

# INNOVATION FOR AGRIBUSINESS



# BIOGAS GENERATION AND APPLICATION



MAX BARNES  
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# ABOUT ME

Max Barnes

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All Energy Pty Ltd

Based in Brisbane, consultancy providing high level energy strategy and process engineering

Expertise in complex brownfields embedded generation, energy strategy and management, renewable thermal and power, and digital solutions



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# SCOPE

- Anaerobic digestion (AD) and its place among W2E options
- EU treatment
- Suitable feedstocks
- Recoverable energy
- By-products



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# MOTIVATION

ABS data shows in last 2 years, power prices up 14.5%, with nat gas up 11.2% vs CPI increase of 3.7%

Over last 10 years, CPI up 23% vs power at 110%

QLD rural tariffs as high as 54 c/kWh!

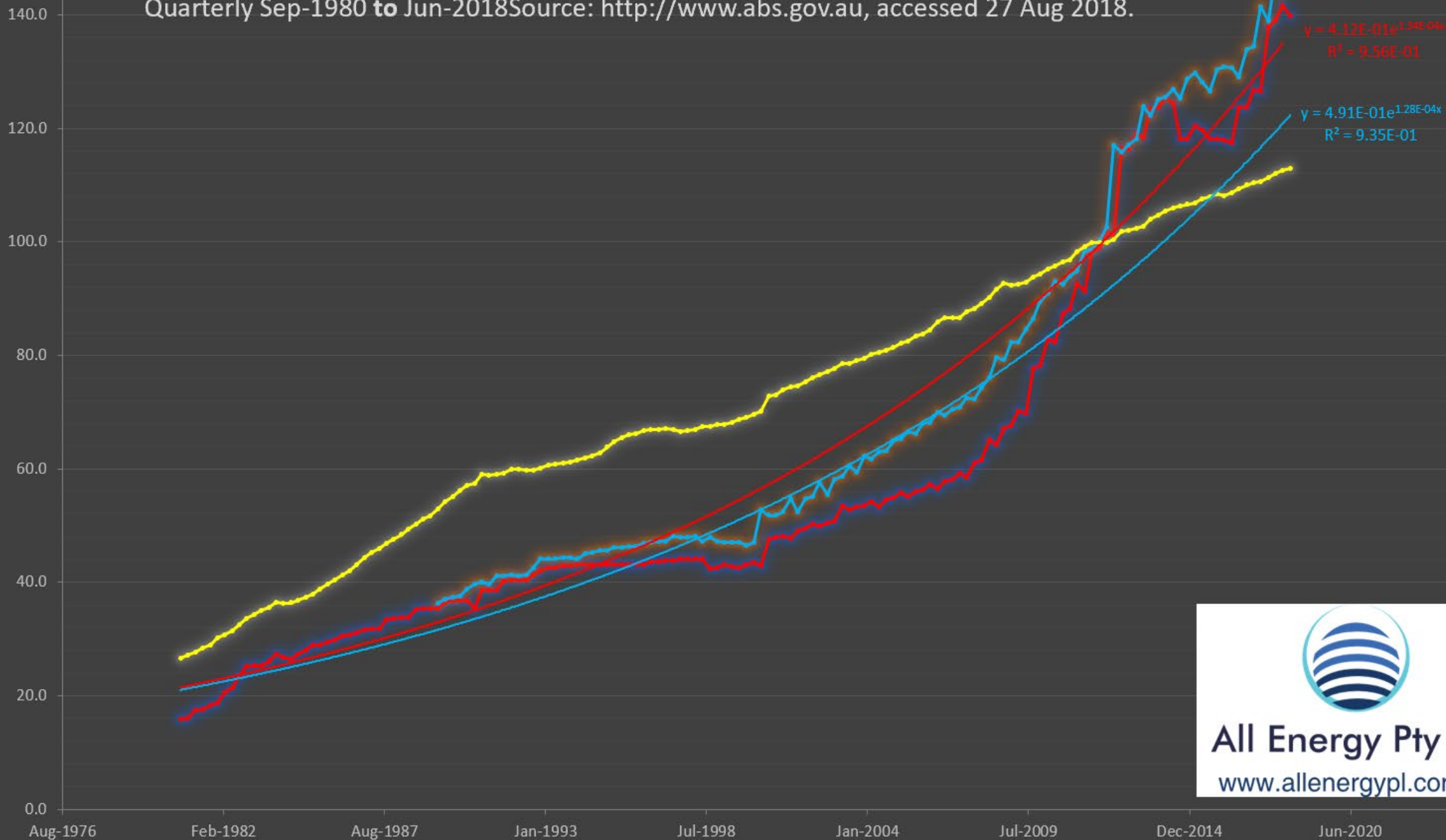


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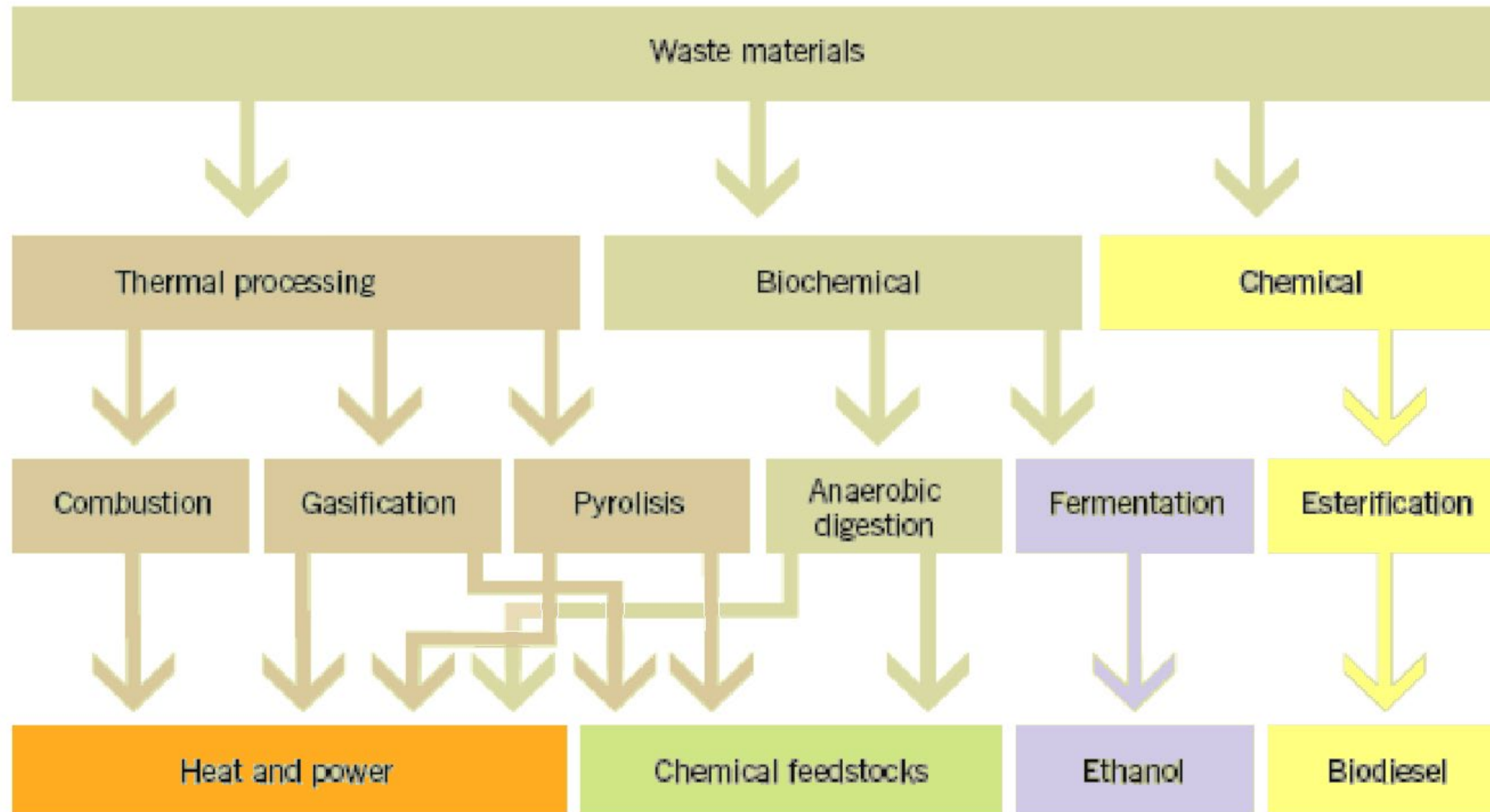
# Electricity - Australia (red), Gas & Other Household Fuels (blue); All Groups CPI - Australia (yellow).

Quarterly Sep-1980 to Jun-2018 Source: <http://www.abs.gov.au>, accessed 27 Aug 2018.



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# BROAD BIOMASS WASTE TO ENERGY (W2E) OPTIONS



# EU TREATMENT OF AD

European Commission publication “The role of waste to energy in the circular economy” (2017)

“ Waste to energy is a broad term that covers much more than waste incineration. It encompasses various waste treatment processes generating energy ... each of which has different environmental impacts and circular economy potential.”

"Improving the energy efficiency of waste-to-energy processes and promoting those processes which combine material and energy recovery can contribute to decarbonising key sectors ... and to reducing greenhouse gas emissions from the waste sector."

"Waste-to-energy processes can play a role provided that ... choices made do not prevent higher levels of prevention, reuse and recycling."



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# KEY TAKEAWAY

“processes such as anaerobic digestion which result in the production of a biogas and of a digestate are regarded by EU waste legislation as a recycling operation”



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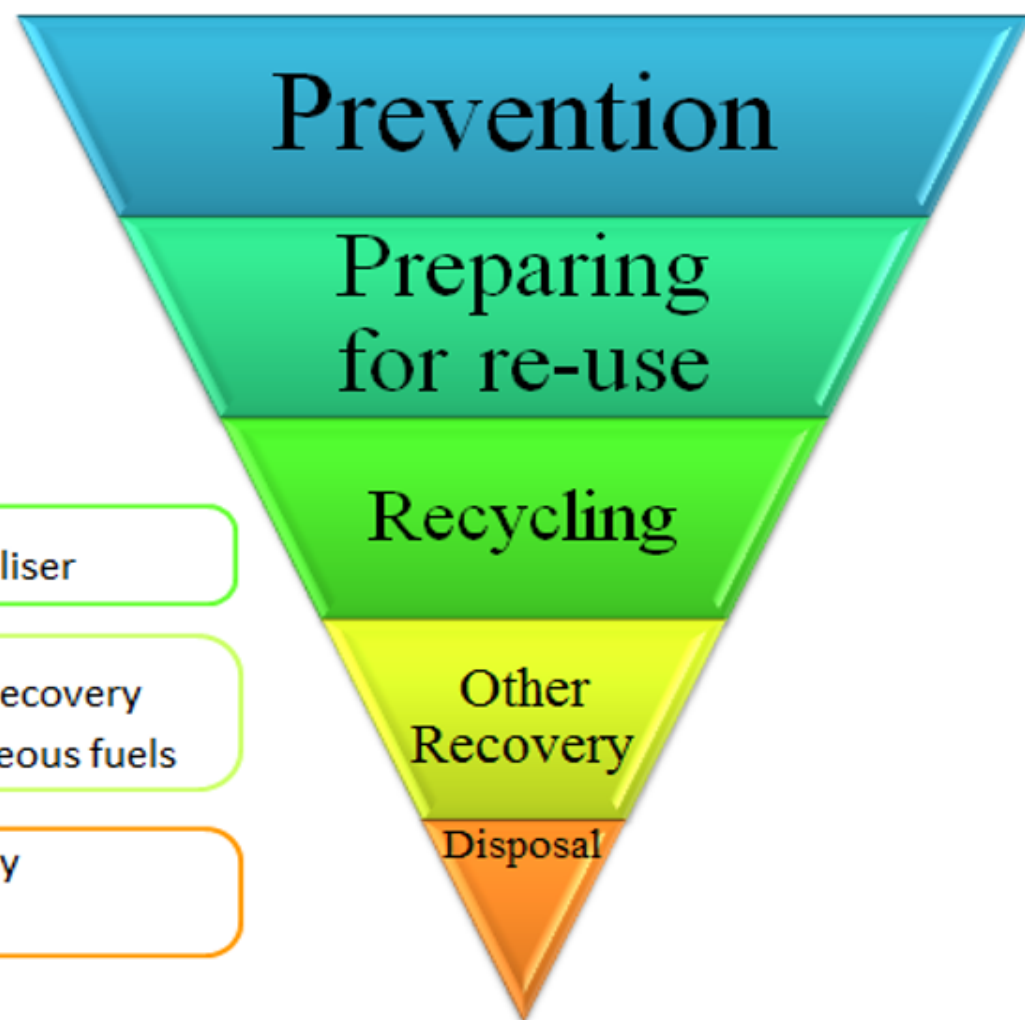


## Examples of waste-to-energy processes

Anaerobic digestion of organic waste where the digestate is recycled as a fertiliser

Waste incineration and co-incineration operations with a high level of energy recovery  
Reprocessing of waste into materials that are to be used as solid, liquid or gaseous fuels

Waste incineration and co-incineration operations with limited energy recovery  
Utilisation of captured landfill gas



# WHAT DOES THIS ALL MEAN?

Anaerobic Digestion ranks higher on the waste hierarchy as it involves energy and material (concentrated NPK digestate) recovery

Excellent choice for volatile waste organics

Let's look further at the technology...



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# FEEDSTOCKS

Ideal feedstocks are:

High solids content and volatile solids content (dry and fresh)

Organic

Steady supply

Food processing waste

Municipal organic waste (food scraps, green waste)

Grease trap waste

Water treatment wastes (activated sludge, DAF sludge)

Agri wastes

Waste streams are often varied and complex and should be considered on a case by case basis



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# RECOVERABLE ENERGY / MATERIAL

Biogas (CH<sub>4</sub> / CO<sub>2</sub> / trace species)

CNG

Pipeline

Generation

Co/Tri-Generation

Concentrated NPK Digestate

Composting

Cropping

What sort of revenues does this generate?



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# REVENUES

## Feedstock

Under landfill levy or for particularly problematic wastes, worst case delivered for free, best case charge gate fee

## Power / Thermal / Diesel Offset

Previous work has shown value of 1 m<sup>3</sup> of biogas as \$0.72 for boiler fuel (\$20 /GJ), \$1.39 and \$0.61 for peak (35 c/kWh) and offpeak (15 c/kWh) power respectively

Diesel offset greatest value at \$1.49 /m<sup>3</sup> (\$1.50 /L)

## Digestate

Not yet observed operator generating revenue from digestate



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# QUESTIONS?

Example plants

Operating conditions / parameters

Vendors



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# THANK YOU

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