

Biogas from Waste and Crops

NZ Biogas Strategy to 2040

BANZ Workshop

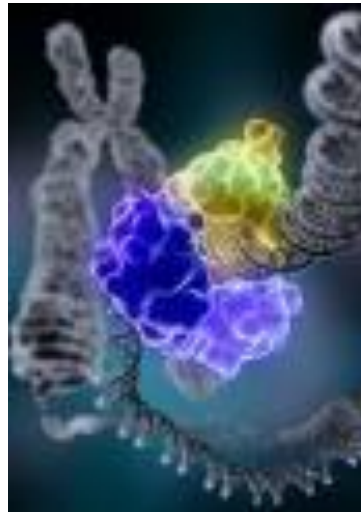
Wellington, 28.2.2011

by Guenter Wabnitz

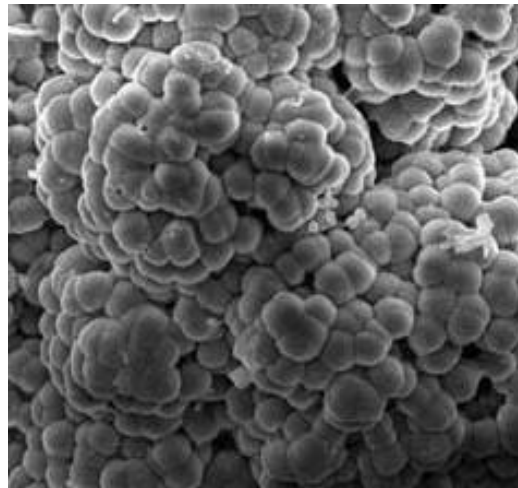
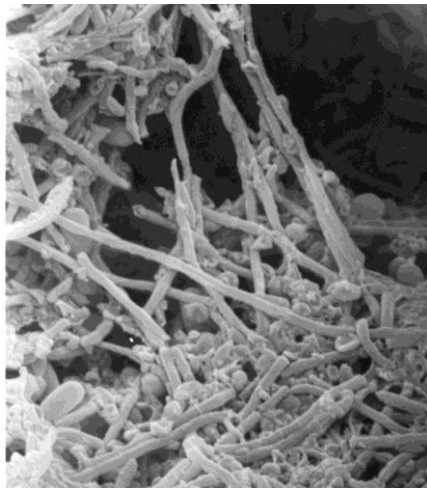


Anaerobic Bacteria

Methanogenic bacteria attached on protozoa



43



- a natural organism
- vigorous eaters and multipliers
- the most efficient converters of biosolids into useful energy,
- producing methane and CO₂

BANZ Biogas Interest Group



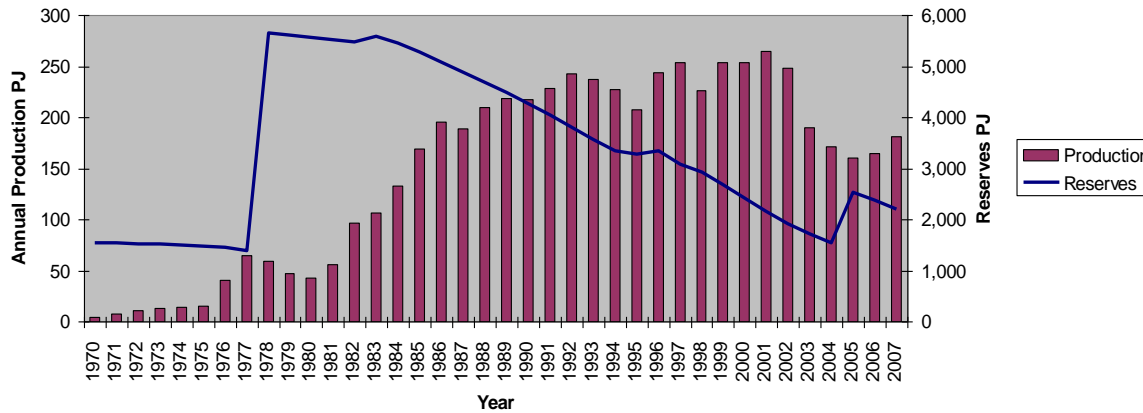
- BANZ Biogas Interest Group inauguration July 2008
- Committee started Nov 2008
- reviewed market
- assisted BANZ on strategy
- organised workshops
- provided point of contact
- provision of information
- biogas website

www.biogas.org.nz

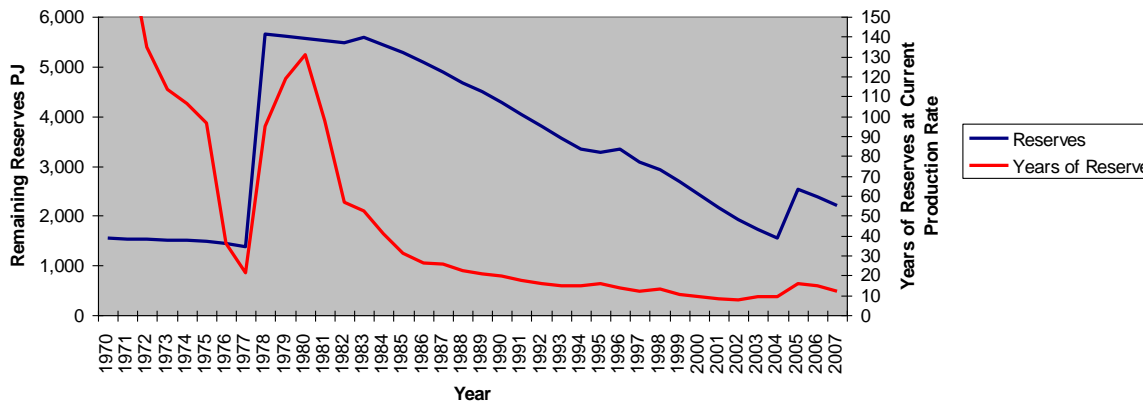
BANZ Biogas Workshop Hamilton July 2008
Fonterra's pond digester in Tirau
NZ's largest pond digester with a maximum rating of
6000 kW (thermal)

NZ Market

NZ Gas Production and Reserves

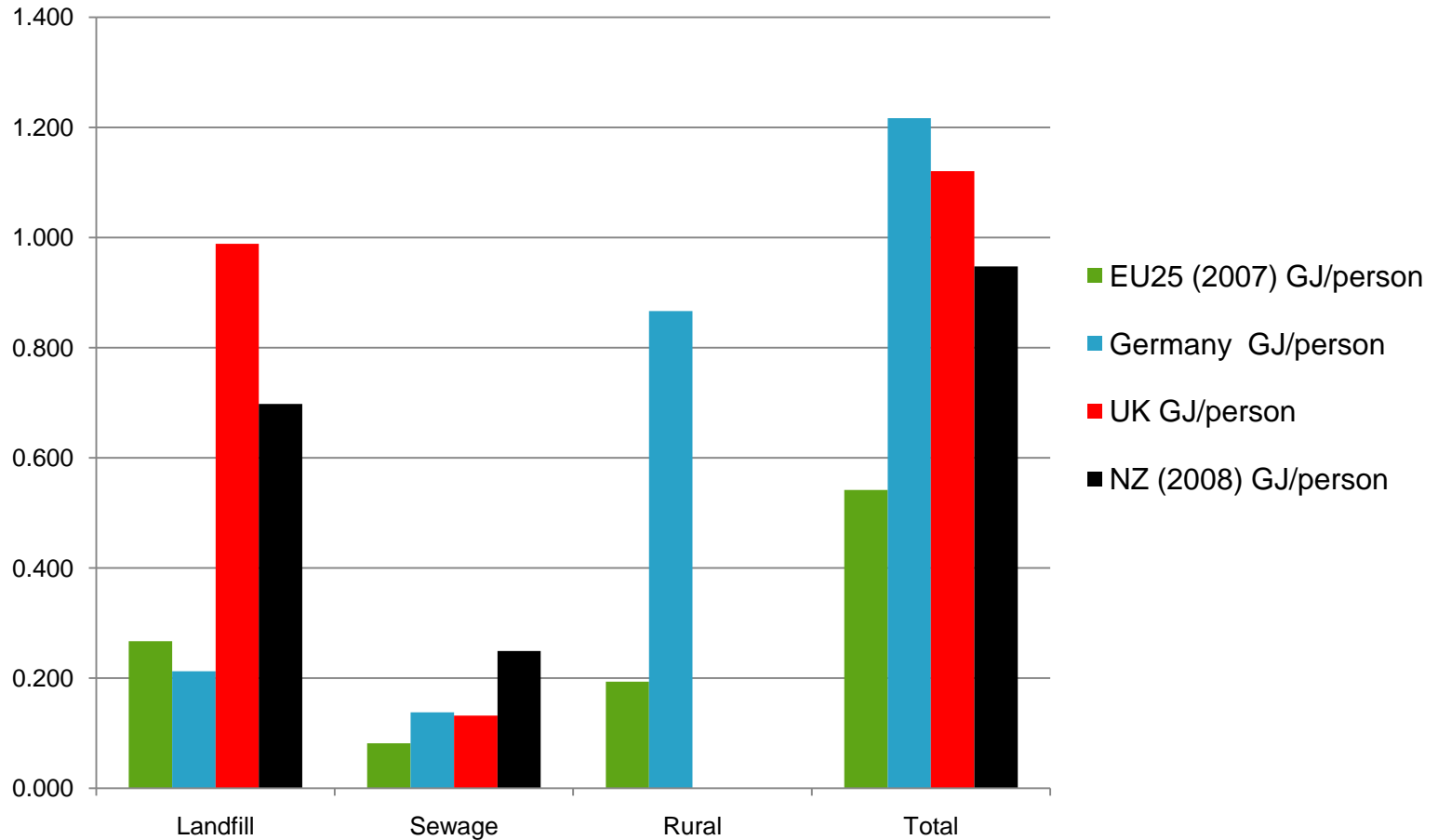


NZ Gas Reserves



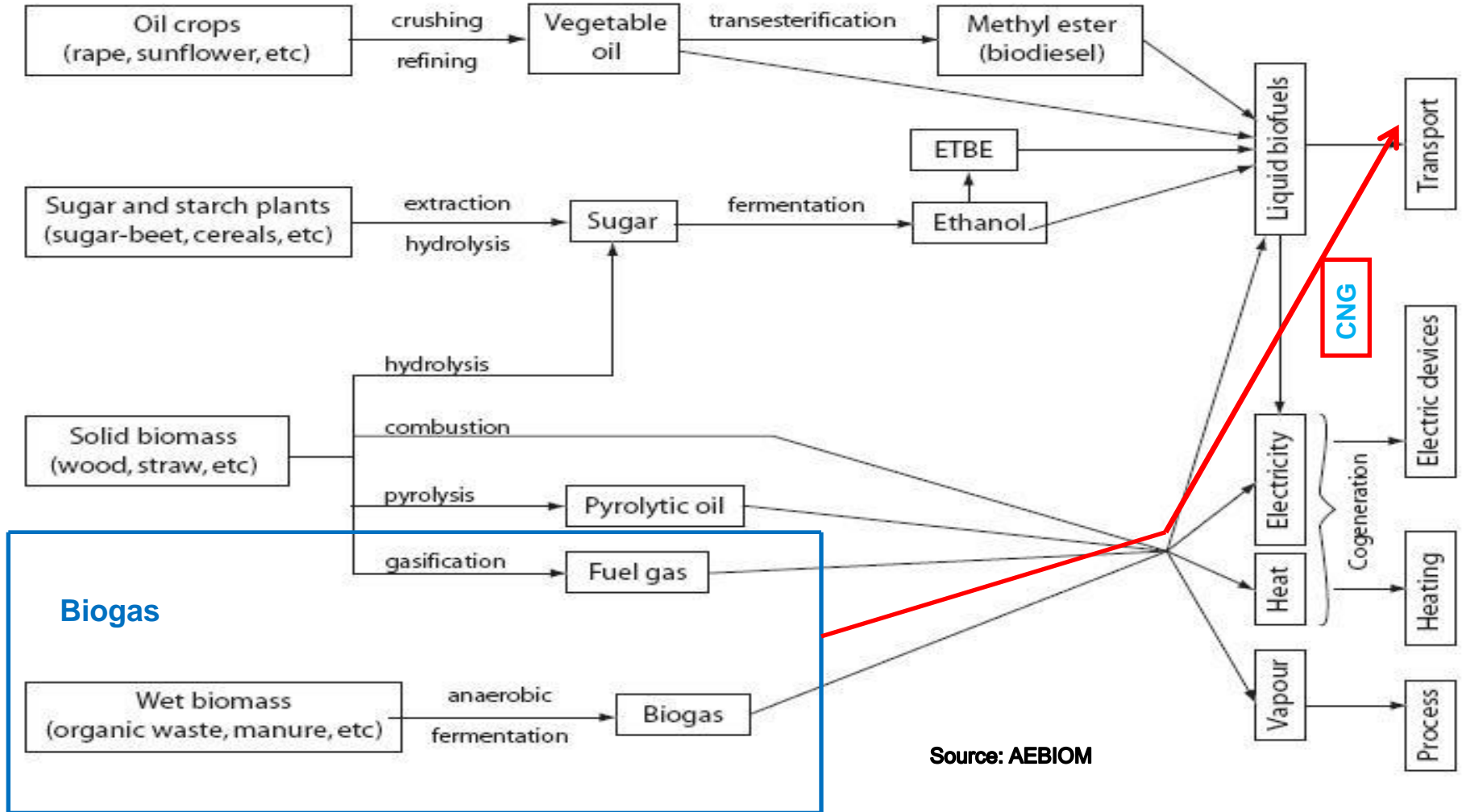
- oil prices rising
- NZ gas reserves depleting
- existing gas markets need security of supply
- existing infrastructure in good shape and efficient
- biogas can replace natural gas
- alternative markets for farmers
- environmental benefits
- local employment opportunities
- land fertility maintained with organic fertiliser

Annual Biogas Use in GJ/ Person by Country 2007/8



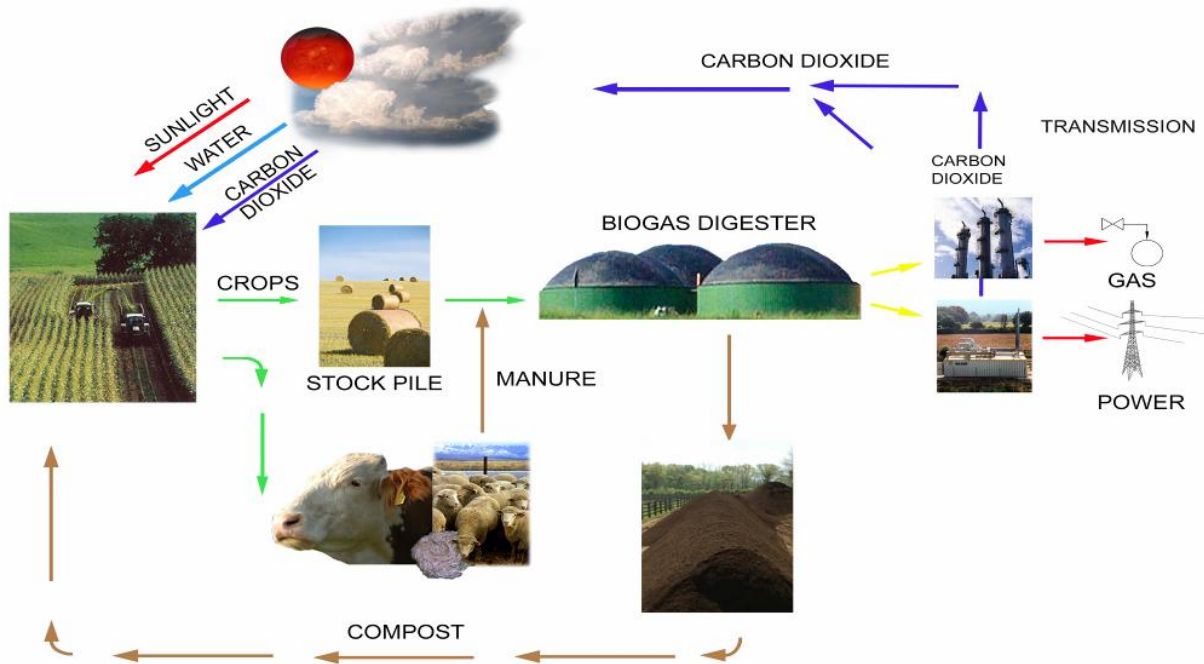
The Role of Biogas in the NZ Bioenergy Industry

Bioenergy routes



Source: AEBIOM

Carbon Neutrality and Sustainability of Biogas



- carbon recycling
- reduced emissions to air, water and land
- reduced demand of artificial fertilisers
- support of local economy
- carbon neutral energy
- reduced dependency from fuel imports
- local market choices
- optimised land use
- local use of power and heat
- appreciation of local ecology

Biogas Tradition: Waste Water Treatment Plants



- mature technology (early 1900s)
- anaerobic digestion of biosolids
- anaerobic digestion used as an efficient means of sludge reduction
- incineration of remaining biosolids
- vitrification of ash utilised in construction

Waste Water Treatment Plant Hamburg 2008

Landfill Gas Extraction in NZ from 3.5 to 7 PJ in 2040



Novagas LFG Flares



Wellington Landfill 2008

- starting in early 1990s
- NZ production about 3.5 PJ per year in 2010

Waste Water Treatment from 0.7 to 1.5 PJ by 2020



WWTP Christchurch

- biogas from landfill and WWTP jointly reticulated in a biogas pipeline network
- absorption chillers fired with biogas
- Council buildings energised with biogas:
- tri-generation of power, heat and cooling with biogas by City Council
- drying of biosolids with biogas and wood
- algae used for final stage water treatment
- biodiesel made from algae

Industrial Waste 1.5 PJ by 2030



Source: Biogas Nord

- organic sludge
- fruit processing waste
- meat waste
- dairy waste
- co-digestion with manure and energy crops
- co-operative local solutions
- mixing of high N_2 and carbon for better nutrient balance

Rural Waste and Residues: 3.5 PJ in 2040



An AD digester in Canterbury uses dairy waste (courtesy Natural Systems Ltd)

- suitable for high-density animal farming
- milking sheds, feed-lots,
- barn fed meat production
- reduced emissions to air, water and soil
- co-generation with plant residue
- improved flexibility
- reduced costs

Energy Crops: 15 PJ by 2040



- one decade of experience in Europe
- ongoing research on crops
- improved technologies
- reduced emissions
- reduced plant sizes
- improved flexibility
- reduced costs

Sorghum and maize crops for energy production

Establishment Phase 2010 - 2015



- prioritisation
- improved collection and utilisation technologies and regulations
- improved statistics
- market development
- economic analysis
- co-ordination of efforts
- funding of projects
- government engagement
- community engagement

1 MW power block at Happy Valley Wellington

Development Phase 2015 - 2020



- demonstration of new technologies
- tools and guidelines
- integrated systems
- trans regional biogas trading
- good operational practices
- industry leadership
- ongoing research and development

Watercare: Mangare Waste Water Treatment Plant
with NZ's largest biogas plant producing max
18 MW (thermal) or 7 MW (el.)

Expansion Phase 2020 - 2040



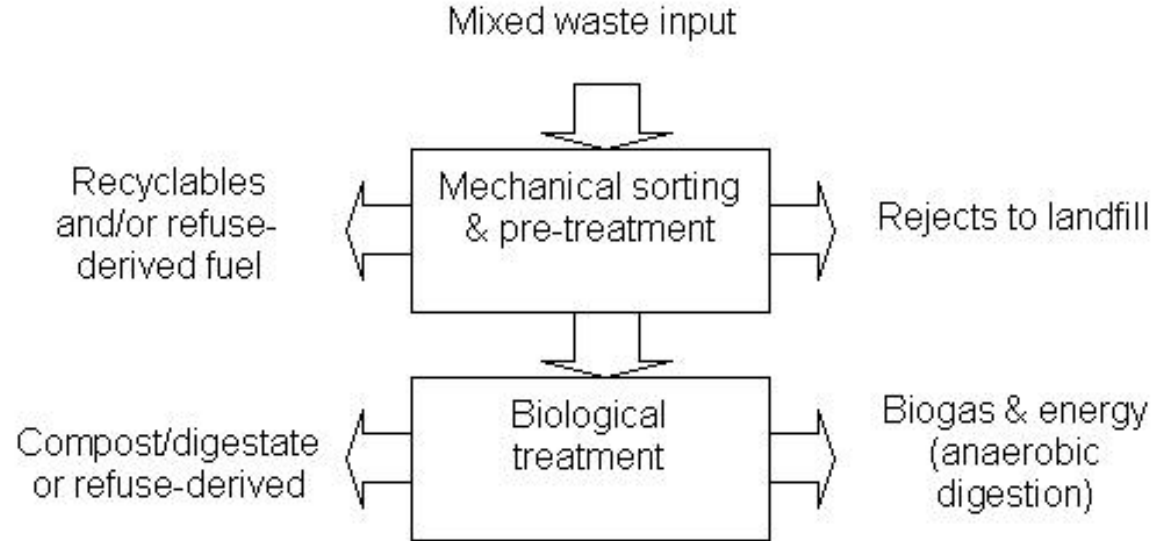
**BIRO, near Hannover, Germany:
2.5 MW (thermal) biogas treatment for local grid connection**

- regulations, e.g. feed-in tariffs;
- biogas upgrading to natural gas specification
- use of natural gas transmission networks
- gas storage in depleted gas reservoirs
- substitution of fossil fuels
- rural sector development to meet demand;
- “high value” biogas utilisation, e.g. CNG

Vision beyond 2040: MBT – Mechanical Biological Treatment



Waste segregation: MBT
Plant Lübeck, Germany



Inputs:

“Restmüll” – remaining waste

Outputs:

- biogas and power
- recyclable materials
- compost
- digestate and non-recyclable to landfill

Leadership and Knowledge Sharing by BANZ



- inter-sectoral collaboration
- co-ordinated project development
- international co-operation
- performance benchmarking
- public education
- policy development
- targeted research and development

biogas as a transport fuel