

HRL Technology



Status and Developments in Biomass and Waste Utilisation at Large Scale

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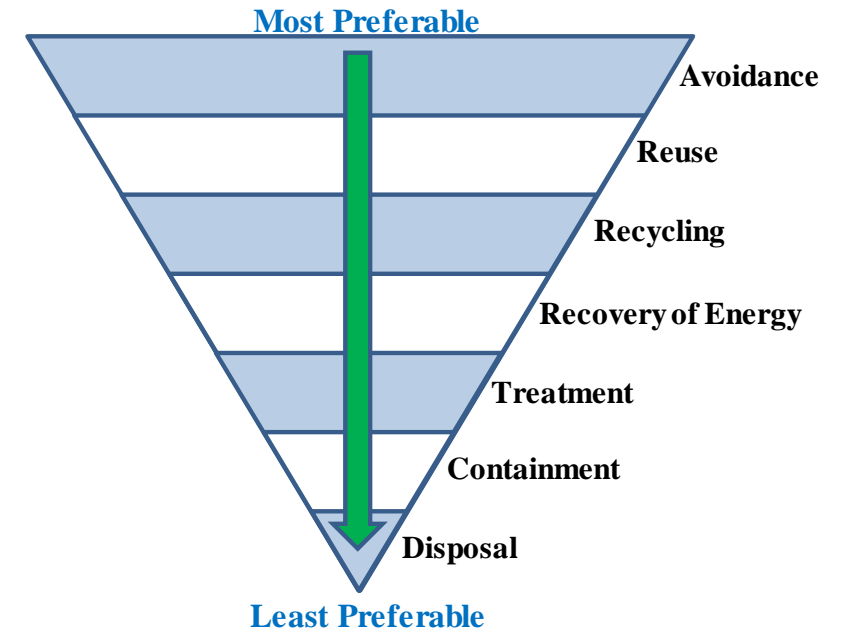
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Presentation Overview

- Drivers for waste and biomass to energy
- Waste and Biomass Feedstocks
- Large Scale Technologies
- Current status internationally
- Current status in Australia
- Factors which impact project development
- Conclusions

Biomass and Waste to Energy – Why?

- Convert a waste or by-product into a higher value product;
- Divert waste from landfill;
- Offset natural gas, LPG or electricity costs;
- Production of renewable base load power;
- Reduce greenhouse gas emissions (methane and carbon dioxide).

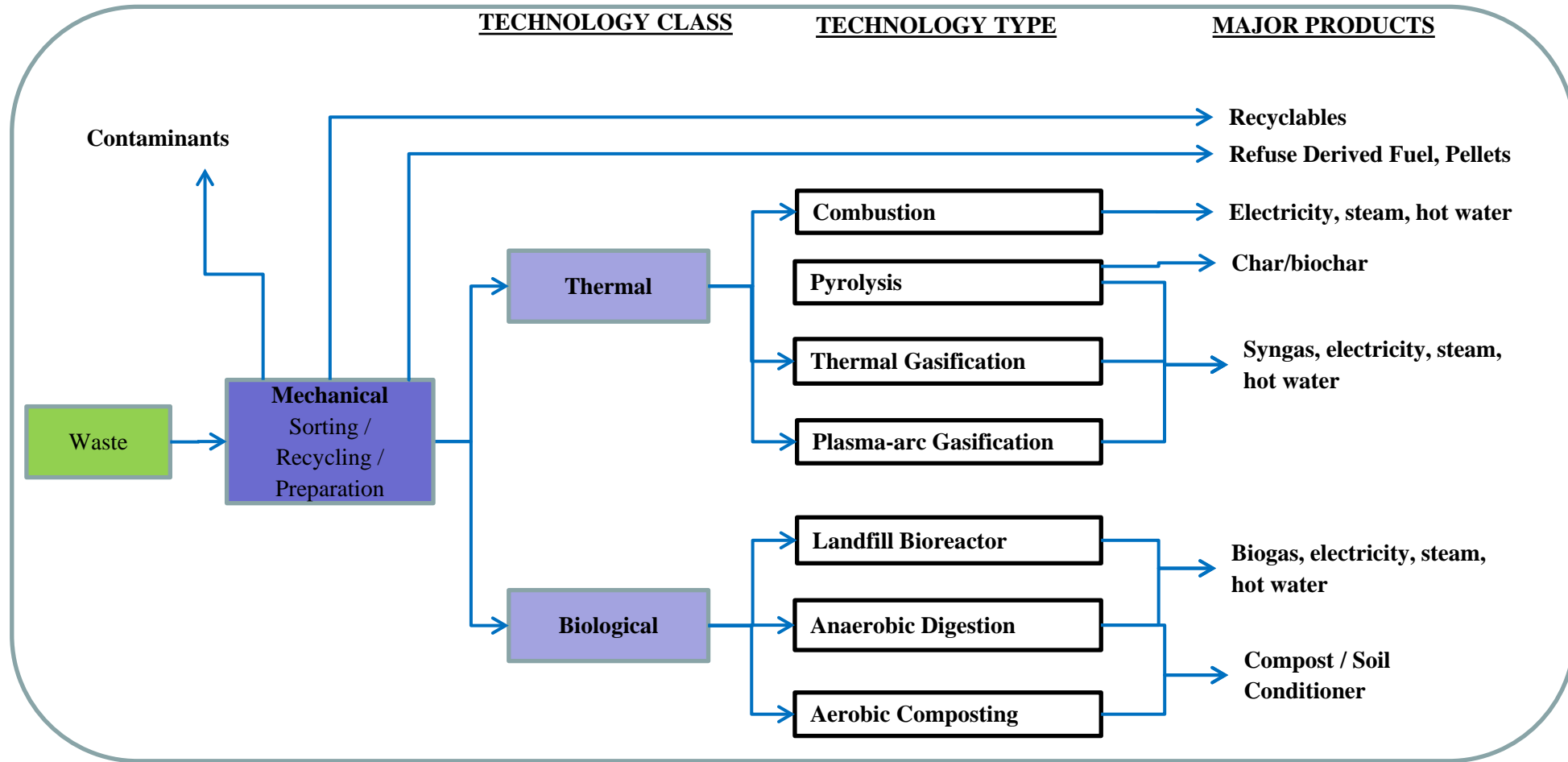


Types of Bioenergy Feedstocks

- Municipal waste (MSW) and green waste
- Industrial waste (C&I, C&D, RDF)
- Landfill and sewage gas
- Bagasse (sugar cane residue)
- Wood waste
- Agricultural crops and waste
- Livestock waste
- Black liquor
- Tyres



Large Scale Technologies for Waste and Biomass to Energy



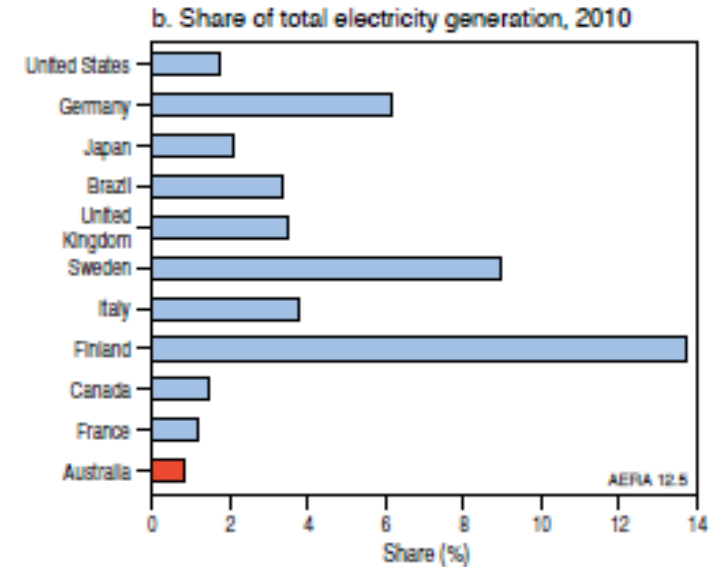
Waste to Energy is any process that converts a waste source into energy

Bioenergy in Australia and Internationally

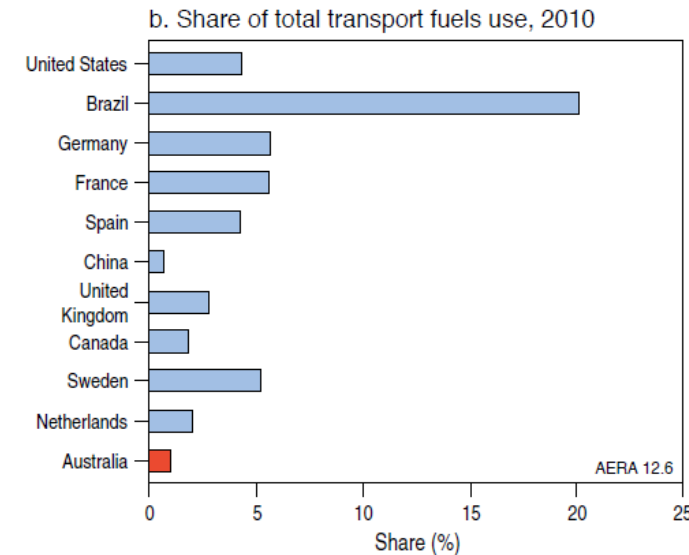
- Waste and biomass to energy is more widely adopted overseas

Country	Primary Energy Demand (%)	Electricity Generation (%)
Australia	~3.1%	~1.3%
OECD	~4.9%	~2.4%
Non-OECD	~10%	Low

- Projected Worldwide growth to 2035 – 6.2%
- Major Drivers
 - EU Legislation promoting biofuels for transport, energy efficiency, greenhouse gas emissions, waste, use of renewables
 - Moving away from fossil fuels – e.g. Germany
 - Cold Climate - Combined heat and power
 - Higher electricity prices



From Australian Energy Resource Assessment

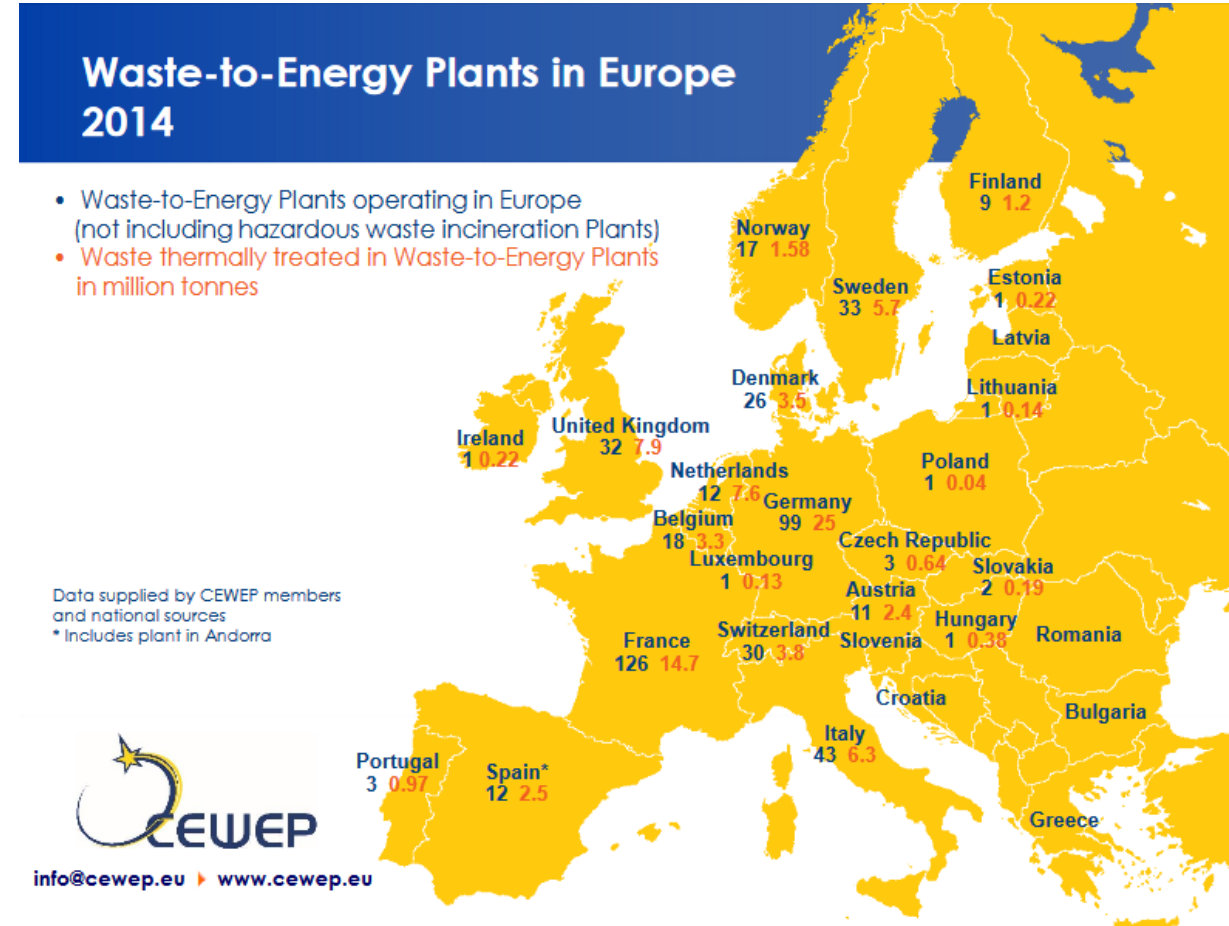
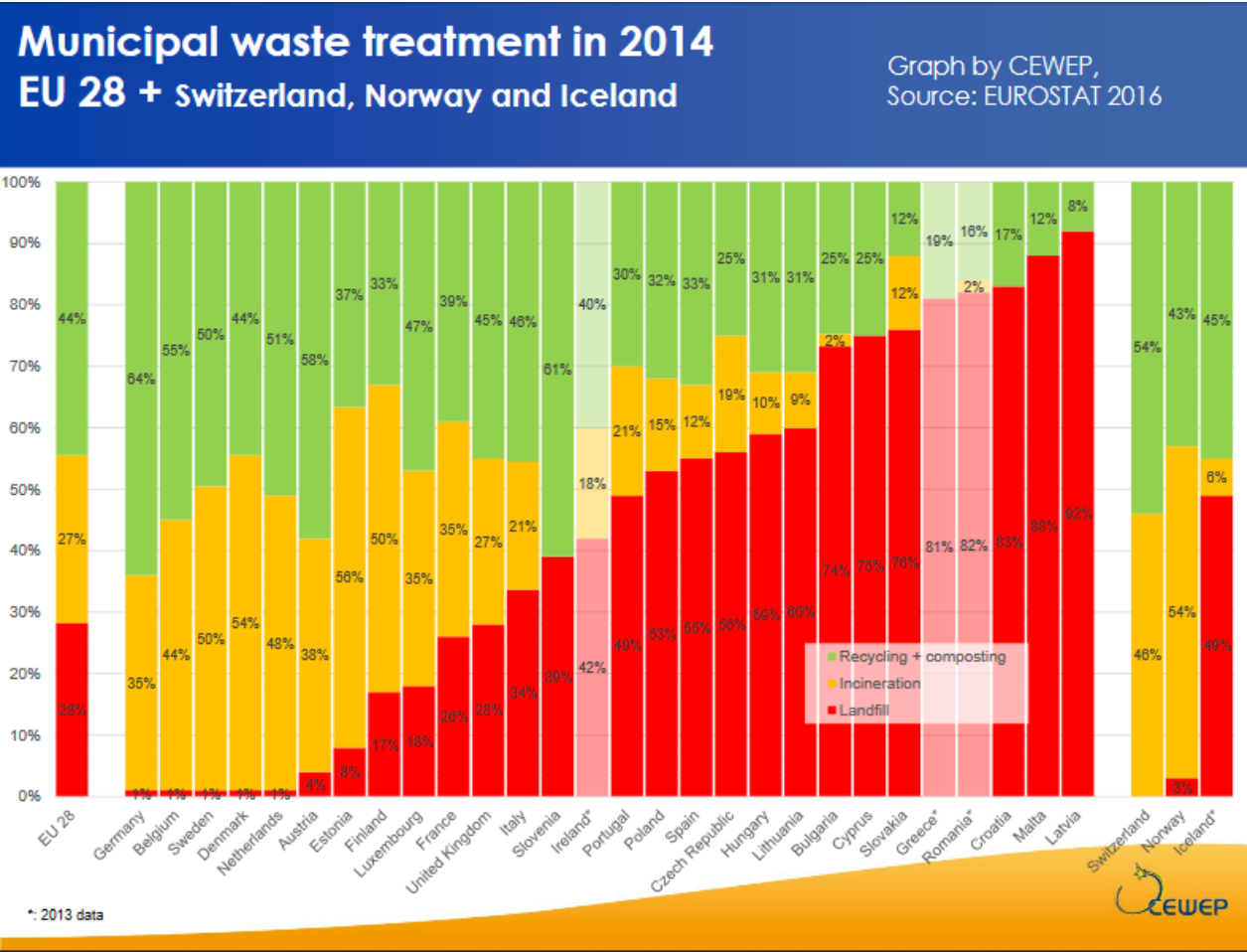


Large Scale Technologies Adopted Internationally

	Technology Scale	Economics	Present deployment
Combustion - Heat	+++	\$	+++
Combustion - Electricity	+++	\$\$	++
Biomass cofiring	+++	\$	+++
Gasification	++	\$\$\$	+
Pyrolysis	+	\$\$\$	+
Landfill Gas	+	\$	++
Anaerobic Digestion	+	\$\$	+++

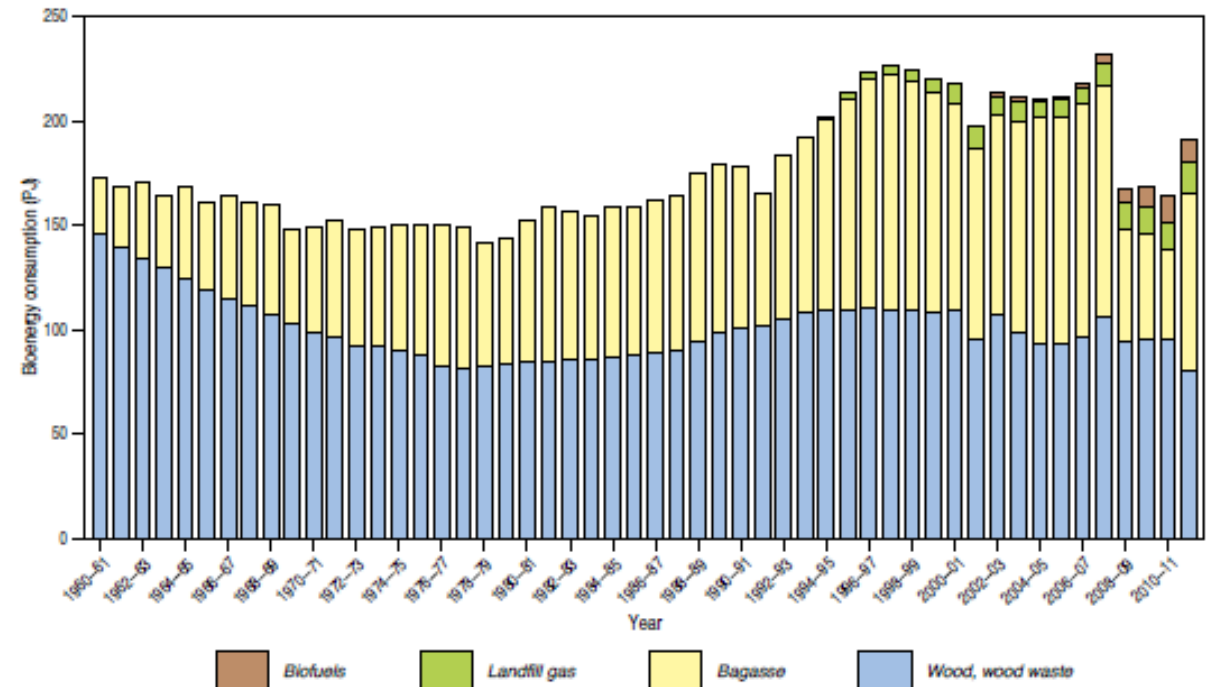


Municipal Waste to Energy in Europe



Technology Status in Australia

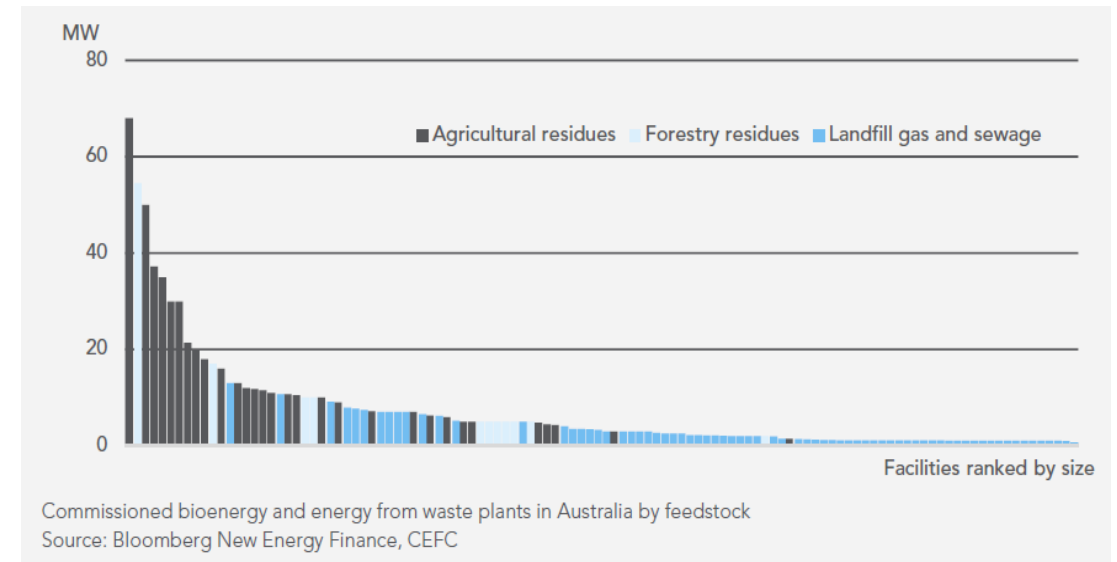
- Bioenergy Production
 - Majority (86%) from bagasse and wood waste.
 - Biogas ~8%
 - Biofuels ~6%
- Low growth
- Direct combustion without electricity production is most widely adopted at larger scale
 - Mainly grate fired boilers



From Australian Energy Resource Assessment

Technology Status in Australia

- Lots of smaller scale projects / applications
 - Landfill gas
 - Wood waste
 - Composting
 - Anaerobic digestion
 - RDF in cement kilns
 - Wood pelletisation
- No commercial-scale WtE plants processing MSW
 - Hundreds internationally



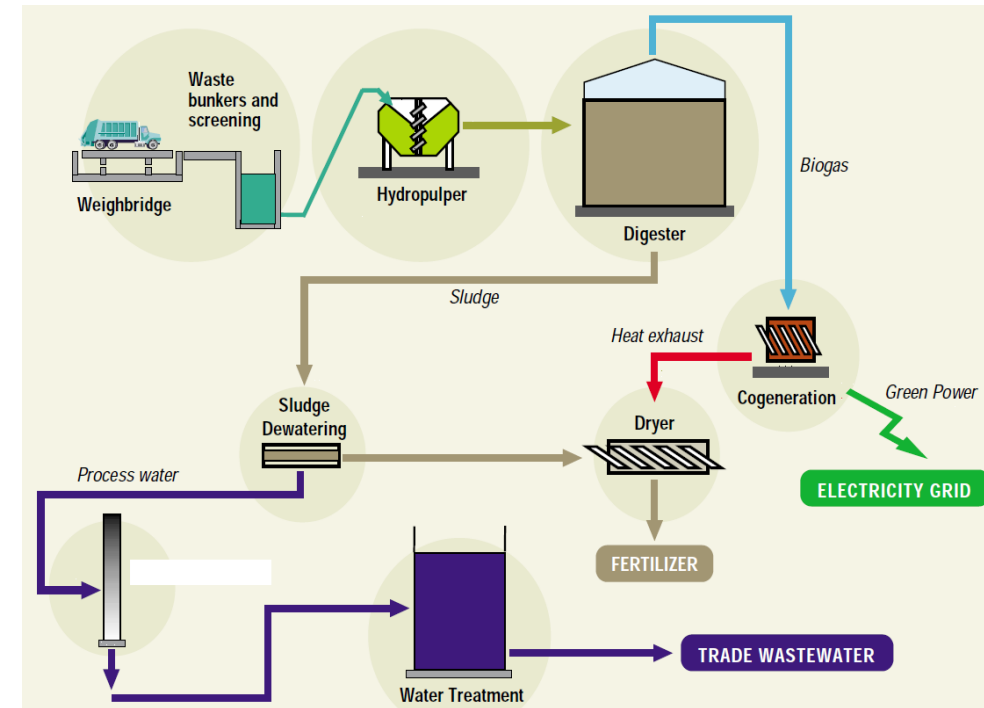
Case Study – Combustion of Grape Marc – Australian Tartaric Products

- Location - Mildura
- Feedstocks – Wine industry waste: spent marc (50,000 tpa)
- Process – Combustion (8MW)
- Product – steam / power
- Drivers
 - High fuel costs (LPG fired boiler)
 - Waste disposal requirements
 - Carbon emissions reductions
- Cost - \$11 million
- Energy costs – down \$2million per year



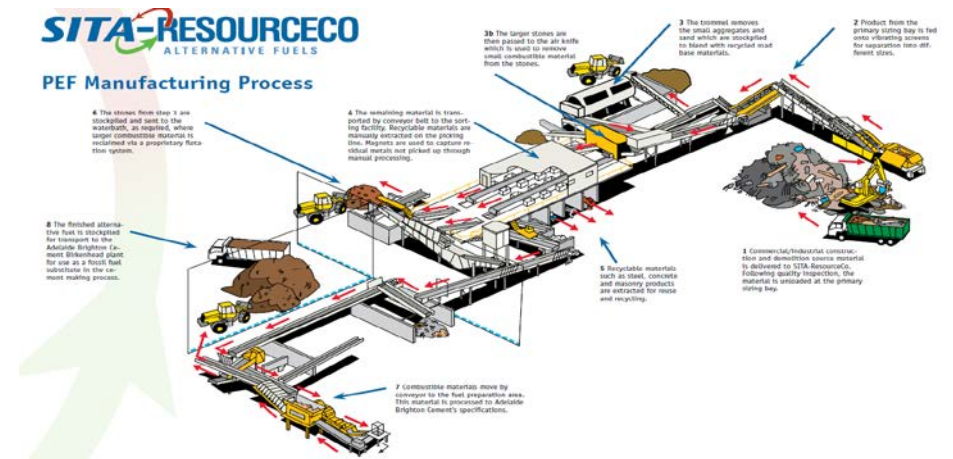
Case Study – Anaerobic Digestion for Organic Waste: EarthPower

- Location - Sydney
- Feedstocks – Liquid and solid organic wastes (82,000 tpa)
- Process – Anaerobic Digestion
- Product – Fertiliser, biogas, electricity
- Commissioned - 2003



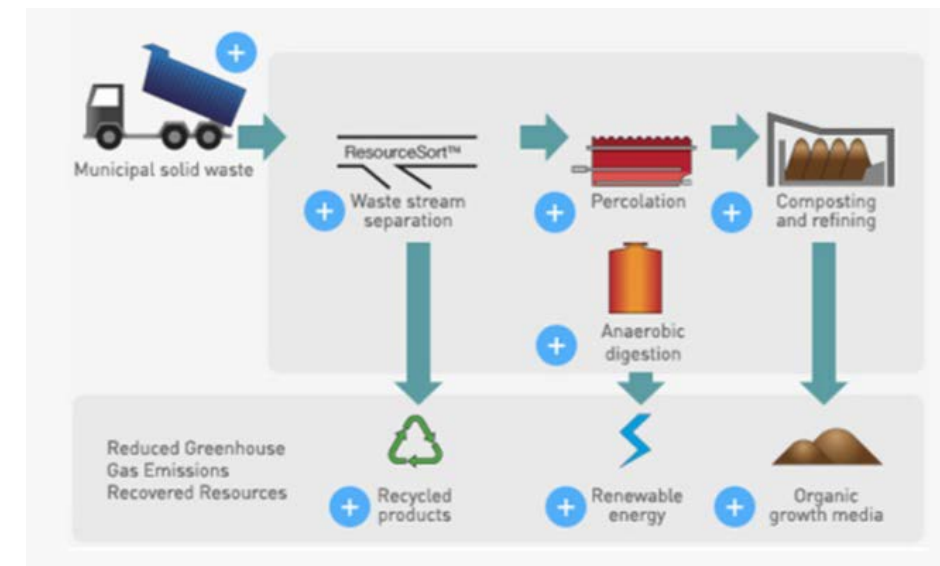
Case Study – Process Engineered Fuel: SITA Resourceco

- Location – Wingfield, South Australia
- Feedstocks – C&I Waste (up to 350,000tpa)
- Process – Mechanical (Sorting, recycling, PEF manufacture)
- Product – Recycled material, 85,000tpa PEF
- Market – Fuel replacement in cement kilns
- Cost - \$20 million in 2006



Case Study – Mechanical Biological Treatment – UR-3R Facilities

- Location – Eastern Creek, Sydney
- Feedstocks – MSW (220,000tpa)
- Process – Sorting and anaerobic digestion
- Product – Recyclables, compost, biogas, electricity
- Cost - \$100 million in 2004
- SITA operates at least 7 similar plants
- Technology is widely adopted in Europe
 - >330 facilities
 - 50,000 to 300,000tpa



Proposed Large Scale Projects in Australia

Proponent	Proposed Location	Estimated Cost	Waste feedstock (tpa)	Energy Outputs (MW)	Technology
New Energy	Port Hedland (WA)	\$180 million	60,000	16.6	Combustion
New Energy	East Rockingham (WA)	\$160 million	225,000	18.5	Combustion
Phoenix Energy	Kwinana (WA)	\$380 million	400,000	32	Combustion
Dial-a-Dump	Eastern Creek (NSW)	\$700 million	1,200,000	140	Combustion
City of Sydney	Sydney (NSW)	Unknown	42,000 MSW (minimum)	Unknown	Combustion

From MRA Consulting, CEFC

Factors which are Impacting Project Development

- Waste supply
 - Quality, quantity and cost
- Government Policy
 - Not consistent between states (waste to energy guidelines, waste levies)
- Product Demand and Price
- Capital costs (processing and meeting emissions)
- Community Acceptance
- Siting
- Technology Risk



From CEFC

Conclusions

- Bioenergy is less widely adopted in Australia than overseas
- There are many technologies proven at large scale
- There is significant scope to increase bioenergy use. However growth is currently low.
- Cost competitiveness will be a key requirement.
- Government policy will drive growth of bioenergy use.