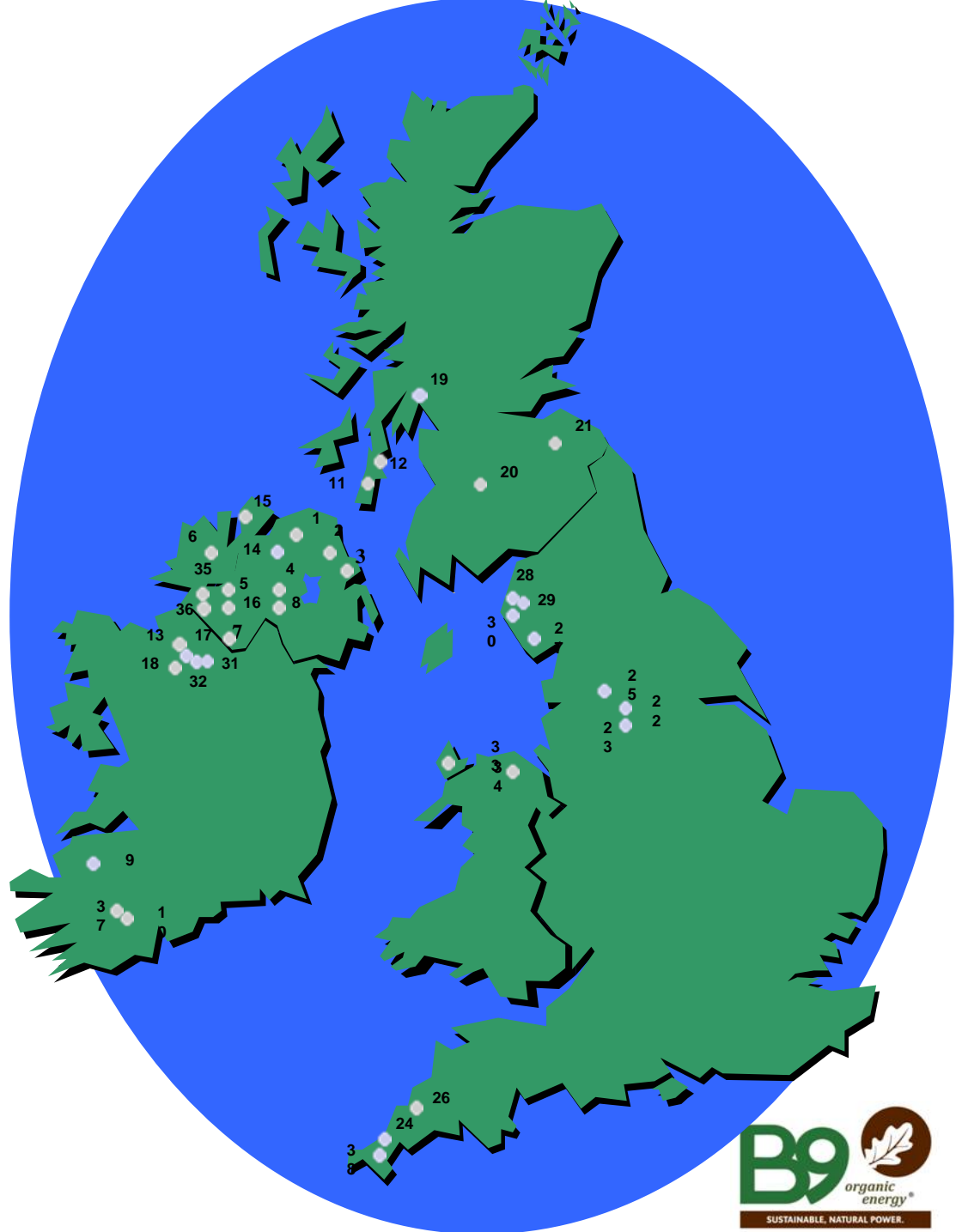


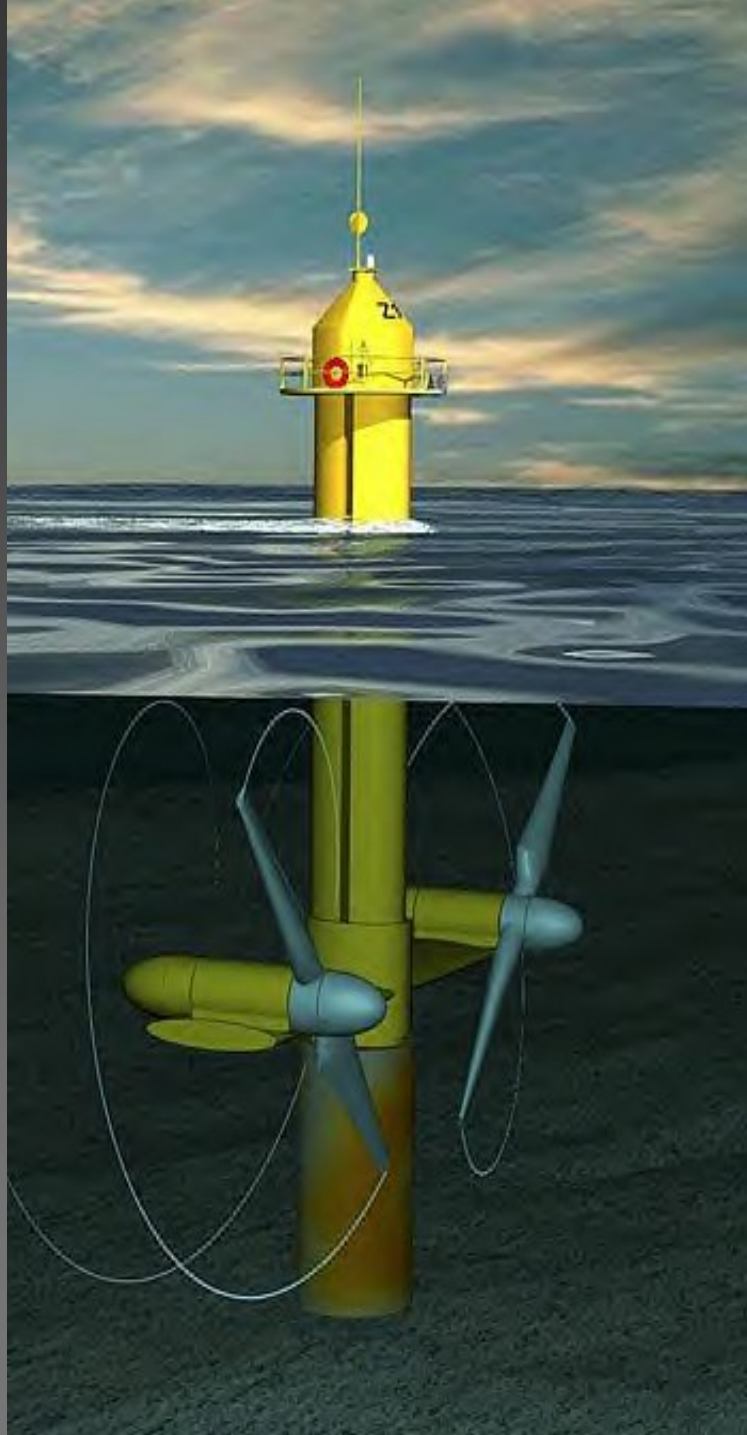
B9 Energy O&M Ltd managed wind farm sites in UK and Ireland

40 wind farms

**>600 wind
turbines**

>400 MW





And Now



B9 Organic Energy Ltd

Energy from Waste through:

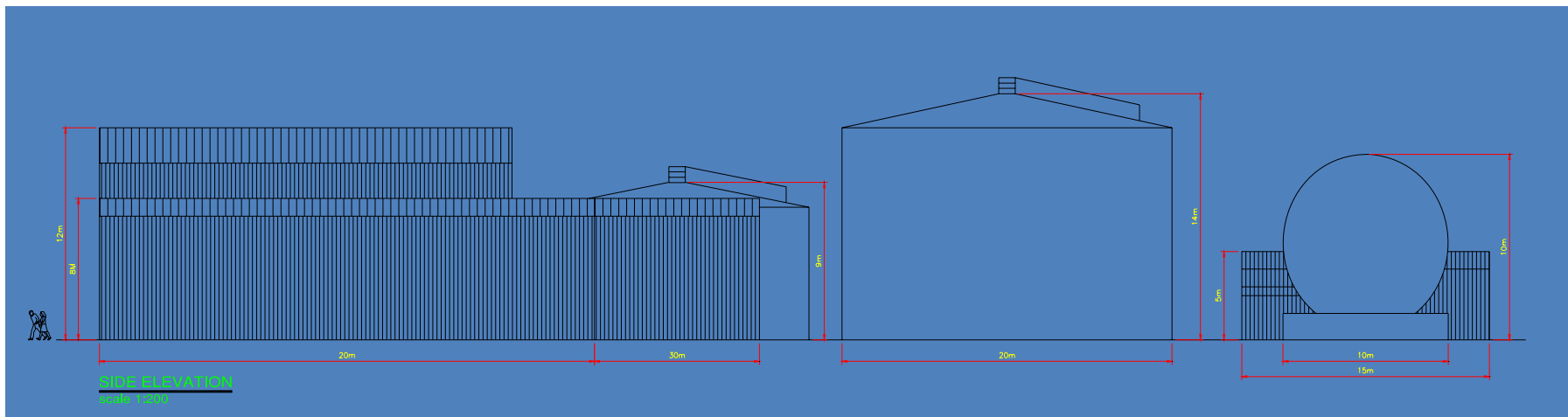
1. Landfill gas development
2. AD waste treatment facilities
3. Government sponsored research project to enhance AD efficiency.



Examples of AD plant

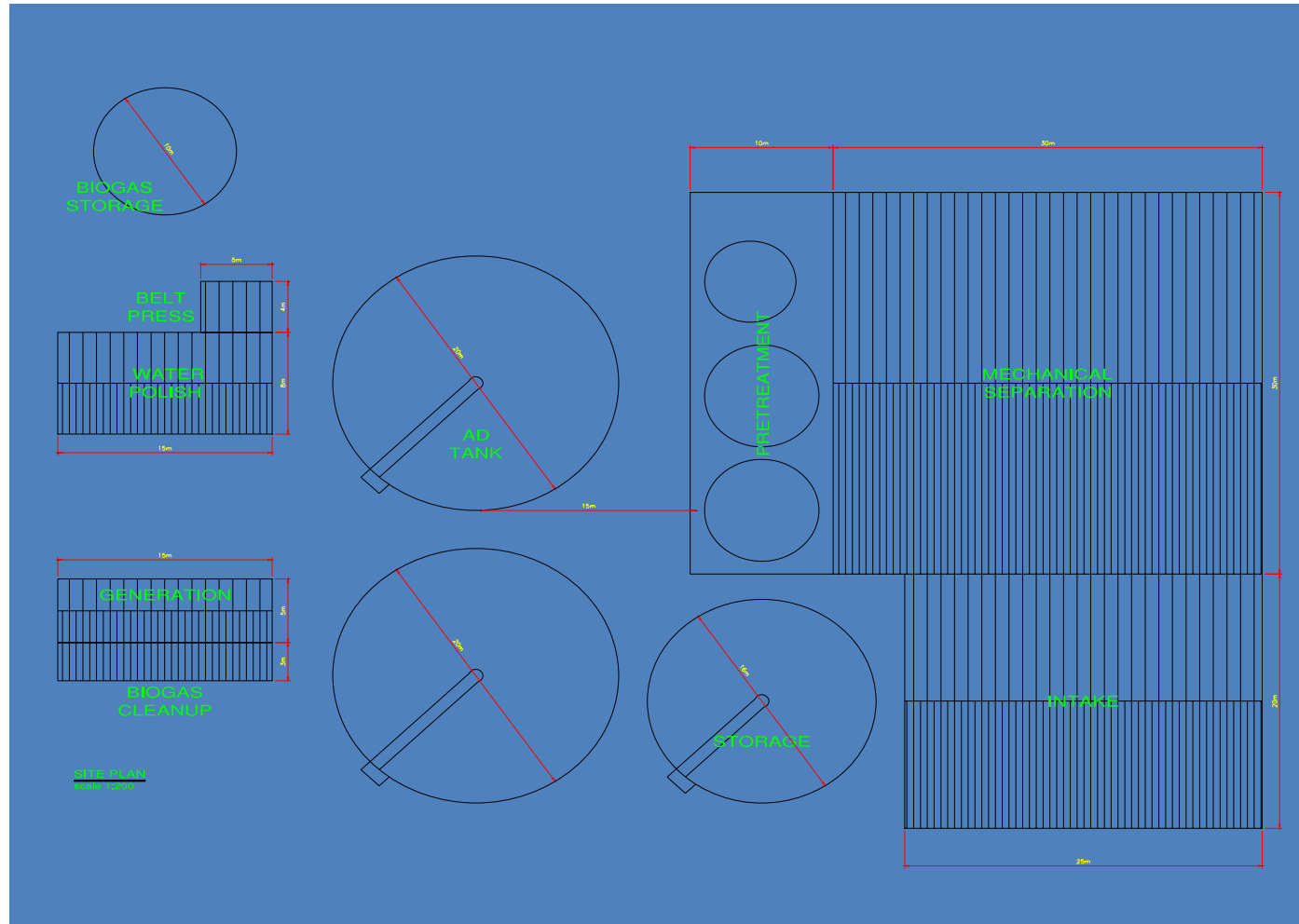


Side View

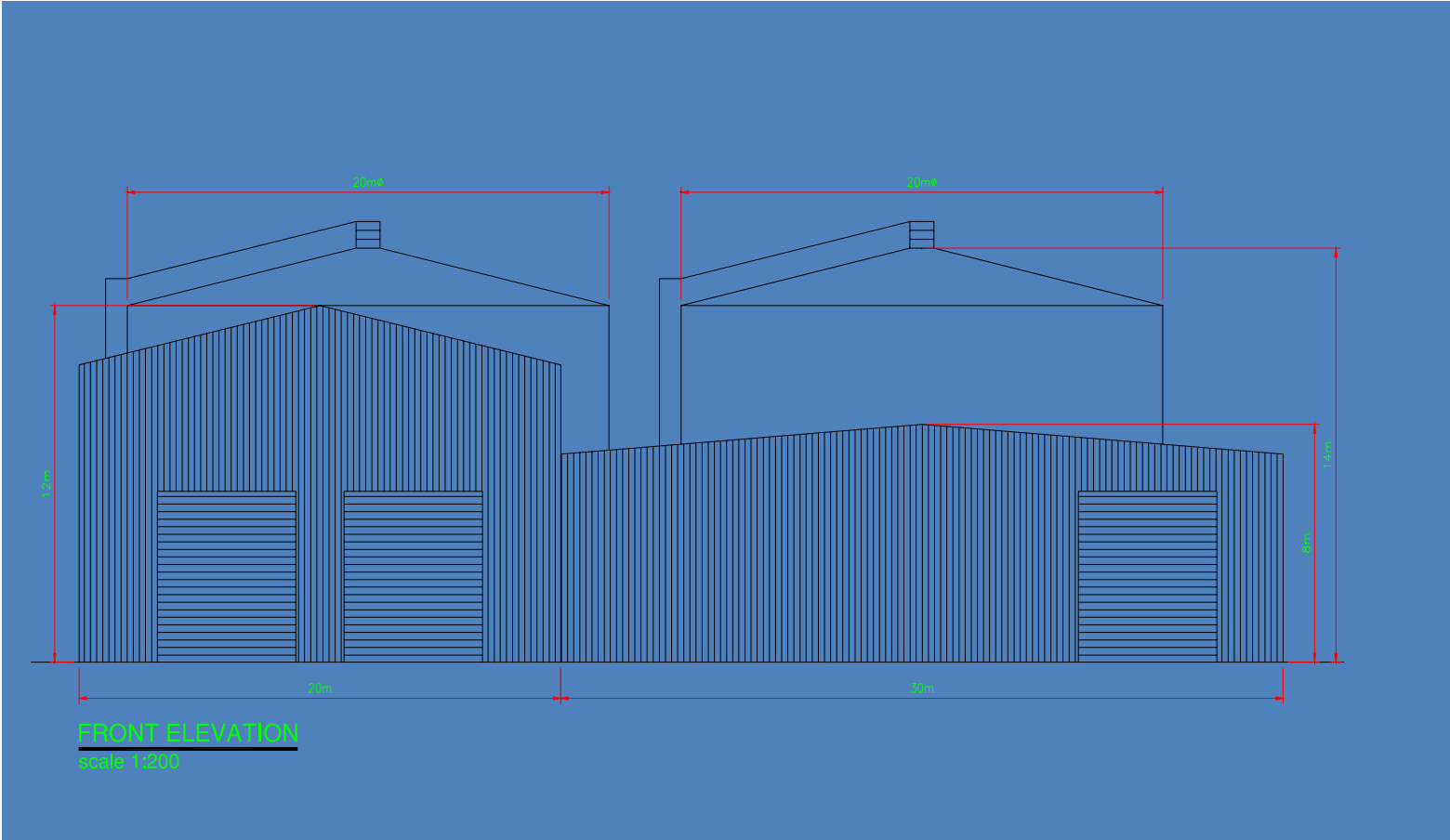


- Typical 50,000 tpa plant
- Footprint approximately 2 acres of land

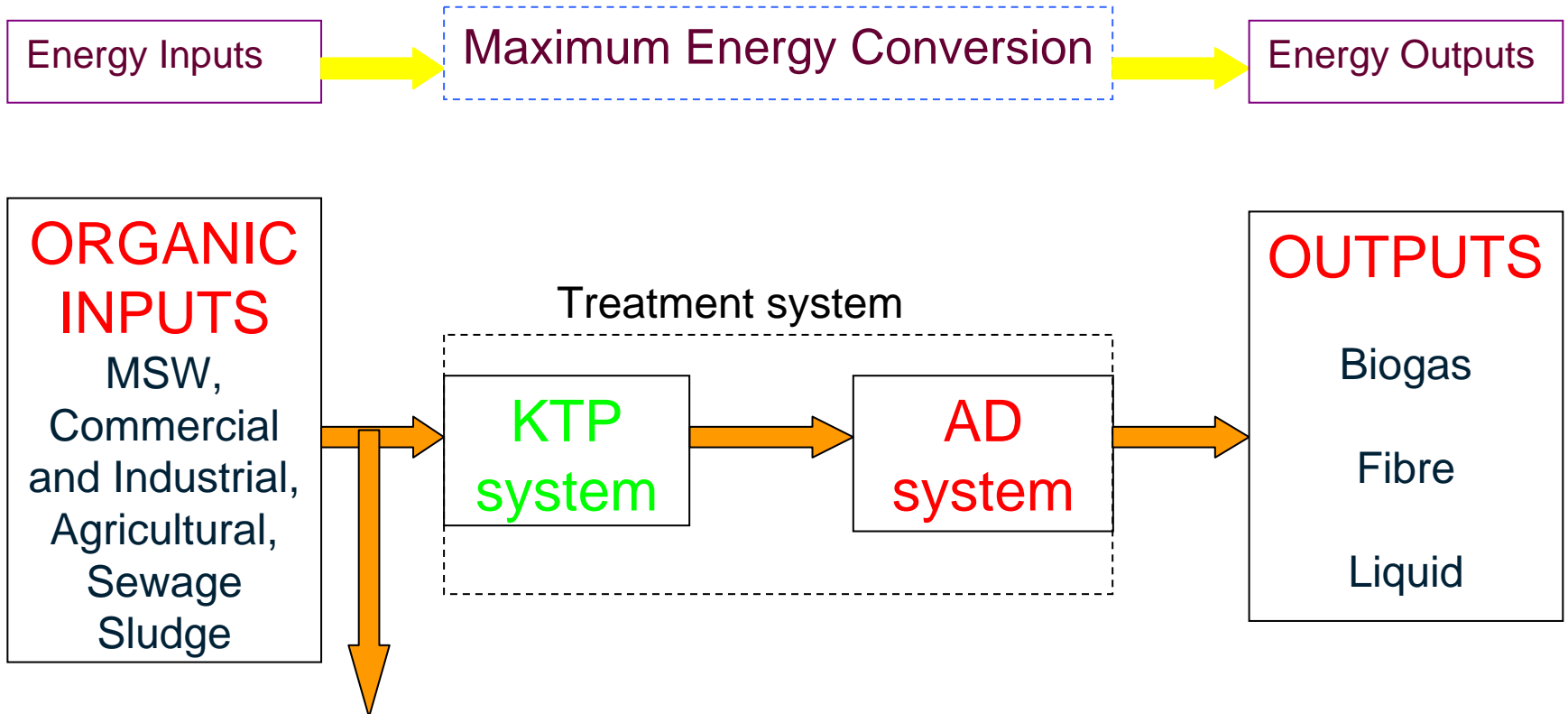
Site Plan



Front View



Research Project



Remove 'recyclables' where necessary

**What elements of Municipal waste
provide energy recovery opportunity?**

The Origins of waste resources

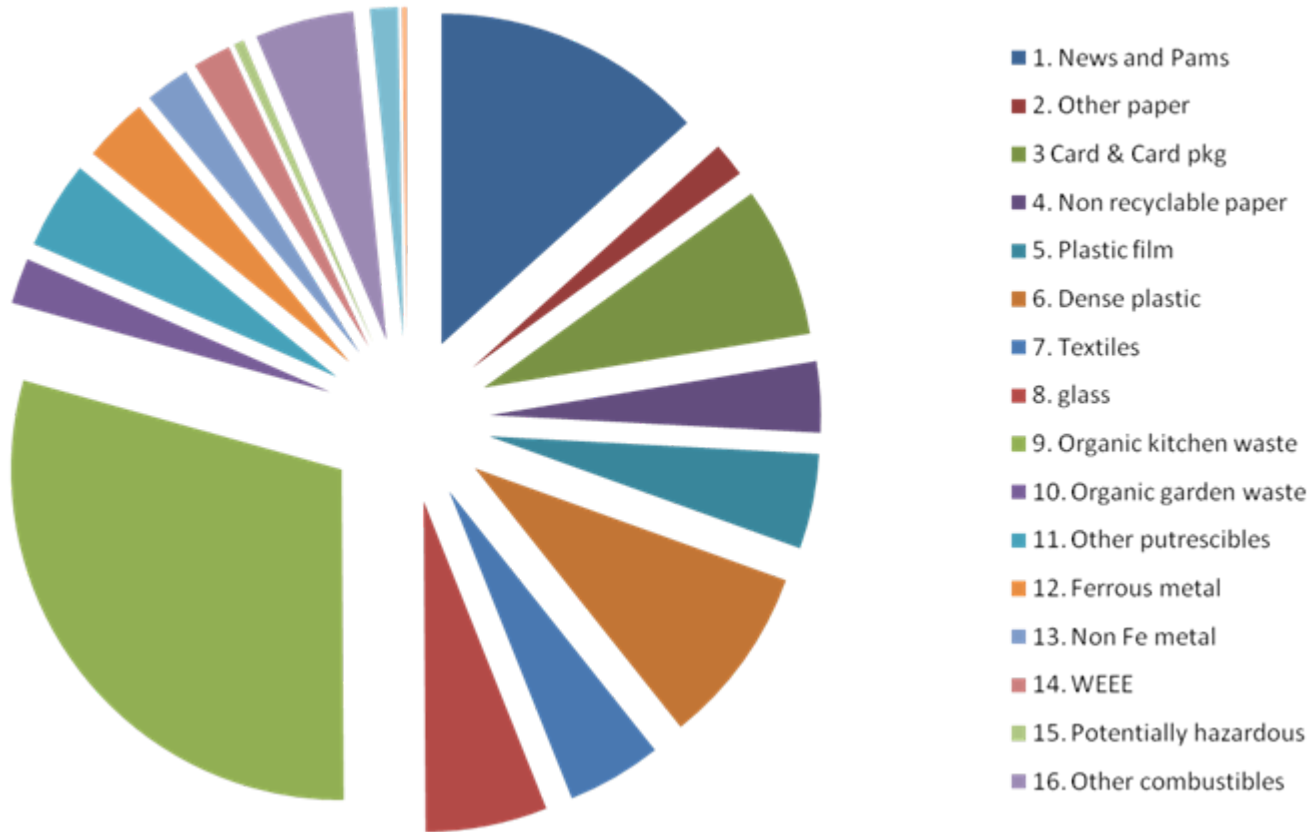


Look at the origins of the waste – the origins of all things

- Rocks and ores –metals, aggregates, glass – non-combustibles or non-biodegradable
- Forest – wood, paper – combustible and biodegradable
- Farm – all food – combustible and biodegradable
- Oil well – fuels, plastics - combustible

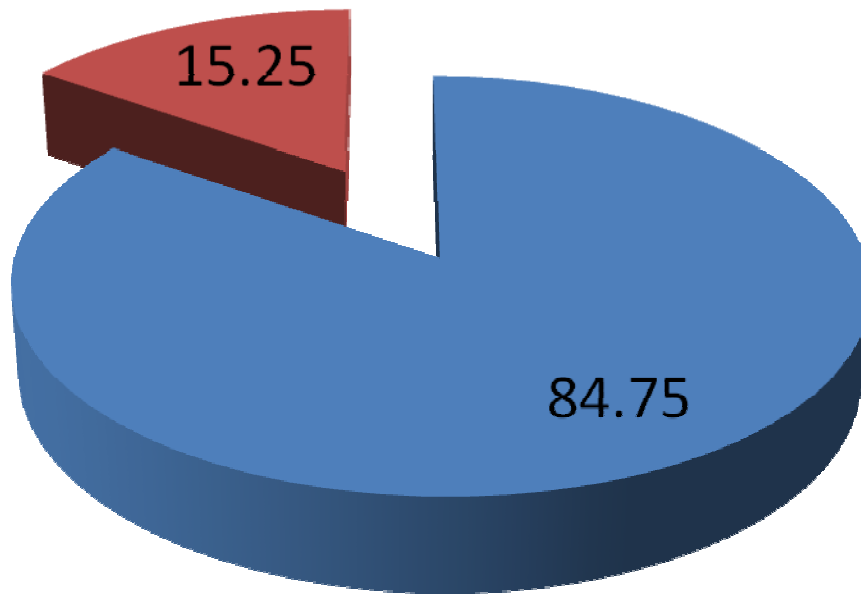
Constituents of waste?

%age each category



Combustibles

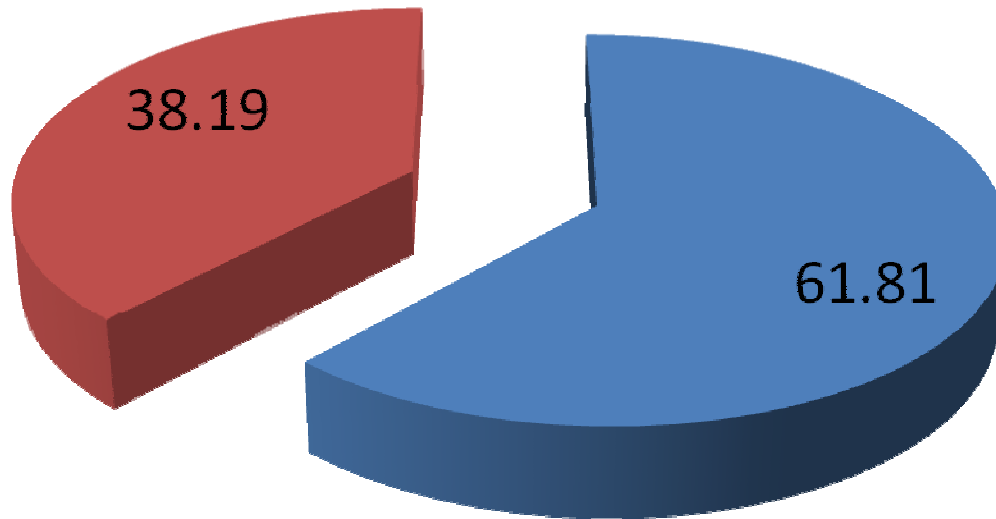
%



- Combustibles
- Non-combustibles

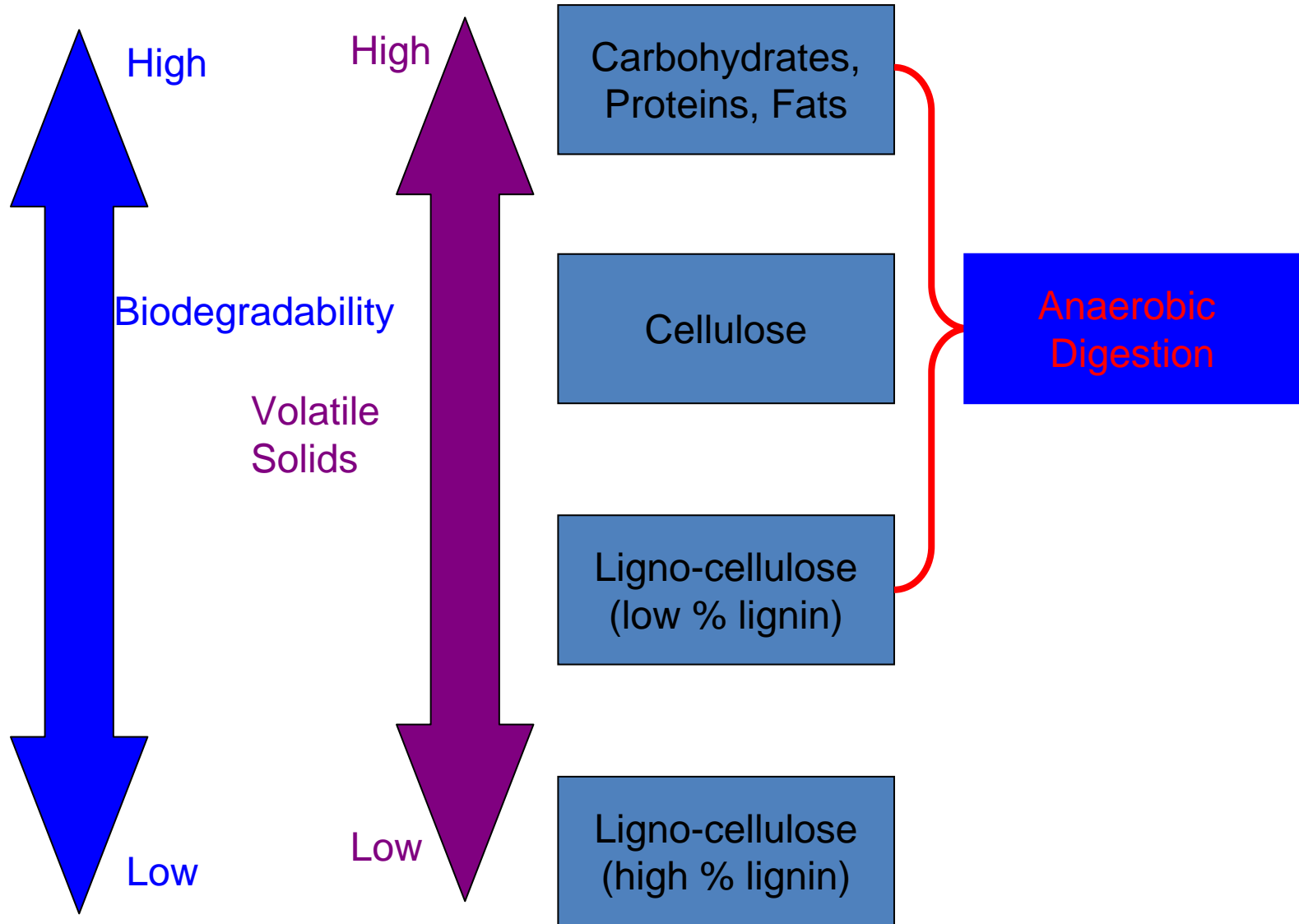
Biodegradables

%



- Biodegradables
- Non-biodegradables

Organic Wastes – Natural Compounds



What are the energy values of the constituents?

- Plastics have similar calorific value to oil and have, arguably the greatest need for optimisation, being non-renewable
- The organic fraction or BMW is over 60% by weight but much of that weight is water
- Plastics therefore, can be combusted with net energy output
- In order to drive off the moisture in BMW, large energy inputs are required – **“burning water”**
- E.g. Sewage sludge: >10MW in – 1MW out

Means of recovering energy from waste

- Thermal treatment
- Anaerobic digestion
- Are there synergies between these technologies and are there conflicts?
- What are the relative economic implications?

The efficiency equation

- Overall efficiency =
- % of feed used in process (proportion into process) X
- % converted by process (proportion burnt) X
- % efficiency of process (boiler efficiency) X
- % efficiency of drive (turbine) X
- Correction for power used on site

Efficiency comparison 1

Using MSW

	% available for process	% converted	% efficiency process	% efficiency drive	% Consumed on site	% Overall efficiency	Efficiency based on what used	KWhr/Te	What is left
Incineration	100	98	79	32	15	21.1	21.1	526.5	Got an ash
AD current	62	55	89	40	15	10.3	16.6	258.0	Got a sludge
AD Future	62	85	89	40	15	15.9	25.7	398.7	Soil conditioner + recycle or 950 KWhr of energy

Efficiency Comparison 2

Using food waste

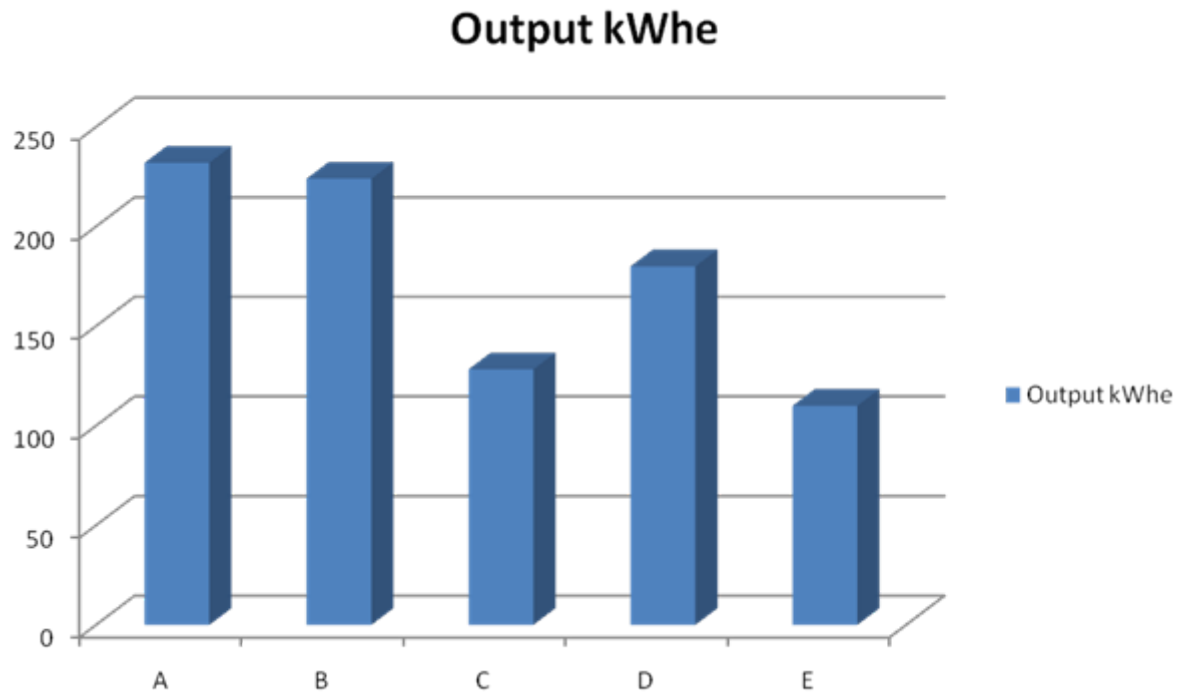
	% available for process	% converted	% efficiency process	% efficiency drive	% Consumed on site	Overall efficiency	Efficiency based on what used	KWhr/Te	What is left
Incineration	100	98	74	32	15	19.7	19.7	167.1	Got an ash (warning low furnace temp)
AD current	98	55	89	40	15	16.3	16.6	138.1	Got a sludge
AD Future	98	85	89	40	15	25.2	25.7	213.5	Soil conditioner + recycle or 17 KWhr of energy

Conclusions on efficiency

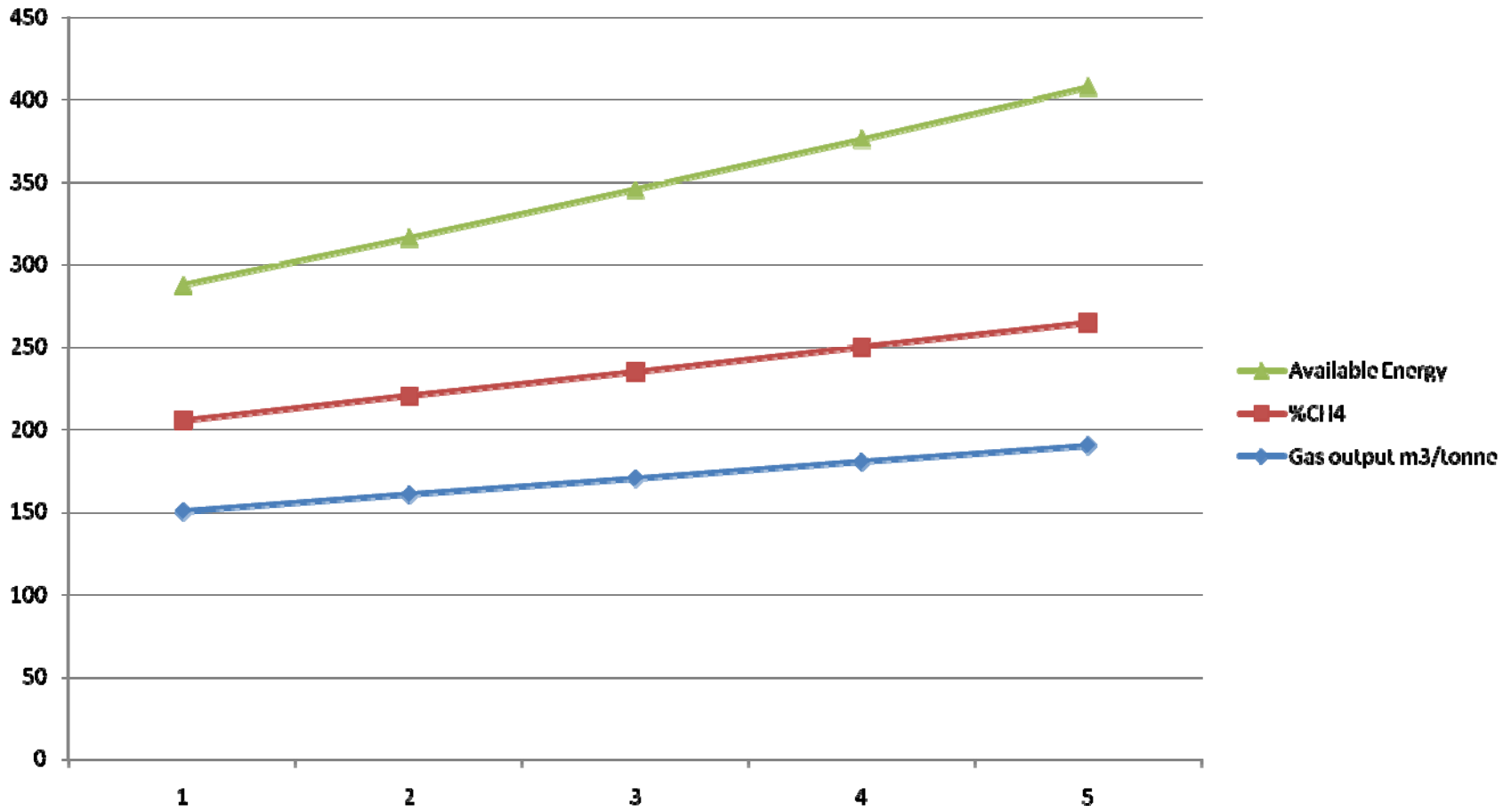
- Efficiency depends on what you put in.
- No single favourite.
- None of the efficiencies shown are what we need!
- Cannot rely on electricity alone!
- Need to beneficially use by product heat.
- Advanced AD uses some of heat for the MRF.
- What is key is that plant is at a scale where heat can be used! (Small or integration is beautiful)

What are their relative efficiencies?

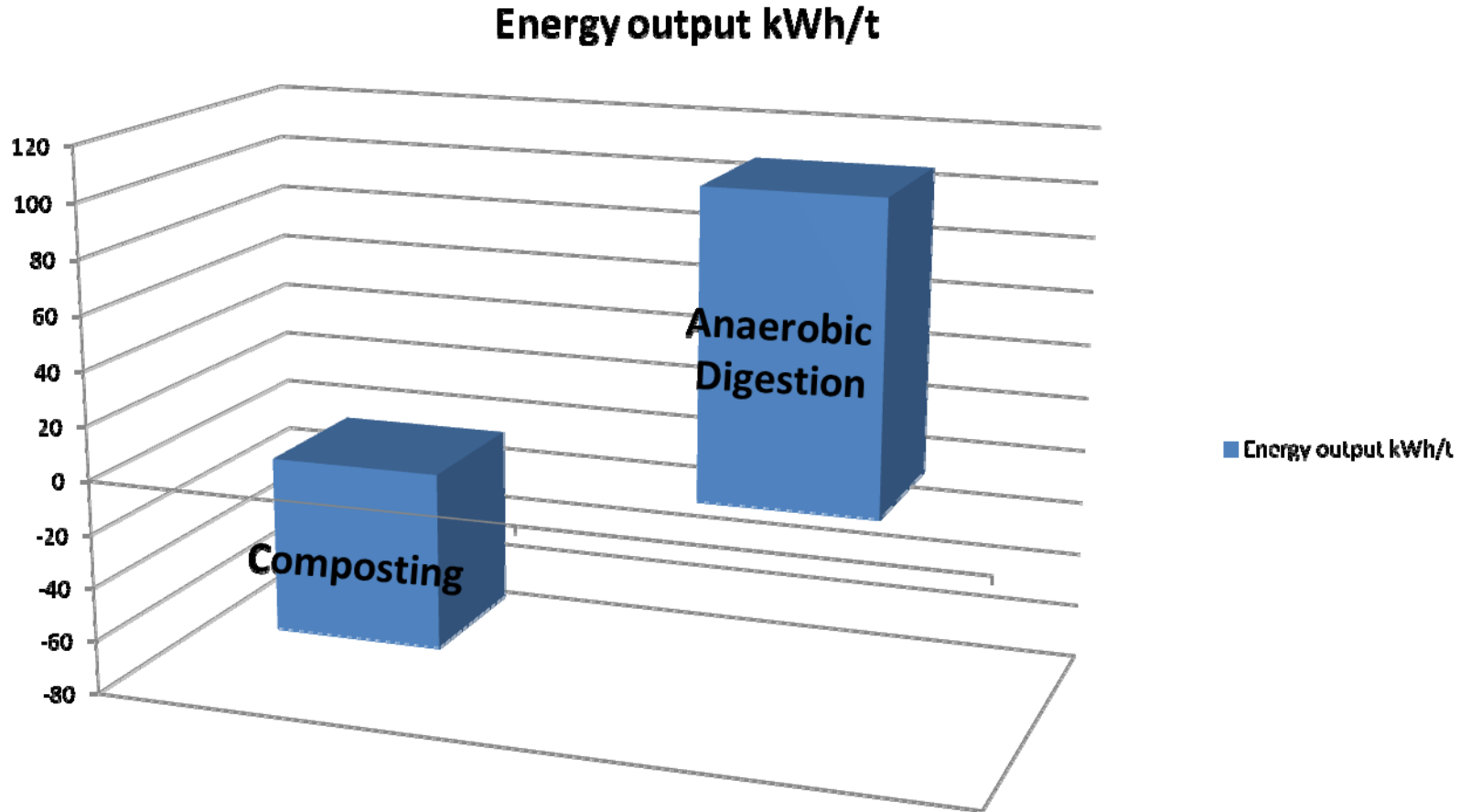
Anaerobic Digestion



What are their relative efficiencies?



Energy efficiency: AD versus Composting



How can we achieve excellence in Scotland in optimising our resources?

- Do we just tick boxes for “job done” or do we tick the box “excellence achieved”?
- What are the economic implications?
 - AD versus Incineration –
 - £50-£60 per tonne versus £80-£120 per tonne

Conclusion

- Make the right decisions based on science not expediency
- Oil at \$200 per barrel within 3 years – Adam Smith again – the Laws of Supply and Demand. ***Eddie O'Connor, Airtricity***
- Get some plants built
- Build it and they will come!

Thanks for the invitation

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